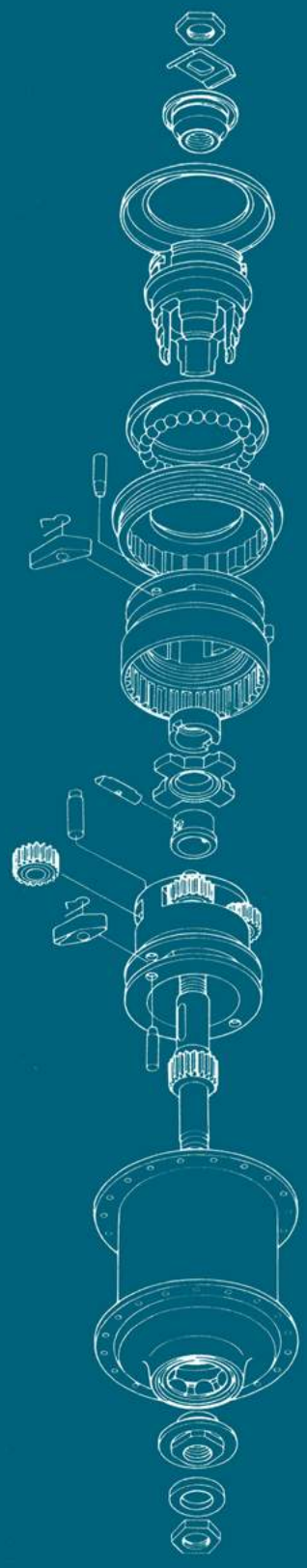
SUTHERLAND'S

HANDBOOK OF COASTER BRAKES and INTERNALLY-GEARED HUBS



SUTHERLAND PUBLICATIONS

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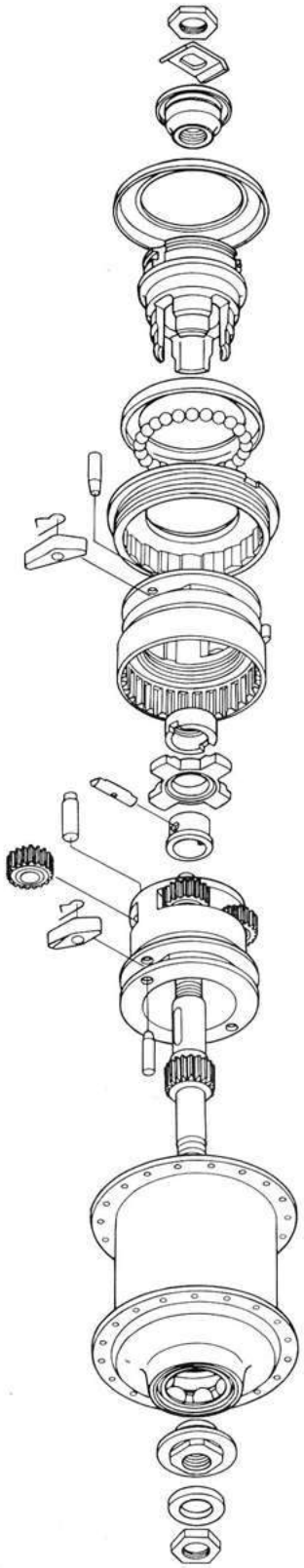

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Introduction

This book is for bicycle mechanics who need to service coaster brakes and internally geared hubs. It is designed so that people with mechanical skills can easily disassemble and assemble any hub they are likely to run across, and quite a few that they are not likely to run across.

A large part of this book was previously published as part of the fourth edition of Sutherland's Handbook for Bicycle Mechanics. We have had many requests to reprint this information. New hubs have also appeared since that edition was published. You will find everything that was in the fourth edition plus these new hubs.

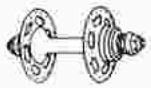
Ed Colaianni did most of the work you see here. He carefully put together nearly all of the assembly and disassembly instructions as well as making sure it was consistent. His dedication will not be forgotten. John Allen also contributed to the previous publication of this data. In addition to compiling many of the tables, he scoured the book for mistakes and made numerous helpful suggestions.

Holden & Holden Design has brought Ed's work up to date by writing and pasting up all the new material. Their cheerful competence and willingness to track down every last detail have made this book possible.

Most of this information has been used for many years by many mechanics so most mistakes will have been caught long ago. However, if you find any mistakes, even small ones, we would like to hear about them. Questions and comments are always welcome.

We are sure any bicycle shop that services bicycles will find this book to be a good investment.

September 1992



INTRODUCTION

HOW TO USE THIS SECTION

When working with a particular hub, follow the procedures under GENERAL NOTES below, then turn to the section devoted to that type of hub. Read the information in the section introduction, then proceed to the trouble chart and disassembly/assembly instructions for that hub.

When disassembling an unfamiliar hub without the aid of drawings, it is a good idea to thread the parts on a wire in the *order* and *orientation* that they were removed. Proceed carefully and note similarities and differences with hubs treated here.

Parts Interchangeability Charts

Charts are provided indicating interchangeability of individual parts between hubs or different models and from different manufactures. Parts names used are taken from manufacturer's literature and vary from brand to brand.

Assembly and Disassembly Instructions

Detailed instructions for overhauling most models of coaster brake and internally geared hubs are provided. Note that the assembly and disassembly instructions refer to the same drawings. Disassembly steps are numbered *down* the *left-hand* columns, assembly steps are numbered *up* the *right-hand* columns. Wherever possible, drawings show parts in the order they are to be removed and replaced. The same parts names are used in the associated parts chart.

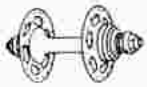
GENERAL NOTES

Chainline

Before removing a single-sprocket rear wheel check the chainline. A straight-edge held against the chainwheel should be parallel with the chain. If it is not, note amount and direction of misalignment so that it can be corrected later. *This test only works if chainwheel is true.* Out-of-true chainwheel will cause excessive wear just as a misaligned chain will.

Axle Nuts and Washers

When working on a wheel be sure to note the position of all axle spacers and nuts. If necessary, thread them on a wire to keep them in order and properly oriented.



INTRODUCTION (cont.)

Bearing Adjustment

Proper tools are essential. *Never grip axle thread in steel vise jaws.* Use an axle vise or brass or wood inserts to avoid damaging threads. Where possible, grip axle by flats or locknuts. Use cone wrenches on cone and locknut flats; use hook wrenches on the round notched locknuts found on Sachs (F & S) hubs and Sturmey-Archer coaster brakes.

To adjust bearings, hold axle firmly and tighten cone finger tight. Back off 1/4 turn, hold it with cone wrench, and lock it in place with locknut. Check bearing operation and side play. Axle should turn smoothly between thumb and forefinger; installed wheel should show a trace of side play at the rim. Tighten or loosen 1/8 turn if necessary. Some unthreaded cones have two locknuts. Adjust cone position with the first locknut and lock in place with the second.

Sprockets, Spacers, Snap Ring and Dust Cap

Most sprockets are held on the driver by 3 lugs and a snap ring. To remove a lugged sprocket, pry snap ring loose with a thin-bladed screw driver. Place one finger over axle to prevent snap ring from flying off.

Older sprockets are right-threaded and held in place by a left-threaded lockring. To remove threaded sprocket, unscrew lockring *clockwise*, then unscrew sprocket *counter-clockwise* with sprocket tool. On freewheeling hubs without a coaster brake it is necessary to remove the driver to unscrew a threaded sprocket.

Note carefully the orientation of a dished sprocket (dished *in* or dished *out*) and the position of all spacers. Improper chainline can be corrected by rearranging spacers and/or reversing dished sprocket. Misaligned chain will cause excessive wear. For sprocket data see parts charts under the hub type and the Sprocket Interchangeability chart on 1-3.

Cleaning Parts

Never use gasoline. It is simply too explosive. An enclosed parts cleaning tank is essential for safe and efficient work. Find a supplier under *degreasing equipment* in the Yellow Pages of the phone book. Always clean the outside of the hub shell: it is the only part of the job that anyone will see.

INTRODUCTION (cont.)

INTERCHANGEABLE 3-LUGGED SPROCKETS, SNAP RINGS AND SPACERS

Sprockets	Sachs (dished 1/8")	Sturmey-Archer (dished 1/16")	Shimano (dished 1/8")	NK 3-speed (dished 1/16")	Sun Tour (dished 1/16")	Karat (specify flat or dished 1/8")
12T	see note[4]					170-12[3]
13T	see note[4]	HSL 713[3]	321 0380			170-13[3]
14T	see note[4]	HSL 714[3]	321 0300			170-14[3]
15T	see note[4]	HSL 715[3]	321 0310[2]			170-15
16T	1004 035 000[1]	HSL 716	321 0320	291	40111601	170-16
17T	1004 047 000[1]	HSL 717	321 0330			170-17
18T	1004 031 000[1]	HSL 718	322 0340	293	40111801	170-18
19T	1004 032 000[1]	HSL 719	322 0350	294	40111901	170-19
20T	1004 033 000[1]	HSL 720	322 0360	295	40112001	170-20
21T	1004 034 000[1]	HSL 747	321 0370			
22T	1004 046 000[1]	HSL 722	333 4900			
Spacer	0518 018 000, J116	HMW 127		30	40112901	
Snap Ring	0512 011 000, DR 616E	HSL 721	321 2100	31	40112911	108

[1] Available flat under a different part number
[2] Also available flat as 321 0311
[3] Flat only
[4] Parts listed are all interchangeable although smaller dished sprockets may not fit with dish toward hub. Bendix, NK coaster brake and New Departure sprockets look similar but do not interchange with the above.

Torque settings

Hub locknut should be tightened to 175-220 inch pounds. Wheel mounting axle nuts should be tightened to 240-300 inch pounds.

Hub Shifters

Triggers, cables, bell cranks and indicator chains are not generally interchangeable between brands. Within each brand parts are interchangeable individually except as noted below. In addition, Sachs and Bendix 3-speed hubs and 3-speed coaster brakes (pages 5-1, 5-3) are copies of each other with all parts interchangeable; the same is true of the numerous Sturmey-Archer copies.

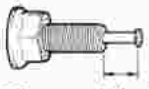
INTRODUCTION
HUB SHIFTERS (cont.)

SHIMANO (all models, with or without coaster brake)

Except for Positron shifter parts, which must be used together or not at all, all Shimano triggers and bell cranks are individually interchangeable. Any hub, including Positron hubs, can be used with any shifter assembly.

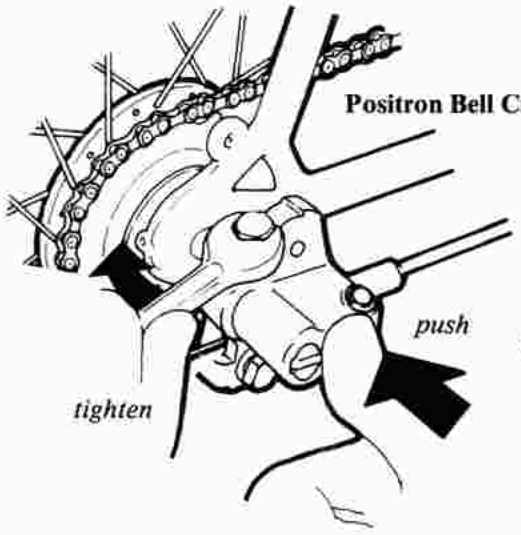
Push Rods
With the appearance of different length axles, different length push rods have also been introduced. When inserted loosely, the proper length push rod protrudes 10–12 mm ($^{13}/_{32}$"–$^{15}/_{32}$").

Push Rod Length

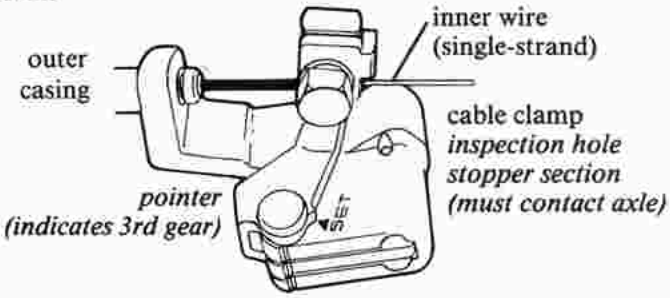


11 mm ($^{7}/_{16}$")

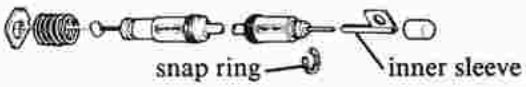
Bell Cranks
Positron bell crank. Positron bell cranks must be used with Positron cable and triggers, but the combination can be used on any Shimano hub. The indexing ("click") action is provided by the bell crank mechanism, rather than in the trigger as in all other systems. The trigger slides smoothly from *1* to *3* and the single-strand Positron cable pulls or pushes the bell crank paddle as required.



Positron Bell Crank (bottom view)



Cable Detail

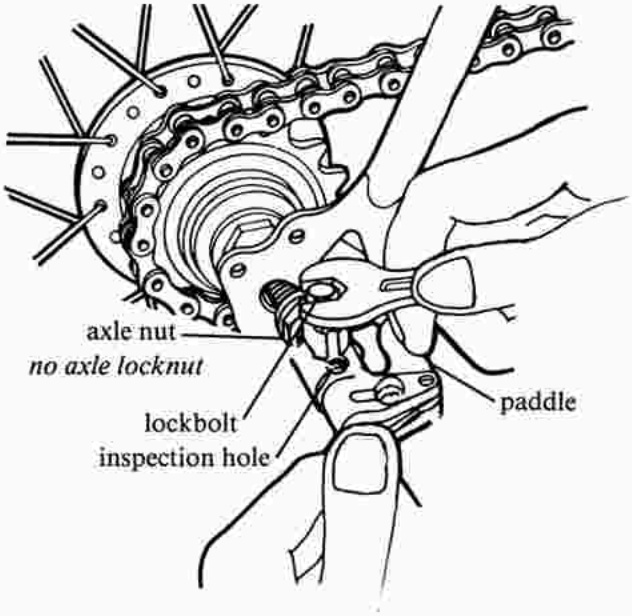


To install the Positron bell crank, first make sure the lockbolt is backed out, then insert the proper length push rod and slip the bell crank over the end of the axle (coaster brake hubs take the bell crank on the left side). Rotate the bell crank to line up with the cable, push inward until bell crank stopper section contacts the end of the axle (as visible through inspection hole) and tighten lockbolt firmly. Be aware of damage to axle threads. Recheck for contact. Click bell crank into 3rd gear position (marked SET), then connect and adjust cable.

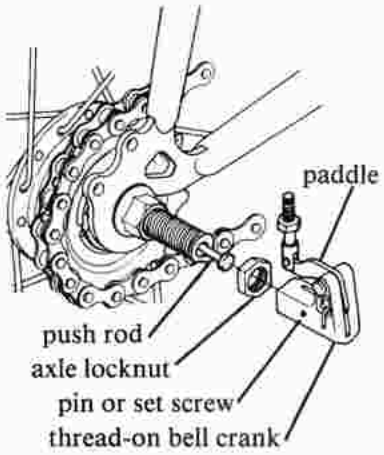
INTRODUCTION
HUB SHIFTERS
SHIMANO (cont.)

Lockbolt (non-threaded) bell crank. Lockbolt bell cranks cannot be used with Positron cable or triggers, but do work with Positron hubs. They install like Positron bell cranks (above) but use the cable and trigger indexing of the threaded bell cranks (below). Note that no axle locknut is used. Be sure to check inspection hole for contact between axle and stopper section.

Lockbolt Bell Crank
push on hard and tighten



Threaded Bell Crank



Threaded bell crank. Threaded bell cranks cannot be used with Positron cable or triggers, but do work on Positron hubs. Thread on by hand until pins or set screws bottom on the end of axle (make sure locknut is clear of bell crank). Back off 1/8 to 5/8 of a turn to proper position for cable alignment. Tighten locknut counterclockwise against bell crank. Attach cable.

Triggers and Cable

All Shimano shifter parts except Positron are individually interchangeable, although single-ended cables require the universal cable clamp at the bell crank end. Positron shifter parts are not interchangeable individually with any others, but the Positron trigger-cable-bell-crank assembly can be used with any hub. Note that the special solid, push-pull cable has a minimum turning radius of 3″ (7.5 cm) and the 4″ (10 cm) nearest the trigger must be straight.

HUBS

INTRODUCTION
HUB SHIFTERS (cont.)
STURMEY-ARCHER

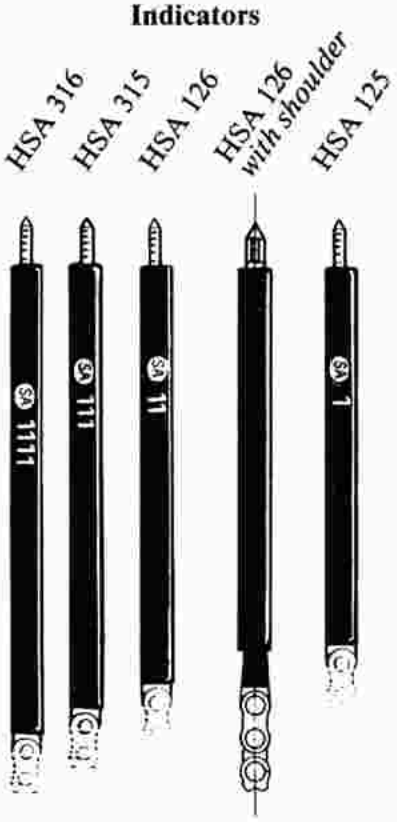
Sturmey-Archer and a number of other manufacturers make shifter parts for Sturmey-Archer-type hubs. These parts are generally all interchangeable.

Indicators and Push Rods

Hub Type \ Axle Length	mm	inches	mm	inches	mm	inches
	146	5 3/4	152	6	158.8	6 1/4
	148	5 13/16	154	6 1/16	160	6 5/16
	149.2	5 7/8	155.6	6 1/8	161.9	6 3/
3-Speed	HSA	125			HSA	126
S3C			HSA	126	HSA	315
TCW	HSA	125			HSA	126
S5/2						
Right side	HSA	125	HSA	126	HSA	315
Left side	HSA	126	HSA	126	HSA	316
S5.1						
Right side	HSA	125	HSA	125	HSA	126
Left side	HSA	126	HSA	126	HSA	316
S5 (early)						
Right side	HSA	125	HSA	126	HSA	126
Left side*	HSA	266	HSA	266	HSA	267
S5 (late)						
Right side	HSA	125	HSA	126	HSA	126
Left side†	HSA	287	HSA	287	HSA	288
4-Speed	HSA	136‡			HSA	137‡

*Threaded push rod under stamped bell crank.
†Push rod with head like a nail under machined bell crank.
‡Takes gear indicator coupling HSA 149.

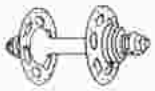
Indicators



Actual Size
for direct comparison

Indicator chains (all models). Indicator chains come with four different length indicator rods (see charts). Older units may not bear the length markings now in use. Use the proper length indicator whenever possible. If the correct length is not installed, the hub must be adjusted by centering the "dead spot" instead of aligning the ends of the rod and axle (see page 4-3 or 5-3). An undersized indicator rod will always work, though it may be difficult to thread in. An oversized indicator rod may prevent low gear from engaging properly. This occurs if the rod protrudes so far past the end of the axle that the indicator chain pulls it at an angle. The shoulder present on some HSA 126 indicator rods marks the length of the shorter HSA 125 and can be used for adjustment when that substitution is attempted.

Push Rods and Bell Cranks (S5 only). Four different push rods and three bell cranks were made for the left-side control of the S5 five-speed hub, but replace by indicator chains in the S5.1 and S5/2. See page 4-23 for parts interchangeability and conversion information. Push rods are listed with indicators in the chart above.



Hub	Trouble Chart page	Exploded Drawing page	Parts Interchangeability Chart page	Disassembly and Assembly Instructions page	Cleaning, Points to Check and Lubrication page	Axle Thread Size
Bendix	2-3	2-20	2-21	2-22	2-23	⅛" x 24 TPI
Centrix (see Sachs Jet)						⅜" x 26 TPI
Hawthorne (see NK)						
Karat (see Centrix)						
Mattatuck (see NK)						
New Departure (see NK)						
NK	2-4	2-30	2-30	2-32	2-33	⅛" x 24 TPI
NK Super Model 120	2-4	2-31	2-31	2-32	2-33	⅜" x 24 TPI
Perry	2-4	2-24	2-25	(see Sturmey-Archer SC)		⅜" x 26 TPI
Sachs (F&S)						
Komet Super	2-3	2-6	2-7	2-8	2-9	note[1]
Sachs Jet	2-3	2-6	2-7	2-8	2-9	
Torpedo	2-5	2-25	2-25	See Sturmey-Archer SC)		
Torpedo Boy	2-3	2-6	2-7	2-8	2-9	
Schwinn Approved (see Sachs (F&S) Komet Super)						⅛" x 24 TPI
Schwinn Approved Mark IV (see Sturmey-Archer SC)						⅜" x 26 TPI
Shimano						
Type A, B or D	2-3	2-11	2-10	2-14	2-16	⅜" x 24 TPI
Type E	2-3	2-11	2-10	2-14	2-16	⅜" x 24 TPI
Mighty Mite	2-3	2-13	2-13	(similar to Type B)		⅜" x 24 TPI
Sturmey-Archer						
SC	2-5	2-24	2-25	2-26	2-27	⅜" x 26 TPI
SC1	2-3	2-24	2-25	2-28	2-29	⅜" x 26 TPI
Styre (see Sturmey-Archer SC)						
Sun Tour	2-3	2-17	2-17	2-18	2-19	⅜" x 24 TPI
Torpedo (see Sachs (F&S) Torpedo)						

BRAKE ARM MOUNTING

Coaster brakes have a brake arm which prevents the left-hand cone and axle from turning when the brake is applied. Attach the brake arm and axle nuts finger-tight before cinching down either. Make sure that the brake arm clamp will not pull the brake out of line as this will cause severe bearing alignment problems. Tighten axle nuts first, then brake arm clamp.

[1] Available with either *German Thread* ⅜" x 26 TPI or *American Thread* ⅜" x 24 TPI.

COASTER BRAKE TERMINOLOGY (by Manufacturer)
Numbers in parenthesis refer to parts chart and exploded drawing.

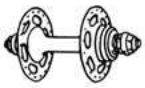
Sachs (F & S)	Shimano	Sun Tour	Bendix	Sturmey-Archer SC	Sturmey-Archer SC1	NK	Function
Driver, Inner Hub Barrel (12)	Driver (14)	Driver (12)	Drive Screw (15)	Driver (18)	Driver (18)	Driving Screw (13)	Transfers rotation from sprocket into hub mechanism.
Driving Cone (10)	Clutch Cone (12)	Clutch Cone (9)	Drive Clutch (12)	Driver Roller Assembly (19-20)	Brake Actuator (16)	Screw Cone (11)	Transfers rotation from driver to hub shell when pedalling forward.
			Drive-End Expander (8)	Actuator Roller Assembly (16)		Brake Clutch (9)	Squeezes braking surfaces together when back pedalling.
Brake Cylinder Assembly (9)	Clutch Spring (8)	Clutch Spring (7)	Retarder Spring (11)		Actuator Spring (15)	Clutch Band (10)	Senses driver direction (forward or backward) and engages appropriate clutch.
	Brake Shoe Assembly (10)			Brake Band (14)	Brake Band (14)		Rubs when braking.
		Brake Shoes (8)	Brake Shoes (9)				
						Brake Disc Set (8)	
Brake Cone, Lever Cone (7)	Brake Cone (7)	Brake Cone (6)	Anchor-End Expander (7)	Brake Cone (8)	Brake Cone (8)	Brake Disc Holder (6)	Keeps stationary braking surface from moving.
Brake Lever, Brake Arm (4)	Brake Arm (4)	Arm (3)	Brake Arm (4)	Brake Arm, Torque Arm (7)	Brake Arm, Torque Arm (7)	Brake Arm (4)	Holds brake cone or disc holder stationary.

INTERNAL EXPANDER TYPE COASTER BRAKES[2] TROUBLE CHART

Symptom	Possible Causes[1]: Resulting from wear, improper lubrication or abuse	Possible Causes[1]: Resulting from improper assembly or installation
No brake (pedals slip backwards)	Keys or teeth on expanders, brake clutch or brake cylinder worn or damaged	
	Hub flanges loose on hub shell body	Retarder spring reversed or missing
	Stripped threads or splines or threads on sprocket	
Forward drive slips	Retarder spring worn or damaged	
	Drive screw or clutch threads worn or damaged	
Hub whines while coasting	Hub shell tapered surface worn or gouged	
Forward drive will not release	Axle bent	
	Bearing cones too tight	
Grinding, cracking noises	Chain too tight	
Hub binds and drags	Ball retainer damaged or broken	Ball retainer reversed
	Broken parts inside hub	
	Dustcap bent	
		Retarder spring reversed
Brake grabs	No lubrication	
Brake squeak	Brake arm loose at frame	
	Braking surfaces worn, glazed or burred	
	Improper lubrication—too slippery	
Poor braking	Tapered surfaces of expanders or brake shoes burred	
	Brake parts worn	
Too much reverse pedal travel	Adjusting cone too loose	

[1] Bendix, Sachs (F & S), Shimano, Sun Tour, Sturmey-Archer SC1

[2] See Coaster Brake Terminology chart for parts numbers.

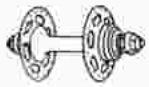


HUBS

NK MATTATUCK and NEW DEPARTURE MULTIPLE DISC COASTER BRAKE TROUBLE CHART

Symptom	Possible Causes[1] Resulting from wear, improper lubrication or abuse	Resulting from improper assembly or installation
	Brake disc (8) tabs worn off	
	Screw cone (11) or brake clutch (9) teeth worn or damaged	
No brake (pedals slip backwards)	Hub flanges loose on hub shell body	
	Sprocket splines stripped	
	Clutch band (10) weak or bent	
Forward drive slips	Driver (13) or screw cone (11) threads worn or damaged	
Hub whines while coasting	Hub shell or screw cone (11) tapered surface worn or gouged	
Forward drive will not release	Axle bent	
	Adjusting cone (19) too tight	
Grinding, cracking noises	Chain too tight	
Binds and drags	Ball retainer damaged or broken	Ball retainer reversed
	Broken parts inside hub	
	Dustcap bent	
	No lubrication	
Brake grabs	Brake arm (4) loose at frame	
Brake squeaks	Brake discs (8) worn, glazed, polished or burred	
	Improper lubrication—too slippery	Brake discs (8) improperly stacked
Poor braking	Brake clutch (9) or screw cone (11) teeth worn	
	Brake parts worn	
Too much reverse pedal travel	Clutch band (10) weak	Too few disks (8)
	Adjusting cone (19) too loose	

[1] Parts numbers in parenthesis refer to parts chart and exploded drawing.

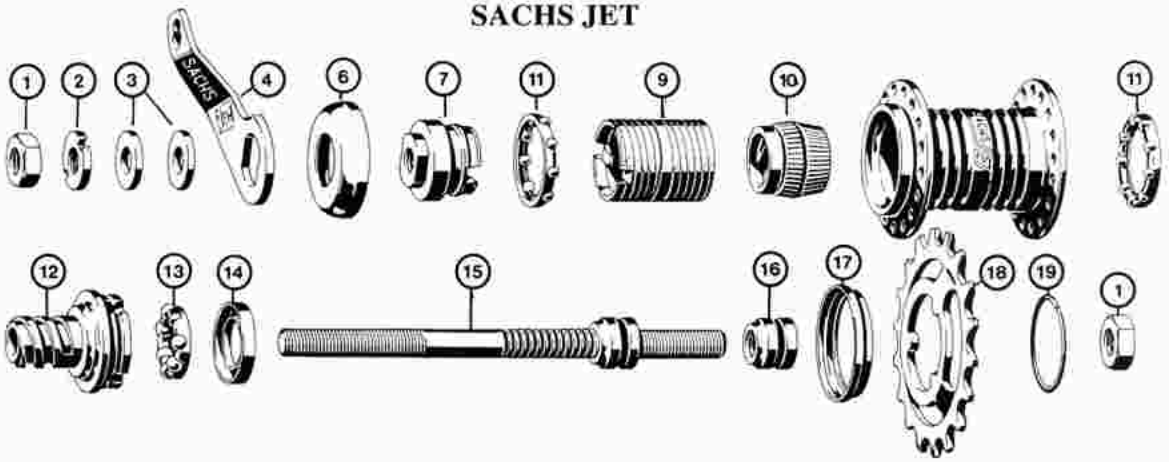


STURMEY-ARCHER SC ROLLER DRIVE COASTER BRAKE TROUBLE CHART

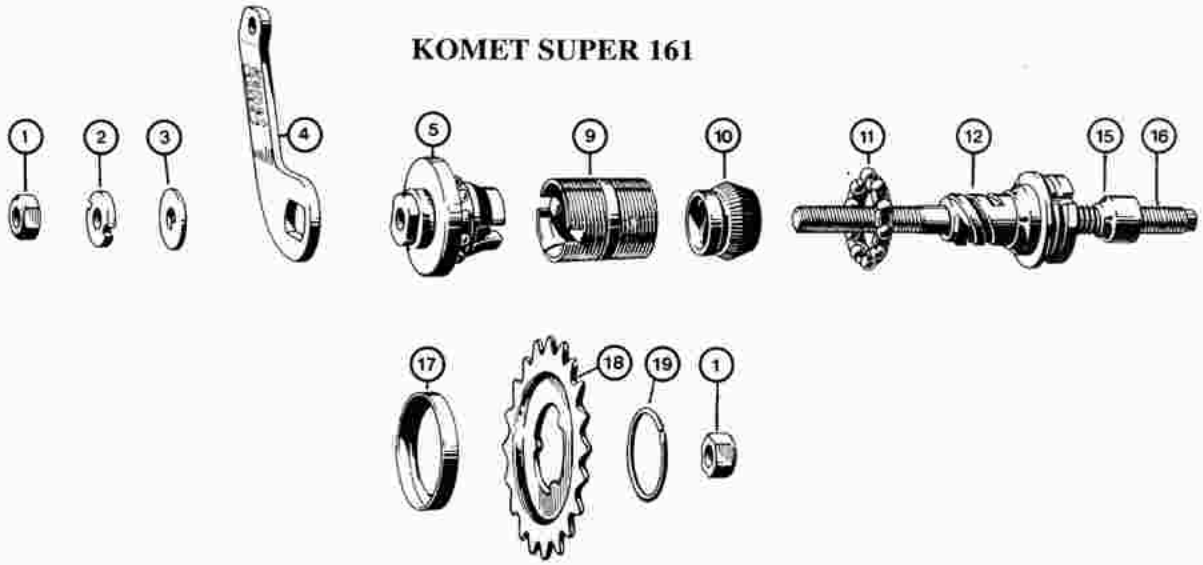
Symptom	Possible Causes[1]: Resulting from wear, improper lubrication or abuse	Possible Causes[1]: Resulting from improper assembly or installation
	Adjusting cone too loose	
	Brake parts worn	
Too much reverse pedal travel	Actuator (16) roller retainer bent, broken	
No brakes (pedals slip backwards)	Actuator (16) race or rollers worn or damaged	Actuator (16) rollers improperly installed
	Hub flanges loose on hub shell	
Forward drive slips	Driver rollers (20) or cage dirty or damaged	Driver rollers (20) improperly installed
Forward drive will not release		
	Axle (25) bent	
	Brake cone (8) too tight	
Grinding, cracking noises	Chain too tight	
	Ball retainer damaged or broken	Ball retainer reversed
Hub binds and drags	Broken parts inside hub	
	Dustcap bent	
	Hub shell roller race worn or damaged	
Brake grabs	No lubrication	
	Brake arm (7) loose at frame	
Brake squeaks	Braking surfaces glazed, polished or burred	
Poor braking	Improper lubrication—too slippery	
	Brake parts worn	
	Brake cone (8) too loose	

[1] Parts numbers in parenthesis refer to parts chart and exploded drawing.

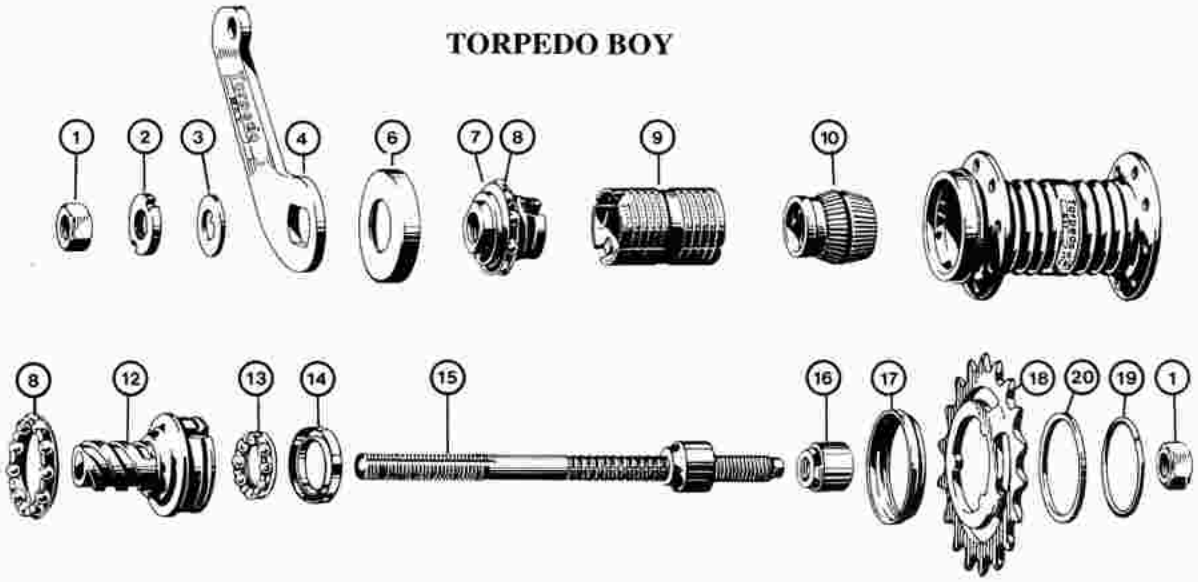
SACHS JET



KOMET SUPER 161



TORPEDO BOY



SACHS (F&S) COASTER BRAKES PARTS INTERCHANGEABILITY

| Vertical line between numbers indicates parts are not interchangeable.

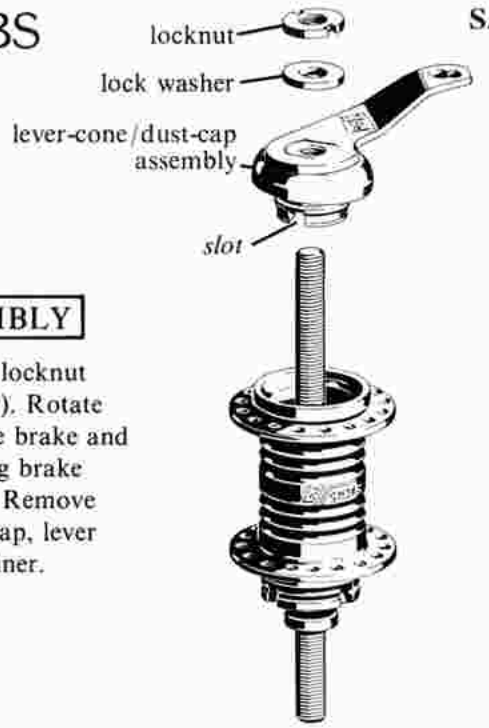
Parts are interchangeable only if they are on the same line and they do not have a vertical line between them.

	Sachs Jet	Komet Super 161[1]	Komet Super	Torpedo Boy (Pixie F & S Boy)	Torpedo Boy (New Part Numbers)
1. **Axle Nuts (2)**					
⅜ x 26 TPI[2]	0316 061 004	T 93	T 93	T 93	0316 061 004
⅜ x 24 TPI[2]	1603 026 000	T 93A	T 93A	T 93A	1603 026 000A
2. **Lock Nuts**					
⅜ x 26 TPI[2]	1603 017 100	K 102	K 102	K 102	1603 017 000
⅜ x 24 TPI[2]	1603 019 000	K 102A	K 102A	K 102A	1603 019 000A
3. **Washer**	2318 003 000	T 77	T 77	T 77	
4. Brake Arm	2319 004 100	K 108	K 108	J 108	2319 001 100
5. Brake Cone / Dust Cap / Ball Retainer Assembly					
⅜ x 26 TPI[2]					2307 001 100
⅜ x 24 TPI[2]		K 161/2A			2374 004 001A
6. **Dust Cap**	2321 006 000	K 161/1	K 104	J 104	2321 001 000
7. Brake Cone					
⅜ x 26 TPI[2]	2374 006 100[4]		K 101	J 101	
⅜ x 24 TPI[2]	2307 003 101		K 101A		
8. Ball Retainer		Star S 2051	K 106 (Star K 91)	J 106 (Star 130)	2376 001 200
9. **Brake Cylinder**	2373 002 000[5]	K 113	K 113	J 113	2373 001 000
Spring for Brake Cylinder		K 113A	K 113A		
10. Driving Cone	2306 002 100[5]	K 107	K 107	J 107	2306 001 000
11. **Ball Retainer**	2376 002 001[5]	K 161/4	K 105	J 106	
	Star 0103-247	S 2050	Star K 042	Star 130	
12. Driver Assembly (Inner Hub Barrel)	2372 004 100[5]	K 161/5	K 114	J 114	2372 001 401
13. Ball Retainer	2376 003 000 Star 0103-519	K 161/5A Star S 1025	10-¼" loose balls	10-¼" loose balls or S-1025	1676 103 100
14. **Dust Cap**	1604 013 002	K 112A			1604 013 002
15. Axle with Fixed Cone					
⅜ x 26 TPI[2]		K 110/4	K 110/4	J 110/4	2371 008 000
⅜ x 24 TPI[2]	1671 103 000[5]	K 110/4A	K 110/4A	J 110/4A	1671 103 001A
16. Fixed Cone					
⅜ x 26 TPI[2]		K 110	K 110	J 110	
⅜ x 24 TPI[2]	2308 003 101	K 110A	K 110A	J 110A	1608 101 000A
Oiler	none			T 82K	
17. Dust Cap, sprocket side	2321 002 101	K 161/6	K 103	J 103	2321 002 101
18. **Sprockets, 17-22[3]**					
19. Sprocket Lockrings[3]	0512 011 000	DR-616E	DR-616E	DR-616E	0512 011 000
20. Sprocket Spacer Washer[3]	none required	none required	none required	J 116 2 required except with 12T sprocket	0518 018 000

[1] 161 is stamped on hub shell.
[2] ⅜ x 26 TPI is sometimes referred to as German thread. ⅜ x 24 TPI is sometimes referred to as American thread. American threaded parts have A stamped in them.
[3] See Sprocket Interchangability at beginning of Hub section.
[4] Includes brake arm and cone.
[5] There are several similar part numbers for these items.

HUBS

SACHS (F & S) COASTER BRAKES DISASSEMBLY AND ASSEMBLY[1]



(1) DISASSEMBLY

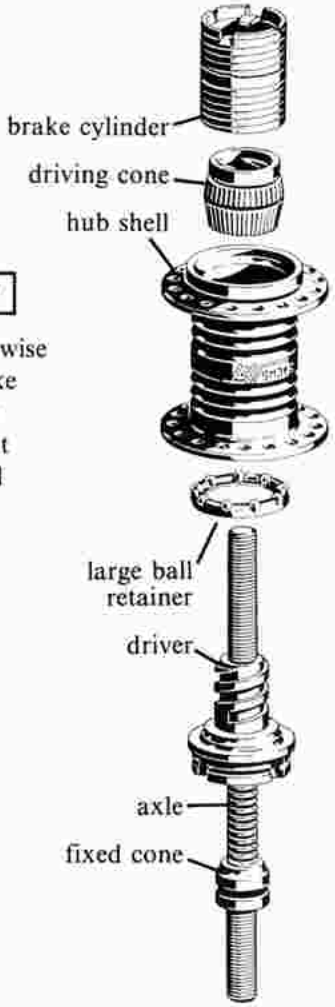
Remove left-hand locknut and washer (if any). Rotate driver to disengage brake and unscrew cone using brake lever as a wrench. Remove brake lever, dust cap, lever cone and ball retainer.

Next Step

Thread lever-cone/dust-cap assembly onto axle. Cone slots must engage brake cylinder tabs and ball retainer must seat in hub race. Replace lock washer (if any) and lock nut. Adjust bearing.

ASSEMBLY 2

Next Step



(2) DISASSEMBLY

Rotate hub counter-clockwise and lift off axle. Lift brake cylinder and driving cone out of hub either as a unit or separately. Lift off ball retainer and driver.

Install driver. Small ball retainer in driver seats onto fixed axle cone. Slip large ball retainer over driver *flat side down.* Slip hub shell over axle *smaller opening down.* Push small end of driving cone into straight-sided end of brake cylinder. Install driving cone and brake cylinder as a unit.[2] Rotate clockwise to engage driver splines.

ASSEMBLY 1

[1] These hubs may also be disassembled by threading out the axle first and replacing it last. This procedure is especially recommended for Karat and Centrix hubs.

[2] For Karat and Centrix assemble brake shoes, lever cone and driving cone and install as a unit.

SACHS (F & S) COASTER BRAKES DISASSEMBLY AND ASSEMBLY (cont.) SUBASSEMBLIES

DISASSEMBLY

Driver

Remove dust cover with a thin-bladed screwdriver. Work slowly around cover to avoid deforming it. Lift out ball retainer.

Driver

Install ball retainer flat side up. Start dust cover straight and tap home with a soft hammer.

ASSEMBLY

DISASSEMBLY

Lever-Cone/Dust-Cap

If brake lever, lever cone and dust cover are press fit together, they should not be forced apart. Ball retainer may be popped off cone.

Lever-Cone/Dust-Cap

Reassemble lever cone, dust cover and brake lever if they have been separated. Pop ball retainer over cone, *flat side toward dust cover.*

ASSEMBLY

CLEANING

Clean all parts, including outside of hub shell, in a suitable solvent. Be very careful not to introduce dirt or grit after cleaning.

POINTS TO CHECK

Numbers in parenthesis refer to parts chart and exploded drawing.

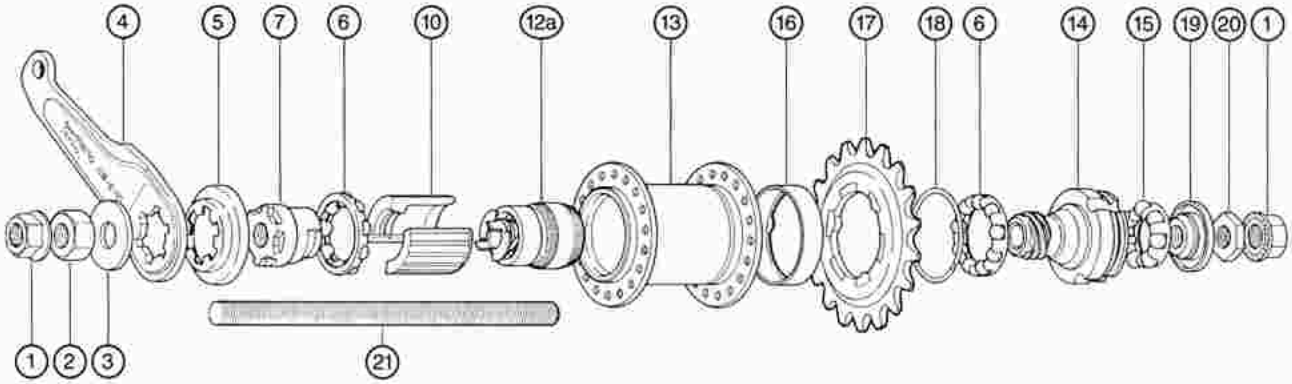
1. Mating threads of driving cone (10) and driver (12) for wear and chipping
2. Conical surface of inside of hub shell and outside of driving cone (10) for wear and burring
3. Brake shoes and driving cone (10) for wear and burring
4. Brake cylinder (9) and hub shell mating surfaces for wear or glazing
5. All threaded parts for damaged or stripped threads
6. Dustcaps and bearing retainers for straightness

LUBRICATION

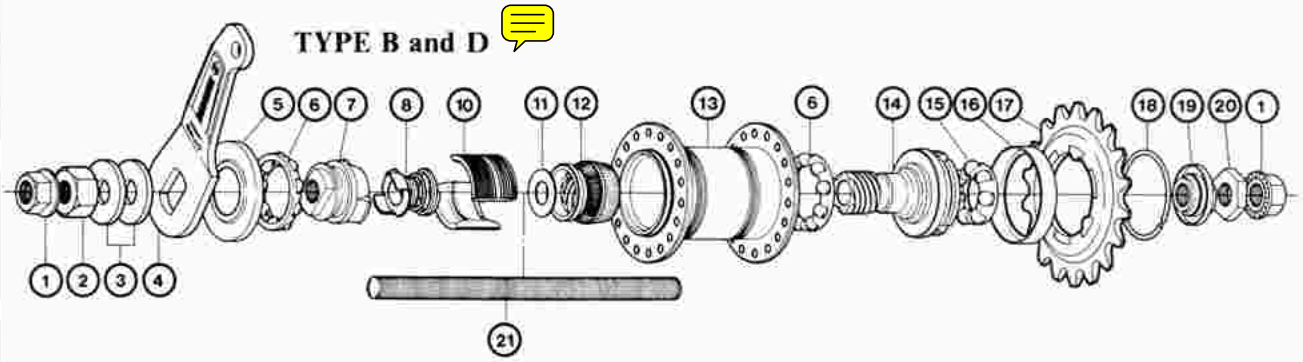
Lubricate ball retainer by filling the spaces between balls with grease. Lubricate hub shell and brake shoes liberally with a high-temperature grease. Grease other internal parts.

HUBS

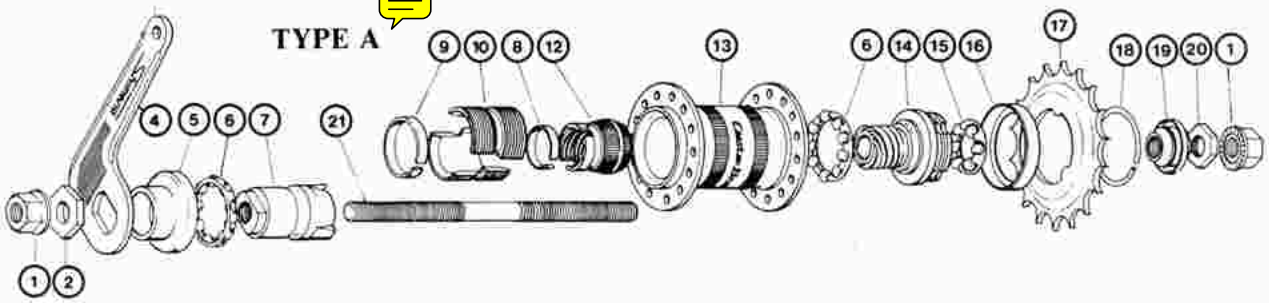
TYPE E



TYPE B and D



TYPE A



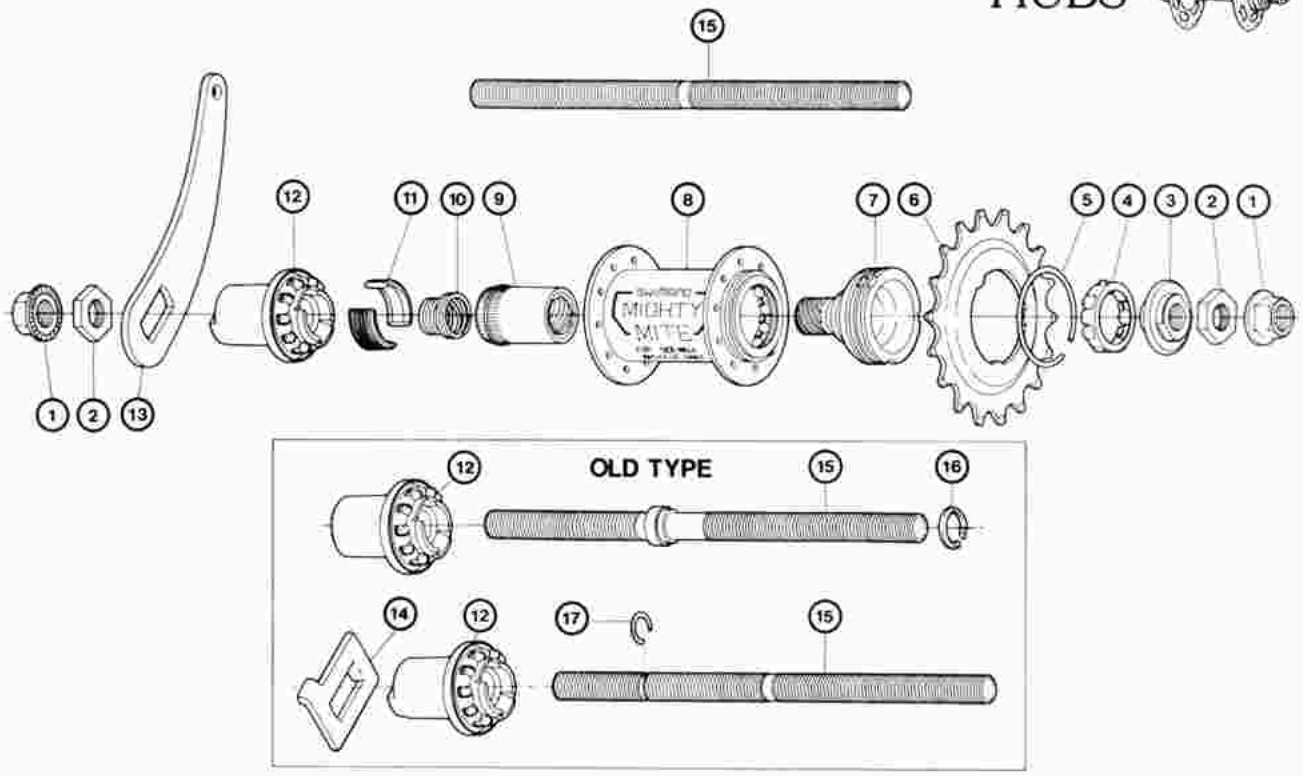
SHIMANO COASTER BRAKE PARTS INTERCHANGEABILITY

| Vertical line between numbers indicate parts are not interchangeable.

		E Type	D Type	B Type	A Type Model 42[1]	A Type Model 45[1]
1. Flange Nut		286 1500	282 3000	282 3000	282 3000	282 3000
2. Arm Nut		283 0900-1	283 0900-1	283 0900	282 2400	282 2400
3. Arm Washer		283 1600-1	283 1600-1	283 1600		
4. Brake Arm		286 1400	283 1405-1	283 1400	282 2100	282 2100
5. Left-Hand Dust Cap		286 1100	283 1300-1	283 1300	282 1900	282 1900
6. Ball Retainer C		282 9005	282 9005	282 9005	282 9005	282 9005
7. Brake Cone		286 0800	283 1100	283 1100	282 1600	282 1600
8. Clutch Spring			283 9033	283 0600	282 2500	282 2500
9. Shoe Spring				282	2300 282	2300
10. Brake Shoes (2 pieces)		286 9806	283 1000	283 1000	282 1500	282 1500
11. Clutch Washer			283 1500	283 1500		
12. Clutch Cone			283 1200	283 1200	282 1400-1	282 1400-1
12a. Clutch Cone Unit		286 9805	283 9801			
13. Hub Shell	24 holes @ 2.5 mm		283 9012	283 9012		
	28 holes @ 2.8 mm		283 9003	283 9003	282 9001	282 9001
	28 holes @ 3.2 mm		283 9004	283 9004		
	36 holes @ 2.8 mm		283 9005	283 9005	282 9003	282 9003
	20 holes				282 9002	282 9002
14. Driver		286 0400	283 0700	283 0700	282 1300-1[1]	282 1301-1[1]
15. Ball Retainer A		321 9022	321 9022	321 9022	321 9022	321 9022
16. Right-Hand Dust Cap		286 1000	282 2000	282 2000	282 0510[1]	282 3100[1]
17. Sprocket[2]	14T	321 0300	321 0300	321 0300	321 0300	321 0300
	15T	321 0311 flat	321 0311 flat	321 0311 flat	321 0310 dished	321 0310 dished
	16T	321 0320	321 0320	321 0320	321 0320	321 0320
	17T	321 0330	321 0330	321 0330	321 0330	321 0330
	18T	322 0340	322 0340	322 0340	321 0340	321 0340
	19T	322 0350	322 0350	322 0350	321 0350	321 0350
	20T	322 0360	322 0360	322 0360	321 0360	321 0360
18. Snap Ring[2]		321 2000	321 2000	321 2000	321 2000	321 2000
19. Cone with Dust Cap		286 9807	281 9013	281 9013	281 9013	281 9013
20. Locknut		281 2100	281 2100	281 2100	281 2100	281 2100
21. Hub Axle	150 mm (5.90")				282 1203	282 1203
	158 mm (6 2/32")		283 0504	283 0504		
	163 mm (6 1/32")	283 0501	283 0501	283 0501	282 1200	282 1200
	165 mm (6½")	286 0130				
	170 mm (6 1/16")	283 0503	283 0503	283 0503	282 1202	282 1202
Internal Kit	163 mm (6 1/32")		281 9024			
	165 mm (6½")	286 9801				
	170 mm (6 1/16")		281 9025			

[1] Model 45 was used by Ross (Chain Bike Corporation).
45 indicates the chainline in millimeters from hub center to sprocket center.

[2] See Sproket Interchangeability at beginning of Hub section.



SHIMANO MIGHTY MITE COASTER BRAKE PARTS INTERCHANGEABILITY

| Vertical line between numbers indicates parts are not interchangeable.

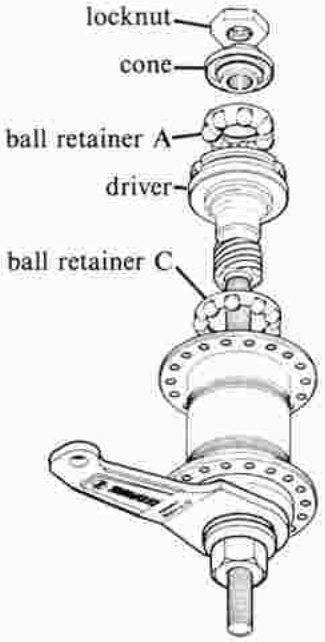
Parts are interchangeable only if they are on the same line and they do not have a vertical line between them.

Item #		New Type	Old Type with brake plate	Old Type with serrated brake plate
1.	**Flange Nut**	**282 3000[1]**	**282 3000[1]**	**282 3000[1]**
2.	Locknut	281 2100[1]	281 2100[1]	281 2100[1]
3.	Cone with Dust Cap	284 9005	284 9005	284 9005
4.	**Ball Retainer**	**321 9022[1]**	**321 9022[1]**	**321 9022[1]**
5.	Snap Ring[2]			
6.	Sprockets[2]			
7.	**Driver**	**284 1500**	**284 1500**	**284 1500**
8.	Hub Shell 24 holes	284 9003	284 9003	284 9003
9.	Clutch Cone	284 1300	284 1300	284 1300
10.	**Clutch Spring**	**284 1101**	**284 1100**	**284 1100**
11.	Brake Shoe	284 1200	284 1200	284 1200
12.	Brake Cone with Ball Retainer	284 9020	284 9002	284 9004
13.	**Brake Arm**	**284 2100**		
14.	Brake Plate		284 0601	
15.	Hub Axle 155 mm	284 0511		
	163 mm	**284 0512**	**284 0501**	**284 0506**
	187 mm	284 0513	284 0502	284 0507
16.	Lock Ring			284 1600
17.	**Snap Ring B**		**284 0700**	

[1] Interchangeable with Shimano B and D type.
[2] See Sprocket Interchangeability at beginning of Hub section.

HUBS

SHIMANO TYPE A, B, D AND E COASTER BRAKES DISASSEMBLY AND ASEMBLY (cont.)



1 DISASSEMBLY

Note the distance that axle protrudes at each end of hub. Remove locknut, cone, small ball retainer (A), driver and large ball retainer (C).[1]

Next Step

Replace large ball retainer (C)[1] *flat side up*. Install driver and small ball retainer (A) *flat side up*. Install cone and locknut and adjust bearing.

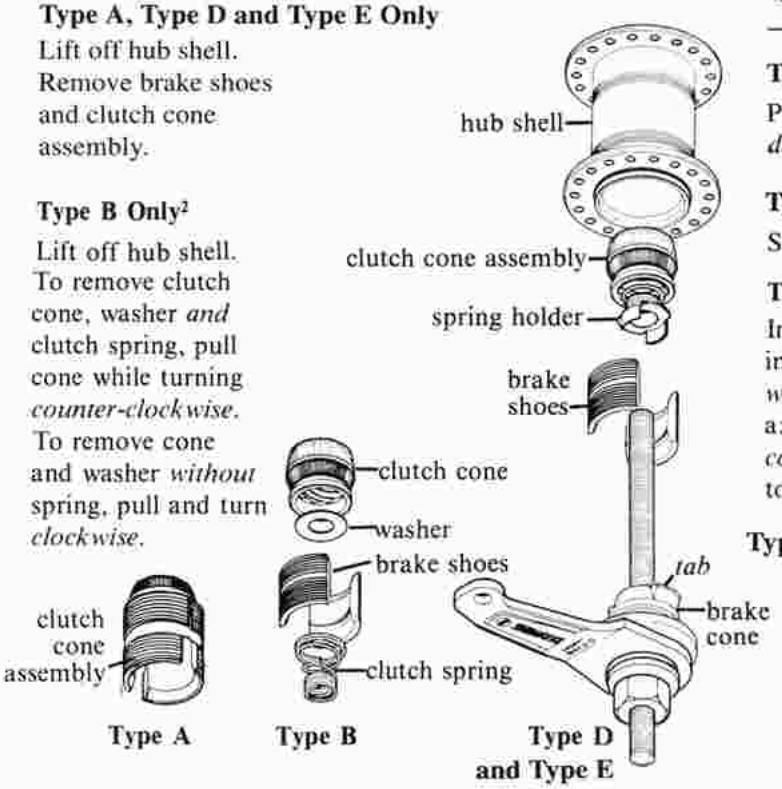
ASSEMBLY 3

Next Step

2 DISASSEMBLY

Type A, Type D and Type E Only
Lift off hub shell. Remove brake shoes and clutch cone assembly.

Type B Only[2]
Lift off hub shell. To remove clutch cone, washer *and* clutch spring, pull cone while turning *counter-clockwise*. To remove cone and washer *without* spring, pull and turn *clockwise*.



Type E Only
Remove large ball retainer C (not shown).

Next Step
Next Page

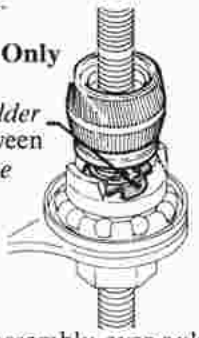
Seat greased brake shoes between brake cone tabs. Position hub shell *straight-sided opening down* and slip over assembly.

Type E Only
Place large ball retainer C *flat side down* on brake core.

Type A Only
Slip clutch cone assembly over axle.

Type B Only
Insert clutch washer and large end of spring in smooth end of clutch cone with a *clockwise* turning motion. Advance spring along axle, push clutch cone and turn assembly *counter-clockwise*. Continue until spring touches brake cone.

Type D and Type E Only



Slip clutch cone assembly over axle seating spring holder *between* brake cone tabs as shown above.

ASSEMBLY 2

[1] On Mighty Mite coaster brake large ball retainer is installed under a press-fit dust cover (not shown). Remove carefully with a thin-bladed screwdriver. To install, start straight by hand and tap home with a soft hammer.
[2] Mighty Mite is similar to Type B.

SHIMANO TYPE A, B, D, AND E COASTER BRAKES DISASSEMBLY AND ASSEMBLY

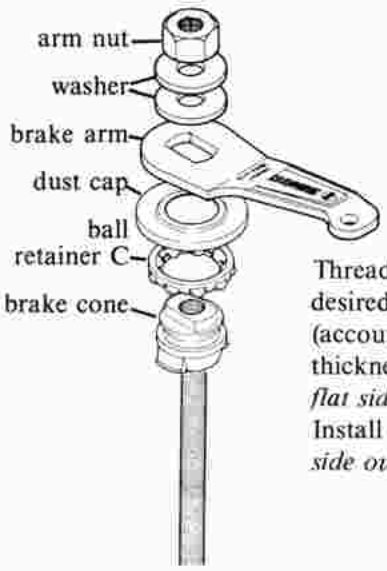
Next Step
Preceding Page

3 DISASSEMBLY

To remove ball retainer C, remove arm nut, arm washer and brake arm. Push off dust cap and ease ball retainer over small end of brake cone. If required, brake cone may be threaded off axle.[1]

Type E Only

Ball retainer C was removed in previous step.



Type A, B and D Only

Thread brake cone onto axle until desired length of axle protrudes[1] (account for arm nut and washer thickness). Ease large ball retainer (C) *flat side up* over small end of cone. Install dust cap, brake arm *(imprinted side out),* washers and arm nut.

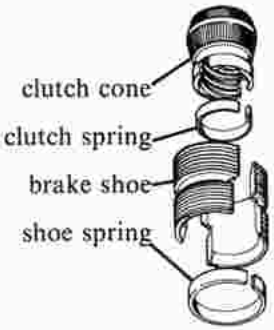
ASSEMBLY 1

SUBASSEMBLIES

DISASSEMBLY

Type A Only
Clutch Cone

Pull brake shoe assembly off clutch cone. Remove shoe spring or clutch spring only if it is to be replaced.



Type A Only
Clutch Cone

Assemble brake shoes and shoe spring. Rotate gap in spring away from gap between shoes. Ease clutch spring over small end of clutch cone with hooked end of spring *clockwise from spring gap.* Incorrect installation will cause excessive drag and wear.

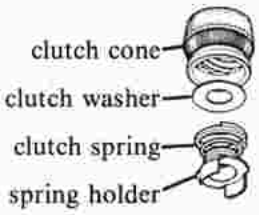
Insert small end of clutch cone into narrow-slot end of brake shoe assembly. Hooked end of clutch spring engages one of the narrow slots between brake shoes.

ASSEMBLY

DISASSEMBLY

Type D Only
Clutch Cone

Pull *spring holder* free with a *counter-clockwise* turning motion. Pull *clutch cone* free with a *clockwise* turning motion. Remove clutch washer.



Type D Only
Clutch Cone

Insert washer and large end of clutch spring into smooth end of clutch cone with a *clockwise* turning motion. Push spring holder into small end of clutch spring with a *counter-clockwise* turning motion.

ASSEMBLY

---

[1]On old type Mighty Mite with a snap ring on the axle, cone is tightened against the snap ring. To remove, loosen by threading cone inward ½ turn, remove snap ring and thread cone off axle. To install, thread cone past snap ring groove, install snap ring and turn cone back until tightened against ring.

SHIMANO TYPE A, B, D AND E COASTER BRAKES DISASSEMBLY AND ASSEMBLY (cont.)

CLEANING

Clean all parts, including outside of hub shell, in a suitable solvent. Be very careful not to introduce dirt or grit after cleaning.

POINTS TO CHECK

Numbers in parenthesis refer to parts chart and exploded drawing.

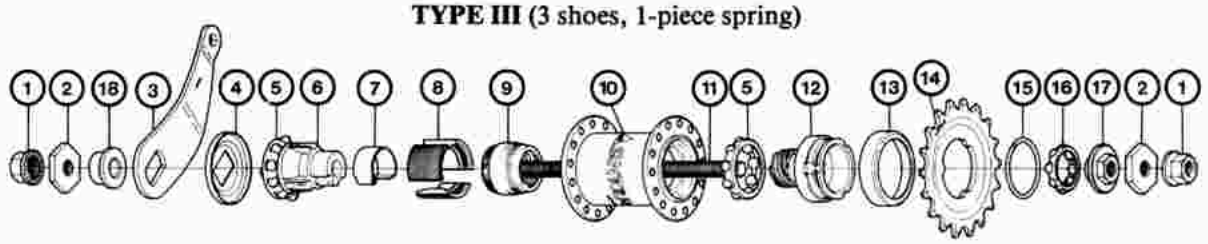
1. Mating threads of clutch cone (12) and driver (14) for wear and chipping
2. Conical surface of inside of hub shell and outside of clutch cone (12) for wear and burring
3. Clutch spring (8) for shape and tension
4. Brake shoe (10) and hub shell mating surfaces for wear or glazing
5. All threaded parts for damaged or stripped threads
6. Dustcaps and bearing retainers for straightness
7. All bearing races and balls for wear or pitting

LUBRICATION

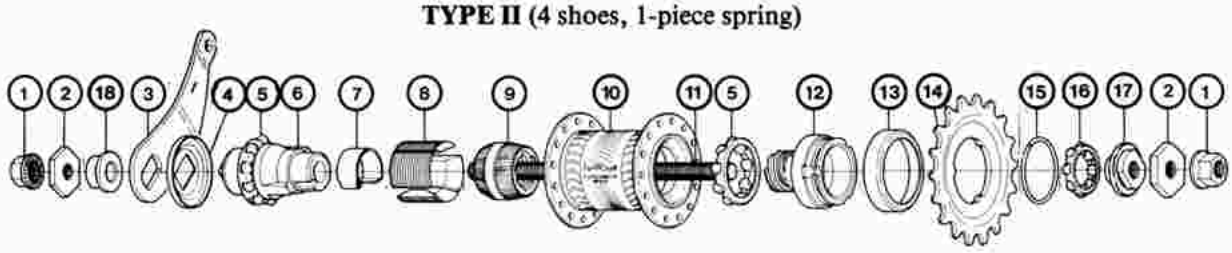
Lubricate ball retainers by filling the spaces between balls with grease. Lubricate hub shell and brake shoes liberally with a high-temperature grease. Grease other internal parts.

SUNTOUR COASTER BRAKE PARTS INTERCHANGEABILITY

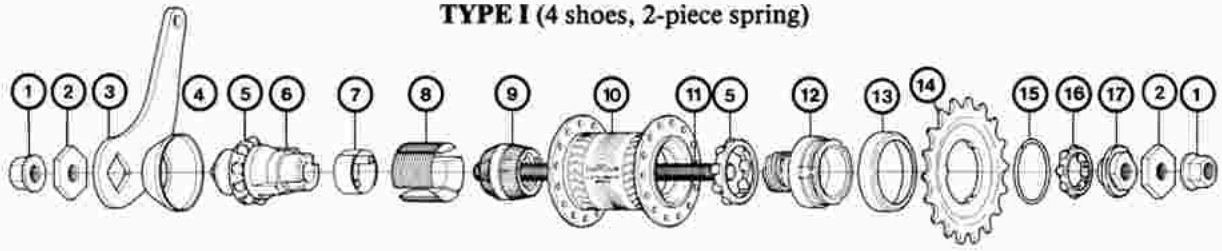
TYPE III (3 shoes, 1-piece spring)



TYPE II (4 shoes, 1-piece spring)



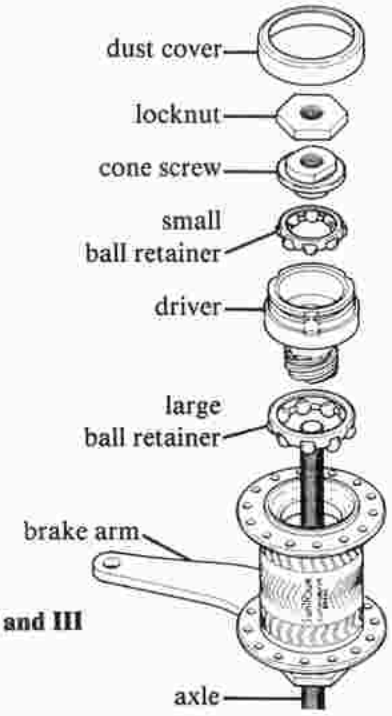
TYPE I (4 shoes, 2-piece spring)



	Type III	Type II	Type I
1. Axle Nut	4200 5800	4200 5800	4200 5800
2. Locknut, 4 mm thick	4200 5700	4200 5700	4200 5700
5 mm thick		4200 5701	4200 5701
3. Arm	4200 1006	4200 1004	4200 1000
4. Dust Cap B	4200 1508	4200 1508	4200 1500
5. Ball Retainer B	4200 8800	4200 8800	4200 8800
6. Brake Cone	4200 0710	4200 0704	4200 0700
7. Clutch Spring	4200 7006	4200 7006	4200 7002
8. Brake Shoe	4200 0807	4200 0800	4200 0800
9. Clutch Cone	4200 0608	4200 0600	4200 0600
10. Hub Shell, 20 H, 3.2 mm		4200 9010	4200 9010
28 H, 3.2 mm		4200 9012	4200 9012
36 H, 3.2 mm	4200 9014	4200 9014	4200 9014
20 H, 2.8 mm	4200 9011	4200 9011	
28 H, 2.8 mm	4200 9013	4200 9013	
36 H, 2.8 mm	4200 9015	4200 9015	
11. Axle, 152 mm	4200 0302	4200 0301	4200 0301
162 mm	4200 0305	4200 0304	4200 0304
170 mm	4200 0307	4200 0306	4200 0306
12. Driver	4200 0402	4200 0400	4200 0400
13. Dust Cap A	4200 1600	4200 1600	4200 1600
16. Ball Retainer A	4011 9023	4011 9023	4011 9023
17. Cone Screw	4200 9000	4200 9000	4200 9000
18. Arm Bushing	4200 1211	4200 1211	

1 DISASSEMBLY

Remove dust cover, right-hand locknut, cone screw, small ball retainer, driver and large ball retainer.



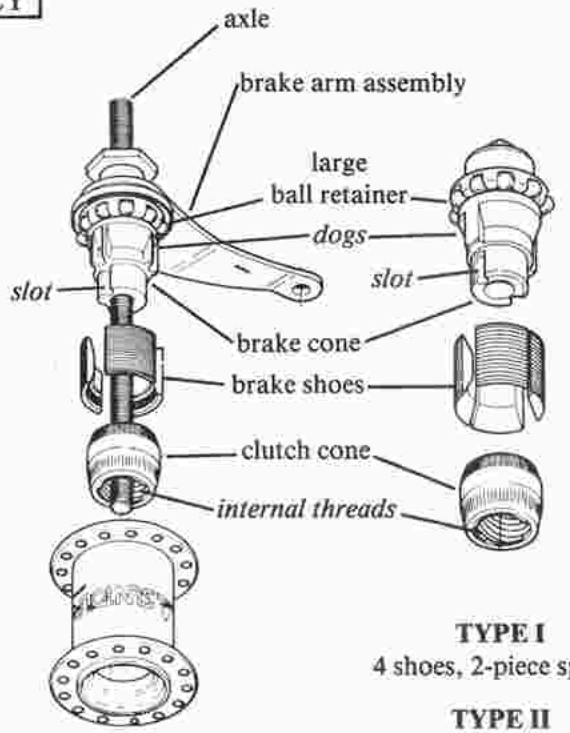
TYPE I, II and III

Holding axle in place, turn hub over. Install large ball retainer, *flat side up*. Install driver and small ball retainer. Thread on screw cone and locknut. Adjust bearing. Replace dust cover.

ASSEMBLY 3

2 DISASSEMBLY

Without inverting assembly, lift hub shell clear of remaining parts. Catch brake shoes as they fall out. Remove clutch cone assembly.



TYPE I
4 shoes, 2-piece spring

TYPE II
(not shown)
4 shoes, 1-piece spring

TYPE III
3 shoes, 1-piece spring

Insert brake arm axle assembly into hub with brake cone dogs in gaps between brake shoes and ball retainer seated on hub shell race. Slot(s) in brake cone must engage loop(s) in clutch spring.

Drop clutch cone assembly into hub shell *threaded end inward*. Stick greased brake shoes in place inside hub.

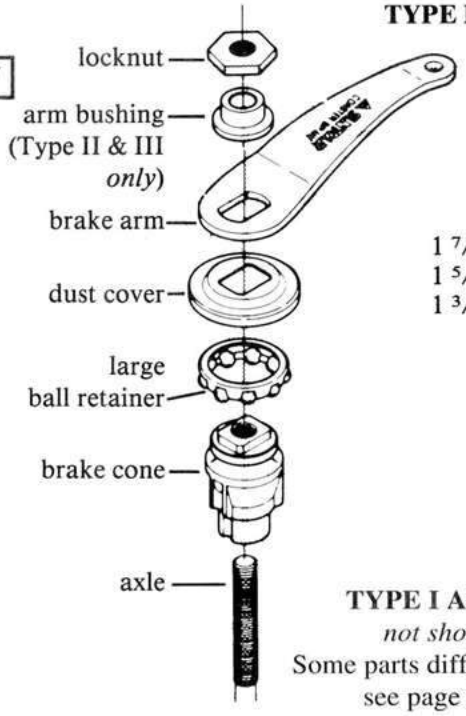
ASSEMBLY 2

SUNTOUR COASTER BRAKE DISASSEMBLY AND ASSEMBLY (cont.)

3 DISASSEMBLY

Position assembly *brake arm up*. Use a soft-jawed vise if gripping threads. Remove left-hand locknut, arm bushing (type II and III only), brake arm and dust cover. Pop ball retainer off brake cone. If necessary, thread brake cone off axle.

TYPE III



TYPE I AND II
not shown
Some parts differ slightly; see page 2-16

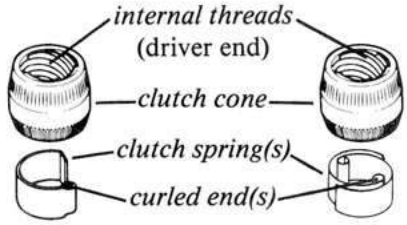
ASSEMBLY 1

If it was removed, thread on brake cone until the proper length of axle protrudes from square end:
1 7/16″ (36 mm) for 6″ (152 mm) axle
1 5/8″ (41 mm) for 6 3/8″ (162 mm) axle
1 3/4″ (45 mm) for 6 11/16″ (170 mm) axle
Place large ball retainer over brake cone *flat side up*. Use dust cover to pop retainer into place. Install brake arm, arm bushing and locknut. Do not let axle or brake arm turn while tightening locknut.

DISASSEMBLY

Push clutch spring(s) out of clutch cone. Be careful not to deform spring(s).

SUBASSEMBLY



TYPE II and III **TYPE I**

Orient clutch cone and spring(s) *as shown*. Insert spring(s) into clutch cone. If installed upside down, brake will not engage.

ASSEMBLY

CLEANING

Clean all parts, including outside of hub shell, in a suitable solvent. Be very careful not to introduce dirt or grit after cleaning.

POINTS TO CHECK

Numbers in parentheses refer to parts chart and exploded drawing.

1. Mating threads of driver (12) and clutch cone (9) for rough action, wear and chipping.
2. Mating coned surfaces inside hub shell (10) and outside driver end of clutch cone (9).
3. Clutch spring(s) (7) for cracks, wear and distortion. Replace spring if thickness is anywhere less than 0.4 mm (1/64″).
4. Brake-shoe side of clutch cone (9) for wear and glazing.
5. Brake shoes (8) and hub shell inner surfaces for wear and glazing. If replacing brake shoes, replace *as a set*.
6. Bearing surfaces of cone screw (17), brake cone (6), driver (12) and hub shell for wear and pitting.
7. All threaded parts for damaged or stripped threads.
8. Dust caps and bearing retainers for straightness.

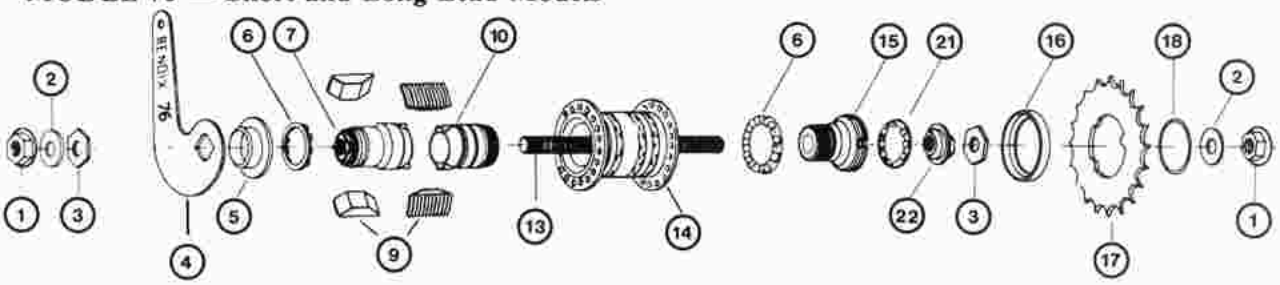
LUBRICATION

Lubricate ball bearings by filling the spaces between balls with grease. Lubricate hub shell and brake shoes liberally with a high-temperature grease. Coat other parts with grease.

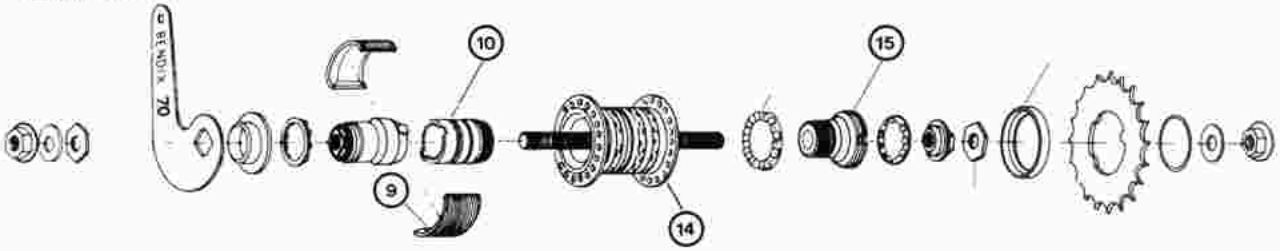
HUBS

BENDIX COASTER BRAKE

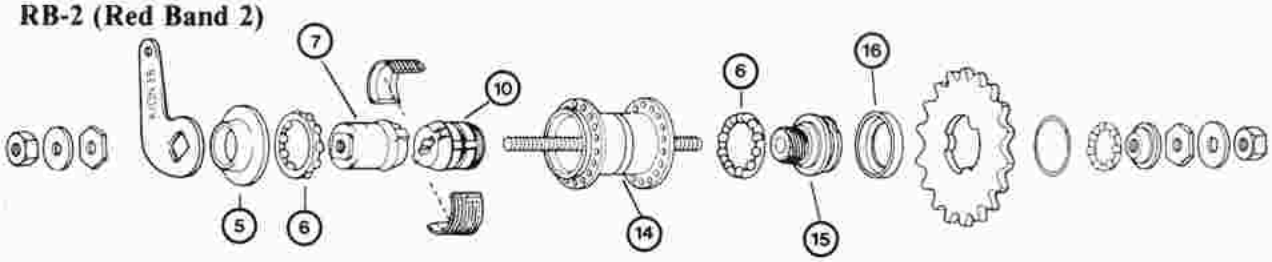
MODEL 76 — Short and Long Lead Models



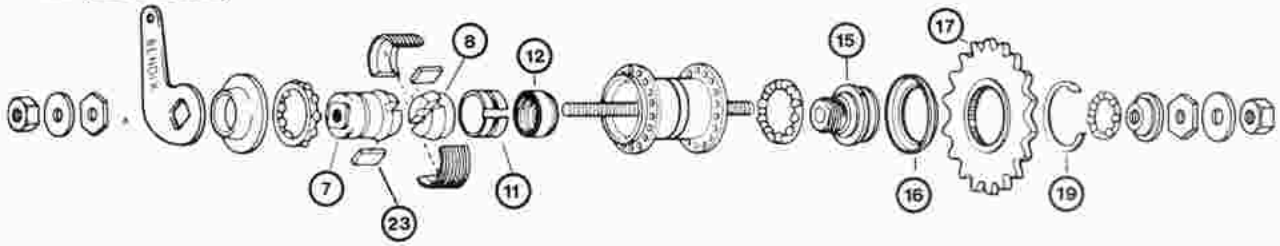
MODEL 70



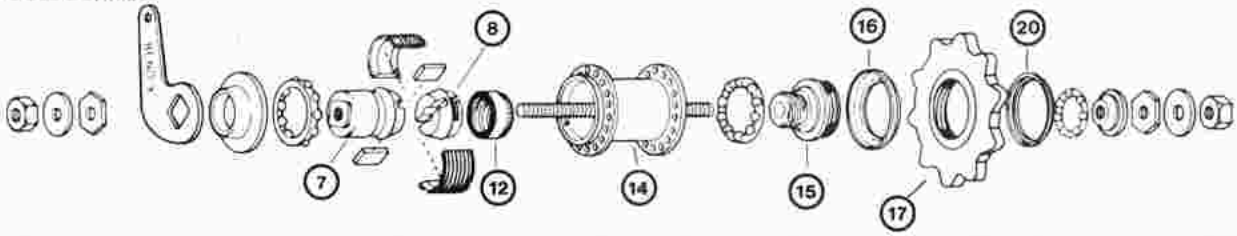
RB-2 (Red Band 2)



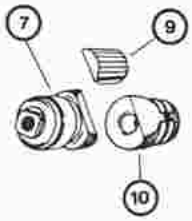
RB (Red Band)

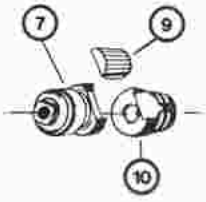


ORIGINAL

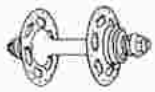


MODEL 70J (70 Junior)
other parts interchangable with Model 70





JUNIOR
other parts interchangable with RB-2



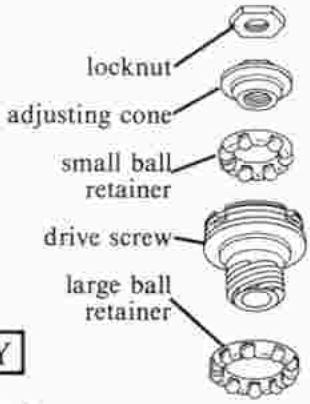
BENDIX COASTER BRAKE PARTS INTERCHANGEABILITY

| Vertical line between numbers indicates parts are not interchangeable.

Parts are interchangeable only if they are on the same line and they do not have a vertical line between them.

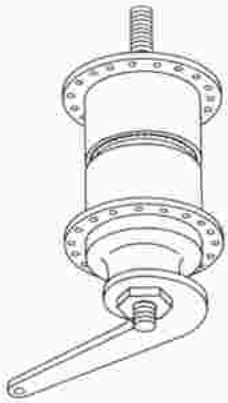
		76 short lead models and long lead models	70, 70J 70 Junior	RB-2 Red Band -2, Junior	RB Red Band	Original Bendix
1.	Axle Nut (2 required)	BB-713	BB-13A	BB-13A	BB-13A	BB-13
2.	Axle Washer	BB-14A	BB-14A	BB-14A	BB-14A	BB-14
3.	Locknut	BB-15	BB-15	BB-15	BB-15	BB-15
4.	Brake Arm	BB-710	BB-510	BB-10	BB-10	BB-10
	Junior		BB-610			
	Tandem	BB-710A	BB-510A	BB-10A	BB-10A	BB-10A
5.	Dust Cap, arm side	BB-532	BB-532	BB-32	BB-32	BB-32
6.	Retainer (9-¼" balls) (2 required)					
	(BB-16 10-¼" balls)	BB-516	BB-516	BB-16	BB-16	BB-16
7.	Expander, anchor end	BB-533	BB-533	BB-133	BB-59	BB-33
	Junior Expander, anchor end		BB-633	BB-233		
8.	Expander, drive end				BB-56	BB-6
9.	Brake Shoes (BB-722, 4 required)					
	(BB-22, 2 required)	BB-722	BB-22	BB-22	BB-22	BB-22
	Junior Brake Shoes (1 required)		BB-222	BB-222		
10.	Retarder Sub-Assembly, short lead (0.667")	BB-159	BB-159	BB-159		
	long lead, zinc plated (0.900")	BB-759				
	Junior Retarder Sub-Assembly		BB-659	BB-259		
11.	Retarder Spring	BB-112	BB-112	BB-112	BB-112	
12.	Drive Clutch				BB-53	BB-3
13.	Axle 6⅜" (162 mm) standard length	BB-4	BB-4	BB-4	BB-4	BB-4
	7⅜" (187 mm) extra length	BB-36	BB-36	BB-36	BB-36	BB-36
	6⅜" (162 mm) high strength, yellow	BB-4A				
14.	Hub Shell 36 holes 0.080 gauge	BB-781	BB-581	BB-81	BB-81	BB-1
	28 holes 0.080 gauge	BB-782	BB-582	BB-82	BB-82	BB-1B
	24 holes 0.080 gauge	BB-783	BB-583	BB-83	BB-83	BB-1A
	20 holes 0.080 gauge	BB-786	BB-586	BB-86	BB-86	
	40 holes 0.080 gauge			BB-87		
	28 holes 0.105 gauge	BB-787				
	36 holes 0.105 gauge	BB-784	BB-584	BB-84	BB-84	BB-1E
	36 holes 0.120 gauge	BB-785	BB-585	BB-85	BB-85	BB-1C
15.	Drive Screw 6-start multiple thread	BB-502	BB-502	BB-102		
	long lead, zinc plated	BB-702				
	3-start multiple thread				BB-52	BB-2
16.	Dust Cap, sprocket	BB-558	BB-558	BB-158	BB-58	BB-31
17.	Sprocket 14T	BB-143	BB-143	BB-143		BB-43
	15T	BB-142	BB-142	BB-142		
	16T	BB-144	BB-144	BB-144		BB-44
	18T	BB-145	BB-145	BB-145	BB-60	BB-45
	19T	BB-146	BB-146	BB-146	BB-61	BB-46
	20T	BB-147	BB-147	BB-147	BB-62	BB-47
	22T	BB-148	BB-148	BB-148	BB-64	
18.	Snap Ring	BB-155	BB-155	BB-155		
19.	Sprocket Retaining Ring				BB-55	
20.	Sprocket Locknut (left-threaded)					BB-5
21.	Retainer (7-¼" balls No. 19)	BB-20	BB-20	BB-20	BB-20	BB-20
22.	Adjusting Cone	BB-7	BB-7	BB-7	BB-7	BB-7
23.	Brake Shoe Key				BB-51	BB-51

BENDIX COASTER BRAKE DISASSEMBLY AND ASSEMBLY (cont.)



(1) DISASSEMBLY

Remove right-hand locknut, adjusting cone, small ball retainer, drive screw and large ball retainer.

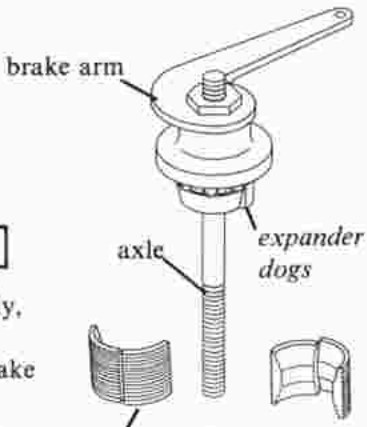


Next Step

Holding axle in place, turn hub over. Install large ball retainer *flat side up*. Install drive screw and small ball retainer. Thread on adjusting cone and locknut. Adjust bearing.

ASSEMBLY 3

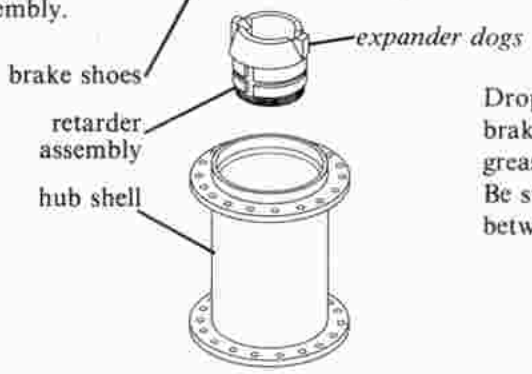
Next Step



(2) DISASSEMBLY

Without inverting assembly, lift hub shell clear of remaining parts. Catch brake shoes as they fall out. Remove retarder assembly.

Insert brake-arm/axle assembly into hub with dogs on anchor-end expander seated in gaps between brake shoes and ball retainer seated on hub shell race.



Drop retarder sub-assembly into the brake shell *expander end up*. Stick greased brake shoes in place inside hub. Be sure that expander dogs lie in gaps between brake shoes.

ASSEMBLY 2

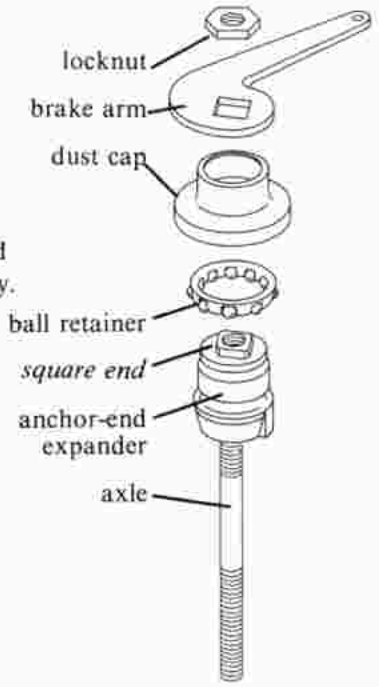
Next Step
Next Page

BENDIX COASTER BRAKE DISASSEMBLY AND ASSEMBLY (cont.)

Next Step
Preceding Page

3 DISASSEMBLY

Remove left-hand locknut, brake arm and dust cap. Pop ball retainer off over anchor-end expander. Thread expander off axle if necessary.



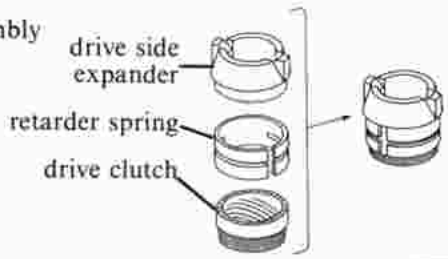
Install anchor-end expander. Square end should be 1⅛" (28mm) from end of axle. *Place large ball retainer over the expander flat side up.* Use dust cap to pop ball retainer into place. Install brake arm and locknut. Tighten locknut by holding it stationary while turning brake arm against it.

ASSEMBLY 1

DISASSEMBLY

Retarder
Pull retarder sub-assembly apart.

SUBASSEMBLY



Retarder
Install the retarder spring on the drive side expander. Install the drive clutch in the retarder spring.

ASSEMBLY

CLEANING

Clean all parts, including outside of hub shell, in a suitable solvent. Be very careful not to introduce dirt or grit after cleaning.

POINTS TO CHECK

Numbers in parenthesis refer to parts chart and exploded drawing.

1. Mating threads of drive screw (15) and drive clutch[1] (12) for wear and chipping
2. Conical surface of inside of hub shell and outside of drive clutch[1] (12) for wear and burring
3. Retarder spring (11) for shape and tension
4. Drive clutch[1] (12) and drive side expander (10) for wear or burring of toothed mating surfaces
5. Brake shoes (9) and hub shell mating surfaces for wear or glazing
6. All threaded parts for damaged or stripped threads
7. Dustcaps and bearing retainers for straightness

LUBRICATION

Lubricate ball bearings by filling the spaces between balls with grease. Lubricate hub shell and brake shoes liberally with a high-temperature grease. Coat other parts with grease.

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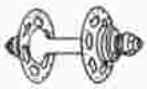
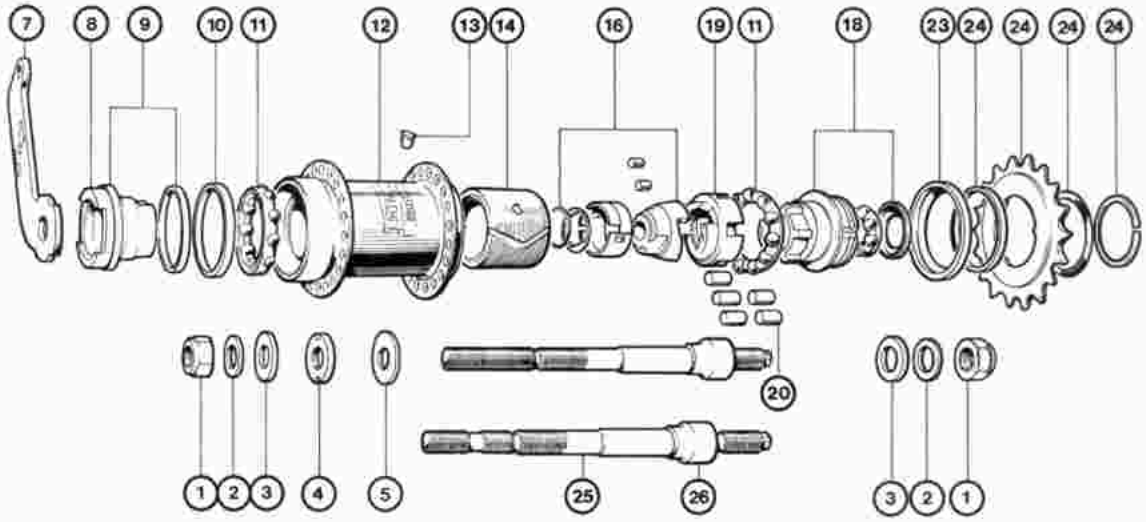
[1] For some models, listed only as part of retarder assembly (10).



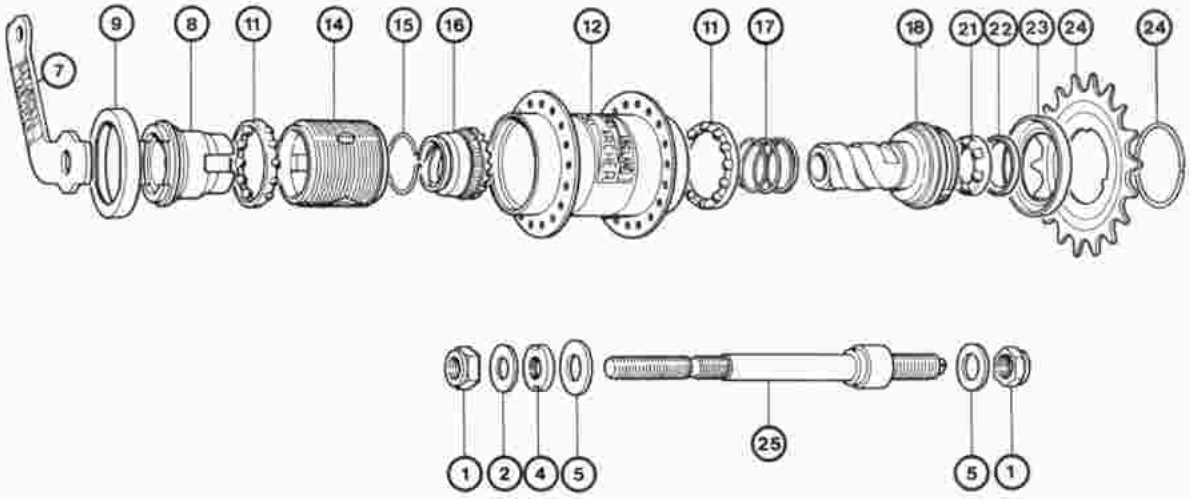
HUBS

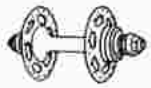
STURMEY ARCHER SC, SC-1, PERRY B-100 TORPEDO COASTER BRAKE

SC



SC1





STURMEY ARCHER SC, SC-1, PERRY B-100 TORPEDO COASTER BRAKE PARTS INTERCHANGEABILITY

| Vertical line between numbers indicates parts are not interchangeable.

Parts are interchangeable only if they are on the same line and they do not have a vertical line between them.

		SC-1	SC	Perry B-100	Torpedo*
1.	Axle Nut	HMN 118	HMN 118	P 320	0316 061 004
2.	Axle Washer 1/16"	HMW 146	HMW 146		
3.	Axle Washer 1/8"		HMW 129		
4.	LH Brake Arm Nut	HMN 257	HMN 257	P 302	1603 017 100
5.	Plain Washer	HMW 366	HMW 366		2318 004 004
6.	Notched Washer			P 304	
7.	Brake Arm	HSH 424	HSH 424	P 305	0319 101 103
8.	Brake Cone Assembly	HSH 457	‖HSH 438	P 306	0374 109 100[2]
9.	Brake Cone Dust Cover	HSH 458	HSH 429		0321 001 000
10.	Shell Dust Cover		HSH 439	P 307	0321 002 000
11.	Ball Retainers (2)	HSH 453	‖HSH 427	P 308	0376 100 000
12.	Hub Shell 28 holes	HSH 460	HSH 423	P 309	
	36 holes	HSH 463	HSH 422		0350 007 111
	40 holes	HSH 465	HSH 421		
13.	Lubricator		HSA 106		
14.	Brake Band	HSH 456	‖HSH 436	P 310	0373 100 000
15.	Actuator Spring	HSH 455			
16.	Brake Actuator	HSH 454	‖HSH 440	P 311	0350 052 100
17.	Return Spring	HSH 459			
18.	Driver Complete	HSH 451	‖HSH 425	P 315 threaded	
	Driver				0372 100 201
19.	Roller Retainer		HSH 430	P 312	0304 001 500
20.	Driver Roller (6.5 mm ϕ)		HSH 428	P 313	0305 001 000
	Circlip				0312 003 000
21.	Inner Ball Cage for Driver	HSA 284			1676 103 100
22.	Dust Cap	HSH 452			1604 013 002
23.	Sprocket Dust Cover	HSH 469	‖HSL 735	P 316	0321 037 105
24.	Sprocket Sprocket Spacer Washer and Sprocket Circlip[1]			P 314 threaded P 317 threaded	
25.	Axles with fixed cone				
	5¾" (145 mm) non-grooved				0351 100 000
	6" (152 mm) non-grooved	HSH 464			
	6⅛" (155 mm) non-grooved				0351 070 100
	6¼" (159 mm) non-grooved		HSH 419	P 318	
	6 5/16" (159 mm) non-grooved				0351 034 100
	6½" (165 mm) non-grooved	HSH 461			
	6⅞" (175 mm) non-grooved	HSH 462			
	6½" (159 mm) grooved	HSH 467	‖HSH 420		
	6⅞" (175 mm) grooved	HSH 468	‖HSH 418		
26.	Fixed Cone		HSH 441		0308 001 100

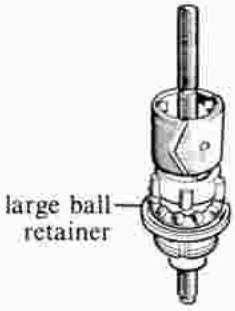
*Torpedo does sell more individual parts than are listed here.

[1] See Sprocket Interchangability at beginning of Hub section.
[2] Includes brake arm.

STURMEY-ARCHER SC ROLLER DRIVE COASTER BRAKE DISASSEMBLY AND ASSEMBLY

1 DISASSEMBLY

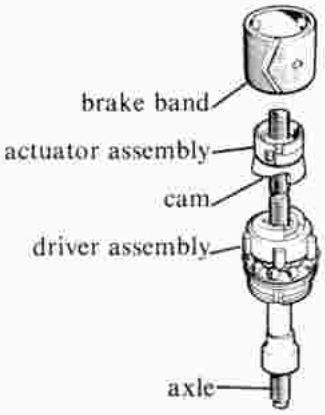
Remove left-hand locknut and lock washer. Unscrew brake cone using brake arm as a wrench. If dust cover and brake arm are press fit on cone, they should not be forced apart. Remove hub shell.



Next Step

2 DISASSEMBLY

Remove brake band and actuator assembly. Lift off driver assembly.



Next Step

Slip driver assembly over axle so that small ball retainer seats on fixed cone. Install actuator *cam end down*. Position brake band with internal tabs up and press over actuator.

ASSEMBLY 1

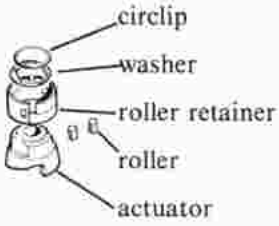
Slip hub shell over assembly. Rotate counter-clockwise until shell race seats on large retainer. Install brake cone, brake arm (brand name facing out) and locknut. Adjust bearing.

ASSEMBLY 2

SUBASSEMBLIES

DISASSEMBLY

Actuator
With a small screwdriver, ease circlip over the end of actuator body. Remove washer and roller retainer; catch rollers.



Actuator
Stick rollers inside roller retainer slots with grease. Slip round end of roller cover over small end of actuator body. Rollers seat against body flats. Install washer and large circlip.

ASSEMBLY

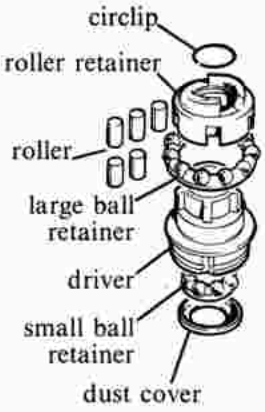
STURMEY-ARCHER SC ROLLER DRIVE COASTER BRAKE DISASSEMBLY AND ASSEMBLY (cont.) SUBASSEMBLIES

DISASSEMBLY

Driver and Hub Shell

With an awl or small screwdriver ease circlip over end of driver body. Lift off roller retainer and catch rollers.

Remove dust cover with a thin-bladed screwdriver. Work slowly around cover to avoid deforming it. Lift out ball retainer.



Hub Shell and Driver

Install large ball retainer with *flat side toward driver race*. Stick rollers in roller retainer with grease. Insert small end of driver through large end of roller retainer. Install circlip.

Install remaining ball retainers *flat side out*. Start dust covers straight and tap home with a soft hammer.

ASSEMBLY

CLEANING

Clean all parts, including outside of hub shell, in a suitable solvent. Be very careful not to introduce dirt or grit after cleaning.

POINTS TO CHECK

Numbers in parenthesis refer to parts chart and exploded drawing.

1. Mating threads of actuator (16) and driver (18) for wear and chipping
2. Surface of driver (18), drive rollers (20) and inside of hub shell for wear and pitting
3. Brake actuator assembly (16) for wear to rollers and roller track
4. Brake band (14) and hub shell mating surfaces for wear or glazing
5. All threaded parts for damaged or stripped threads
6. Dustcaps and bearing retainers for straightness

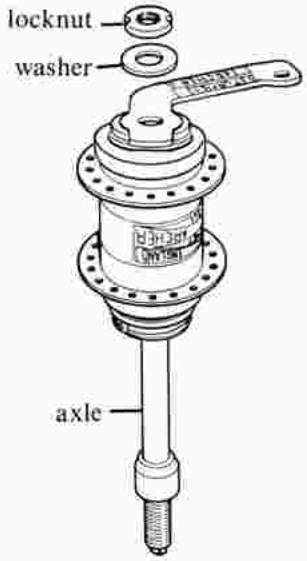
LUBRICATION

Lubricate ball bearings by filling the spaces between balls with grease. Lubricate hub shell and brake band liberally with a high-temperature grease. Coat other parts with grease.

STURMEY-ARCHER SC1 COASTER BRAKE DISASSEMBLY AND ASSEMBLY

(1) DISASSEMBLY

Remove left-hand locknut and lock washer. Holding driver staionary, unscrew and remove axle.



Turn assembly over.
Install axle from driver side, threading through brake cone. Install lock washer and locknut. Adjust bearing.

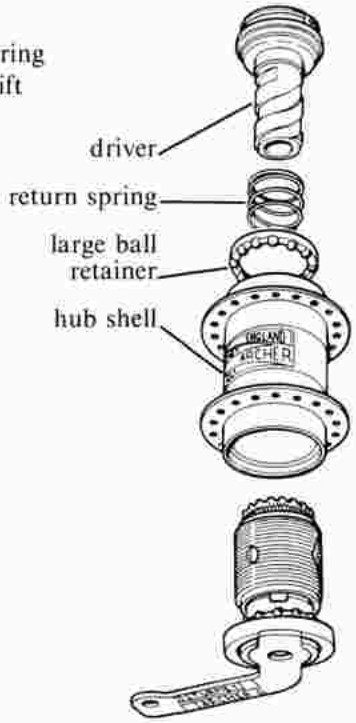
ASSEMBLY 3

Next Step

Next Step

(2) DISASSEMBLY

Turn assembly over.
Remove driver, return spring and large ball retainer. Lift off hub shell.



Install hub shell *large opening down*.
Insert large ball retainer *flat side up*.
Install return spring and driver.

ASSEMBLY 2

Next Step
Next Page

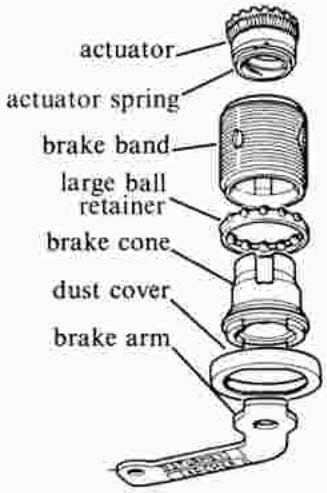
Next Step
Preceding Page

STURMEY-ARCHER SC1 COASTER BRAKE DISASSEMBLY AND ASSEMBLY (cont.)

3 DISASSEMBLY

Remove actuator. Remove actuator spring only if it is to be replaced. Ease spring over the end of actuator body with a thin bladed screwdriver.

Remove brake band and large ball retainer. Remove brake cone, dust cover and brake arm separately or as a unit. If these parts are press fit together they should not be forced apart.



If separated, press brake cone, dust cover and brake arm together with brake arm imprint facing out. Install large ball retainer *flat side toward dust cover.* Install brake band with internal tabs engaged in brake cone slots. If actuator spring was removed from actuator, install spring with *hooked end clockwise from spring gap* as viewed from small end of actuator. *Incorrect installation will cause excess drag and wear.* Install actuator *small end down* with actuator spring engaged in one of the brake band slots.

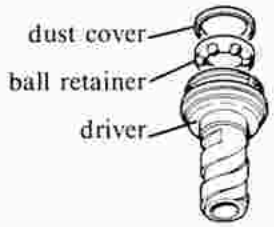
ASSEMBLY 1

SUBASSEMBLY

DISASSEMBLY

Driver

Remove dust cover with a thin-bladed screwdriver. Work slowly around cover to avoid deforming it. Lift out ball retainer.



Driver

Install ball retainer flat side up. Start dust cover straight and tap home with a soft hammer.

ASSEMBLY

CLEANING

Clean all parts, including outside of hub shell, in a suitable solvent. Be very careful not to introduce dirt or grit after cleaning.

POINTS TO CHECK

Numbers in parenthesis refer to parts chart and exploded drawing.

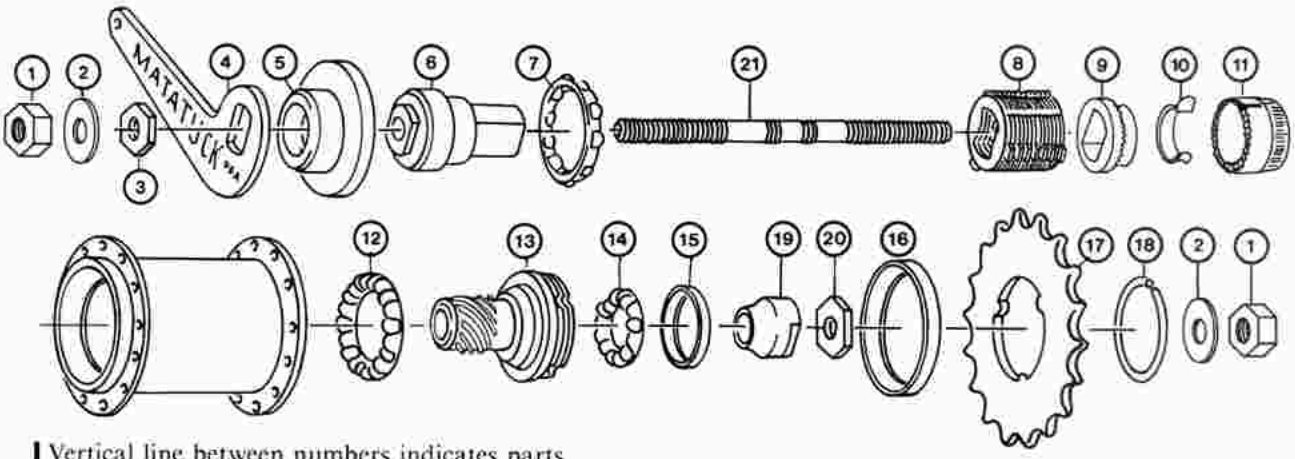
1. Mating threads of actuator (16) and driver (18) for wear and chipping
2. Mating surface of inside of hub shell and outside of actuator (16) for wear and burring
3. Actuator spring (15) for shape and tension
4. Brake band (14) and actuator (16) for wear or burring at mating surfaces
5. Brake band (14) and hub shell mating surfaces for wear or glazing
6. All threaded parts for damaged or stripped threads
7. Dustcaps and bearing retainers for straightness

LUBRICATION

Lubricate ball bearings by filling the spaces between balls with grease. Lubricate hub shell and brake band liberally with a high-temperature grease. Coat other parts with grease.

HUBS

NK, MATTATUCK, NEW DEPARTURE COASTER BRAKES
PARTS INTERCHANGEABILITY

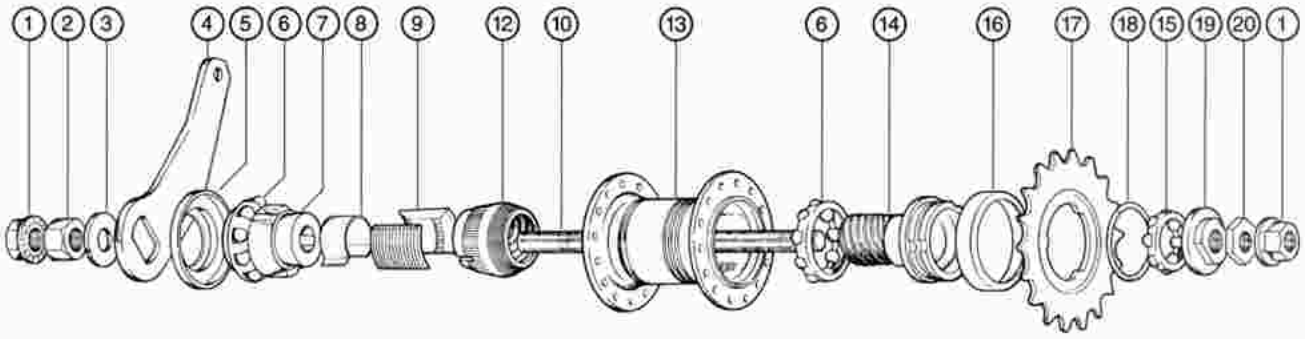


| Vertical line between numbers indicates parts are not interchangeable.

Parts are interchangeable only if they are on the same line and they do not have a vertical line between them.

Item #		NK	New Departure	Mattatuck
1.	Axle Nut	NK 88	HD-13	E-13
2.	Washer	NK 87	HD-14	E-14
3.	Arm Lock Nut	NK 82	HD-15	E-15
4.	Brake Arm	NK 75	HD-10	E-10
5.	Dust Cap, brake arm side	NK 80	HD-32	E-32
6.	Brake Disc Holder	NK 68	HD-22	E-22
7.	Ball Retainer	NK 76	HD-16	E-16
8.	Brake Discs (17 discs per set)[1]	NK 723	HD-278	E-278
9.	Brake Clutch	NK 71	HD-6	E-6
10.	Clutch Band (Transfer Spring)	NK 78	HD-12	E-12
11.	Screw Cone (Clutch Sleeve)			
	9 thread	NK 96		
	3 thread	NK 70 (rare)	HD-3	E-3
12.	Ball Retainer (10 - ¼" balls)	NK 76	HD-20	E-16
13.	Driver			
	9 thread (for 3 lug sprockets)	NK 95		
	3 thread (for 3 lug sprockets)	NK 90 (rare)		E-2
	3 thread (for screw-on sprockets)		HD-2	
14.	Ball Retainer (7 or 8 - ¼" balls)	NK 77	HD-20	E-20
15.	Dust Cap, driver[2]	NK 94		E-31-5
16.	Dust Cap, sprocket side	NK 93[3]	HD-31	E-31[3]
17.	Sprocket (threaded)		HD-17	
	Sprocket (3 lug) 20 teeth	NK 921		
	19 teeth	NK 922		
	18 teeth	NK 923		
	16 teeth	NK 925		
	14 teeth	NK 927		
18.	Sprocket Lock Ring	NK 91		E-5-5
	Sprocket Locknut (left threaded)		HD-5	
19.	Adjusting Cone	NK 74	HD-7	E-7
20.	Cone Locknut	NK 99	HD-15[2]	E-15
21.	Axle 6¼"	NK 671	HD-4	E-4
	6¾"	NK 672		

[1] Some New Departure hubs use 21 and 23 discs. Total thickness should be approximately ¾" (19 mm).
[2] On New Departure hubs driver dust cap is part of cone locknut.
[3] These two parts interchange.



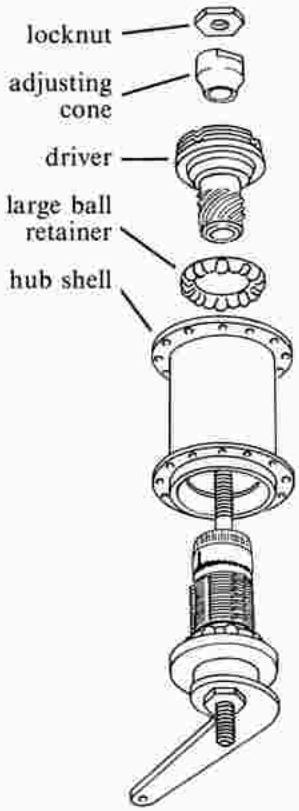
1. Flange Nut		S120-1[1]
2. Arm Nut		S120-2[1]
3. Arm Washer		S120-3[1]
4. Brake Arm		S120-4
5. Left-Hand Dust Cap		S120-5
6. Ball Retainer C		S120-6[1]
7. Brake Cone		S120-7
8. Clutch Spring		S120-8
9. Brake Shoe		S120-9[1]
10. Hub Axle	152 mm	S120-101[1]
	160 mm	S120-102[1]
	163 mm	S120-103[1]
	170 mm	S120-104[1]
11. Arm Clip Set (flat)		S120-11
12. Clutch Cone		S120-12
13. Hub Shell	16 holes @ 2.5 mm	S120-130
	20 holes @ 2.5 mm	S120-131
	24 holes @ 2.5 mm	S120-132
	28 holes @ 2.5 mm	S120-133
	28 holes @ 3.2 mm	S120-134
13. Hub Shell (cont.)	32 holes @ 2.5 mm	S120-135
	36 holes @ 2.5 mm	S120-136
	36 holes @ 3.2 mm	S120-137
	36 holes @ 3.8 mm	S120-138
	40 holes @ 2.5 mm	S120-139
14. Driver		S120-14[1]
15. Ball Retainer A		S120-15[1]
16. Right-Hand Dust Cap		S120-16
17. Sprocket[2]	14T	S120-171[1]
	16T	S120-172[1]
	18T	S120-173[1]
	19T	S120-174[1]
	20T	S120-175[1]
	22T	S120-176[1]
18. Snap Ring		S120-18[1]
19. Cone with Dust Cap		S120-19[1]
20. Locknut		S120-20[1]
21. Clip Screw		S120-21
22. Brake Arm Clip		S120-22
23. Clip Nut		S120-23

[1]Part is interchangeable with Shimano Model D.

[2]See Sprocket Interchangeability at beginning of Hub section.

1 DISASSEMBLY

Remove right-hand locknut and adjusting cone. Rotate driver counter-clockwise and remove. Remove large ball retainer and lift off hub shell.



Install large ball retainer *flat side up.* Install driver, adjusting cone and locknut. Adjust bearing.

Make sure brake disc tabs are still aligned. Align slots in hub shell with tabs and slip hub over assembly. When hub is correctly seated, brake-arm-side ball retainer is not visible behind dust cap. If hub does not seat properly, lift off and repeat this step.

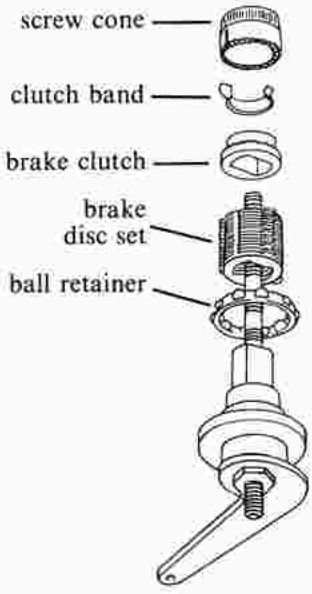
ASSEMBLY 3

Next Step

Next Step

2 DISASSEMBLY

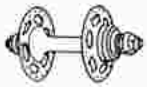
Remove screw cone and brake clutch. Remove clutch band from brake clutch only if necessary. Remove brake discs and ball retainer.



Position axle *brake arm side down.* Install ball retainer *flat side down.* Install one non-turn brake disc over brake holder flats. Install remaining brake discs, alternating tabbed and non-turn discs. Align tabs.
Reinstall clutch band on brake clutch if required. Viewed from above, hooked end of clutch band must be *clockwise* from clutch band gap or excessive drag and wear will result.
Install brake clutch *clutch band up.* Install screw cone with slot engaging hooked end of clutch band.

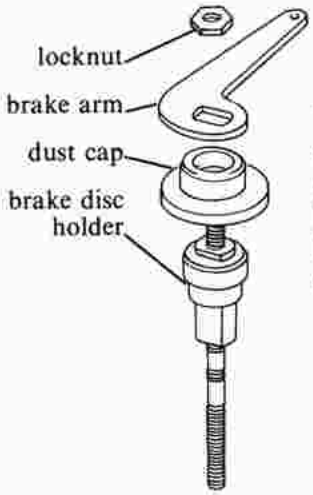
ASSEMBLY 2

Next Step
Next Page



3 DISASSEMBLY

Remove brake-end locknut, brake arm, dust cap and brake disc holder.



Next Step
Preceding Page

Thread brake holder onto one end of axle far enough to cover half of ridged central section. Install dust cap and brake arm, *imprinted side out*. Install locknut, tighten while holding brake arm stationary.

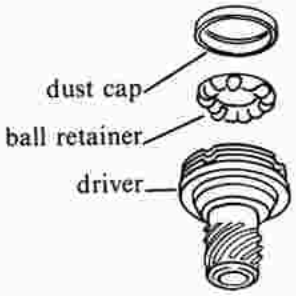
ASSEMBLY 1

SUBASSEMBLY

DISASSEMBLY

Driver

Remove dust cover with a thin-bladed screwdriver. Work slowly around cover to avoid deforming it. Lift out ball retainer.



Driver

Install ball retainer flat side up. Start dust cover straight and tap home with a soft hammer.

ASSEMBLY

CLEANING

Clean all parts, including outside of hub shell, in a suitable solvent. Be very careful not to introduce dirt or grit after cleaning.

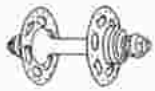
POINTS TO CHECK

Numbers in parenthesis refer to parts chart and exploded drawing.

1. Mating threads of screw cone (11) and driver (13) for wear and chipping
2. Conical surface of inside of hub shell and outside of screw cone (11) for wear and burring
3. Clutch band (10) for shape and tension
4. Retarder assembly (9-11) for wear or burring of toothed mating surfaces
5. Brake disks (8) for burring, wear, or excessive polishing
6. Brake disc (8) tabs and flatted holes for wear
7. All threaded parts for damaged or stripped threads
8. Dustcaps and bearing retainers for straightness

LUBRICATION

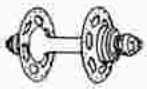
Lubricate ball retainers by filling the spaces between balls with grease. Lubricate hub shell and brake disc set liberally with a high-temperature grease. Grease other internal parts.



Hub	Trouble Chart page	Exploded Drawing page	Parts Interchangeability Chart page	Disassembly and Assembly Instructions page	Cleaning, Points to Check and Lubrication page	Axle Thread Size
Bendix						
Blue Band	3-2	3-4	3-4	3-6	3-8	⅜" x 24 TPI
Red Band	3-2	3-4	3-4	3-9	3-11	⅜" x 24 TPI
Yellow Band	3-2	3-4	3-4	3-6	3-8	⅜" x 24 TPI
Sachs (F & S)						
Automatic A2110	3-3	3-12	3-12	3-17	3-18	⅜" x 26 TPI
Duomatic 101 (no brake)	3-3	3-12	3-12	similar to 102		1⅜" x 26 TPI
Duomatic 102	3-3	3-12	3-12	similar to R2110		1⅜" x 26 TPI
Duomatic R2110	3-3	3-12	3-12	3-14	3-16	⅜" x 26 TPI

BRAKE ARM MOUNTING

Coaster brake hubs have a brake arm which prevents the left-hand cone and axle from turning. Attach the brake arm and axle nuts finger tight before cinching down either. Make sure that the brake arm clamp will not pull the brake arm out of line as this will cause severe bearing alignment problems. Tighten axle nuts first, then brake arm clamp.

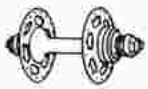


HUBS

BENDIX RED, BLUE & YELLOW BAND 2-SPEED COASTER BRAKES TROUBLE CHART

Symptom	Possible Causes[1]: Resulting from wear, improper lubrication or abuse	Possible Causes[1]: Resulting from improper assembly or installation
Binds	Dust caps bent	Ball retainer reversed
Makes grinding, cracking or rubbing noise	Ball retainer damaged or broken	
	Chain too tight	
	Damaged or gummed internal parts	
	Cones (6) (24) (28) too tight	
	Axle (16) bent	
Brake does not release	Braking surfaces (29) (8) rough or burred	
	Threads of low-speed driver (33) (20) and clutch (12) damaged	
Brake squeaks	No lubricant	
Poor braking	Braking surfaces (29) (8) glazed or worn	Too few brake discs (8) or discs improperly stacked (Red Band)
Excessive backwards pedal travel	Cones (6) (24) (28) too loose	
	Improper lubrication	
No braking (freewheels backward)	Teeth on low-speed clutch (12) worn	
	Teeth on drive-side expander (30) worn (Yellow and Blue Band)	
Slips in 2nd gear	Sprocket loose on driver (33) (18)	
	Low-speed retarder spring (31) weak	
Slips in 1st gear	Bearing surfaces of low-speed and high-speed drivers (18) (20) (32) (33) worn	
Whines when coasting or driving	Low-speed clutch (12) or hub shell worn	
Jumps from 2nd to 1st, or slips slightly in 2nd	Bearing or tapered surfaces of high-speed clutch (14) and hub shell worn	
	Gear ring on high-speed driver (18) (32) broken loose	
Shifts erratically or does not shift	Fingers on indexing spring (17) damaged	Indexing spring (17) improperly installed
	High-speed retarder spring weak	

[1] Parts numbers in parenthesis refer to parts chart and exploded drawing.



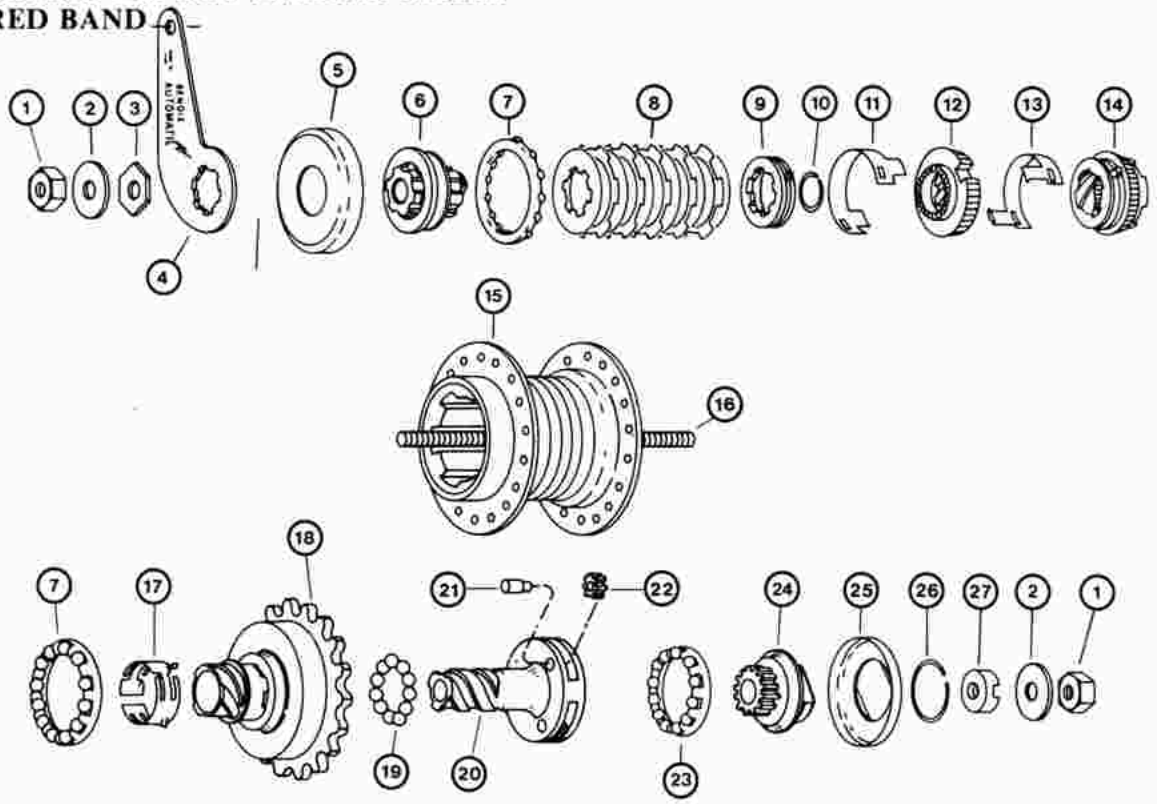
SACHS (F& S) 2-SPEED COASTER BRAKES TROUBLE CHART

Symptom	Possible Causes[1]: Resulting from wear, improper lubrication or abuse	Possible Causes[1]: Resulting from improper assembly or installation
Slips in 1st gear	Brake cone (8) pawls faulty	Brake cone (8) pawls improperly installed
Slips in 2nd gear	Drive ring (17) or hub shell (7) dogs worn	
Jumps 2nd to 1st	Gear ring (12) pawls faulty	
		Gear ring (12) pawls improperly installed
Stays in 1st gear only (hub turning at same speed as driver)		Flyweights (14) for smaller size wheel
	Flyweights (14) sticking	
Intermittently fails to shift	Control bush (16) friction spring too weak (Duomatic)	
Stays in 2nd gear only (hub turning faster than driver)	Brake cone (8) friction spring too weak	Brake cone (8) friction spring reversed (Automatic)
	Control bush (16) damaged or broken (Duomatic)	Improper friction spring used on brake cone (8) (Duomatic)
Pedals driven forward while coasting	Chain too tight	Ball retainer reversed
	Bearings too tight	Friction spring (9) reversed (Automatic)
	No lubrication or wrong lubrication	
Stiff running, noisy	Ball retainer damaged or broken	
	Brake lever forcing cone out of line	
Jammed	Loose or broken parts inside hub	
	Broken gear teeth	
Too much play in axle	Bearings loose or damaged	
No brake	Brake cone (8) friction spring weak or broken	Brake cone (8) friction spring missing
Weak brake	Wrong lubricant	
	Brake parts glazed or worn	
Brake too strong or jerky	Brake lever (4) loose at chainstay	
	Brake shell (6) unlubricated	
	Axle (28) loose in dropouts	
Brake does not release	Driver bush (13) and brake cone (8) threads worn or chipped	

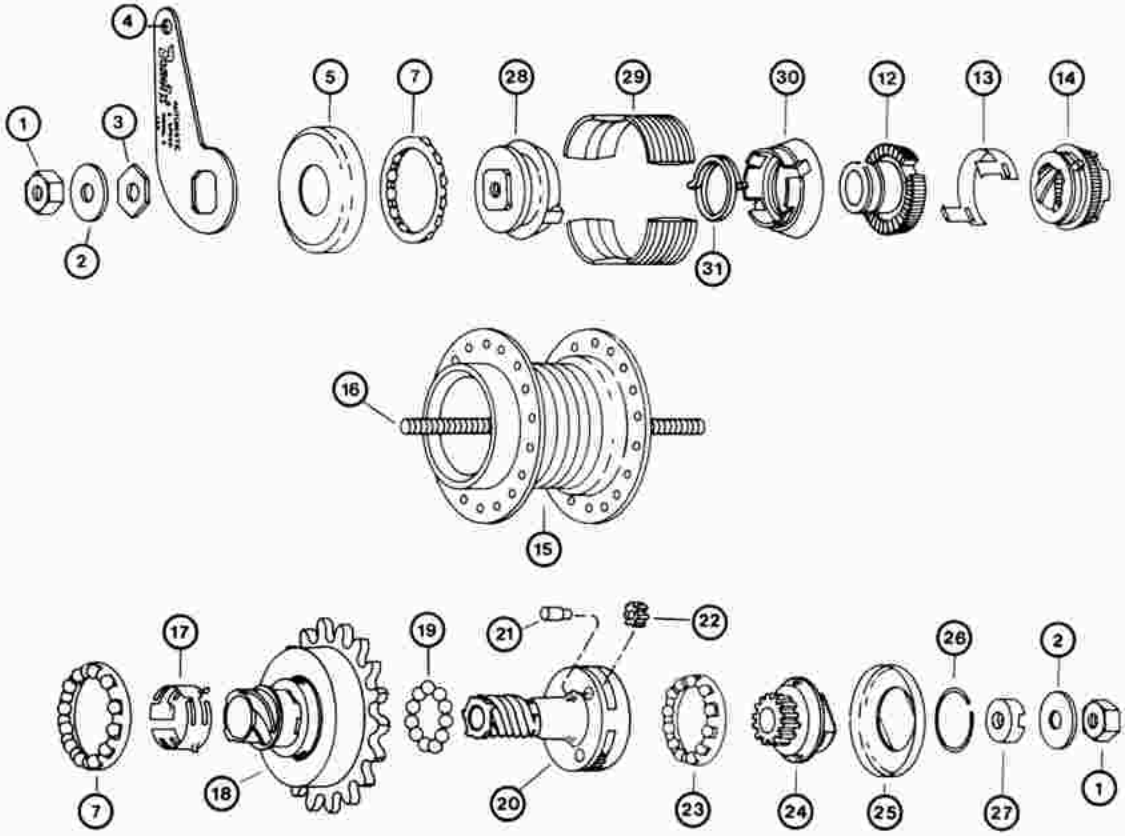
[1] Parts numbers in parenthesis refer to parts chart and exploded drawing.

HUBS

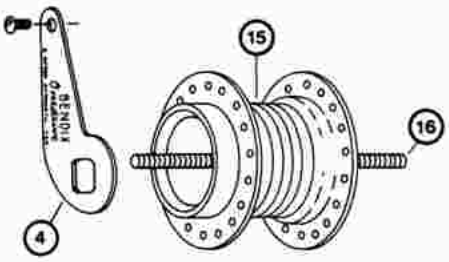
BENDIX 2 SPEED COASTER BRAKE
RED BAND

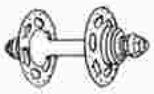


YELLOW BAND



BLUE BAND OVERDRIVE (Parts not interchangable with Yellow Band)





HUBS

BENDIX 2 SPEED COASTER BRAKE PARTS INTERCHANGEABILITY

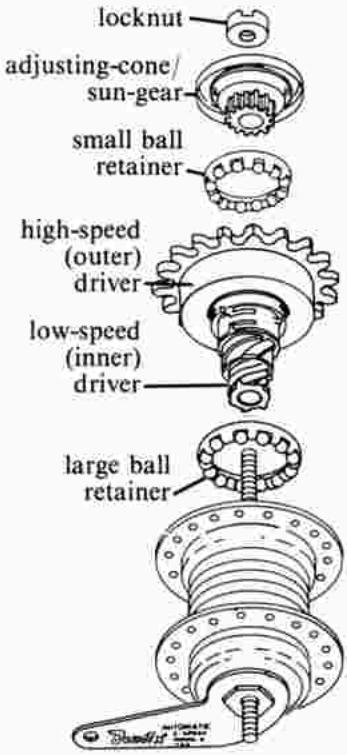
| Vertical line between numbers indicates parts are not interchangeable.

	Parts are interchangeable only if they are on the same line and they do not have a vertical line between them.	Blue Band Overdrive	Yellow Band Shoe Type Regular	Red Band Disc Type Regular
1.	Axle nut	BB-13A	BB-13A	BB-13A
2.	Axle washer	BB-14A	BB-14A	BB-14A
3.	Locknut, arm side	BB-15	BB-15	BB-15
4.	Brake arm	AB-410	AB-310	AB-10
5.	Dust cap, arm side	AB-331	AB-331	AB-31
6.	Cone, arm, disc support			AB-33
7.	Retainer	AB-16	AB-16	AB-16
8.	Disc set			AB-22
9.	Pressure plate assembly			AB-6
10.	Retaining ring			AB-9
11.	Low speed retarder coupling			AB-12
12.	Low speed driving clutch	AB-303	AB-303	AB-3
13.	High speed retarder coupling	AB-21	AB-21	AB-21
14.	High speed clutch assembly	AB-23	AB-23	AB-23
15.	Hub shell	AB-401	AB-301	
16.	Axle	AB-304	AB-304	BB-4
17.	Indexing spring	AB-26	AB-26	AB-26
18.	Sprocket, high speed drive, sleeve assembly, 18 T		AB-318	AB-18
	Sprocket, high speed drive, sleeve assembly, 19 T		AB-319	AB-19
19.	¼" balls, 11 used			
20.	Low speed driving screw		AB-302	AB-2
	Low speed screw assembly (includes driver, gears and pins)		AB-328	AB-28
21.	Planet gear pin, 3 used	AB-30	AB-30	AB-30
22.	Planet gear, 3 used	AB-37	AB-37	AB-37
23.	Retainer	AB-20	AB-20	AB-20
24.	Adjusting cone sun gear	AB-7	AB-7	AB-7
25.	Dust cap, sprocket side	AB-32	AB-32	AB-32
26.	Retaining ring, dust cap	AB-41	AB-41	AB-41
27.	Locknut, adjusting cone	AB-35	AB-35	AB-35
28.	Expander, anchor end	AB-333	AB-333	
29.	Shoes, 4 used	AB-322	AB-322	
30.	Expander, drive end	AB-306	AB-306	
31.	Retarder spring clutch	AB-312	AB-312	
32.	Driving screw, high speed	AB-418		
33.	Sprocket, driving screw, low speed, 20 T	AB-402		
	Sprocket, low speed driving screw assembly, 20 T (with gears and pins)	AB-428		
	Clutch pack assembly			AB-45
	Retarder subassembly	AB-345	AB-345	
	Retarder spring	AB-23A	AB-23A	AB-23A
	Offset brake arm for automatic	AB-310A	AB-310A	

BENDIX BLUE AND YELLOW BAND 2-SPEED COASTER BRAKES DISASSEMBLY AND ASSEMBLY

1 DISASSEMBLY

If possible, put hub in low gear. Remove adjusting cone locknut with Bendix wrench.[1] On underdrive[2] (yellow band) models, turn sprocket clockwise while unscrewing adjusting-cone/sun-gear. On overdrive (blue band) models, hold sprocket stationary. *Coupling can be damaged if sun gear is unscrewed with hub in overdrive.* Thread cone off axle. Lift out small ball retainer. Remove both drivers together to avoid spilling loose balls. Lift out large ball retainer.



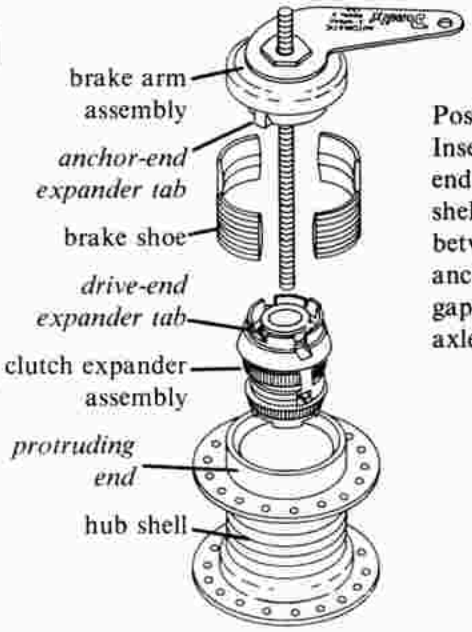
Invert assembly, holding brake arm and hub shell together. Install large ball retainer *ball side down.* Install both drivers as a unit, turning clockwise until seated. Install small ball retainer *ball side down.* Thread on sun gear until it touches planet gears.
Continue turning sun gear clockwise seeing that high-speed (outer) driver rotates counter-clockwise and low speed (inner) driver remains stationary.
Install locknut and adjust bearing so that there is just a trace of side play at wheel rim.

ASSEMBLY 2

Next Step

2 DISASSEMBLY

Do not invert assembly. Catch brake shoes as hub shell is lifted off remaining parts. Remove clutch expander assembly.



Next Step

Position hub shell protruding end up. Insert clutch expander assembly small end first. Stick brake shoes into hub shell with grease so that they seat between drive end expander tabs. Line anchor-end expander tabs up with the gaps between brake shoes and insert axle brake arm assembly.

ASSEMBLY 1

[1] A serviceable substitute can be fashioned from a spark plug by chipping out the center electrode and cutting back the side electrode so that the stub engages locknut slots.

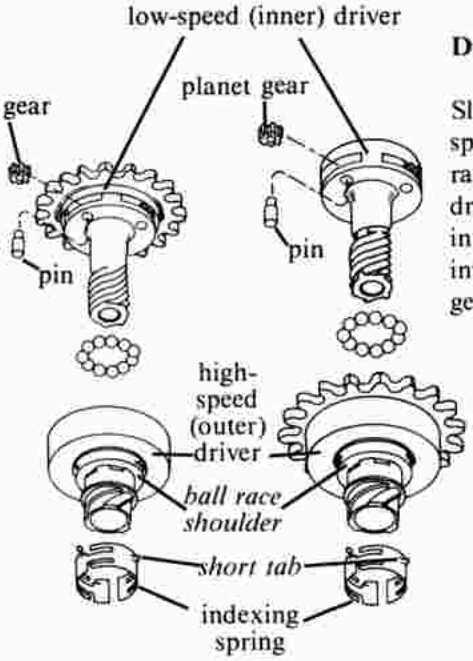
[2] Underdrive models have sprocket on high-speed (outer) driver and should be built up in hub shells with yellow bands, overdrive models have sprocket on low-speed (inner) driver and should only be installed in hub shells marked with blue bands. See driver illustrations on following page.

BENDIX BLUE AND YELLOW BAND 2-SPEED COASTER BRAKES DISASSEMBLY AND ASSEMBLY (cont.) SUBASSEMBLIES

DISASSEMBLY

Drivers

Separate drivers and catch loose balls. Drive out pins and remove planet gears from low-speed driver. Remove indexing spring from high-speed driver.



Drivers

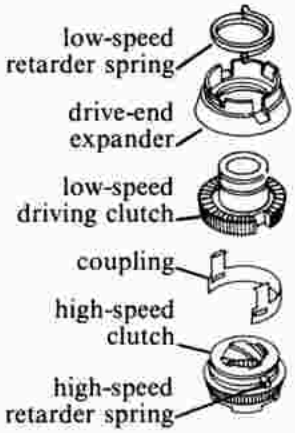
Slip indexing spring over sleeve of high-speed driver with *short* tabs against ball race shoulder. Position planet gears and drive in pins. Stick the 11 loose balls in place and insert low-speed driver into high-speed driver so that planet gears engage gear ring.

ASSEMBLY

DISASSEMBLY

Clutch Expander

Unhook coupling from high-speed clutch retarder spring and from low-speed clutch. Remove high-speed clutch retarder spring only if necessary. Remove low-speed clutch retarder spring and lift off drive-end expander.



Clutch Expander

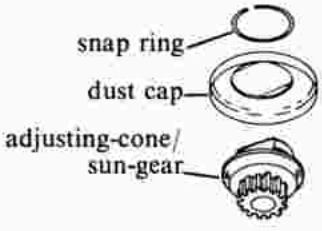
Slip large end of drive-end expander over small end of low-speed driving clutch and replace low-speed retarder spring. Support driving clutch on low-speed driver for this step if necessary. Replace high-speed driving clutch retarder spring if it was removed. Hook coupling over high-speed clutch. *Low* window of coupling engages *low* retarder spring hook. Hook other end of coupling into low-speed driving clutch slots.

ASSEMBLY

DISASSEMBLY

Adjusting-Cone/Sun-Gear

Remove snap ring and lift off dust cover.

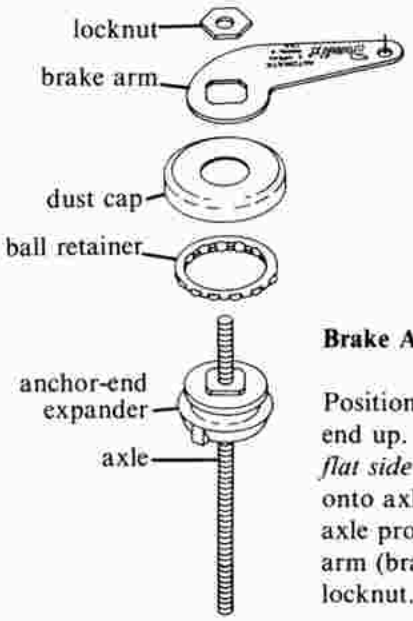


Adjusting-Cone/Sun-Gear

Install dust cover and replace snap ring.

ASSEMBLY

BENDIX BLUE AND YELLOW BAND 2-SPEED COASTER BRAKES DISASSEMBLY AND ASSEMBLY SUBASSEMBLIES (cont.)



DISASSEMBLY

Brake Arm

Remove locknut, brake arm, dust cap and anchor-end expander. Pop retainer over small end of expander with even pressure.

ASSEMBLY

Brake Arm

Position anchor end expander square end up. Use dust cap to pop on retainer *flat side up*. Thread anchor-end expander onto axle with about 1⅛" (29 mm) of axle protruding. Install dust cap, brake arm (brand name facing out) and tighten locknut.

CLEANING -

Clean all parts, including outside of hub shell, in a suitable solvent. Be very careful not to introduce dirt or grit after cleaning.

POINTS TO CHECK

Numbers in parenthesis refer to parts chart and exploded drawing.

1. Retarder springs (31) (14) and indexing spring (17) for shape and tension
2. Driving clutches (12) (14) for worn teeth or serrations
3. Braking surfaces (29) (15) for wear, glazing and burring
4. Drivers (18) (20) and driving clutches (12) (14) for worn threads
5. Sun gear (24), gear ring (18) and planet gears (22) for worn or chipped teeth
6. Bearing surfaces of both drivers (18) (20), adjusting cone (24), left-hand cone (6) and hub shell (15) for wear and pitting. Replace balls and ball retainers at overhaul.

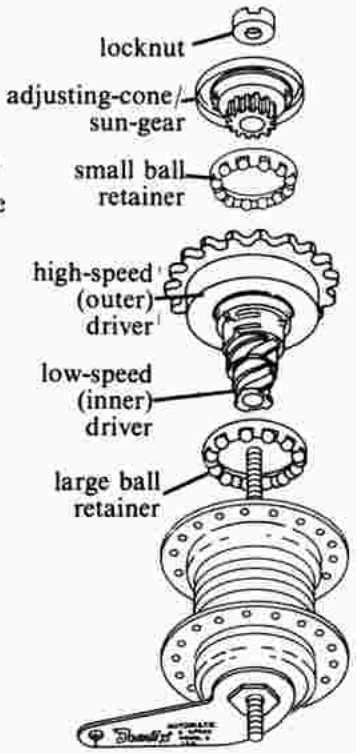
LUBRICATION

Lubricate ball bearings by filling the spaces between balls with grease. Lubricate hub shell and brake shoes liberally with a high-temperature grease. Coat other parts with grease.

BENDIX RED BAND 2-SPEED COASTER BRAKE DISASSEMBLY AND ASSEMBLY

(1) DISASSEMBLY

Remove adjusting cone locknut with Bendix wrench.[1] Turn sprocket clockwise while unscrewing adjusting-cone/sun-gear. (Hub can be made to remain stationary during this operation by shifting it into low gear.) Lift out small ball retainer. Remove both drivers together to avoid spilling loose balls. Rotate drivers counter-clockwise to disengage from clutch. Lift out large ball retainer.



Install large ball retainer *ball side down.* Install both drivers as a unit, turning clockwise until seated. Install small ball retainer *ball side down.* Thread on sun gear until it touches planet gears.

Continue turning cone *clockwise while turning sprocket counter-clockwise.* Install locknut and adjust bearing.

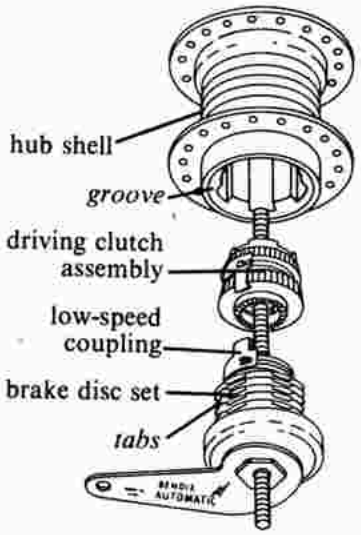
ASSEMBLY 3

Next Step

Next Step

(2) DISASSEMBLY

Lift off hub shell. Remove driving clutch assembly.



Align disc set tabs. Install driving clutch assembly *teeth down.* Slots in clutch engage low-speed coupling tabs. Lower hub shell over assembly being careful to align internal grooves with brake disc tabs. If hub shell will not seat, lift off, re-align tabs and try again.

ASSEMBLY 2

Next Step
Next Page

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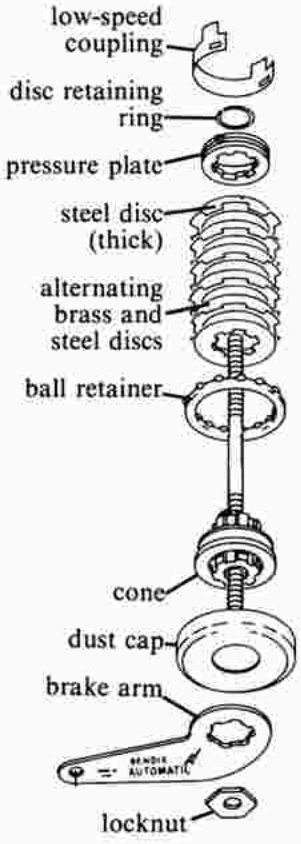
[1] A serviceable substitute can be fashioned from a spark plug by removing the center electrode and cutting back the side electrode so that the stub engages locknut slots.

BENDIX RED BAND 2-SPEED COASTER BRAKE DISASSEMBLY AND ASSEMBLY (cont.)

3 DISASSEMBLY

Remove low-speed retarder coupling. Pry off disc retaining ring with a thin-bladed screwdriver. Lift off pressure plate, brake discs and ball retainer.

Remove locknut, brake arm and dust cap. Thread off left-hand cone.



Next Step
Preceding Page

Thread left-hand cone onto axle until about 1⅛" (29 mm) of axle protrudes. Install dust cap, brake arm and locknut.

Install large ball retainer *flat side toward brake arm*. Install brake disc set, alternating brass and steel discs. If disc set has two *thick steel* discs, use one at each end; if it has one only, install it last. Install pressure plate, disc retaining ring and low-speed retarder coupling.

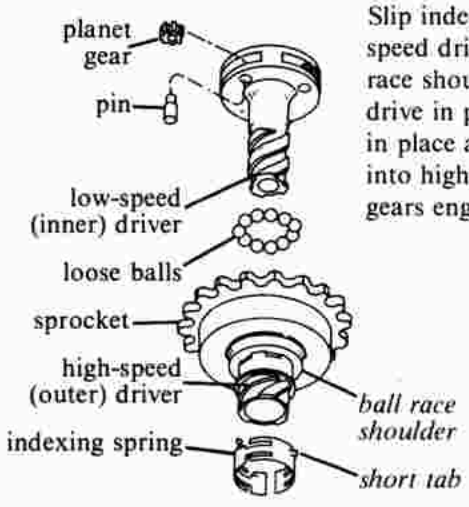
ASSEMBLY 1

SUBASSEMBLIES

DISASSEMBLY

Drivers

Separate drivers and catch loose balls. Drive out pins and remove planet gears from low-speed driver. Remove indexing spring from high-speed driver.



Drivers

Slip indexing spring over sleeve of high-speed driver with *short* tabs against ball race shoulder. Position planet gears and drive in pins. Stick the 11 loose balls in place and insert low-speed driver into high-speed driver so that planet gears engage gear ring.

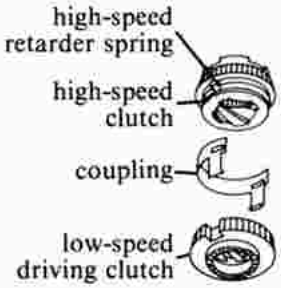
ASSEMBLY

BENDIX RED BAND 2-SPEED COASTER BRAKE DISASSEMBLY AND ASSEMBLY SUBASSEMBLIES (cont.)

DISASSEMBLY

Driving Clutch

Unhook coupling from high-speed clutch retarder spring and from low-speed clutch. Remove high-speed clutch retarder spring only if necessary.



Driving Clutch

Replace high-speed driving clutch retarder spring if it was removed. Hook coupling over high-speed clutch. *Low* window of coupling engages *low* retarder spring hook.

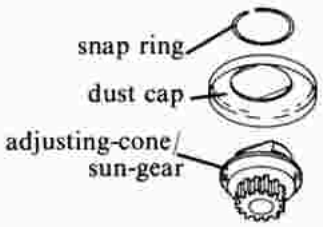
Orient low-speed driving clutch as shown and hook into coupling *with teeth facing out.*

ASSEMBLY

DISASSEMBLY

Adjusting-Cone/Sun-Gear

Remove snap ring and lift off dust cover.



Adjusting-Cone/Sun-Gear

Install dust cover and replace snap ring.

ASSEMBLY

CLEANING

Clean all parts, including outside of hub shell, in a suitable solvent. Be very careful not to introduce dirt or grit after cleaning.

POINTS TO CHECK

Numbers in parenthesis refer to parts chart and exploded drawing.

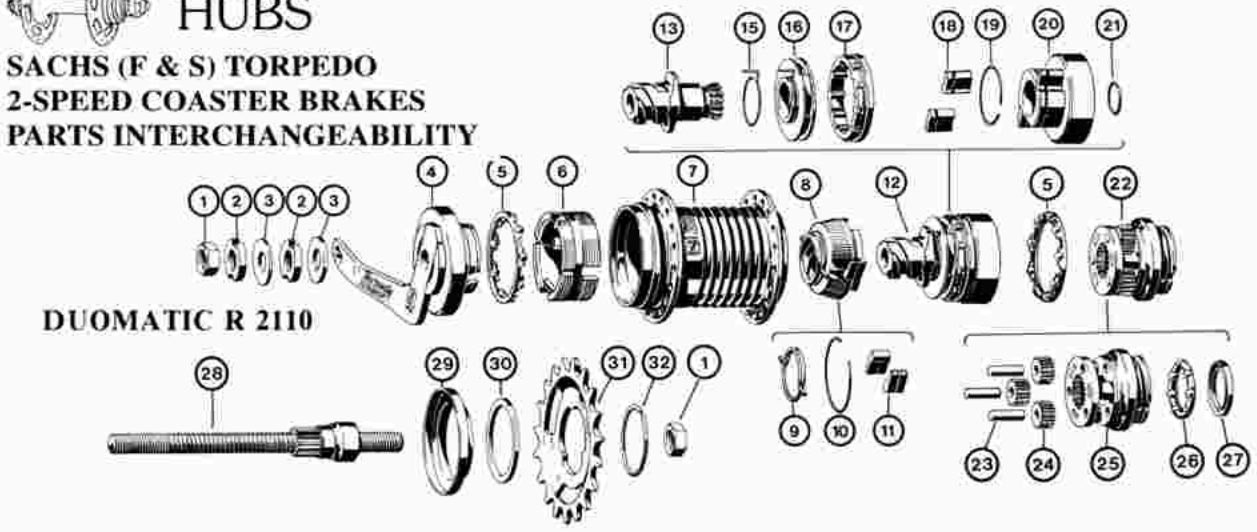
1. Retarder springs (9) (14) and indexing spring (17) for shape and tension
2. Driving clutches (12) (14) for worn teeth or serrations
3. Braking surfaces (8) (9) for wear, glazing and burring
4. Drivers (18) (20) and driving clutches (12) (14) for worn threads
5. Sun gear (24), gear ring (18) and planet gears (22) for worn or chipped teeth
6. Bearing surfaces of both drivers (18) (20), adjusting cone (24), left-hand cone (6) and hub shell (15) for wear and pitting. Replace balls and ball retainers at overhaul.

LUBRICATION

Lubricate ball bearings by filling the spaces between balls with grease. Lubricate hub shell and brake disc set liberally with a high-temperature grease. Coat other parts with grease.

HUBS

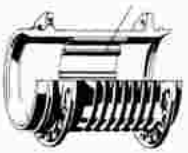
SACHS (F & S) TORPEDO 2-SPEED COASTER BRAKES PARTS INTERCHANGEABILITY



DUOMATIC R 2110

OLD STYLE

Hub shell with
10 trapezoidal teeth
36 holes - 0101 103 100
28 holes - 0101 103 101



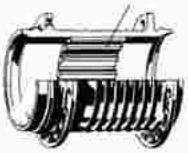
Driving ring (dog ring)
with 10 trapezoidal teeth
0101 104 100

Driver bush
0102 107 000

Control bush -
brown, black or tan
0172 109 100
Install only in old style hubs

NEW STYLE

Hub shell with
18 teeth (saw-toothed)
36 holes - 0101 103 200
28 holes - 0101 103 201



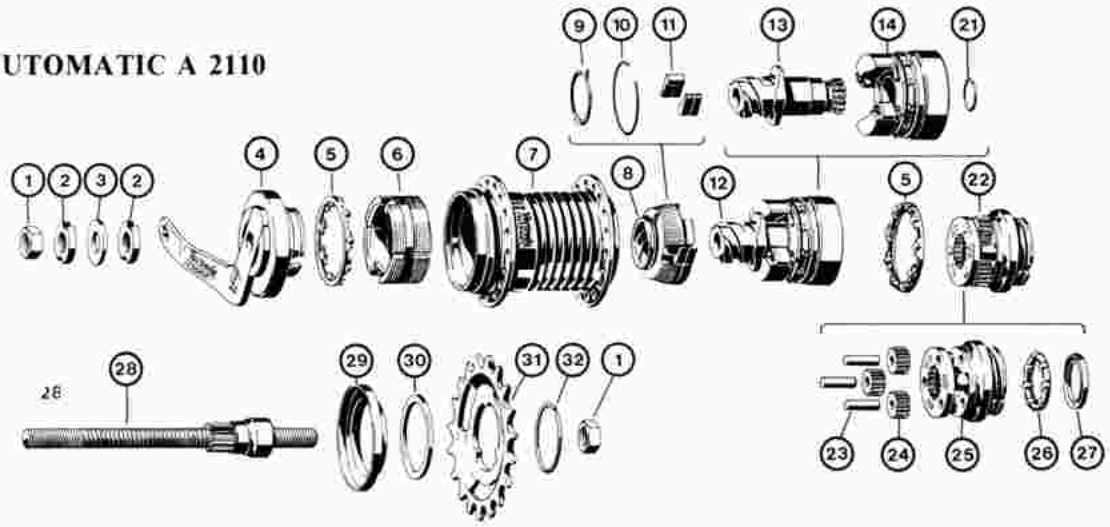
Driving ring (dog ring)
with 9 teeth (saw-toothed)
0101 104 200

Driver bush with collar
0102 107 100

Yellow control bush with
modified internal section
0172 109 101

New driver bushes combined with new control bushes can be installed into hubs of old or new design.

AUTOMATIC A 2110



SACHS (F & S) TORPEDO 2-SPEED COASTER BRAKES PARTS INTERCHANGEABILITY	Torpedo Automatic A2110	Torpedo Duomatic R2110	Torpedo Duomatic 102	Torpedo Duomatic 101 without brake
1. Hex Nut	0316 061 004	0316 061 004	0516 003 000[123]	parts in this
2. Lock Nut	1603 017 000	1603 017 000	0516 001 200[123]	column replace
3. Washer	2318 004 004	2318 004 004		parts in the 102
Fixing Plate			0517 102 000[123]	column to make
Lock Washer			0517 003 000[123]	hub without brake
4. Lever Cone Assembly	0174 103 000	0174 103 000	0174 101 000	0574 107 100
Lever Cone			0507 101 100	
Dust Cap			0521 103 100	
Brake Lever			0119 100 100	
5. Ball Cage	0576 104 100	0576 104 100	0576 104 100[123]	
6. Brake Shell (Brake Cylinder)	0573 103 000[2]	0173 102 000	0173 100 000[6]	0173 102 000[4]
7. Hub Shell 36 holes	0101 106 000	see inset	0170 100 000	0101 100 000
28 holes	0101 106 001	see inset	0170 100 001	0101 100 001
24 holes			0170 100 002	0100 100 002
8. Brake Cone Assembly	0574 106 000[1]	0174 101 100	0174 101 000	
9. Friction Spring	0513 102 000[1]	0113 103 000	0113 101 000[6]	
10. Circlip	0512 102 000[12]	0512 102 000[12]	0512 102 000[12]	
11. Pawls (2)	0536 104 000[12]	0536 104 000[12]	0536 104 000[12]	
Brake Cone	0516 101 000[12]		0106 101 000	
12. Driver Bush Assembly		0172 116 000		
for 24"-28" wheels	0172 113 000			
(bare flyweight spring)				
for 20"-22" wheels	0172 113 001			
(galvanized flyweight spring)				
13. Driver Bush	0102 105 000	see inset	0102 101 000	
14. Gear Ring Assembly	0172 111 000			
for 24"-28" wheels				
(bare flyweight spring)				
Gear Ring Assembly hing	0172 111 001			
for 20"-22" wheels				
(galvanized flyweight spring)				
Pawl Carrier Assembly			0172 014 000	
Pawl Carrier			0104 100 100	
15. Friction Spring		0113 100 000	0113 100 000	
16. Control Bush		see inset		
17. Driving Ring (Dog Ring)		see inset	0101 101 000	
18. Pawls		0136 104 000	0136 100 000	
19. Circlip		0112 100 000		
20. Gear Ring		0181 100 000	0133 100 100	
Circlip (2)			0112 101 000	
21. Circlip	0112 103 000	0112 103 000		
Axle Circlip			0517 002 000[123]	
Thrust Washer, small diameter			0518 106 000[123]	
22. Planet Gear Carrier Assembly	0172 105 000	0172 105 000	0172 100 100	0172 100 200
23. Pivot Pins (3)	0114 101 000[1]	0114 101 000[1]	0114 100 000	
24. Planet Gears (3)	0533 103 000[123]	0533 103 000[123]	0533 103 000[123]	
25. Planet Gear Carrier	0172 106 000	0172 106 000	0172 102 100	
26. Ball Cage S 2048	0576 102 000[123]	0576 102 000[123]	0576 102 000[123]	
27. Dust Cap	0121 108 000[123]	0121 108 000[123]	0521 106 000	
Thrust Washer, large diameter			0118 101 000	
28. Axle 148 mm (5.821") 9.5 mm ϕ	0171 103 000	0171 103 000		
158 mm (6.221") 10.5 mm ϕ	0171 106 000	0171 106 000	0109 100 000	
Fixed Cone			0574 105 000	0508 102 000
29. Dust Cap (sprocket side)	0121 109 000[1]	0121 109 000[1]	0121 101 000	0121 108 000
30. Washer (spacer)	0518 018 000[5]	0518 018 000[5]	0518 018 000[5]	
31. Sprockets[5]				
32. Circlip[5]	0512 011 000[5]	0512 011 000[5]	0512 011 000[5]	
Adjusting Cone				0174 100 000
Locking Element				0172 103 000

[1] Interchanges with 3 speed H3111. [2] Interchanges with 3 speed 515. [3] Interchanges with 3 speed 415.
[4] Same as Brake Shell on Duomatic R2110. [5] See Sprocket Interchangeability at beginning of Hub section.
[6] See Brake Shell Replacement on Duomatic 102 Hubs, page 3-16.

SACHS (F & S) TORPEDO R 2110 DUOMATIC 2-SPEED COASTER BRAKE DISASSEMBLY AND ASSEMBLY

1 DISASSEMBLY

Remove locknuts, washers and lever cone assembly. The brake lever, lever cone and dust cap are press fit together and should not be forced apart. Lift out ball retainer and brake cylinder.

Next Step

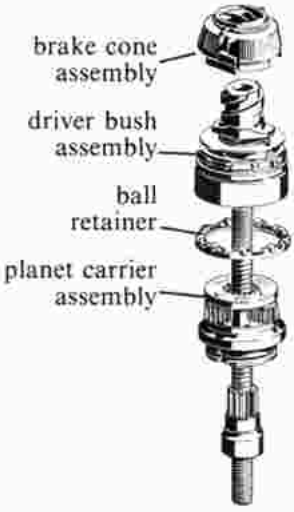
2 DISASSEMBLY

Lift hub shell clear of remaining internal parts

Next Step

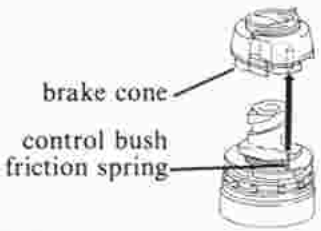
3 DISASSEMBLY

Remove brake cone assembly, driver bush assembly, ball retainer and planet carrier assembly.



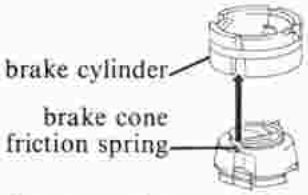
Next Step

Assemble brake cone and driver bush. Be sure control bush friction spring fits in the hole in brake cone. Lower this assembly over planet gears.



Install ball retainer flat side down.
Lower planet carrier assembly onto axle.

ASSEMBLY 1



Install brake cylinder with internal tabs up. Rotate until slots in brake cylinder engage hooked ends of brake cone friction spring.
Install ball retainer flat side up. Install lever cone assembly. If brake arm, lever cone and dust cap were forced apart inspect carefully. If serviceable, press together with brand name on brake arm facing out. Install assembly with slots on lever cone engaging brake cylinder tabs. Install adjuster locknut, lockwasher and locknut. Adjust bearing, locking the first nut in place with the second.

ASSEMBLY 3

Next Step

Position hub shell long end up and lower over assembly until it seats.

ASSEMBLY 2

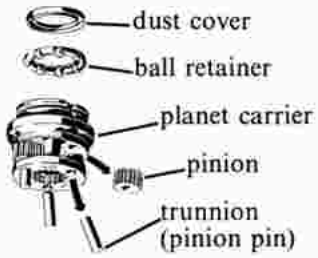
SACHS (F & S) TORPEDO R 2110 DUOMATIC 2-SPEED COASTER BRAKE SUBASSEMBLIES

DISASSEMBLY

Planet Carrier

Remove dust cover with a thin-bladed screwdriver. Work slowly around cover to avoid deforming it. Lift out ball retainer.

Push out trunnions (pinion pins) and remove pinions.



Planet Carrier

Install ball retainer flat side up. Start dust cover straight and tap home with a soft hammer.

Position pinions and insert trunnions (pinion pins).

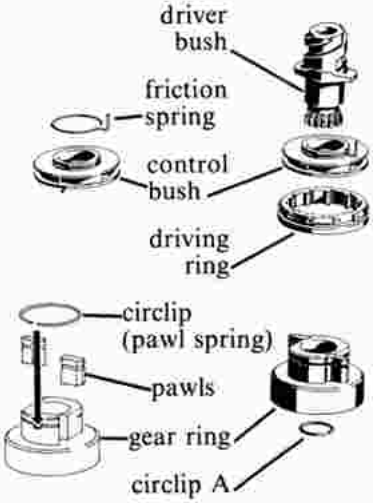
ASSEMBLY

DISASSEMBLY

Driver Bush

Remove circlip A only if it is necessary to disassemble driver bush assembly. Use an awl to ease circlip over driver bush gear.

Remove gear ring pawls and pawl circlip. Remove control bush friction spring only if necessary.



Driver Bush

Replace control bush friction spring if it was removed.

Install gear ring pawls under pawl circlip. Rotate circlip gap over indentation which closes circlip groove. *Viewed as shown, pawls must point counter-clockwise.*

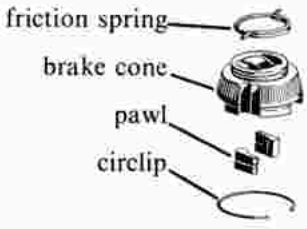
Position driving ring flange down and slip over gear ring. Install control bush, rotating counter-clockwise until it engages pawls. Install driver bush, invert assembly and replace circlip A.

ASSEMBLY

DISASSEMBLY

Brake Cone

Remove friction spring only if it is to be replaced. To remove pawls, pull outward until end of circlip clears groove, then ease circlip off the end of brake cone.



Brake Cone

Install friction spring if it was removed. Use *black* spring only with *bronze* brake cylinder. Use *copper plated* spring only with *steel* brake cylinder.

Install pawls under circlip. Rotate circlip gap over indentations that close circlip groove. Viewed as shown, pawls must point counter-clockwise.

ASSEMBLY

SACHS (F & S) TORPEDO R 2110 DUOMATIC 2-SPEED COASTER BRAKE DISASSEMBLY AND ASSEMBLY (cont.)

CLEANING

Clean all parts, including outside of hub shell, in a suitable solvent. Be very careful not to introduce dirt or grit after cleaning.

POINTS TO CHECK

Numbers in parenthesis refer to parts chart and exploded drawing.

1. Driving edges of pawls (18) (11), driving ring (17) and hub shell (7) for worn or chipped corners
2. Teeth on driver bush (12), planet carrier (25), planet gears (24), sun gear (28) and gear ring (20) for wear and chipping
3. Circlips (19) (20) (21) and friction springs (9) (15) for shape and tension. Verify that brake cone has copper plated friction spring for steel brake shell or black friction spring for bronze brake shell. Manufacturer recommends replacing driver bush circlip (A) if it was removed.
4. Bearing surfaces of planet carrier (22), cones and hub shell (7) for wear and pitting. Replace bearing retainers at overhaul.
5. Serrations on brake cone (8) and brake shell (6) for wear
6. Threads on driver bush (13) and brake cone (8) for wear
7. Brake shell (6) and hub shell (7) for wear or glazing of braking surfaces

LUBRICATION

Lubricate ball bearings by filling the spaces between balls with grease. Lubricate hub shell and brake cylinder liberally with a high-temperature grease. Manufacturer strongly recommends *Sachs Gear Grease* for *bronze* brake shells with *black* friction spring and *Grease for Steel Brake Shells* for *steel* shells with *copper plated* friction spring. Lightly oil other internal parts with a *good* cycle oil. (WD-40 is too light for lasting lubrication, 3-in-1 Oil gums up with age.)

DUOMATIC 102 BRAKE SHELL REPLACEMENT

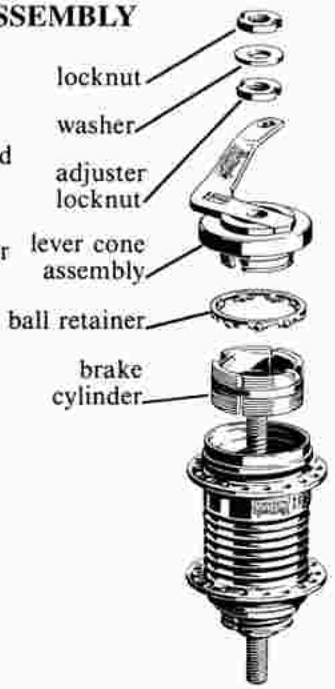
Bronze brake cylinder 0173 100 000 is no longer available. It has been superseded by steel brake cylinder 0173 102 000. *Always* use the correct friction spring and lubricant for the brake cylinder installed, as summarized below.

Brake Shell	Lubricant	Friction Spring (on Brake Cone)
1. Steel Brake Shell, Part 0173 102 000	Grease for Steel Brake Shells, Part 0369 135 100	Copper-Plated Friction Spring, Part 0113 103 000
2. Bronze Brake Shell, Part 0173 100 000	Sachs Gear Grease, Part 0369 111 100	Black Friction Spring, Part 0113 101 000

SACHS (F & S) TORPEDO A 2110 AUTOMATIC 2-SPEED COASTER BRAKE DISASSEMBLY AND ASSEMBLY

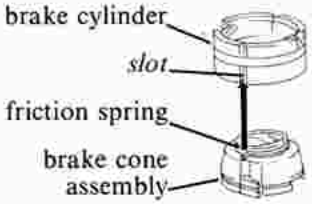
1 DISASSEMBLY

Remove locknuts, washer and lever cone assembly. The brake lever, lever cone and dust cap are press fit together and should not be forced apart. Lift out ball retainer and brake cylinder.



Next Step

Install brake cylinder with tabs up. Rotate until brake cylinder slot engages hooked end of friction spring.



Install ball retainer flat side up. Install lever cone assembly. If brake arm, lever cone and dust cap were forced apart inspect carefully. If serviceable, press together with brand name on brake arm facing out. Install assembly with slots on lever cone engaging brake cylinder tabs. Install adjuster locknut, lockwasher and locknut. Adjust bearing, locking the first nut in place with the second.

ASSEMBLY 3

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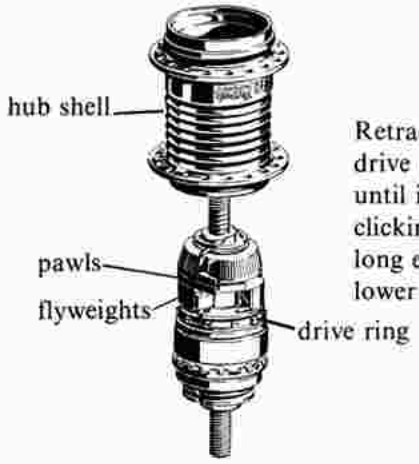
2 DISASSEMBLY

Lift hub shell clear of remaining internal parts



Next Step

Next Step

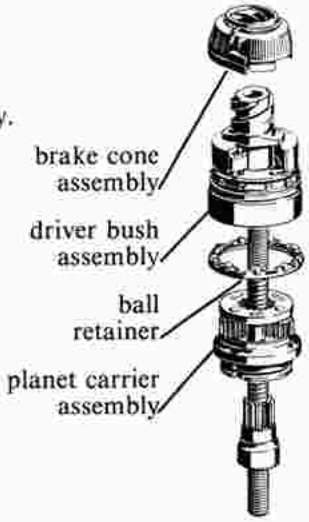
Retract flyweights by turning drive ring counter-clockwise until it rotates freely without clicking. Position hub shell long end up and carefully lower over assembly.

ASSEMBLY 2

---

3 DISASSEMBLY

Remove brake cone assembly. driver bush assembly, ball retainer and planet carrier assembly.



Next Step

Lower planet carrier assembly onto axle. Install ball retainer *flat side down*. Slip driver bush assembly over planet carrier. Install brake cone assembly on driver bush.

ASSEMBLY 1

HUBS

SACHS (F & S) TORPEDO A 2110 AUTOMATIC 2-SPEED COASTER BRAKE
DISASSEMBLY AND ASSEMBLY (CONT.)
SUBASSEMBLIES

DISASSEMBLY

Planet Carrier

Remove dust cover with a thin-bladed screwdriver. Work slowly around cover to avoid deforming it. Lift out ball retainer.

Push out trunnions (pinion pins) and remove pinions.

Planet Carrier

Install ball retainer flat side up. Start dust cover straight and tap home with a soft hammer.

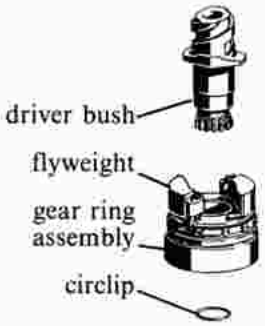
Position pinions and insert trunnions (pinion pins).

ASSEMBLY

DISASSEMBLY

Driver Bush

Remove circlip only to separate driver bush and gear ring assembly. Gear ring assembly is not designed to be disassembled.



Driver Bush

Assemble driver bush, gear ring assembly and circlip.

Flyweight spring rating is indicated by spring finish and a colored dot on one flyweight which should be the same color as the plastic band on the lever cone assembly:

- red for 20-22 inch wheels, spring galvanized;
- blue for 24-28 inch wheels, spring surface untreated.

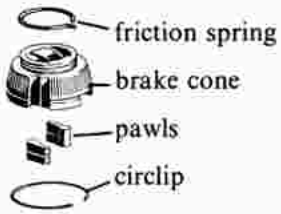
ASSEMBLY

DISASSEMBLY

Brake Cone

Remove friction spring only if it is to be replaced. Ease spring out of groove with a thin-bladed screw driver.

To remove pawls, pull outward until end of circlip clears groove, then ease circlip off the end of brake cone.



Brake Cone

Install friction spring *with hooked end clockwise from gap.* Incorrect installation will cause excess drag, wear and possible brake failure.

Install pawls under straight-ended circlip. Position ends of circlip near indentations that close circlip groove. *Viewed as shown, pawls must point counter-clockwise.*

ASSEMBLY

CLEANING

Clean all parts, including outside of hub shell, in a suitable solvent. Be very careful not to introduce dirt or grit after cleaning.

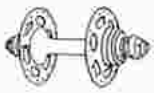
POINTS TO CHECK

Numbers in parenthesis refer to parts chart and exploded drawing.

1. Pawls (18) (11), driving ring (14), hub shell (7), driver bush (12), planet carrier (22), planet gears (24), sun gear (28) and gear ring (14) for worn or chipped driving surfaces
2. Circlips (19) (20) (21) and friction spring (9) for shape and tension. Manufacturer recommends replacing driver bush circlip if it was removed.
3. Bearing surfaces of planet carrier (22), cones and hub shell (7) for wear and pitting. Replace ball retainers at overhaul.
4. Serrations on brake cone (8) and brake shell (6) for wear
5. Brake shell (6) and hub shell (7) for wear or glazing of braking surfaces

LUBRICATION

Lubricate ball bearings by filling the spaces between balls with grease. Lubricate hub shell and brake cylinder liberally with a high-temperature grease. Manufacturer strongly recommends *Sachs Gear Grease* for *bronze* brake shells with *black* friction spring and *Grease for Steel Brake Shells* for *steel* shells with *copper plated* friction spring. Lightly oil other internal parts with a *good* cycle oil. (WD-40 is too light for lasting lubrication, 3-in-1 Oil gums up with age.)



Hub	Trouble Chart page	Exploded Drawing page	Parts Interchangeability Chart page	Disassembly and Assembly Instructions page	Cleaning, Points to Check and Lubrication page	Axle Thread Size
Brampton (see Sturmey-Archer AW)						
Hercules (see Sturmey Archer AW)						
Sachs (F & S)						
Torpedo 415	5-5	5-28	5-29	similar to H3111		13/32" x 26 TPI
H3102	5-5	5-30	5-21	similar to H3111		13/32" x 26 TPI
Schwinn Approved (see Sturmey-Archer AW)						
Shimano						
Cartridge	4-4	4-8	4-9	4-14	4-16	3/8" x 26 TPI
F and G	4-4	4-8	4-9	4-10	4-13	3/8" x 26 TPI
333	4-4	4-8	4-9	similar to F and G		3/8" x 26 TPI
Sturmey-Archer						
AB/C (see AW)						
AG3 (see AW)						
AW	4-5	4-17	4-17	4-18	4-21	13/32" x 26 TPI
FW	4-6	4-22	4-23	similar to S5		13/32" x 26 TPI
SAB3 (see AW)						
S5 and S5/2	4-6	4-22	4-23	similar to S5.1		13/32" x 26 TPI
S5-1	4-6	4-22	4-23	4-24	4-27	13/32" x 26 TPI
Styre (see Sturmey-Archer AW)						
Sun Tour (see Sturmey-Archer AW)						

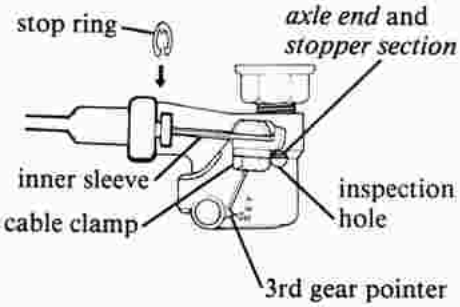
WHEEL MOUNTING

The axle of a multi-speed hub must be firmly held in the dropouts so that it cannot turn. Axle flats, serrated fixing washers or flange nuts and tapped non-turn washers are used to this effect. Make sure serrated parts seat against the *frame* (not against a washer) and non-turn washer tabs engage dropout slot. If the axle become loose in the dropouts it will be necessary to readjust the shift cable.

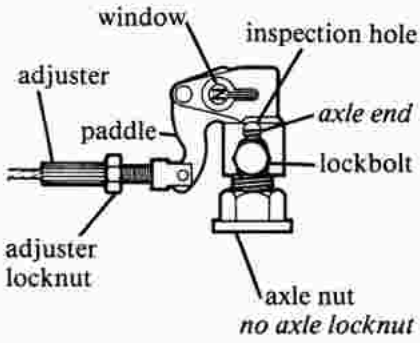
HUBS

THREE, FOUR AND FIVE SPEED HUBS

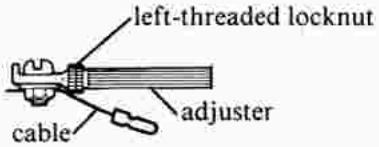
Positron Bell Crank (bottom view)

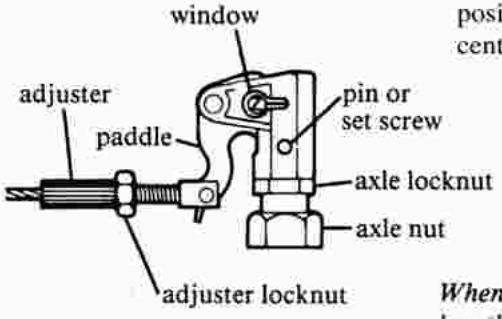


Lockbolt Bell Crank (top view)



Universal Cable Clamp





Threaded Bell Crank (top view)

TRIGGER INTERCHANGEABILITY

See pages 1-3 thru 1-6 at the beginning of this book for trigger, cable, indicator and bell crank interchangeability.

CABLE ADJUSTMENT

Improper adjustment is the most common cause of problems with 3-, 4- and 5-speed hubs. Many people have quit riding bikes because their hub slipped out of gear when they were standing up in the pedals. Always check trigger and cable operation before deciding to overhaul a hub.

To have a cable that is in proper adjustment and will *stay* that way, all fittings must be tight enough not to creep along the frame, the cable must be free of kinks and knots, the pulley must operate smoothly and the bell crank or indicator chain must not be twisted. (Always back off a thread-on bell crank or an indicator chain 1/8 of a turn from finger tight.)

Shimano (Cartridge, F, G and 333 Hubs)

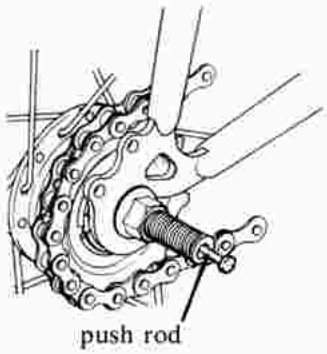
All Shimano Hubs use a bell crank and push rod arrangement. For installation and interchangeability see pages 1-4 and 1-5. Note that push rod length is critical and depends on the length of the axle used.

Positron bell crank. Positron bell cranks must be used with Positron triggers and the single-strand, push-pull Positron cable, but the combination can be used on any Shimano hub. The end of the axle must rest against the bell crank stopper section (as visible through inspection hole). To adjust, move the shifter to the 3 position, loosen the cable, click the bell crank to the position marked Set (push hard) and retighten the cable.

Lockbolt and threaded bell cranks. Check for proper installation (pages 1-4 and 1-5). Move paddle to make sure push rod is not missing. Threaded bell crank should be ⅛ to ¼ of a turn from finger tight (pins or set screw bottoming on end of axle with axle locknut loose). Lockbolt bell crank slips on without axle locknut; make sure stopper section contacts the end of the axle, as visible through inspection hole. Adjust cable with trigger in the *N* or *2* position so that the circled *N* on the bell crank paddle is centered in its window (see illustration).

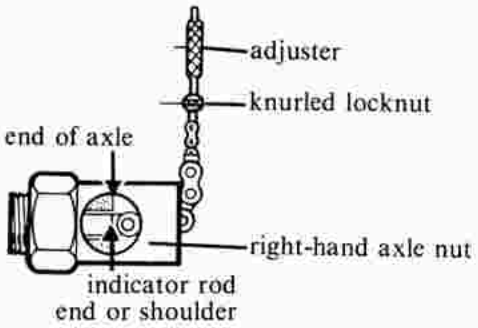
Push Rod Length

When loosely inserted, proper length push rod protrudes
10–12 mm
13/32 – 15/32"



Sturmey-Archer 3-Speeds

Make sure that indicator rod is backed off from ⅛ to ⅝ of a turn from finger tight. Adjust cable so that the end of the indicator rod is just even with the end of the axle with the shifter in the *N* position.[1] This method may not work with a non-standard indicator chain or axle. If it cannot be used, adjust the cable so that the "dead spot" (pedals freewheeling forward) falls exactly half way between *N* and *H* shift trigger positions. This is best done by moving the pedals quickly back and forth with one hand while slowly pushing the trigger from *H* toward *N*. Count indicator chain links as they come out of the axle before the *beginning* of the dead spot; continue moving the pedals and advancing trigger and count the number of links that emerge between the *end* of the dead spot and the click as the trigger goes to *N*. If these two counts are not the same, adjust the cable and try again. In no case should either gear be closer than ½ *link* to the dead spot. Tighten knurled locknut against adjuster.



Sturmey-Archer FW (4-speed)

FW hubs use a special 4-speed trigger and indicator chain with a two-piece indicator rod. Hold the indicator chain stationary and make sure the two segments of the indicator rod are tightly screwed together by attempting to tighten the left end (visible in the left end of the hollow axle) with a narrow screwdriver. Adjust the cable so that the *left* end of the indicator rod is even with the *left* end of the axle with the shifter in the *L* position. This only works if the proper length indicator rod is installed for the axle. If in doubt, center the "dead spot" between 3rd and 4th gear as described for the AW.

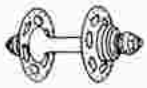
Sturmey-Archer S5, S5.1

Shift left-hand cable to the extended position. Adjust cable until slack. Move shifter to the other position and tighten cable until bell crank or indicator chain stops moving. Right-hand cable can be adjusted like an AW cable, except that it is the indicator rod *shoulder* that lines up with the end of the axle.

Sachs (F & S)

See page 5-2

[1] If the end of the axle is not visible in the axle nut window, indicator chain will bottom at last link in low gear. Install a spacer under axle nut.



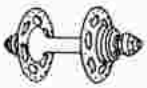
HUBS

SHIMANO F, G and CARTRIDGE TYPE 3-SPEED HUBS TROUBLE CHART

Symptom	Possible Causes[1] Resulting from wear, improper lubrication or abuse	Resulting from improper assembly or installation
3rd gear instead of 2nd	Cable too loose	
2nd gear instead of 1st	No rollers (15)	
Slips in 1st	Driver (31) pawls nearest sprocket faulty, pawl springs weak or broken	Driver (31) pawls or pawl springs nearest sprocket improperly installed
Slips in 2nd	Planet carrier (18) pawls faulty, pawl springs weak or broken	Planet carrier (18) pawls or pawl springs improperly installed
Slips in 3rd	Driver (30) pawls farthest from sprocket faulty, pawl springs weak or broken	Driver (30) pawls or pawl springs farthest from sprocket improperly installed
1st gear instead of 2nd	Cable too tight	
Jumps from 2nd to 1st	Return spring (42) bent or weak	Return spring (42) missing
Sluggish shifting	Left-hand cone (41) misadjusted	
	Axle sun gear (40) chipped or worn	
Jumps from 3rd to 2nd	Ring gear (10) pawls faulty	Cable return spring missing
		Ring gear (10) pawls improperly installed
2nd gear instead of 3rd	----------	Cartridge type driver (30) installed with F type axle (40)

3rd gear only		Right-hand sliding key (39) missing or displaced
Runs stiffly or noisily	One pawl of a pair faulty	Left-hand sliding key (38) (39) missing or displaced
	Axle (40) bent	One pawl of a pair improperly installed
	Gear teeth chipped or worn	F type left-hand cone (41) installed with cartridge type axle (40)
	Dropouts not parallel	Ball retainer reversed
	Improper or no lubrication	
	Loose or broken parts inside hub	
	Chain too tight	
	Gear teeth chipped or worn	
	Cones too tight	
	Ball retainer broken or damaged	

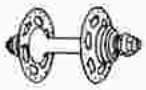
[1] Parts numbers in parenthesis refer to parts chart and exploded drawing.



STURMEY-ARCHER AW 3-SPEED HUB TROUBLE CHART

Symptom	Possible Causes[1]: Resulting from wear, improper lubrication or abuse	Possible Causes[1]: Resulting from improper assembly or installation
		Low gear pawls (12) installed in gear ring (20) by mistake
		Thrust ring (19) not seated over axle key (16) flats
2nd gear instead of 1st	Clutch spring (32) bent or too long	No washer under right-hand axle nut (31): indicator chain bottoms out at last link
Jumps from 1st to 2nd	Cable too loose	Indicator not fully screwed in
Slips in 2nd	Indicator threads stripped	
	Gear ring (20) dogs worn	
	Clutch (18) worn	
	Pinion pin (15) ends worn	
Jumps from 3rd to 2nd	Gear ring (20) pawls sticking or worn, pawl springs weak or broken	Gear ring (20) pawls or springs improperly installed
Slips in 3rd	Cable too tight	
	Dirt between axle (9) and clutch (18)	
Sluggish shifting	Weak or bent clutch spring (32)	
Slips in 1st	Right-hand cone (5) too loose	
	Cable sticks; indicator chain twisted	
	Planet cage (11) pawls sticking or pawl springs weak	Planet cage (11) pawls or springs improperly installed
	Corroded parts, improper or no lubrication	Spring cap pinched between right-hand cone and driver
	Chain too tight	Too many balls in ball ring (22)
	Cones (5) too tight	One pawl of a pair improperly installed
	One pawl of a pair sticking	
	Chainstay ends not parallel	Ball retainer reversed
Stiff running or noisy	Axle (9) bent	
	Loose or broken parts inside hub	
	Dust caps distorted	
	Ball retainer (7) damaged or broken	

[1] Parts numbers in parenthesis refer to parts chart and exploded drawing.



HUBS

STURMEY-ARCHER FW, S5 and S5.1 FOUR AND FIVE SPEED HUBS TROUBLE CHART

Symptom	Possible Causes[1]: Resulting from wear, improper lubrication or abuse	Possible Causes[1]: Resulting from improper assembly or installation
3rd gear instead of 1st or 2nd		Low gear pawls (12*) installed in gear ring (20) by mistake
		Thrust ring (19*) not seated over axle key flats (14)
Jumps from 1st or 2nd to 3rd	Clutch spring (32*) bent or too long	No washer under axle nut (31*) (1); indicator chain bottoms out at last link
	Cable too loose	Indicator (19) not fully screwed in
	Indicator (19) threads stripped	
Slips in 3rd	Clutch (18*) worn	
	Gear ring (20*) dogs worn	
2nd gear instead of 1st and 4th instead of 5th	Compensator spring bent, weak, or damaged (FW)	Compensator spring missing (FW)
	Primary sun pinion (10) dogs or axle (13) dogs worn; faulty coiling of low gear spring (12)	
	Left cable too slack (S5, S5.1)	
Slips in 1st gear Jumps from 5th to 3rd	Pushrod too short (S5)	
	Bellcrank paddle slipped past pushrod (S5)	
	Left cable too tight (S5.1)	
	Weak pinion return spring (7) (S5.1)	Pinion return spring (7) missing
Slips in 2nd gear Jumps from 4th to 3rd	Dog ring locknut (4) loose (S5,S5.1)	
	Dog ring (6) teeth worn	
	Low gear spring (12) weak	Pinion sleeve reversed (FW,S5)
	Left cable too tight (S5)	Pushrod too long (S5)
	Left cable too slack (S5.1)	

(cont.)
Next Page

[1] Parts numbers followed by * refer to AW parts chart p. 4-17, others to S5 parts chart p. 4-22.

STURMEY-ARCHER FW, S5 and S5.1
FOUR AND FIVE SPEED HUBS
TROUBLE CHART (cont.)

Symptom	Possible Causes[1]: Resulting from wear, improper lubrication or abuse	Possible Causes[1]: Resulting from improper assembly or installation
Jumps from 4th and 5th to 3rd	Planet cage (15) dogs worn	
	Clutch (18*) worn	
	Gear ring (20*) pawls sticking or worn	Gear ring (20*) pawls or springs improperly installed
Slips in 4th and 5th	Cable too tight	
	Dirt between axle (13) and clutch (18*)	Clutch spring (32*) missing
	Weak or bent clutch spring (32*)	
Slips in 1st and 2nd	Right-hand cone (5*) too loose	
	Cable sticks; indicator chain (19) twisted	
	Planet cage (15) pawls sticking or pawl springs weak	Planet cage (15) pawls or springs improperly installed
		Wide S3C ball ring (22*) installed in other hub
Stiff running or noisy	Corroded parts, improper or no lubrication	
	Chain too tight	Too many balls in ball ring (22)
	Cones (5*) too tight	One pawl of a pair improperly installed
	Chainstay ends not parallel	
	Axle (13) bent	Planet pinions (16) incorrectly timed (marked teeth must point outward at once)
	Loose or broken parts inside hub	
	Distorted dust caps	
	Ball retainer damaged or broken	
Shifts poorly		Pinion return spring washer (8) missing
	Compensator spring bent, weak or damaged (FW)	
	Dirt between axle (13) and clutch (18*)	
	Clutch spring (32*) weak or bent	
	Right cone (5*) too loose	

[1] Parts numbers followed by * refer to AW parts chart p. 4-17, others to S5 parts chart p. 4-22.

HUBS

SHIMANO F, G and CARTRIDGE TYPE 3-SPEED HUBS

CARTRIDGE TYPE

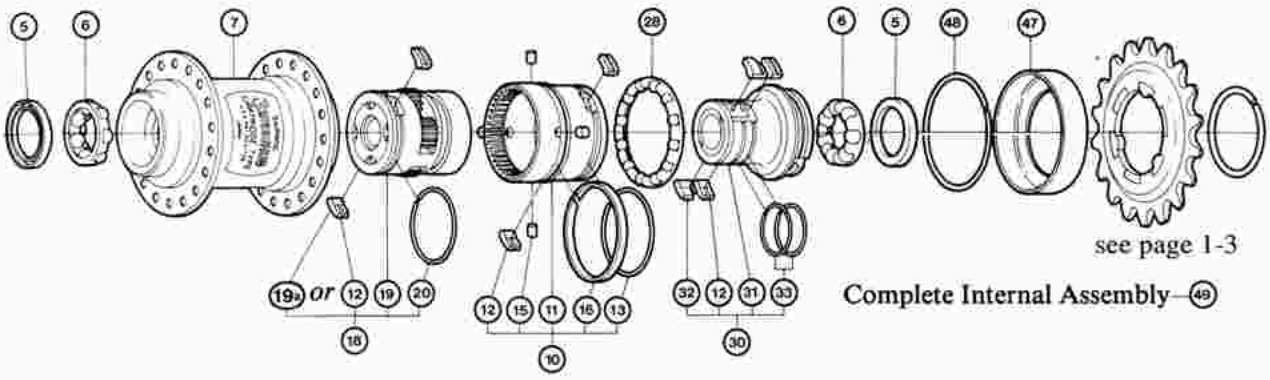
New Parts Summary
see parts list for full interchangeability

Model Year	1978–81	1982	1983
Driver*	Pawl A	Pawl I	
Planet Carrier	Pawl A	Pawl I	
Sliding Keys	2 A Keys *or* 1 BR Key & Washer		Key BR & Washer
Stop Ring Color	Gray		Black
*Driver F pawls and ring gear A pawls are unchanged.			

Pawls

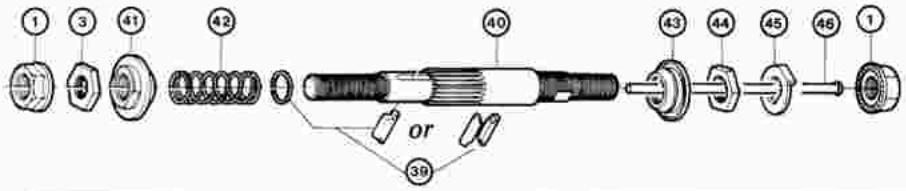
A— black, *slot centered*

I — gray, *slot off-center*



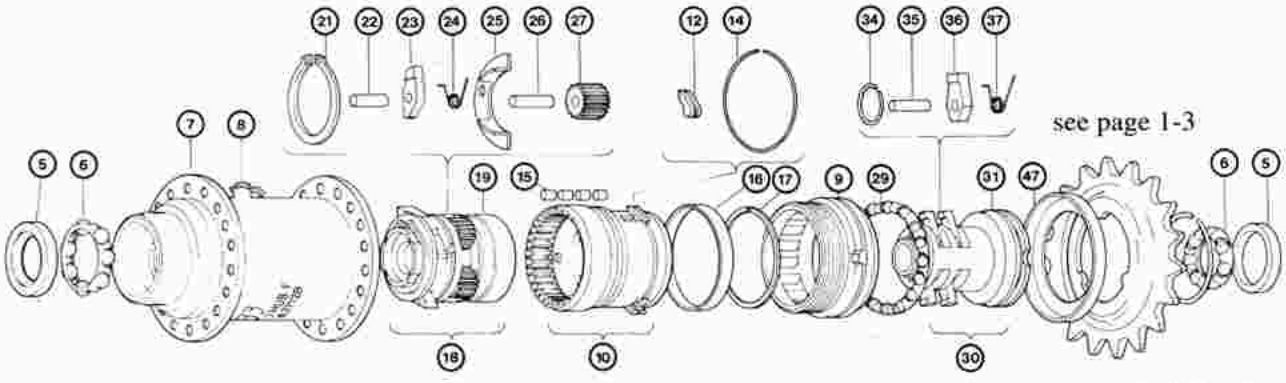
see page 1-3

Complete Internal Assembly—49

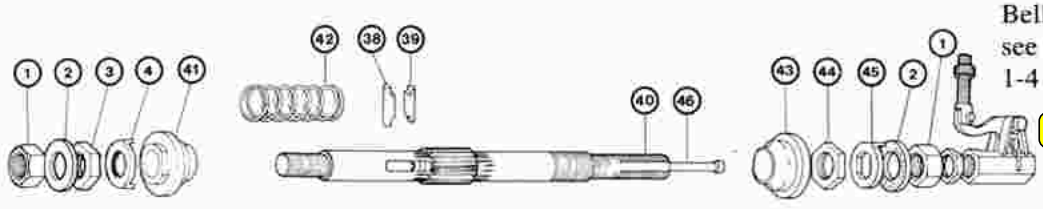


For Bell Crank see pages 1-4 and 1-5.

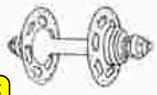
F TYPE & G TYPE



see page 1-3



Bell Crank— see pages 1-4 and 1-5.



SHIMANO 3-SPEED HUB PARTS INTERCHANGEABILITY

		Cartridge Type					
	1983 G-3S23	1982 SG-3S21	1978-81	G Type	F Type	FA Type, 333‡
1. Nut	220 1501-1	220 1501-1	220 1501-1	321 7000	321 7000	531
2. Washer				200 0500	200 0500	530
3. Locknut 3 mm (A)		321 3800	321 3800	321 3800	321 3800	529
Locknut 4.5 mm	220 1510-1					
4. Cone Stay Washer			321 6900	321 6900	528	
5. Dust Cap A	321 2700	321 2700	321 2700	321 2700	321 2700	125
6. Ball Retainer A	3-321 9022	321 9022	321 9022	321 9022	321 9022	124
7. Hub Shell						
with Left Cup 28H	*	*	322 9001	321 9001	321 9001	
36H	*	*	322 9002	321 9002	321 9002	102
40H				321 9003		
8. Lubricator				321 0400	321 0400	101
9. Ball Cup				321 5600	321 5600	132
10. Complete Ratchet A-1 (Ring Gear)	3-322 9014	322 9014	322 9014	321 9012	321 9014	FAA-1
11. Ratchet A	*	322 9030	322 9030			
12. Pawl A	321 0500-2	321 0500-2	321 0500-2	321 0500-2		
13. Ring Spring A (33.5 mm)	322 1100	322 1100	322 1100			
14. Pawl Spring A					321 1100-1	
15. Roller	321 6200	321 6200	321 6200	321 6200	321 6200	217
16. Roller Cover	322 5900	322 5900	322 5900	321 5900	321 5900	218
17. Snap Ring D			321 2100	321 2100	219	
18. Complete Ratchet B-1 (Planet Cage)	3-322 9018†	322 9017-1	322 9017	321 9017	321 9017	FAB-2
19. Ratchet B-1	*	*	322 9031	321 5800	321 5800	209
Pawl A (also #12)			321 0500-2			
19a. Pawl I	322 0700	322 0700				
20. Ring Spring C (28 mm)	322 1300	322 1300	322 1300			
21. Snap Ring A				321 1800	321 1800	210
22. Pawl Pin C				321 1000	321 1000	206
23. Pawl C				321 0700	321 0700	104
24. Pawl Spring C				321 1300	321 1300	105
25. Pawl Plate				321 6100	321 6100	211
26. Pinion Pin B				321 6300	321 6300	208
27. Planet Pinion				321 5500	321 5500	107
28. Ball Retainer (3/16")	3-321 9081	321 9081	321 9081			
29. Ball Retainer B				321 9023	321 9023	134
30. Complete Driver	3-322 9009-2	322 9009	322 9009	321 9009	321 9009	S5
31. Driver	322 9032	322 9032	322 9032	321 7100	321 7100	538
32. Pawl F	322 0600	322 0600	322 0600			
33. Ring Spring B (19 mm)	322 1200	322 1200	322 1200			
Pawl A (also #12)			321 0500-2			
Pawl I (also #19a)	322 0700	322 0700				
34. Snap Ring B				321 1900	321 1900	142
35. Pawl Pin B				321 0900	321 0900	141
36. Pawl B				321 0600	321 0600	139
37. Pawl Spring B				321 1200	321 1200	140
38. Sliding Key B				321 2600	321 2600	122
39. Sliding Key A		321 2500	321 2500	321 2500	321 2500	120
Sliding Key BR	321 2501	321 2501				
40. Axle (153 mm)	322 5200	322 5200	322 5200	321 5200	321 5200	521
Axle (173 mm)	322 5000					
41. LH Cone with Dust Cap B	3-322 9025-1	322 9025	322 9025	321 9025	321 9025	527
42. Spring	321 3000	321 3000	321 3000	321 3000	321 3000	123
43. RH Cone with Dust Cap B	3-321 9024-1†	321 9024	321 9024	321 9024	321 9024	543,126
44. Locknut B (7/16" x 3 mm)	321 3900	321 3900	321 3900	321 3900	321 3900	544
45. Non-turn Washer	321 6400	321 6400	321 6400	321 6400	321 6400	545
46. Push Rod						
(108.4 mm for 153 mm axle)	321 7300-1	321 7300	321 7300	321 7300	321 7300	546
(113.4 mm for 173 mm axle)	321 7500-1					
47. Dust Cap	322 0400	321 2900	321 2900	321 2900	321 2900	135
48. Seal Spring	322 0410					
49. Complete Internal Assembly						
153 mm axle	3-322 9902	3-322 9010				
173 mm axle	3-322 9922					

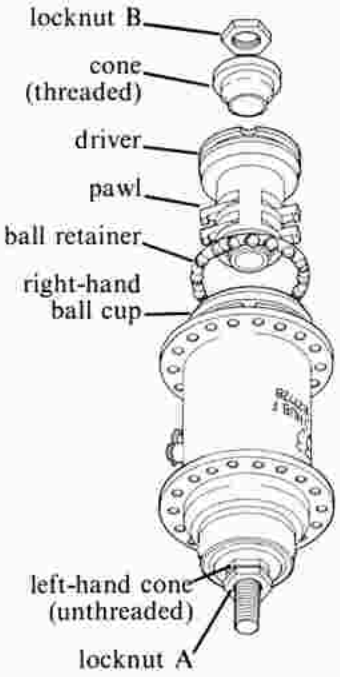
Parts are interchangeable only if they are on the same line and do not have a vertical line between them.
* Not available separately. †Marked in black to indicate 1983 model.
‡Type 333 hub parts are interchangeable with F-type except the two-piece planet cage and two-piece gear ring. These parts can be replaced as a unit with F-type complete ratchet A-1 and F-type complete ratchet B-1.

SHIMANO F TYPE AND G TYPE 3-SPEED HUBS DISASSEMBLY AND ASSEMBLY

(1) DISASSEMBLY

Remove right-hand locknut (B) and threaded cone. Lift off driver assembly. Remove ball retainer.

Slip Shimano ball cup tool (not shown) over axle to engage right-hand ball cup. Invert assembly, hold tool in vise and turn wheel counter-clockwise to loosen ball cup.



Slip spring, unthreaded cone and cone stay washer over axle. Hold washer down against spring and thread locknut A on axle a few turns only. Note that stay washer tabs engage cone flats. Be sure spring is tensioned enough to hold sliding key B in place. Replace the spring if it is too weak.

Lift hub shell about ½" (12mm) and tighten axle shoulder (not visibile) against left-hand cone by turning axle clockwise with a wrench on axle flats. Lower hub shell to seat against left-hand cone.

Install ball retainer flat side up. Rotate driver pawls into operating position (full clockwise, viewed from above) and hold them in against their springs while inserting driver. Install right-hand (threaded) cone, non-turn washer and locknut. Adjust bearing.

Next Step

ASSEMBLY 5

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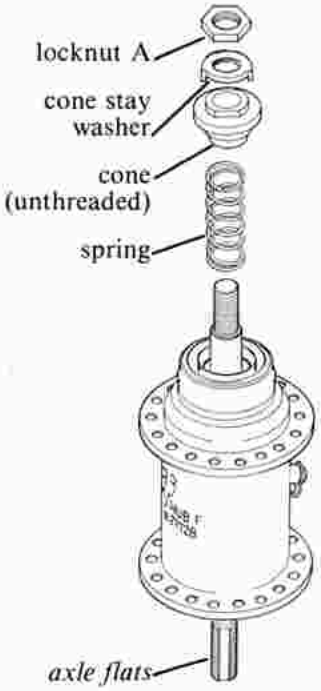
(2) DISASSEMBLY

Invert assembly. Remove left-hand locknut (A), cone stay washer, unthreaded cone and spring.



Next Step

Slip spring, unthreaded cone and cone stay washer over axle. Hold washer down against spring and thread locknut A on axle *a few turns only*. Note that stay washer tabs engage cone flats.

ASSEMBLY 4

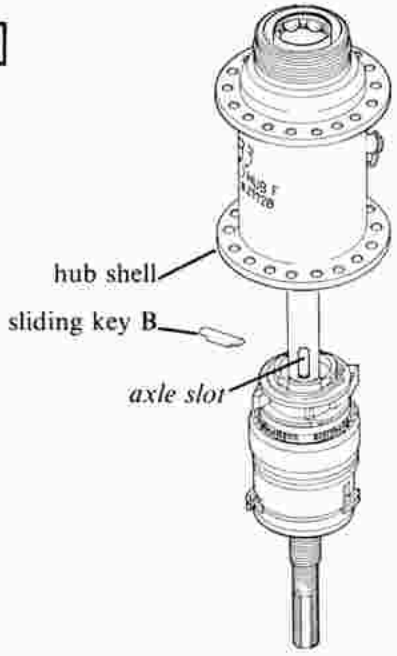
Next Step
Next Page

SHIMANO F TYPE AND G TYPE 3-SPEED HUBS DISASSEMBLY AND ASSEMBLY (cont.)

Next Step
Preceding Page

3 DISASSEMBLY

Lift off hub shell. Remove long sliding key (B) from axle slot.



Insert long key (sliding key B) into axle slot, *rounded side up*. Slip hub shell over assembly.

ASSEMBLY 3

Next Step

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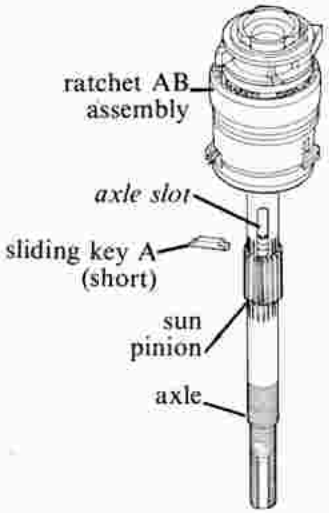
4 DISASSEMBLY

Remove axle from vise and dislodge short sliding key (A) from inside assembly. Separate assembly from axle.



Next Step

Clamp axle by flats in vise. Insert short key (sliding key A) into axle slot, *half-round side down.*

Slip ratchet AB assembly over axle. If key interferes with planet pinions, rotate assembly slightly. When properly seated, sun pinion engages planet pinions and key is just visible in axle slot, *flat side up* with both ends covered by planet carrier.

ASSEMBLY 2

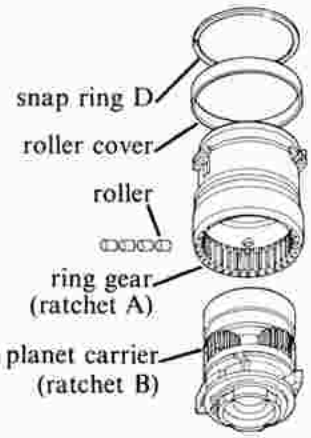
Next Step

---

5 DISASSEMBLY

Remove snap ring (D). Holding assembly vertically, lift off roller cover; tap out the four rollers beneath it.

Separate planet carrier assembly (ratchet B) from ring gear assembly (ratchet A)



Next Step

Insert planet carrier assembly (ratchet B) into ring gear assembly (ratchet A) so that planet pinions engage ring gear. Hold unit vertically and install the four rollers, roller cover and snap ring D.

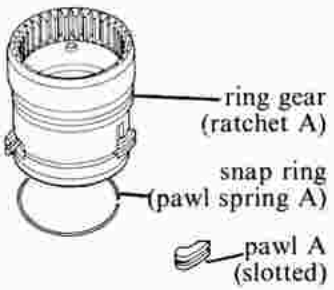
ASSEMBLY 1

SHIMANO F TYPE AND G TYPE 3-SPEED HUBS
DISASSEMBLY AND ASSEMBLY (cont.)
SUBASSEMBLIES

DISASSEMBLY

Ring Gear (ratchet A)

Remove snap ring (pawl spring A) and slotted pawls (A).



Ring Gear (ratchet A)

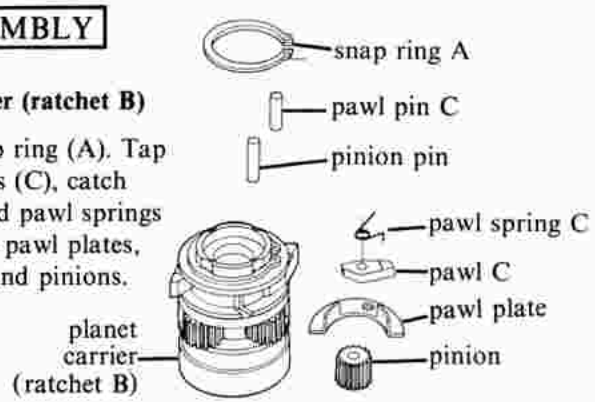
Install slotted pawls (A) and light gauge snap ring (pawl spring A). Position gap in snap ring over break in snap ring groove.

ASSEMBLY

DISASSEMBLY

Planet Carrier (ratchet B)

Remove snap ring (A). Tap out pawl pins (C), catch pawls (C) and pawl springs (C). Remove pawl plates, pinion pins and pinions.



Planet Carrier (ratchet B)

Install pinions and pinion pins. Install pawl plates, aligning plate holes with pawl pin holes. Place pawl spring (C) over recessed area of pawl (C), position over pawl plate and insert pawl pin (C). Install snap ring (A). Be sure snap ring covers pawl pin ends.

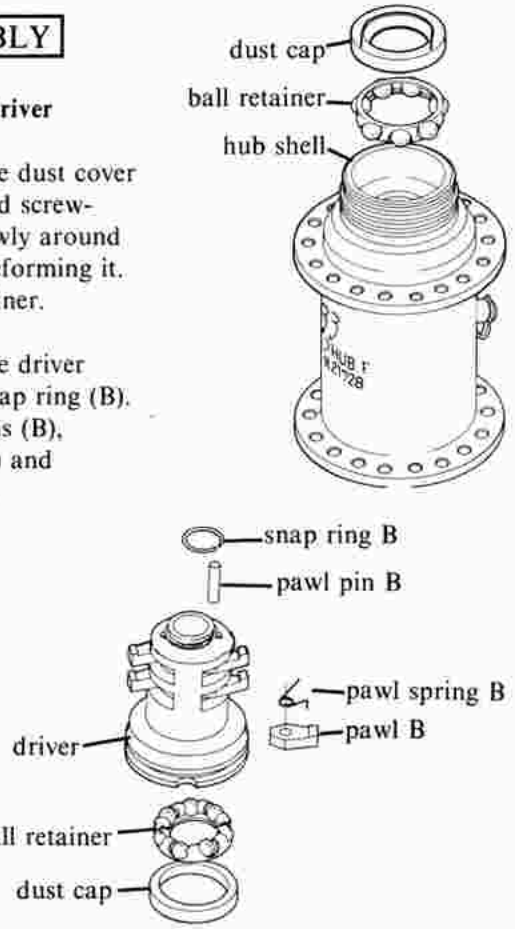
ASSEMBLY

DISASSEMBLY

Hub Shell and Driver

Bearings. Remove dust cover with a thin-bladed screwdriver. Work slowly around cover to avoid deforming it. Lift out ball retainer.

Pawls. To remove driver pawls, remove snap ring (B). Tap out pawl pins (B), remove pawls (B) and pawl springs (B).



Hub Shell and Driver

Bearings. Install ball retainer *flat side out.* Start dust cover straight and tap home with a soft hammer.

Pawls. To replace driver pawls, hold pawl springs (B) over recessed area of pawl (B) with hooked end against the *inside surface* of the *long end* of pawl.[1] (Viewed as shown, pawls point *counter-clockwise.*) Insert spring and pawl into first pawl slot and insert pawl pin (B) just far enough to pass through driver flange, pawl spring and pawl. Position second pawl and spring and push pawl pin all the way in. Repeat procedure for remaining two pawls. Replace snap ring (B). Be sure snap ring covers pawl pin ends.

ASSEMBLY

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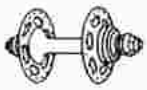
[1] Some older hubs have two driver pawl springs mirror image of those shown. On these hubs two pawl recesses face up, two down.



CLEANING

Clean all parts, including outside of hub shell and axle bore, in a suitable solvent. Be very careful not to introduce dirt or grit after cleaning.

POINTS TO CHECK

1. Pawls for worn or chipped corners
2. Ratchets inside hub shell (7), planet carrier (18), ring gear (10) and ball cup (9) for worn or chipped teeth
3. Pinions (27), axle (40), ring gear (10) for worn or chipped gear teeth
4. Return spring (42) and ring spring (14) for size and strength (replace small pawl springs (24) (37) at overhaul)
5. Bearing surfaces of driver (31), right-hand ball cup (9), left-hand ball cup (7), cones (41) (43) and pinion pins (26) for wear and pitting (replace bearing retainers (6) (29) at overhaul)
6. All threaded parts for worn or damaged threads

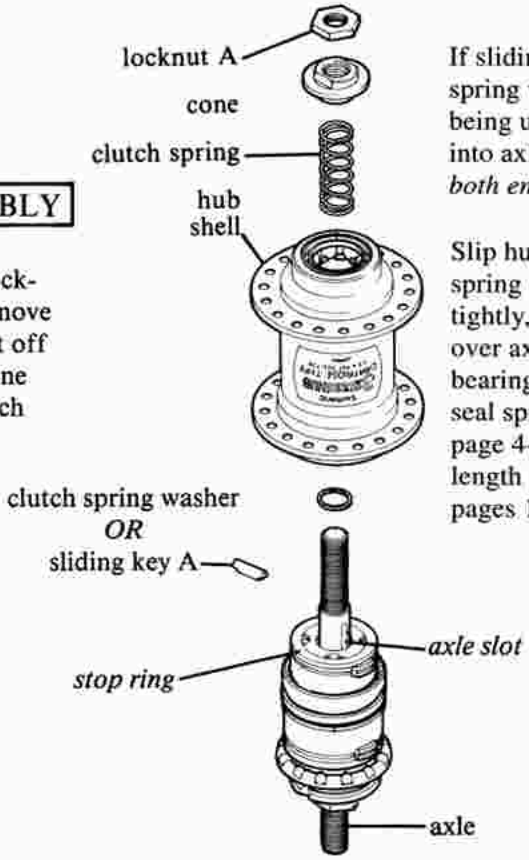
LUBRICATION

Lubricate ball bearings by filling the spaces between balls with grease. Be careful not to grease pawl springs. Lightly oil other internal parts with a *good* cycle oil. (WD-40 is too light for lasting lubrication, 3-in-1 Oil gums up with age.) Add about two teaspoons (8 ml) of oil when assembled.

SHIMANO CARTRIDGE TYPE 3-SPEED HUB DISASSEMBLY AND ASSEMBLY

1 DISASSEMBLY

Remove left-hand locknut A and cone. Remove clutch spring and lift off hub shell. Remove one sliding key A *or* clutch washer, whichever is present.



If sliding key BR is being used, slip clutch spring washer over axle. If sliding keys A are being used, omit washer and insert second key into axle slot; position key *flat side down* with *both ends* visible outside ratchet B.

Slip hub shell over assembly. Examine clutch spring carefully; if one end is wound more tightly, position spring *tight end up*. Slip spring over axle. Install cone and locknut A. Adjust bearing. If sprocket has been removed, replace seal spring (if present) and dust cap (shown on page 4-8). Do not forget to install correct length pushrod when mounting wheel (see pages 1-4 and 1-5).

ASSEMBLY 2

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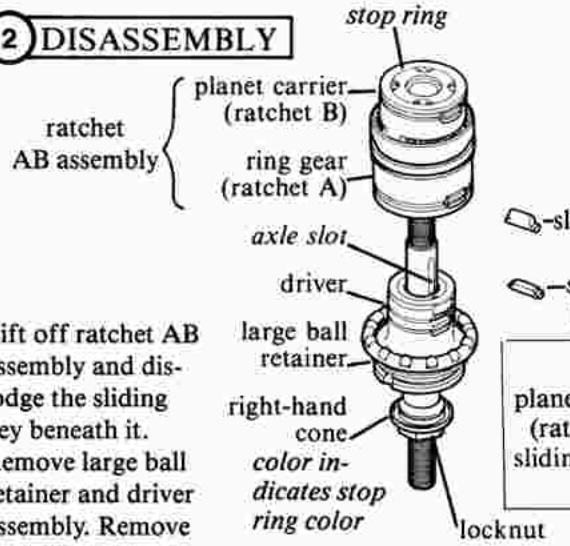
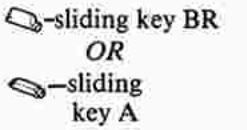
2 DISASSEMBLY



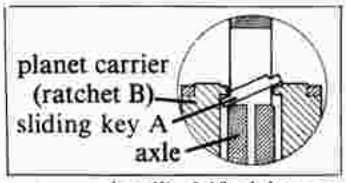
Lift off ratchet AB assembly and dislodge the sliding key beneath it. Remove large ball retainer and driver assembly. Remove locknut and cone from right-hand end of axle.

Next Step

If planet carrier stop ring is finished in black, sliding key BR and clutch spring washer *must* be used. Insert sliding key BR in axle slot *small end up*. Press in driver pawls and install ratchet AB assembly.



If planet carrier is not finished in black, *either* a pair of sliding keys A *or* a sliding key BR with a clutch spring washer may be used. To install sliding keys A, press in driver pawls and install ratchet AB assembly. Lift *driver* 1/8" (3 mm) and insert first sliding key A *flat side up* with *one* end covered by ratchet B (see detail). Lift driver an additional 3/16" (5 mm) to allow sliding key A to drop into a horizontal position with *both* ends covered by ratchet B. Continue assembly without dislodging this key.



Install right-hand cone and locknut. Position axle *right-hand (hollow) end down* and install driver assembly. Install large ball retainer *flat side down*.

ASSEMBLY 1

SHIMANO CARTRIDGE TYPE 3-SPEED HUB DISASSEMBLY AND ASSEMBLY (cont.)

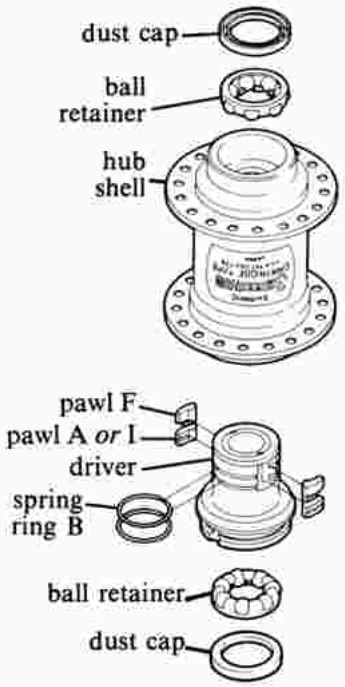
SUBASSEMBLIES

DISASSEMBLY

Hub Shell and Driver

Remove dust cap with a thin-bladed screwdriver. Work slowly around cap to avoid deforming it. Lift out ball retainer.

Slip driver ring springs B over small end of driver (to avoid deforming them) and catch pawls. Note that driver uses a pair of F pawls and a pair of either A or I pawls.*



Hub Shell and Driver

Install ball retainer *flat side out*. Start dust cap straight and tap home with a soft hammer. Repeat for other bearing.

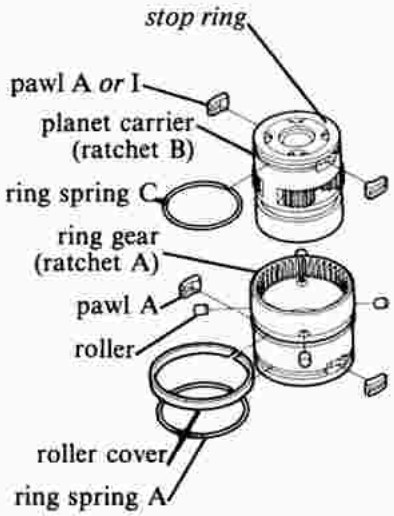
Position driver *large end down*. Driver takes two F pawls and either two A pawls or two I pawls.* I and F pawls are not interchangeable but complete drivers are. Place one of the lower pawls (I or A) in its socket and start ring spring B in groove, sliding it over the small end of the driver to avoid deforming it. Insert second pawl and slip spring over pawl to seat in groove. Viewed as shown, driver pawls must face *counterclockwise*. Ring spring gap must be positioned over closure in groove. Repeat for driver F pawls.

ASSEMBLY

DISASSEMBLY

Ratchet AB

Remove pawls only if necessary. Ease ring spring A over the end of ring gear (ratchet B) to avoid deforming it and catch ring gear A pawls. Planet carrier (ratchet A) takes either A or I pawls.* Remove ring spring C and planet carrier pawls in the same manner. Holding assembly vertically, pry off split roller cover. Tilt and tap out the four rollers. Separate ring gear and planet carrier. Pinions and pinion pins are not designed to be removed.



Ratchet AB

Insert internal ratchet end of planet carrier into ring gear. Install rollers and roller cover. Position assembly with *planet carrier up*. Planet carrier (ratchet B) takes either A or I pawls. A and I pawls are not interchangeable, but complete planet carriers are *if they have the same color stop ring*.* Ease ring spring C over the end of planet carrier and install planet carrier pawls. Repeat for ring gear A pawls and ring spring A. Viewed as shown, pawls must point *counterclockwise*. Ring spring gaps must be positioned over closures in ring spring grooves.

ASSEMBLY

pawl I *gray, slot off-center*

pawl A *black, slot centered*

*Pages 4-8 and 4-9 give complete interchangeability information. Detail above summarizes pawl identification.

CLEANING

Clean all parts, including outside of hub shell and axle bore, in a suitable solvent. Be very careful not to introduce dirt or grit after cleaning.

POINTS TO CHECK

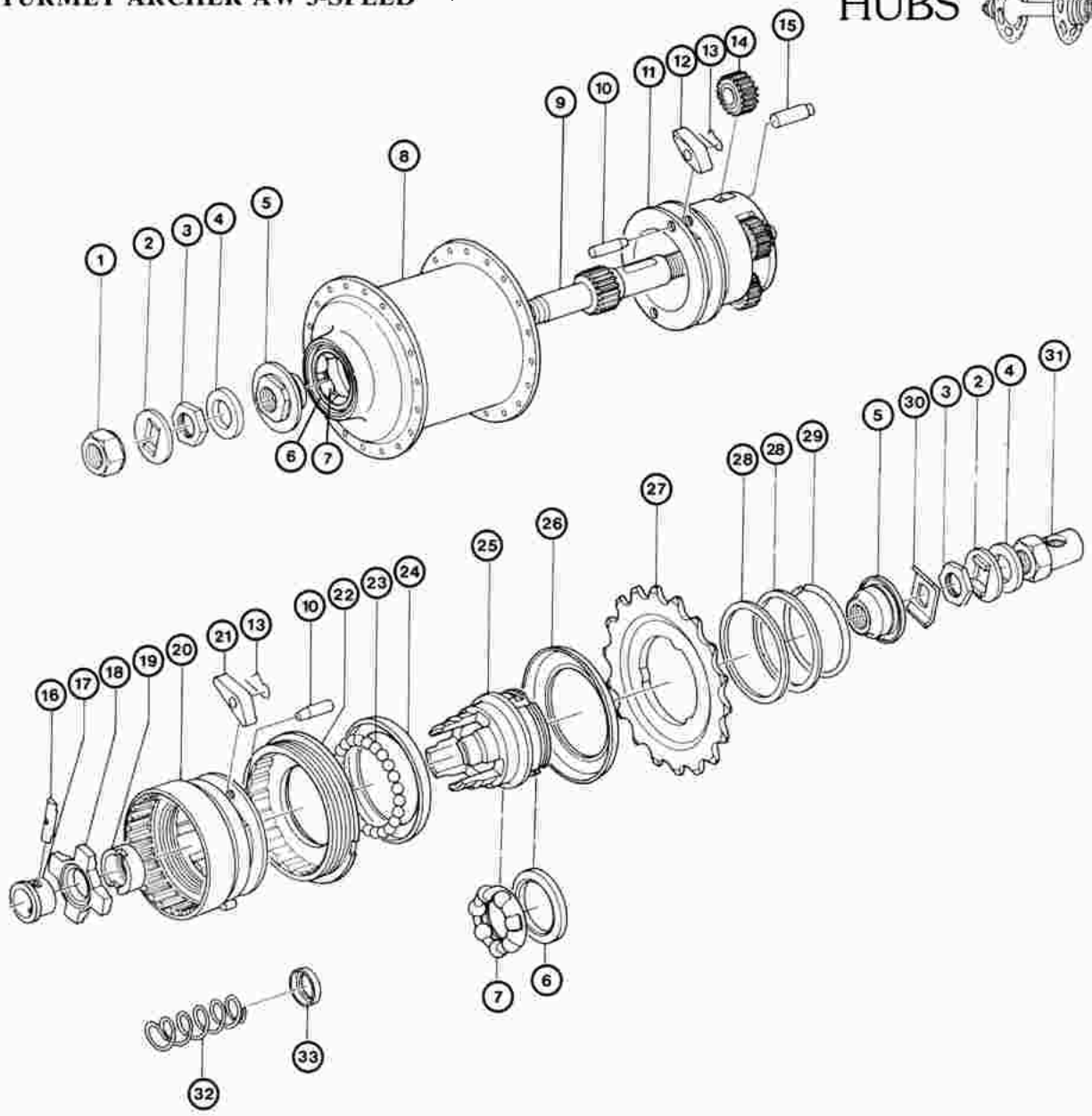
Numbers in parenthesis refer to parts chart and exploded drawing.

1. Pawls for worn or chipped corners
2. Ratchets inside hub shell (7), planet carrier (18) and ring gear (10) for worn or chipped teeth
3. Pinions (27), axle (40) and ring gear (10) for worn or chipped gear teeth
4. Return spring (42) and ring springs (13) (20) (33) for size and strength
5. Bearing surfaces of driver (31), right-hand ball cup (9), left-hand ball cup (7) and cones (41) (43) for wear and pitting (replace bearing retainers (6) at overhaul)
6. All threaded parts for worn or damaged threads

LUBRICATION

Lubricate ball bearings by filling the spaces between balls with grease. Be careful not to grease pawl springs. Lightly oil other internal parts with a *good* cycle oil. (WD-40 is too light for lasting lubrication, 3-in-1 Oil gums up with age.) Add about two teaspoons (8 ml) of oil when assembled.

STURMEY ARCHER AW 3-SPEED



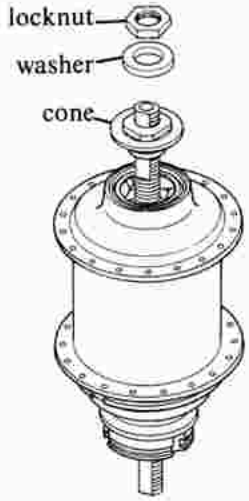
1.	Axle Nut	HMN	128	16.	Axle Key	HSA	124
2.	Serrated Lockwasher	HMW	155	17.	Clutch Sleeve	HSA	116
3.	Cone Locknut	HMN	132	18.	Clutch	HSA	117
4.	Washer	HMW	129	19.	Thrust Ring	HSA	283
5.	Cone	HSA	101	20.	Gear Ring	HSA	118
6.	Dust Cap	HSA	102	21.	Pawl for Gear Ring	HSA	119
7.	Ball Cage	HSA	284	22.	Ball Ring RH[1]	HSA	121
8.	Hub Shell Assembly - 40 holes	HSA	104	23.	3/16" Balls		
	36 holes	HSA	105	24	Inner Dust Cap	HSA	122
	28 holes	HSA	239	25.	Driver	HSA	123
9.	Axle 5¾" (146 mm)	HSA	107	26.	Sprocket Dust Cap	HSL	701
	6¼" (159 mm)	HSA	108	27.	Sprocket[1]		
10.	Pawl Pin	HSA	112	28.	Sprocket Spacing Washer[1]		
11.	Planet Cage	HSA	113	29.	Sprocket Circlip[1]		
12.	Low Gear Pawl	HSA	111	30.	Cone Lockwasher	HMW	147
13.	Pawl Spring	HSA	120	31.	RH Axle Nut	HMN	129
14.	Planet Pinion	HSA	115	32.	Clutch Spring	HSA	128
15.	Pinion Pin	HSA	114	33.	Cap for Clutch Spring	HSA	129

[1] See Sprocket Interchangeability at beginning of Hubs section.

STURMEY-ARCHER AW 3-SPEED HUB DISASSEMBLY AND ASSEMBLY

1 DISASSEMBLY

Remove left-hand locknut, washer and cone.



Turn assembly over.
Install cone, lockwasher and locknut.
Adjust bearing.

ASSEMBLY 5

Next Step

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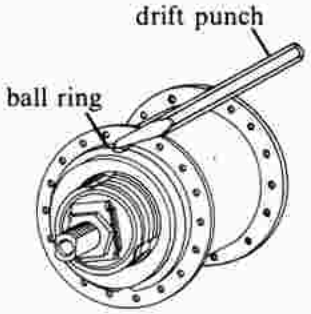
2 DISASSEMBLY

Next Step

Turn assembly over.
The right-hand ball ring may have a double start thread. If the ball ring is replaced in the opposite position, the wheel may need retruing. To facilitate proper reassembly, mark the ball ring at the point nearest lubricator.

Place a drift punch as shown and loosen the ball ring by rapping the punch firmly with a hammer.



Turn assembly over.
When correctly oriented, tighten with a hammer and drift punch.

ASSEMBLY 4

Next Step

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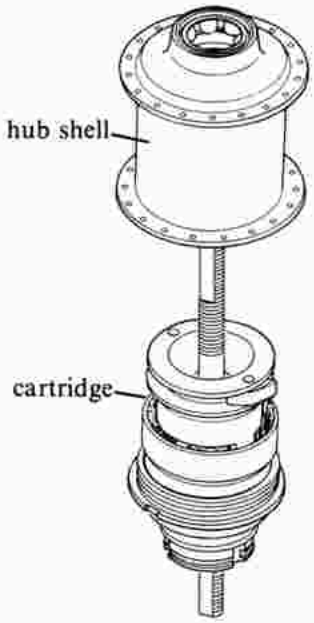
3 DISASSEMBLY

Next Step

Unscrew right-hand ball ring completely and remove the cartridge from the hub shell.



Thread cartridge finger tight into hub. If the mark made during disassembly is not next to the lubricator, remove and restart.

ASSEMBLY 3

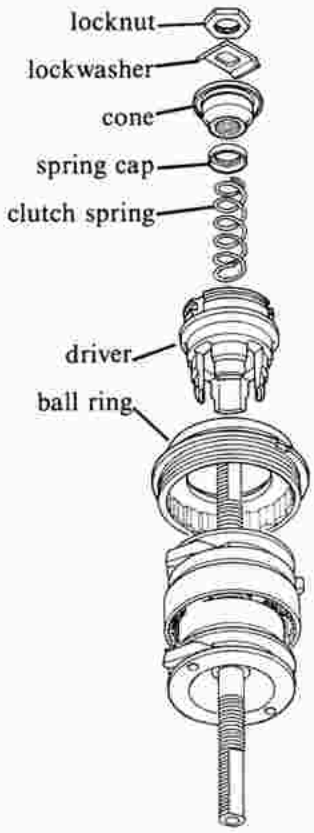
Next Step
Next Page

STURMEY-ARCHER AW 3-SPEED HUB DISASSEMBLY AND ASSEMBLY (cont.)

4 DISASSEMBLY

Remove right-hand locknut, lockwasher and cone. Remove clutch spring, cap and driver.[1] Remove ball ring and gear ring.

Next Step



Next Step
Preceding Page

Install ball ring. Install driver, clutch spring and spring cap.[1] Install cone, lockwasher and locknut. Adjust bearing. If bearing runs rough, check spring cap.[1]

ASSEMBLY 2

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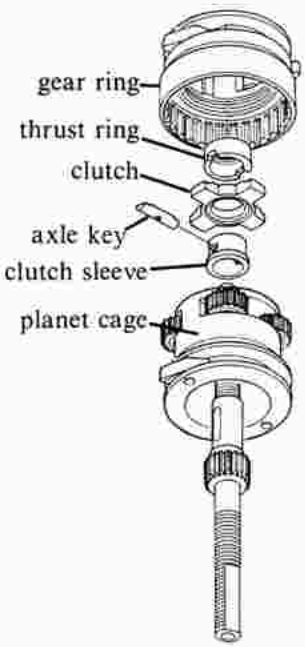
5 DISASSEMBLY

Lift off gear ring. Remove thrust ring.[2] Push out axle key. Remove clutch sleeve. Remove planet cage.



Next Step

Replace planet cage. Install clutch sleeve *flange down*. Install clutch with tabs flush against planet cage. Insert axle key through both clutch sleeve and axle slot with flats facing up. Install thrust ring.[2] *Notches in thrust ring must engage axle key flats.* Replace gear ring.

ASSEMBLY 1

---

[1] Old model spring caps are too large to fit through the driver. On these hubs, the spring and cap are removed *after* and installed *before* the driver. Otherwise the spring cap will be compressed between the cone and the bearing with damage to both. Upon installation the driver must be held in place against the spring until the cone is installed.

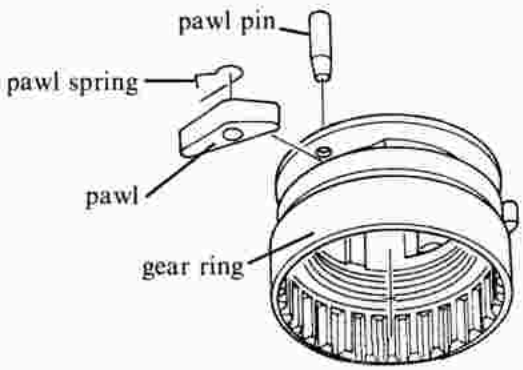
[2] If thrust ring has top and bottom openings of *equal* diameter it must have a thrust washer on top of it.

STURMEY-ARCHER AW 3-SPEED HUB DISASSEMBLY AND ASSEMBLY (cont.) SUBASSEMBLIES

DISASSEMBLY

Gear Ring

Remove pawl pins, pawls and springs. Be careful not to lose pawl springs.



Gear Ring

Place spring in position on top of gear ring (large) pawl with hooked end bearing on the *inside surface* of the *long end* of pawl. Slide spring and pawl into slot and insert pawl pin *tapered end first*. Make sure spring is hooked around pin. Test pawl operation and repeat for other gear ring pawl.

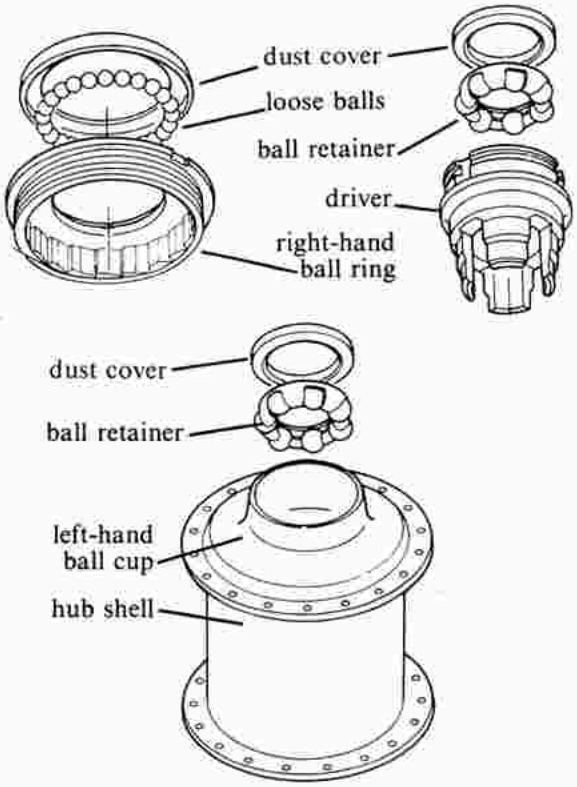
ASSEMBLY

DISASSEMBLY

Driver, Hub Shell and Ball Ring

Remove dust cover with a thin-bladed screwdriver. Work slowly around cover to avoid deforming it. Lift out ball retainer.

Remove left-hand ball cup only if necessary. Cups with wrench flats are left-threaded, all others press fit. Support hub flange on two blocks of wood and pound out press fit cup with a third block and a hammer.



Driver, Hub Shell and Ball Ring

Install left-hand ball cup in hub shell if it was removed. Non-threaded cups can be pressed into threaded hub shells. Start cup straight and pound in with a soft hammer or a hammer and a block of wood.

Install balls or ball retainer. *Orient retainer as shown.* Start dust cover straight by hand and tap home with a soft hammer.

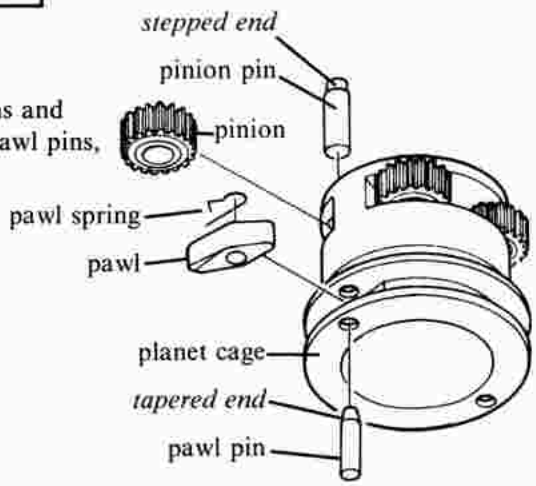
ASSEMBLY

STURMEY-ARCHER AW 3-SPEED HUB DISASSEMBLY AND ASSEMBLY (cont.) SUBASSEMBLIES

DISASSEMBLY

Planet Cage

Remove pinion pins and pinions. Remove pawl pins, pawls and springs.



Planet Cage

Slide pinion into slot and replace pinion pin *stepped end out*. Repeat for remaining pinions. Place pawl spring in position on planet cage (small) pawl, with hooked end bearing on *inside surface* of *long end* of pawl. Slide pawl and spring into slot and insert pawl pin *tapered end first*. Make sure spring is hooked around pin. Repeat for remaining pawl. Pawls must point clockwise, viewed from above. Check pawl operation before proceeding.

ASSEMBLY

CLEANING

Clean all parts, including outside of hub shell and axle bore, in a suitable solvent. Be very careful not to introduce dirt or grit after cleaning.

POINTS TO CHECK

Numbers in parenthesis refer to parts chart and exploded drawing.

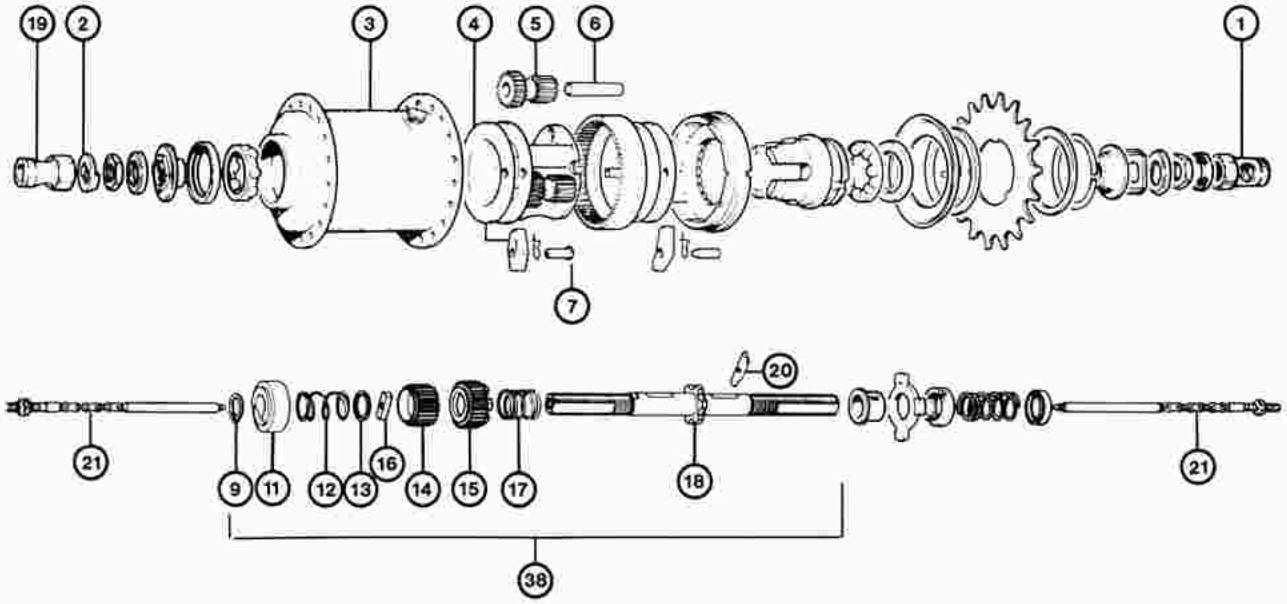
1. Clutch (18), gear ring internal dogs (20), and small ends of pinion pins (15) for rounded or chipped driving edges (rounding to even 1/64" (0.4 mm) at the corners of these parts may cause hub to slip out of gear)
2. Pawls (12, 21), ball ring (22) and left ball cup in hub shell (8) for worn or chipped corners
3. Sun pinion (9), planet pinions (14) and gear ring (20) for wear or chipping
4. Bearing surfaces of left ball cup (8), ball ring (22), driver (25) (inside and out), cones (5) and pinion pins (15) for wear and pitting
5. Axle key (16) and indicator chain for stripped threads
6. Clutch spring (32) for length and tension (compare with new spring)
7. Dustcaps and ball retainers for straightness
8. All threaded parts for stripped or damaged threads
9. Axle (9) for straightness

LUBRICATION

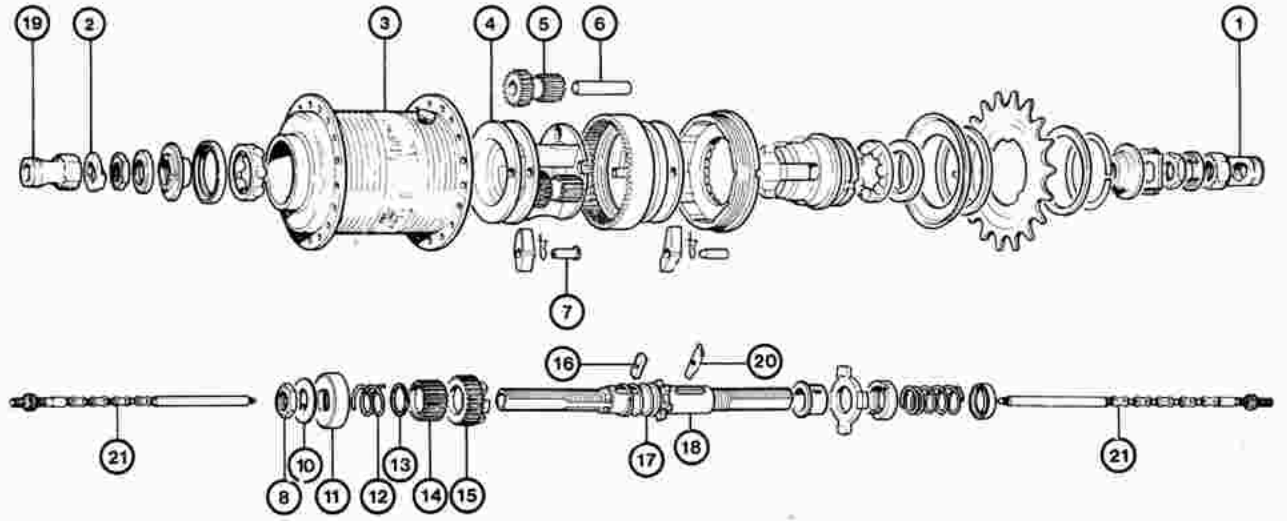
Lubricate ball bearings by filling the spaces between balls with grease. Be careful not to grease pawls. Lightly oil other internal parts with a *good* cycle oil. (WD-40 is too light for lasting lubrication, 3-in-1 Oil gums up with age.) Add about two teaspoons (8 ml) of oil when assembled.

HUBS

STURMEY-ARCHER S5/2 5-SPEED HUB



STURMEY-ARCHER S5.1 5-SPEED HUB

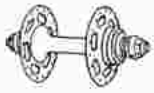


| Vertical line between numbers indicates parts are not interchangeable.

Parts are interchangeable only if they are on the same line and they do not have a vertical line between them.

→← Parts have one-way interchangeability only.

}{ Parts are interchangeable as a unit.



STURMEY-ARCHER 4- and 5-SPEED HUBS PARTS INTERCHANGEABILITY

	S5/2 and 5-speed alloy	S5.1 (indicator chain on left side)	S5 (bell crank on left side)	FW 4-speed
1. RH Axle Nut	HMN 129*	HMN 129*	HMN 129*	HMN 131
2. Axle Lockwasher (serrated)	HMN 155	HMW 155	HMN 145*	HMW 145*
3. Hub Shell† 36 holes	HSA 334	HSA 270	HSA 270	HSA 131
40 holes		HSA 271	HSA 130	
28 holes	HSA 333	HSA 290		
Alloy, 36 holes	HSA 337			
4. Planet Cage	HSA 354	HSA 132	HSA 132	HSA 132
5. Planet Pinion	HSA 134	HSA 134	HSA 134	HSA 134
6. Pinion Pin	HSA 135	HSA 135	HSA 135	HSA 135
7. Pawl Pin for Planet Cage	HSA 133	HSA 133	HSA 133	HSA 133
8. Locknut for Dog Ring		HMN 133	HMN 133	HMW 133
9. Circlip Retainer for Dog Ring	HSL 729			
10. Lockwasher for Dog Ring		HMW 149	HMW 149	HMW 149
11. Dog Ring	HSA 343	HSA 138	HSA 138	HSA 138
12. Pinion Return Spring	HSA 346	HSA 319		
13. Washer for Pinion Return Spring	HMW 488	HMW 488		
14. Secondary Sun Pinion	HSA 344	HSA 318	HSA 141	HSA 141
15. Primary Sun Pinion	HSA 345	HSA 317	HSA 269	HSA 142
16. Low Gear Axle Key	HSA 342	HSA 295	HSA 268	HSA 139
Pinion Sleeve (not shown)			HSA 140	HSA 140
17. Low Gear Spring	HSA 347	HSA 273	HSA 273	
Spring Set for 4-Speed (not shown)				HSA 183
Low Gear Spring				HSA 143
Compensator Spring				HSA 147
Clutch Spring				HSA 148
Compensator Spring Collar (not shown)				HSA 146
18. Axle 5 13/16" (148 mm) *short*		HSA 320		
6 1/16" (154 mm) *medium*		HSA 321		
6 5/16" (160 mm *long*		HSA 322		
5 3/4" (146 mm) *short*				HSA 144
6" (152 mm) *short*			HSA 274	
6 1/4" (159 mm) *long*			HSA 145	HSA 145
5 7/8" (149 mm) *short*	HSA 339			
6 1/8" (156 mm) *medium*	HSA 340			
6 3/8" (162 mm) *long*	HSA 341			
19. LH Axle Nut	HMN 129*	HMN 129*	HMN 128	HMN 130
Gear Indicator LH for short axles	HSA 126*	HSA 126*		
Gear Indicator LH for medium axles	HSA 126*	HSA 126*		
Gear Indicator LH for long axles	HSA 316	HSA 316		
Gear Push Rod				
Threaded, no head				
For Short Axle			HSA 266	
For Long Axle			HSA 267	
Stamped Bellcrank			HSJ 608	
Unthreaded, head like a nail				
For Short Axle			HSA 287	
For Long Axle			HSA 288	
Machined Bellcrank			HSJ 679	
20. Axle Key	HSA 124*	HSA 124*	HSA 124*	HSA 163‡
21. Gear Indicator RH for short axles	HSA 125*	HSA 125*	HSA 126*	HSA 136
Gear Indicator RH for medium axles	HSA 126*	HSA 126*		
Gear Indicator RH for long axles	HSA 126*	HSA 126*	HSA 126*	HSA 137
Gear Indicator Coupling				HSA 149

*Same parts as for AW, p. 4-17.

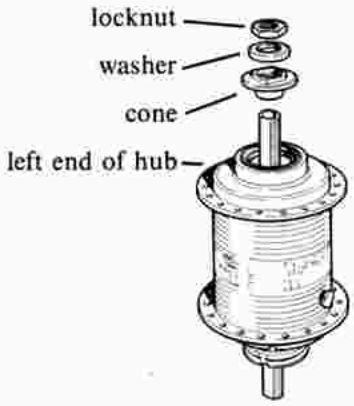
†The S5 cartridge will fit into any AW 3-speed hub shell. The AW cartridge will fit S5 or FW hub shells but may not work properly without changing the left ball cup. A planet cage centering flange in the AW left ball cup keeps the pawls aligned and prevents the hub from slipping in low gear. Not all S5 ball cups lack this flange. Compare it to an AW left ball cup.

‡HSA 163 for 4-speed is drilled through and not threaded. HSA 124 is threaded.

STURMEY-ARCHER S5.1 5-SPEED HUB
DISASSEMBLY AND ASSEMBLY

1 DISASSEMBLY

Remove left-hand locknut, washer and cone.



Install cone, lockwasher and locknut. Adjust bearing.

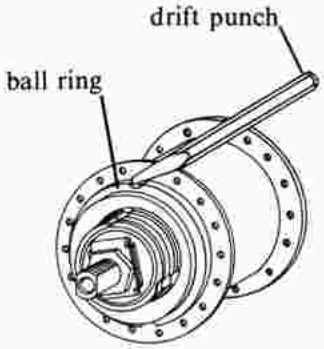
ASSEMBLY 6

Next Step

2 DISASSEMBLY

The right-hand ball ring may have a double start thread. If the ball ring is replaced in the opposite position, the wheel may need retruing. To facilitate proper reassembly, mark the ball ring at the point nearest lubricator.

Place a drift punch as shown and loosen the ball ring by rapping the punch firmly with a hammer.



Next Step

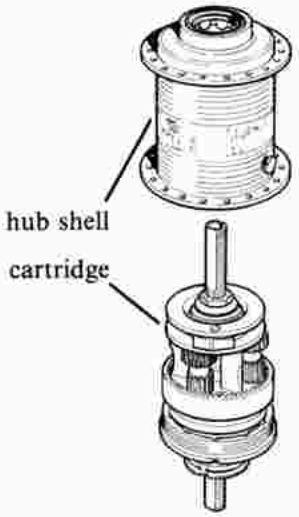
When correctly oriented, tighten with a hammer and drift punch.

ASSEMBLY 5

Next Step

3 DISASSEMBLY

Unscrew right-hand ball ring completely and remove the cartridge from the hub shell.



Next Step
Next Page

Next Step

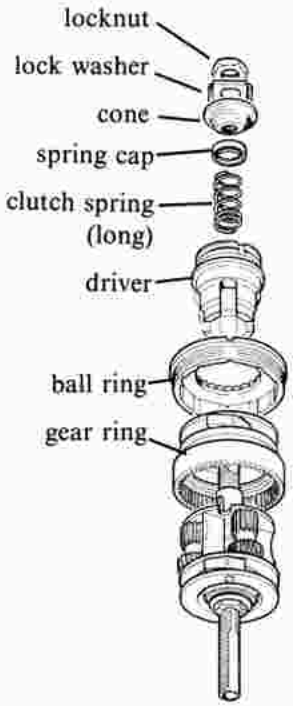
Thread cartridge finger tight into hub. If the mark made during disassembly is not next to the lubricator, remove and restart.

ASSEMBLY 4

STURMEY-ARCHER S5.1 5-SPEED HUB DISASSEMBLY AND ASSEMBLY (cont.)

4 DISASSEMBLY

Remove right-hand locknut, lockwasher and cone. Remove clutch spring, spring cap and driver.[1] Remove ball ring and gear ring.



Next Step

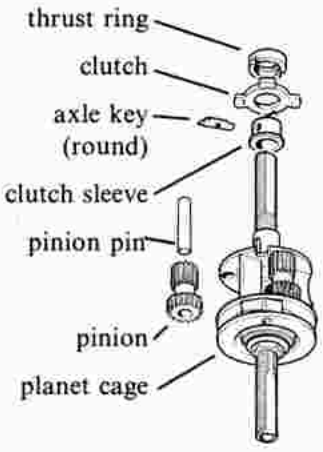
Next Step Preceding Page

Install gear ring and ball ring. Install driver, clutch spring and spring cap.[1] Install cone, lockwasher and locknut. Adjust bearing. If bearing runs rough, check spring cap.[1]

ASSEMBLY 3

5 DISASSEMBLY

Remove thrust ring.[2] Push out axle key, remove clutch sleeve and sliding clutch. Remove pinion pins and pinions. Lift off planet cage.



Next Step Next Page

Next Step

Install clutch sleeve and clutch. Slide in round axle key with flats up. Install thrust ring[2] with slots seated on the axle key flats.

Pinion timing *marked teeth point outward at once*

Slide planet cage over the long-slot end of axle. Note that each planet pinion has one marked tooth. Install pinions so that marked teeth point outward (see detail). *Do not let planet cage turn during pinion installation.*

ASSEMBLY 2

[1]Old model spring caps are too large to fit through the driver. On these hubs, the spring and cap are removed *after* and installed *before* the driver. Otherwise the spring cap will be compressed between the cone and the bearing with damage to both. Upon installation the driver must be held in place against the spring until the cone is installed.

[2]If thrust ring has top and bottom openings of *equal* diameter it must have a thrust washer on top of it.

STURMEY-ARCHER S5.1 5-SPEED HUB DISASSEMBLY AND ASSEMBLY (cont.)

SUBASSEMBLIES

Next Step
Preceding Page

(6) DISASSEMBLY

Position axle as shown. Flatten dog ring lockwasher. Remove dog ring locknut, lockwasher and dog ring. Remove pinion return spring and washer. Invert axle and tap gently to dislodge washer. With axle still inverted push the two sun pinions up until the larger one engages the axle dogs. The low-gear axle key should be visible in the bottom of its slot. Push out axle key. Remove the two sun pinions and low-gear spring.

Slide light gauge low-gear spring over short-slot end of axle. Install primary sun pinion smooth face up and secondary sun pinion smooth face down.

Push the two sun pinions along the axle so the larger engages axle dogs; invert assembly and slide in square low-gear axle key. Release the two sun pinions. If the hole in the axle key is not visible through the hollow axle, the key is not properly seated; remove and reseat.

Insert washer and pinion return spring. Install dog ring.

Install lock washer with key in axle keyway. Install *unplated* locknut *rounded side up.* Incorrect installation will cause shifting problems as this locknut has the threads relieved on one side. Push dog ring against spring until it seats over square-section part of axle and tighten locknut with a wrench. Bend up lockwasher to prevent nut from turning.

ASSEMBLY (1)

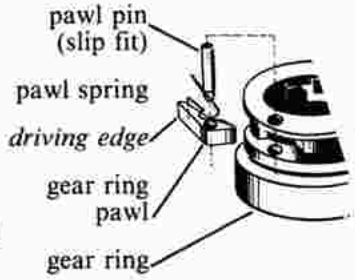
DISASSEMBLY

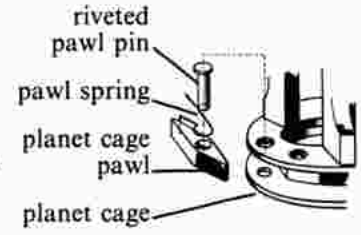
Gear Ring and Planet Cage

Pawl springs can be removed with the pawls in place, although some deformation usually results. Ease the hooked end of the spring over the side or long end of pawl to the other side. Spread the ends of spring and slide out.

If pawls are to be removed, springs are best removed at that time. Riveted pawl pins can be removed only by drilling. Hollow pawl pins can be driven out with the correct size drift punch.

SUBASSEMBLIES





Gear Ring and Planet Cage

If only pawl springs have been removed, springs may be fitted with pawls in place. Holding spring by hooked end, hook straigt end around pawl pin beside pawl. Ease hooked end over the side or long end of pawl. Straight end must come to bear on piece body and hooked end on pawl slightly behind driving edge.

If pawls were removed, fit pawl, pawl spring and pin together. *Make sure pawls are oriented as shown.*

Gear ring pawl pins are slip fit, held in place by ball ring. Solid planet cage pawl pins must be lightly riveted over. Hollow planet cage pawl pins are driven in with a soft hammer.

ASSEMBLY

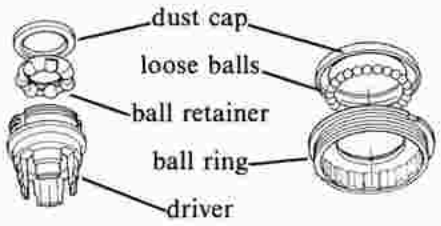
STURMEY-ARCHER S5.1 5-SPEED HUB DISASSEMBLY AND ASSEMBLY (cont.)
SUBASSEMBLIES

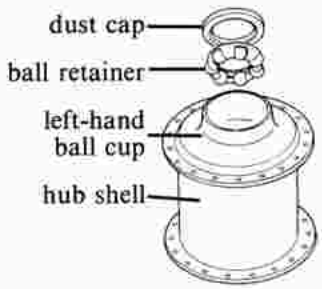
DISASSEMBLY

Driver, Hub Shell and Ball Ring

Remove dust cover with a thin-bladed screwdriver. Work slowly around cover to avoid deforming it. Lift out ball retainer.

Remove left-hand ball cup only if necessary. Cups with wrench flats are left-threaded, all others press fit. Support hub flange on two blocks of wood and pound out press fit cup with a third block and a hammer.





Driver, Hub Shell and Ball Ring

Install left-hand ball cup in hub shell if it was removed. Non-threaded cups can be pressed into threaded hub shells. Start cup straight and pound in with a soft hammer or a hammer and a block of wood.

Install balls or ball retainer. *Orient retainer as shown.* Start dust cover straight by hand and tap home with a soft hammer.

ASSEMBLY

CLEANING

Clean all parts, including outside of hub shell and axle bore, in a suitable solvent. Be very careful not to introduce dirt or grit after cleaning.

POINTS TO CHECK

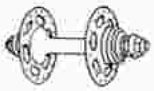
Part numbers followed by * refer to AW parts chart, others to S5 parts chart.

1. Clutch[1] (18*), gear ring dogs[1] (20*), planet cage (15) dogs, axle (13) dogs and primary sun pinion (10) dogs for rounding or chipping
2. Pawls (12*) (21*), ball ring (22*) and left-hand ball cup (3) for worn or chipped corners
3. Sun pinions (9) (10), planet pinions (16), dog ring (6) and gear ring (20*) for worn or chipped teeth
4. Axle keys (11) (14) and indicators (19) for stripped threads, bent or damaged links or bent rod
5. Clutch spring (32*), pinion return spring (7) and low-gear spring (12) for length and tension (compare with new spring)
6. All threaded parts for stripped or damaged threads
7. Dustcaps and ball retainers for straightness
8. Axle (9) for straightness
9. Bearing surfaces of left ball cup (3), ball ring (22*), driver (25*), cones (5*) and pinion pins (17) for wear and pitting
10. Replace ball retainers, loose balls and pawl springs at overhaul

[1] Rounding to a radius of so little as 1/64" at the corners can cause hub to slip out of gear

LUBRICATION

Lubricate ball bearings by filling the spaces between balls with grease. Be careful not to grease pawls. Lightly oil other parts with a *good* cycle oil. (WD-40 is too light for lasting lubrication, 3-in-1 Oil gums up with age.) Add about two teaspoons (8 ml) of oil when assembled.



Hub	Trouble Chart page	Exploded Drawing page	Parts Interchangeability Chart page	Disassembly and Assembly Instructions page	Cleaning, Points to Check and Lubrication Axle page	Thread Size
Bendix Torpedo (see Sachs Torpedo)						
Sachs (F & S) Torpedo						
515	5-5	5-28	5-29	similar to H3111		13/32" x 26 TPI
H3111	5-5	5-28	5-29	5-28	5-30	13/32" x 26 TPI
415 (no brake)	5-5		5-31	similar to H3111		13/32" x 26 TPI
H3102 (no brake)	5-5	5-30	5-31	similar to H3111		13/32" x 26 TPI
Shimano						
3CC	5-4	5-8	5-9	5-14	5-17	3/8" x 26 TPI
3SC	5-4	5-8	5-9	510	5-13	3/8" x 26 TPI
333 Trimatic (similar to 3SC)						
Sturmey-Archer						
AWC	5-6	5-18	5-19			13/32" x 26 TPI
S3C	5-6	5-18	5-19	5-20	5-23	13/32" x 26 TPI
TCW-III	5-6		5-19	similar to S3C		13/32" x 26 TPI

WHEEL MOUNTING

Hubs with coaster brakes have a brake arm that prevents the left-hand cone and axle from turning. Attach the brake arm and axle nuts finger tight before cinching down either. Make sure the brake arm clamp will not pull the brake arm out of line as this will cause severe bearing alignment problems. Tighten axle nuts first, then brake arm clamp.

TRIGGER INTERCHANGEABILITY

Triggers are not interchangeable between brands (except Bendix and Sachs, which are copies). See pages 1-2 thru 1-6 at the beginning of the Hubs section for trigger, cable, indicator and bell crank interchangeability within each brand.

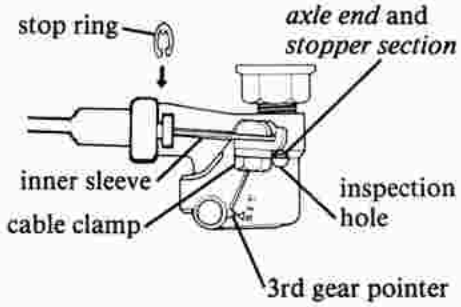
THREE-SPEED COASTER BRAKES

CABLE ADJUSTMENT

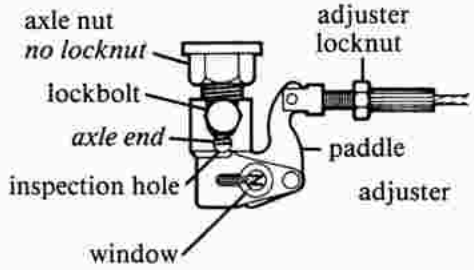
Improper adjustment is the most common cause of problems with 3-speed coaster brakes. Many people have quit riding bikes because their hub slipped out of gear when they were standing up in the pedals. Always check trigger and cable operation before deciding to overhaul a hub.

To have a cable that is in proper adjustment and will *stay* that way, all fittings must be tight enough not to creep along the frame, the cable must be free of kinks and knots, the pulley must operate smoothly and the bell crank or indicator chain must not be twisted. (Always back off a thread-on bell crank or an indicator chain 1/8 of a turn from finger tight.)

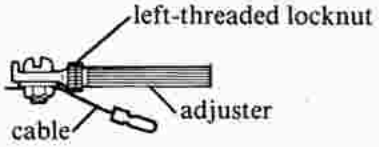
Positron Bell Crank (top view)

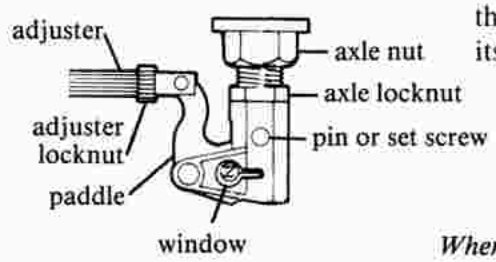


Lockbolt Bell Crank (bottom view)



Universal Cable Clamp





Threaded Bell Crank (top view)

Shimano (3CC and 3SC)

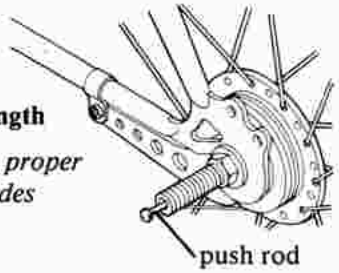
All Shimano hubs use a bell crank and push rod arrangement; coaster brake hubs take the bell crank on the *left* end of the axle. For installation and interchangeability see pages 1-4 and 1-5. Note that push rod length is critical and depends on the length of the axle used.

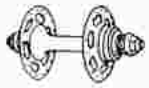
Positron bell crank. Positron bell cranks must be used with Positron triggers and single-strand, push-pull Positron cable; the combination, however, can be used on any Shimano hub. The end of the axle must rest against the bell crank stopper section (as visible through inspection hole). To adjust, move the shifter to the *3* position, loosen the cable, click the bell crank to position marked SET (push hard) and retighten the cable.

Lockbolt and threaded bell cranks. Check for proper installation (pages 1-4 and 1-5). Move paddle to make sure push rod is not missing. Threaded bell crank should be 1/8 to 1/4 of a turn from finger tight (pin or set screw bottoming on end of axle with axle locknut loose). Lockbolt bell crank slips on without axle locknut; make sure stopper section contacts the end of the axle, as visible through inspection hole. Adjust cable with trigger in *N* or *2* position so that the circled *N* on the bell crank paddle is centered in its window (see illustration).

Push Rod Length

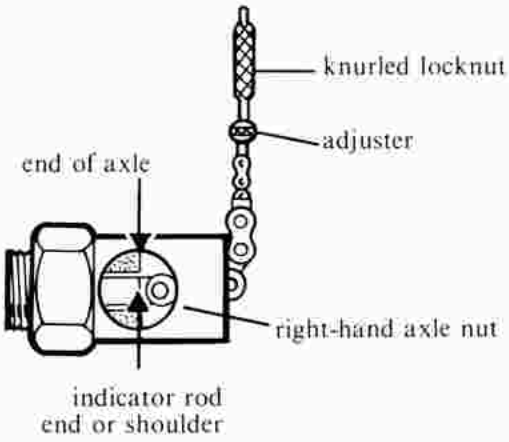
When loosely inserted, proper length push rod protrudes 10–12 mm
13/32 – 15/32"





Sturmey-Archer (S3C)

Make sure that indicator rod is backed off from ⅛ to ¾ of a turn from finger tight. Adjust cable so that the end of the indicator rod is just even with the end of the axle with the shifter in the *N* position.[1] This method may not work with a non-standard indicator chain or axle. If it cannot be used, adjust the cable so that the "dead spot" (pedals freewheeling forward) falls exactly halfway between *N* and *H* shift trigger positions. This is best done by moving the pedals quickly back and forth with one hand while slowly pushing the trigger from *H* toward *N*. Count indicator chain links as they come out of the axle before the *beginning* of the dead spot; continue moving the pedals and advancing trigger, and count the number of links that emerge between the *end* of the dead spot and the click as the trigger goes to *N*. If these two counts are not the same, adjust the cable and try again. In no case should either gear be closer than *½ link* to the dead spot. Tighten knurled locknut against adjuster.



Sachs (F&S) Torpedo H3111, 415 and 515

Sachs (F&S) and Bendix hubs are copies with all parts interchangeable. To adjust, shift into 3rd gear and turn pedals at least one full turn. Slacken cable, then tighten until indicator chain just begins to move at the point where it emerges from axle nut. Check adjustment by shifting into 1st gear (turn pedals) and pulling on cable by hand; indicator chain should not move.

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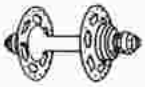
[1]If the end of the axle is not visible in the axle nut window, indicator chain will bottom at last link in low gear. Install a spacer under axle nut.



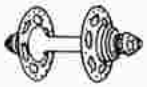
HUBS

SHIMANO 3SC and 3CC 3-SPEED COASTER BRAKES TROUBLE CHART

Symptom	Possible Causes[1] Resulting from wear, improper lubrication or abuse	Resulting from improper assembly or installation
Slips in 1st and 2nd gear	Planet carrier (25) pawls (D) faulty, pawl springs weak or broken	Planet carrier (25) pawls (D) or pawl springs (D) improperly installed
		Stop spring (26) incorrectly installed
Jumps from 1st to 2nd	Cable too loose	
Jumps from 2nd to 1st	Sliding clutch (39) driving edge rounded	
	Planet carrier (25) internal dogs worn	
2nd instead of 1st	Return spring (20) weak	Return spring (20) missing
Jumps from 3rd to 2nd	Cable too tight	
		Axle key (38) reversed or crooked in axle slot
2nd instead of 3rd		
Slips in 1st gear	Ring gear (44) pawls (E) or pawl springs (E) faulty	Ring gear (44) pawls or pawl springs improperly installed
Brake grabs or jerks	Brake arm (11) (12) loose at frame	
	Wrong lubricant or lack of lubricant	
Stiff running or noisy	Brake arm (11) (12) forcing brake cone (11) (14) out of line	Stop nut (33) adjusted for insufficient brake shoe play (3SC)
	One pawl of a pair faulty	Thrust washer (32) or clutch washer (40) missing
	Axle bent	
	Dropouts not parallel	Slide spring (23) reversed
	Improper or no lubrication	Brake shoes (16) misaligned or reversed
	Loose or broken parts inside hub	One pawl of a pair improperly installed
	Chain too tight	Ball retainer reversed
	Cones too tight	
	Gear teeth chipped or worn	
	Ball retainer damaged or broken	
No brake Weak brake Too much pedal travel	Slide spring (23) weak or broken	Stop nut (33) adjusted for excessive brake shoe play (3SC)
	Hub shell or brake shoes (16) (17) glazed or worn	
	Wrong lubricant	
	Brake shoe (16) or planet carrier (25) tapered surfaces worn or burred	
Brake slips in 1st and 2nd gear	Ring gear (43) lead (49) or cam (50) teeth worn	

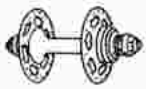
[1]Numbers in parenthesis refer to parts chart and exploded drawing.

F & S 3-SPEED HUBS & 3-SPEED COASTER BRAKES TROUBLE CHART



Symptom	Possible Causes[1] Resulting from wear, improper lubrication or abuse	Resulting from improper assembly or installation
Slips in 1st gear	Brake cone (13) pawls faulty	Brake cone (13) pawls improperly installed
Slips in 2nd gear	Clutch gear (33) teeth broken	
Slips in 3rd gear	Improper lubrication—gummed or dirty	
Jumps from 2nd to 1st	Gear ring (29) pawls faulty	Gear ring (29) pawls improperly installed
Jumps from 3rd to 2nd	Cable too tight	
Jumps from 1st to 2nd	Cable too loose	
Jumps from 2nd to 3rd	Axle key (54) threads stripped	
Pedals driven forward while coasting	Chain too tight	
	Bearings too tight	
Stiff running, noisy	No lubrication or wrong lubrication	Axle circlip (17) missing
	Ball retainer damaged or broken	Ball retainer reversed
	Brake lever (6) forcing cone out of line	Friction spring (14) reversed
Jammed	Loose or broken parts inside hub	
	Broken gear teeth	
Sluggish shifting	Pull chain (55) damaged	
	Cable kinked, damaged, unlubricated	
Too much play in axle	Bearings loose or damaged	
No brake	Friction spring (14) weak or worn	Friction spring (14) missing
Weak brake	Wrong lubricant	
	Brake parts glazed or worn	
Brake too strong or jerky	Brake lever (6) loose at chainstay	
	Brake shell (11) unlubricated	
	Axle (39) loose in dropouts	
Brake does not release	Unlubricated thrust surface between axle (39) and planet carrier (19)	
	Planet carrier (19) and brake cone (13) threads worn or chipped	

[1] Parts numbers in parenthesis refer to parts chart and exploded drawing.

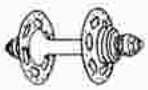


STURMEY-ARCHER AWC, S3C and TCW-III 3-SPEED COASTER BRAKES TROUBLE CHART

Symptom	Possible Causes[1]: Resulting from wear, improper lubrication or abuse	Possible Causes[1]: Resulting from improper assembly or installation
2nd gear instead of 1st		Planet cage (12) pawl ring pawls installed in gear ring (20*)
		Ratchet ring (20) improperly installed: dogs *beside* gear ring (17) tabs rather than *engaging slots* in tab
Jumps from 1st to 2nd	Clutch spring (32*) bent or too long	No washer (4*) under right-hand axle nut (31*): indicator chain bottoms out at last link
	Cable too loose	Indicator (32) not fully screwed in
Slips in 2nd	Indicator (32) threads stripped	
	Gear ring (17) dogs worn	
	Clutch (31) worn	
	Pinion pin (14) ends worn	
2nd gear instead of 3rd Jumps from 3rd to 2nd	Gear ring pawl ring (18) pawls faulty or worn, pawl springs weak or broken	Gear ring pawl ring (18) pawls or springs improperly installed
Slips in 3rd	Cable too tight	
	Dirt between axle (29) and clutch(31)	
Sluggish shifting	Weak or bent clutch spring (32*)	
Slips in 1st	Right-hand cone (5*) too loose	
	Cable sticks; indicator chain twisted	
(cont.)	Planet cage pawl ring (12) pawls sticking or pawl springs weak	Planet cage pawl ring (12) pawls or springs improperly installed

Next Page

[1]Parts numbers followed by * refer to AW parts p. 4-17, others to S3C/TCW-III parts chart on p. 5-9.



STURMEY-ARCHER AWC, S3C and TCW-III 3-SPEED COASTER BRAKES TROUBLE CHART (cont.)

Symptom	Possible Causes[1] Resulting from wear, improper lubrication or abuse	Resulting from improper assembly or installation
Stiff running noisy	Chain too tight	Spring cap (33*) pinched between right-hand cone and driver (22)
	One pawl of a pair sticking	Too many balls in ball ring (21)
	Chainstay ends not parallel	AW ball ring (21) installed in S3C
	Loose or broken parts inside hub	Ball retainer reversed
	Dust caps distorted	One pawl of a pair improperly installed
	Ball retainer damaged or broken	Wider TCW brake band (5) in S3C
Brake will not release	Corroded parts; improper or no lubrication	Brake actuating spring (7) reversed
	Axle (29) bent	Wide S3C ball ring (21) on TCW III
	Left-hand cone (3) brake band (5) or thrust plate(8) tapered surfaces rough burred	
	Brake arm (1) forcing left-hand cone (3) out of line	
Too much back-pedal travel	Cones too tight	
Weak brake	Improperly lubrication — too slippery	
	Brake band (5) or hub shell (11) worn or glazed	
	Thrust plate (8) or planet cage (12) threads chipped	
No brake (pedals slip back)	Brake actuating spring (7) worn or damaged	Brake actuating spring (7) missing
	Driver (22) pawls or pawl springs faulty, broken (S3C)	Driver (22) pawls missing, backwards; pawl springs improperly installed
Intermittent brake	Cable misadjusted (TCW III)	

[1] Parts numbers followed by * refer to AW parts chart, others to S3C/TCW III parts chart.

HUBS

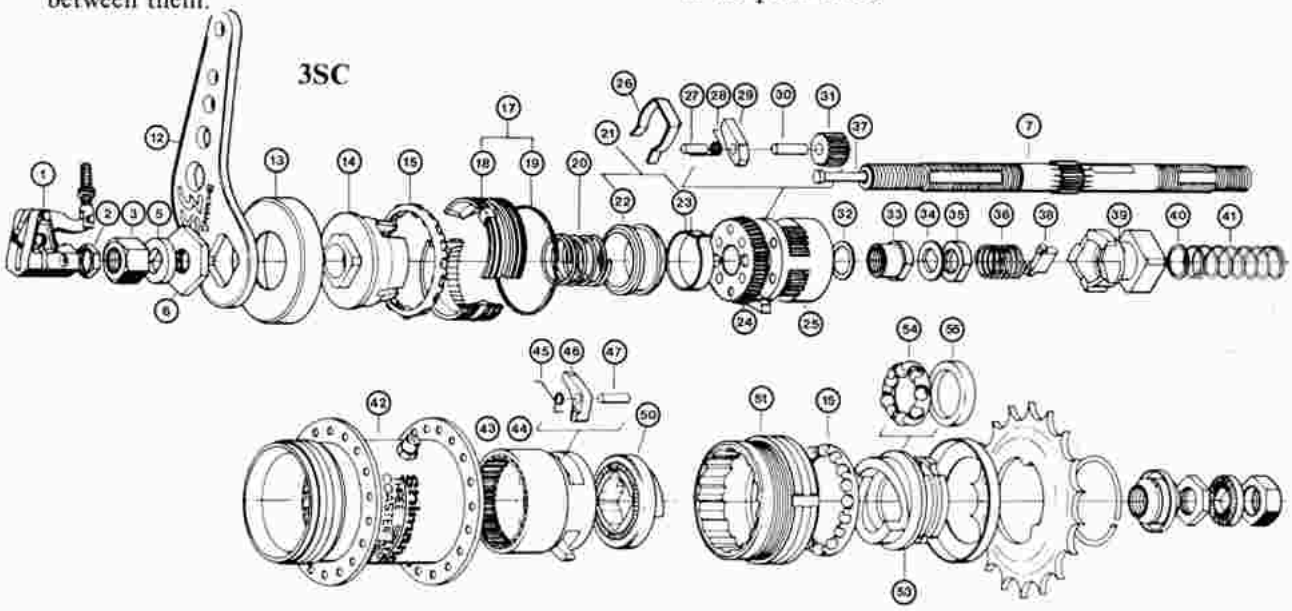
SHIMANO 3 SPEED COASTER BRAKE

Vertical line between numbers indicates parts are not interchangeable.

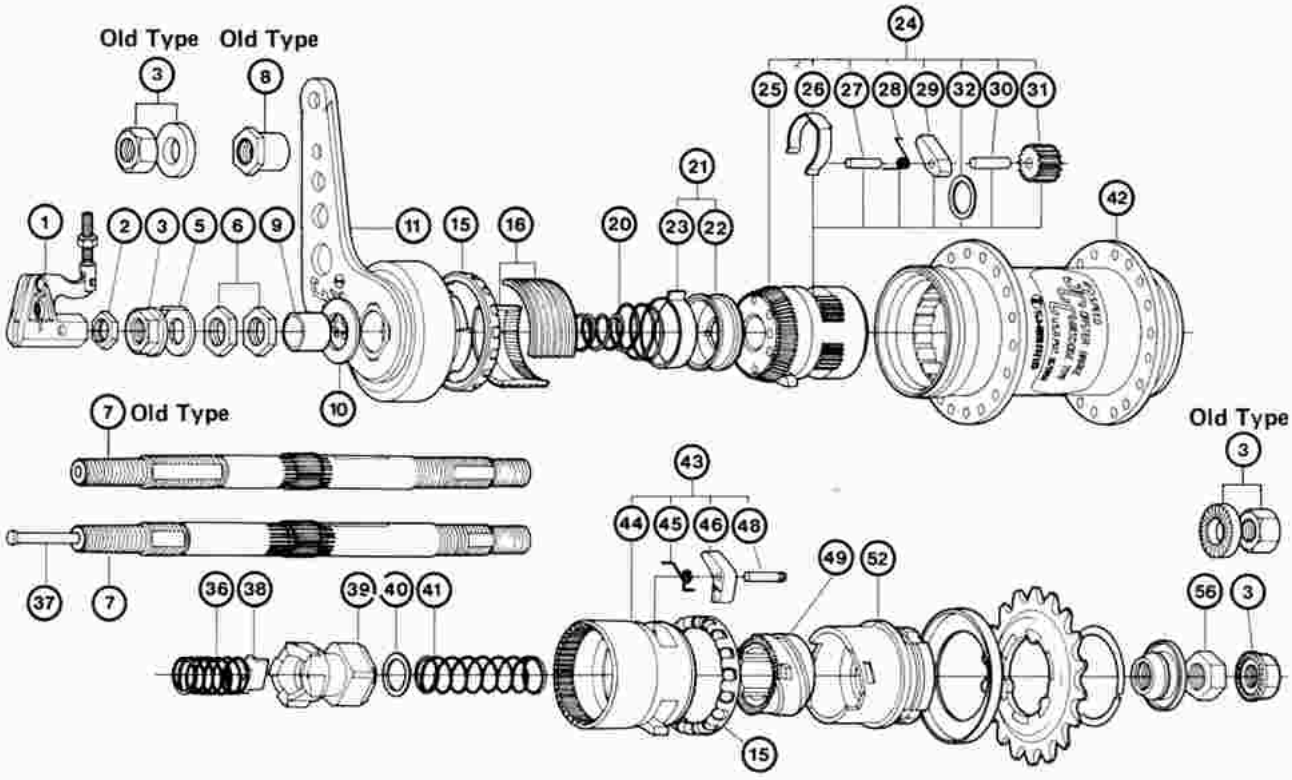
Parts are interchangeable only if they are on the same line and they do not have a vertical line between them.

Parts not numbered are interchangeable with Shimano 3-speed.

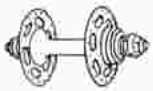
Additional parts which are interchangeable with Shimano 3-speed are marked with an asterisk in the parts table.



3CC CARTRIDGE TYPE



SHIMANO 3-SPEED COASTER BRAKE PARTS INTERCHANGEABILITY



HUBS

		New Type 3CC TC-200		Old Type 3CC TC-100		3SC	
1.	Bell Crank Complete	321	9029-1	333	9001-1	333	9001-1
2.	Bell Crank Locknut	321	8300*	321	8300*	321	8300*
3.	Axle Nut	220	1501-1	200	0300	333	4100
4.	Lock Washer					333	4200
5.	Non Turn Washer	321	6400	321	6400		
6.	Left-Hand Locknut	321	3900	321	3900	333	0301
7.	Axle 168 mm (6⅝")	334	1500-1[2]	334	1500[2]	333	3800
8.	Stop Nut			334	0400[2]		
9.	Sleeve	334	0400-1[2]				
10.	Brake Arm Washer	334	1600	334	1600		
11.	Brake Arm Assembly	334	9007	334	9007		
12.	Brake Arm					333	0500-1
13.	Dust Cap L					333	1100-1
14.	Brake Cone					333	1200-1
15.	Ball Retainer B	321	9023*	321	9023*	321	9023*
16.	Brake Shoe Set	334	9008	334	9008		
17.	Brake Shoe and Spring					333	9031[1]
18.	Brake Shoe					333	1300
19.	Brake Shoe Spring					333	1400
20.	Return Spring	334	0800	334	0800	333	1900
21.	Spring Guide and Slide Spring	333	9032	333	9032	333	9032
22.	Spring Guide	333	2100	333	2100	333	2100
23.	Slide Spring	333	2000	333	2000	333	2000
24.	Carrier Assembly	334	9009	334	9009		
25.	Carrier	333	2200	333	2200	333	2200
26.	Stop Spring	333	4800	333	4800	333	4800
27.	Pawl Pin D	333	2600	333	2600	333	2600
28.	Pawl Spring D	333	2700	333	2700	333	2700
29.	Pawl D	333	2500	333	2500	333	2500
30.	Pinion Pin	333	2300-1	333	2300-1	333	2300-1
31.	Planet Pinion	321	5500*	321	5500*	321	5500*
32.	Thrust Washer	333	2400	333	2400	333	2400
33.	Stop Nut					333	0400-1
34.	Non Turn Washer					333	3900
35.	Lock Nut B					333	4000-1
36.	Clutch Spring B	332	3400	332	3400	333	3200
37.	Push Rod	321	7300-1	321	7300	321	7300
38.	Axle Key	333	3300	333	3300	333	3300
39.	Sliding Clutch	334	1200-1	334	1200	333	3100
40.	Clutch Washer	333	3400	333	3400	333	3400
41.	Clutch Spring A	333	3500	333	3500	333	3500
42.	Hub Shell 28 holes	334	9003-1	334	9003	333	9007
	36 holes	334	9005-1	334	9005	333	9014
43.	Ring Gear Assembly	334	9010	334	9010		
44.	Ring Gear	334	1100	334	1100	333	2800
45.	Pawl Spring E	333	3000	333	3000	333	3000
46.	Pawl E	333	2900	333	2900	333	2900
47.	Pawl Pin D					333	2600
48.	Pawl Pin E	333	4600	333	4600		
49.	Lead	334	1300	334	1300		
50.	Cam					333	3600
51.	Right-Hand Ball Cup					333	1800
52.	Driver with Ball Retainer, Dust Cap	334	9015	334	9015		
53.	Driver					333	3700
54.	Ball Retainer A					321	9022
55.	Dust Cap A					321	2700
56.	Right-Hand Locknut	321	4000	321	4000		

*Interchangeable with Shimano 3-speed.

[1] Old part number 33 9019.

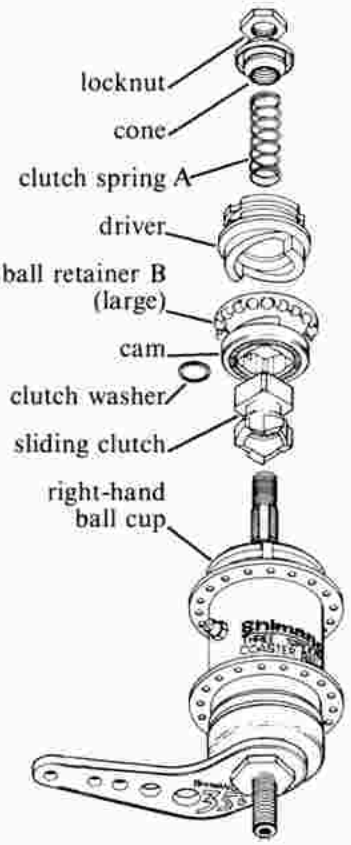
[2] New Style Axle (334-1500-1) combined with Sleeve (334-0400-1) interchange with Old Style Axle (334-1500) and Stop Nut (334-0400). Individually these parts are not interchangeable

SHIMANO 3SC
3-SPEED COASTER BRAKE
DISASSEMBLY AND ASSEMBLY

1 DISASSEMBLY

Remove right-hand locknut and cone. Lift off driver and clutch spring A. Remove sliding clutch, cam and large ball retainer (B). Remove clutch washer from inside clutch.

Slip Shimano ball cup tool (not shown) over axle to engage right-hand ball cup. Invert assembly, hold tool in vise and turn wheel counter-clockwise to loosen ball cup.



Next Step

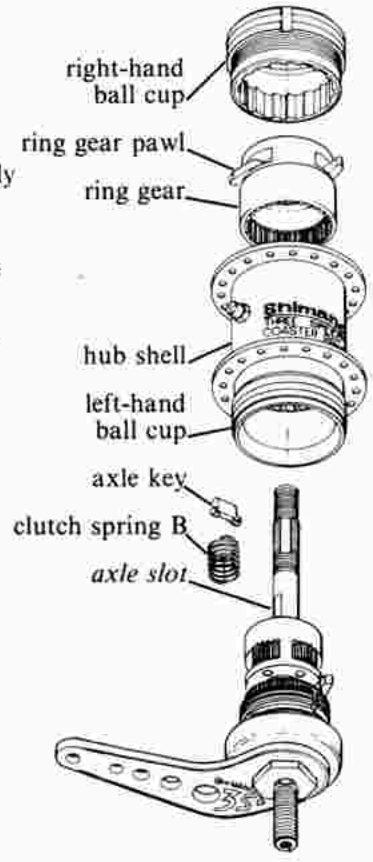
Install sliding clutch, square end up. Install cam *flat serrated side down*. Install clutch washer clutch spring and driver. Install ball retainer (B) *flat side up*. Install right-hand cone and locknut. Adjust bearing.

ASSEMBLY 4

Next Step

2 DISASSEMBLY

Remove tool, lift hub slightly and unscrew ball cup. Remove hub shell and ring gear assembly. Remove axle key and light gauge spring (clutch spring B) from axle.



Next Step
Next Page

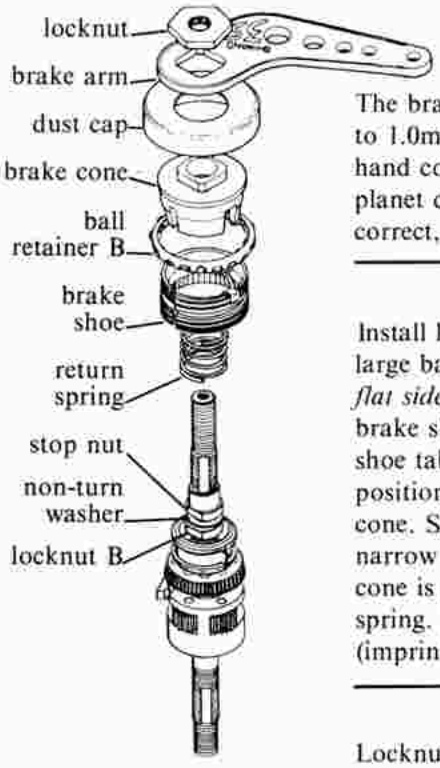
Invert assembly. Install light gauge clutch spring (B). Install axle key *notch down* in axle slot. Slip hub shell over assembly with left-hand ball cup seating against balls in ball retainer. Rotate ring gear pawls into operating position (full clockwise, viewed from above), press in and slip ring gear over axle into hub shell. Thread in right-hand ball cup. Tighten with ball-cup tool.

ASSEMBLY 3

SHIMANO 3SC
3-SPEED COASTER BRAKE
DISASSEMBLY AND ASSEMBLY (cont.)

3 DISASSEMBLY

Remove left-hand locknut. Lift off brake arm, dust cap, brake cone, large ball retainer (B) and brake shoe. Remove return spring. Loosen stop nut. If merely adjusting brake shoe clearance, go to assembly step 2.



Next Step Preceding Page

The brake shoe should have from 0.5mm to 1.0mm vertical play between the left-hand cone and the serrated end of the planet carrier. If adjustment is not correct, go to disassembly, step 3.

Install large diameter return spring. Slip large ball retainer over left hand cone *flat side toward dust cap*. Assemble brake shoe and brake cone with brake shoe tabs engaging slots in cone. Note position of the narrow slot in brake cone. Slip assembly over axle so that narrow slot engages slide spring as brake cone is pushed down against return spring. Install dust cap, brake arm (imprinted side up) and large locknut.

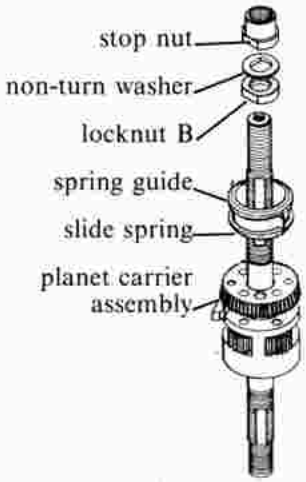
Locknut (B) determines brake shoe play; threading it down reduces play, threading it up increases play. Lock locknut (B) in place with non-turn washer and stop nut as shown.

ASSEMBLY 2

Next Step

4 DISASSEMBLY

Remove stop nut, non-turn washer and locknut (B). Lift off spring guide and planet carrier. Remove slide spring from spring guide only if it is to be replace.



Next Step

Install spring guide with dogs down. Make sure hooked end of slide spring is *clockwise from spring gap*. Incorrect installation will cause excessive drag and wear. Spring guide dogs engage holes in planet carrier. Thread locknut (B) finger tight against axle shoulder, then back off about one full turn.

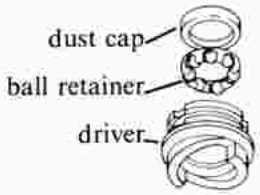
Fix axle in vise, hollow end up. Slip planet carrier assembly over axle with planet pinions engaging sun pinion.

ASSEMBLY 1

SHIMANO 3SC
3-SPEED COASTER BRAKE
DISASSEMBLY AND ASSEMBLY (cont.)
SUBASSEMBLIES

DISASSEMBLY

Driver
Remove dust cover with a thin-bladed screwdriver. Work slowly around cover to avoid deforming it. Lift out ball retainer.



Driver
Install ball retainer flat side up. Start dust cover straight and tap home with a soft hammer.

ASSEMBLY

DISASSEMBLY

Ring Gear
Push out pawl pins (E), catch pawls (E) and pawl springs (E).

Ring Gear
Position ring gear with *gear teeth down.* When installed, Pawl (E) has *long end out* and *recessed side down.* Pawl spring (E) lies in pawl recess with *long* hooked leg through hole in gear ring and *short* hooked leg bearing against the *outside surface* of the *short end* of pawl (*long* leg has *short* hooked segment and vice versa). Install pawl spring, pawl and pawl pin. *Be sure pin passes through spring coil.* Check pawl operation. Repeat for other pawl.

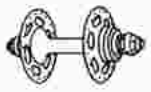
ASSEMBLY

DISASSEMBLY

Planet Carrier
Tap out pawl pins (D) a few millimeters. Pull pins out, catch pawls (D) and pawl springs (D). Remove stop spring form carrier body groove. Tap or push out pinion pins. Remove pinions. Extract thrust washer.

Planet Carrier
Stick thrust washer in place. Position pinion, insert pinion pin. Repeat for remaining pinions. Pins protrude about 1mm above the central planet carrier flange. Install stop ring with wide section between the protruding ends of two pinion pins *that do not have a pawl pin hole between them.* Position planet carrier with serrated cone up. When installed, hooked end of pawl spring (D) bears against *inside* surface of the *long end* of pawl (D). Straight end of pawl spring bears against stop spring. Install pawls with *driving edge pointing counter-clockwise.* Insert pawl pin through pawl spring and pawl. Pawl pin does not protrude above carrier body. Check pawl operation before proceeding.

ASSEMBLY



SHIMANO 3SC
3-SPEED COASTER BRAKE
DISASSEMBLY AND ASSEMBLY (cont.)

CLEANING

Clean all parts, including outside of hub shell and axle bore, in a suitable solvent. Be very careful not to introduce dirt or grit after cleaning.

POINTS TO CHECK

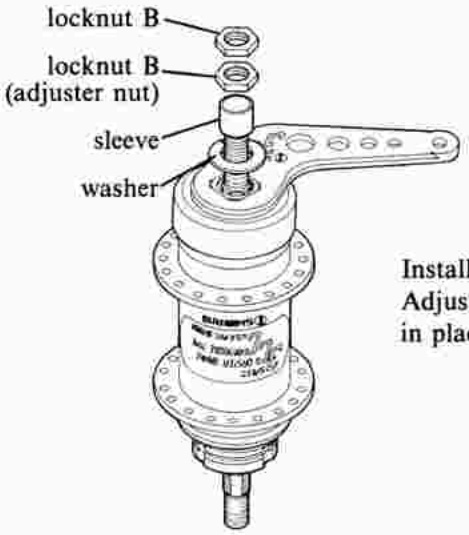
Numbers in parenthesis refer to parts chart and exploded drawing.

1. Pawls (29, 46), ratchets in hub shell (42) and right-hand ball cup (51) for chipped or rounded edges
2. Gear teeth on axle (7), planet pinions (31), and ring gear (43) for wear and chipping
3. Sliding clutch (39), and inside of planet carrier (24) for rounded or chipped driving edges
4. Return spring (20), slide spring (23), stop spring (26) and clutch springs (36, 41) for shape and tension; replace pawl springs (28, 45) at overhaul
5. Right-hand cone, driver (53), brake cone (14) and hub shell (42) bearing races for wear and pitting
6. Dustcaps, ball retainers (15, 54) and axle (7) for straightness
7. All threaded parts for damaged or stripped threads
8. Brake shoes (18) and hub shell (42) for wear or glazing
9. Teeth or serrations of cam (50), ring gear (44), planet carrier (24) and brake shoes (18) for wear or burring
10. Threads of cam (50) and driver (53) for wear or roughness

LUBRICATION

Lubricate ball retainers by filling the spaces between balls with grease. Lubricate hub shell and brake shoes liberally with a high-temperature grease. Be careful not to grease pawl springs. Lightly oil other internal parts with a *good* cycle oil. (WD-40 is too light for lasting lubrication, 3-in-1 Oil gums up with age.) Add about two teaspoons (8 ml) of oil when assembled.

SHIMANO 3CC CARTRIDGE TYPE 3-SPEED COASTER BRAKE DISASSEMBLY AND ASSEMBLY



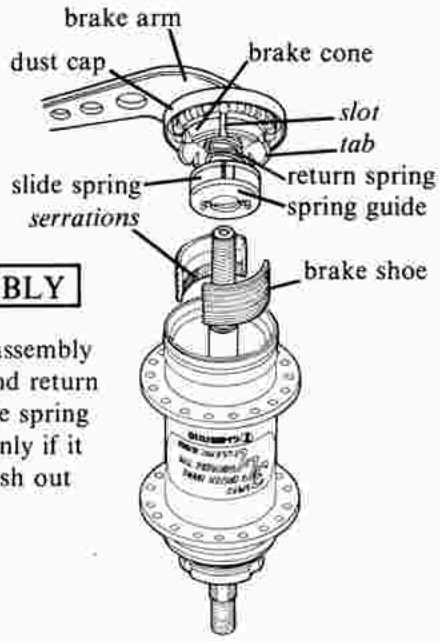
1 DISASSEMBLY

Remove left-hand B locknuts, washer and sleeve.

Next Step

Install washer, sleeve and B locknuts. Adjust bearing, locking first locknut in place with the second.

ASSEMBLY 4



2 DISASSEMBLY

Lift off brake arm assembly with spring guide and return spring. Remove slide spring from spring guide only if it is to be replaced. Fish out brake shoes.

Next Step
Next Page

Next Step

Position brake shoes *internal serrations down* and stick into hub shell. Replace spring guide slide spring if it was removed. Viewed as shown, *hooked end of slide spring must be counter-clockwise from gap.* Incorrect installation will cause excessive drag and wear.

Assemble brake arm, spring guide and return spring into a single unit by inserting return spring with a clockwise twisting motion. *Rotate spring guide until hooked end of slide spring is aligned with brake cone slot.* Note position of brake cone tabs, and slip spring-guide/brake-cone assembly over axle with brake cone tabs engaging gaps between brake shoes. Rotate slightly until properly seated.

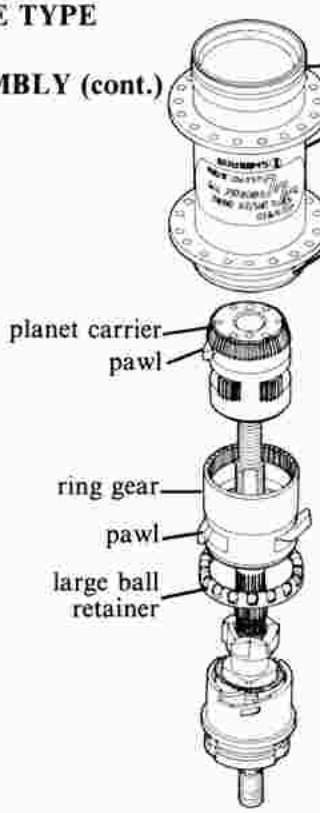
ASSEMBLY 3

SHIMANO 3CC CARTRIDGE TYPE 3-SPEED COASTER BRAKE DISASSEMBLY AND ASSEMBLY (cont.)

3 DISASSEMBLY

Lift off hub shell.

Remove planet carrier assembly. Hold ring gear pawls full counter-clockwise and lift carrier off over sliding clutch. Remove large ball retainer.



Next Step

Next Step Preceding Page

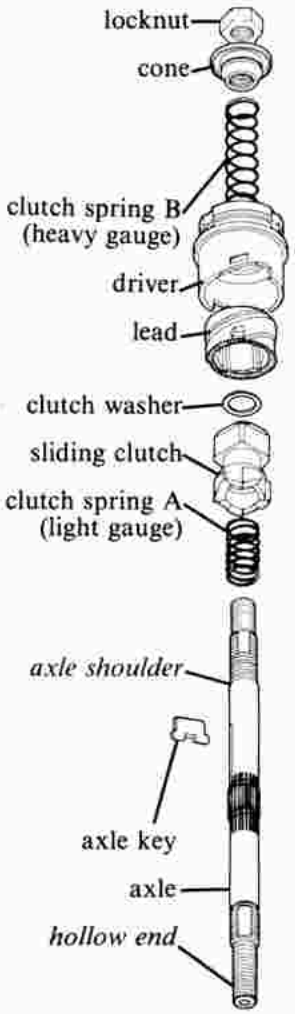
Position hub shell *long end up*, push in planet carrier pawls and slip hub shell over assembly.

Invert assembly. Install large ball retainer *flat side toward driver*. Position ring gear assembly *gear teeth up*, rotate pawls into operating position (full counter-clockwise, viewed from above) and slip ring gear over sliding clutch. Insert planet carrier into ring gear.

ASSEMBLY 2

4 DISASSEMBLY

Invert assembly, remove right-hand locknut, cone and heavy gauge clutch spring (B). Lift off driver and lead. Remove sliding clutch; extract clutch washer from inside clutch. Remove axle key and light gauge clutch spring (A).



Next Step

Position axle *hollow end down*. Install light gauge clutch spring (A). Compress spring and insert axle key *notch down* as shown. Release spring to hold key in position. Install sliding clutch *square end up*. Slip clutch washer into clutch. Install lead teeth down. Screw driver onto lead. Install clutch spring (B). Thread on cone and tighten against axle shoulder. Install right-hand locknut.

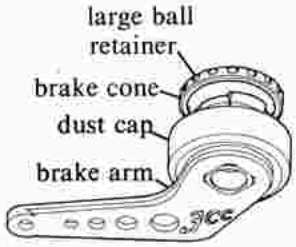
ASSEMBLY 1

SHIMANO 3CC CARTRIDGE TYPE 3-SPEED COASTER BRAKE DISASSEMBLY AND ASSEMBLY (cont.)

SUBASSEMBLIES

DISASSEMBLY

Pop large ball retainer over brake cone tabs. Brake cone, brake arm and dust cap are press fit together and should not be forced apart.



Pop large ball retainer over brake cone tabs *flat side toward dust cap.*

ASSEMBLY

DISASSEMBLY

Ring Gear

Push out pawl pins (E), catch pawls (E) and pawl springs (E).

Ring Gear

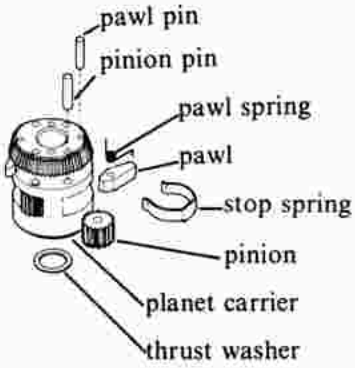
Position ring gear with *gear teeth down.* When installed, Pawl (E) has *long end out* and *recessed side down.* Pawl spring (E) lies in pawl recess with *long* hooked leg through hole in gear ring and *short* hooked leg bearing against the *outside surface* of the *short end* of pawl (*long* leg has *short* hooked segment and vice versa). Install pawl spring, pawl and pawl pin. *Be sure pin passes through spring coil.* Check pawl operation. Repeat for other pawl.

ASSEMBLY

DISASSEMBLY

Planet Carrier

Tap out pawl pins (D) a few millimeters. Pull pins out, catch pawls (D) and pawl springs (D). Remove stop spring form carrier body groove. Tap or push out pinion pins. Remove pinions. Extract thrust washer.



Planet Carrier

Stick thrust washer in place. Position pinion, insert pinion pin. Repeat for remaining pinions. Pins protrude about 1mm above the central planet carrier flange. Install stop ring with wide section between the protruding ends of two pinion pins *that do not have a pawl pin hole between them.* Position planet carrier with serrated cone up. When installed, hooked end of pawl spring (D) bears against *inside* surface of the *long end* of pawl (D). Straight end of pawl spring bears against stop spring. Install pawls with *driving edge pointing counter-clockwise.* Insert pawl pin through pawl spring and pawl. Pawl pin does not protrude above carrier body. Check pawl operation before proceeding.

ASSEMBLY

SHIMANO 3CC CARTRIDGE TYPE 3-SPEED COASTER BRAKE DISASSEMBLY AND ASSEMBLY (cont.)

CLEANING

Clean all parts, including outside of hub shell and axle bore, in a suitable solvent. Be very careful not to introduce dirt or grit after cleaning.

POINTS TO CHECK

1. Pawls (29, 46), ratchets in hub shell (42) for chipped or rounded edges
2. Gear teeth on axle (7), planet pinions (31), and ring gear (42) for wear and chipping
3. Sliding clutch (39), and inside of planet carrier (24) for rounded or chipped driving edges
4. Return spring (20), slide spring (23), stop spring (26) and clutch springs (36, 41) for shape and tension; replace pawl springs (28, 45) at overhaul
5. Right-hand cone, driver (52), brake cone (11) and hub shell (42) bearing races for wear and pitting
6. Dustcaps, ball retainers (15, 52) and axle (7) for straightness
7. All threaded parts for damaged or stripped threads
8. Brake shoes (16) and hub shell (42) for wear or glazing
9. Teeth or serrations of lead (49), ring gear (44), planet carrier (24) and brake shoes (16) for wear or burring
10. Threads of lead (49) and driver (52) for wear or roughness

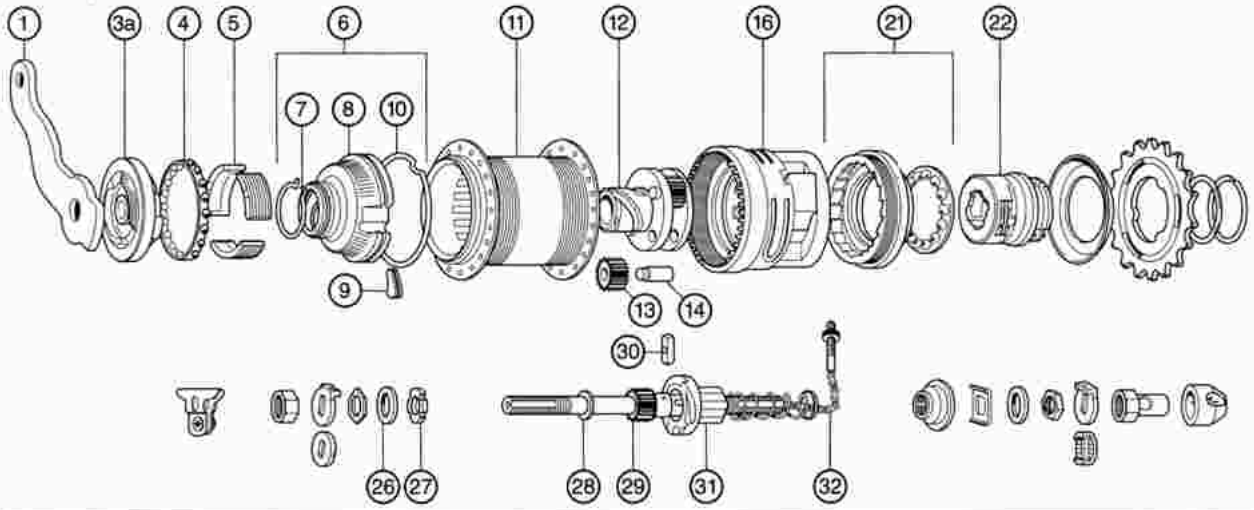
LUBRICATION

Lubricate ball retainers by filling the spaces between balls with grease. Lubricate hub shell and brake shoes liberally with a high-temperature grease. Be careful not to grease pawl springs. Lightly oil other internal parts with a *good* cycle oil. (WD-40 is too light for lasting lubrication, 3-in-1 Oil gums up with age.) Add about two teaspoons (8 ml) of oil when assembled.

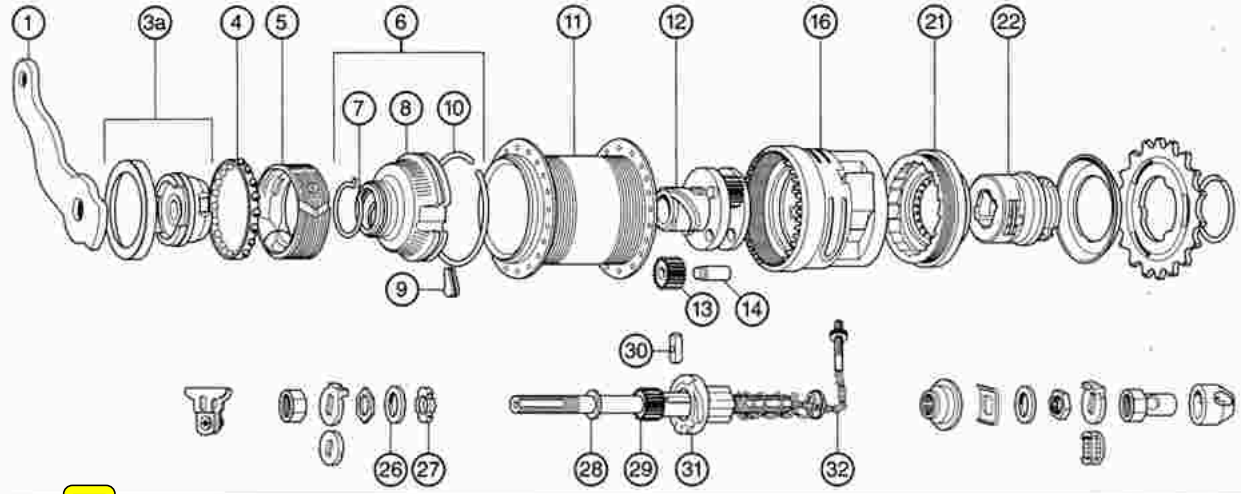
HUBS

STURMEY-ARCHER 3-SPEED COASTER BRAKE

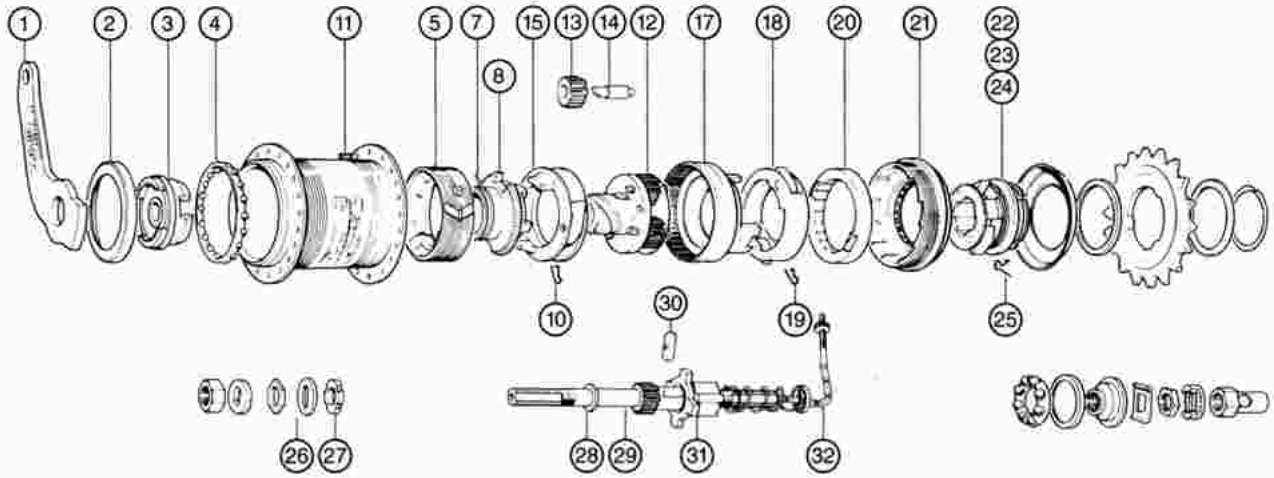
AWC (after 5/91)



AWC (before 5/91)

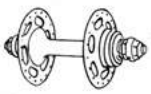


S3C



[1]The lockwasher, brake arm nut and brake arm as a unit may be interchanged.
[2]Same as AW. [3]HSA 469 replaces HSA 302 (see Subassembly text).
[4]If thrust ring has same size opening at both ends, a thrust washer must be installed. This occurs only on older models.
[5]Hub shells marked 88-8 (August 1988) or earlier have 2 pawl drivers. Replace 2 pawl driver assembly and clutch together.

STURMEY-ARCHER 3-SPEED COASTER BRAKES PARTS INTERCHANGEABILITY



| Vertical line between numbers indicate parts are not interchangeable.

Parts are interchangeable only if they are on the same line and they do not have a vertical line between them.

Parts not listed are the same as AW.

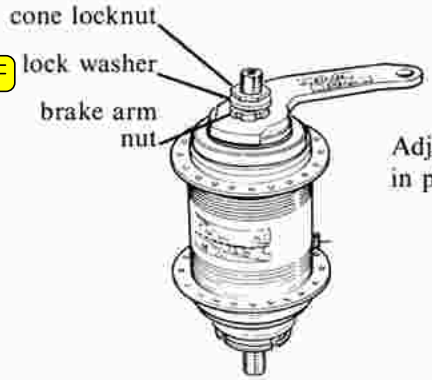
This page has been updated in 2012 to cover the latest-model hubs. The S-RC3(II) is identical to the AWC(II) except for the aluminum-alloy hub shell.

	AWC(II) S-RC3(II)	AWC 2004-2005	AWC After 5/91	AWC Before 5/91	S3C Changes	S3C	TCW Mark III
Brake Arm/Cone Assy	HSH 491	HSH 488				HSH 449	HSH 403
1. Brake Arm	HSH 483	HSH 487	HSH 471	HSH 471	HSH 450[1]	HSH 446	HSH 402
2. LH Dust Cap						HSH 404	HSH 404
3. LH Cone						HSH 447	HSH 405
3a. Cone/Dust Cap Assy		HSH 485	HSH 477	HSH 472			
4. Ball Cage (18 3/16" balls)	HSA 164	HSA 164	HSA 164	HSA 164		HSA 164	HSA 164
Lubricator (old style)						HSA 106	
5. Brake Shoes/Band	HSH 490	HSH 478	HSH 478	HSH 448		HSH 448	HSH 406
6. Brake Actuator Assy	HSH 473	HSH 473	HSH 473	HSH 473			
7. Drag Spring	HSH 407	HSH 407	HSH 407	HSH 407		HSH 407	HSH 407
8. Actuator	HSH 476	HSH 476	HSH 476	HSH 476		HSH 408	HSH 408
Thrust Plate						HSH 408	HSH 408
9. Pawl	HSA 410	HSA 410	HSH 474	HSH 474			
10. Pawl Spring	HSH 450	HSH 450	HSH 475	HSH 475		HSA 120[2]	HSA 120[2]
Seal Spring		HSA 818					
11. Hub Shell 28 hole	HSA 465	HSA 617	HSA 465			HSA 232	
36 hole	HSA 400	HSA 616	HSA 400	HSA 400		HSA 233	HSA 166
40 hole						HSA 323	HSA 165
12. Planet Cage	HSA 402	HSA 402	HSA 402	HSA 402		HSA 291	HSA 169
13. Planet Pinion	HSA 292	HSA 292	HSA 292	HSA 292		HSA 292	HSA 115
14. Pinion Pin	HSA 401	HSA 401	HSA 401	HSA 401		HSA 293	HSA 170
15. Pawl Ring Assy						HSA 168	HSA 168
Pawl Spring						HSA 120[2]	HSA 120[2]
16. Gear Ring Assembly	HSA 554	HSA 554	HSA 403	HSA 403			
17. Gear Ring	HSA 558	HSA 558				HSA 296	HSA 171
18. Gear Ring Pawl Ring						HSA 307	HSA 172
19. Spring for Pawl Ring						HSA 253	
Pawl Pin	HSA 415	HSA 415					
Gear Ring Drag Spring	HSA 542	HSA 542					
20. Ratchet Ring						HSA 304	
21. RH Ball Ring	HSA 437	HSA 437	HSA 437	HSA 308		HSA 308	HSA 121[2]
22. Driver/Brake Pawls[5]	HSA 407[5]	HSA 407[5]	HSA 407[5]	HSA 407[5]		HSA 311	
23. Ball Cage Assy	HSA 438	HSA 438	HSA 438	HSA 284[2]			
24. Outer Dust Cap	HSA 102	HSA 102	HSA 102	HSA 102[2]			
25. Pawl Spring						HSA 469[3]	
26. Lockwasher	HMW150	HMW150	HMW150	HMW150	HMW150[1]	HMW156	HMW156
27. Brake Arm Locknut	HMN 384	HMN 403	HMN 344	HMN 344	HMN 344[1]	HMN 334	HMN 135
28. Axle Circlip	HSL 729	HSL 729	HSL 729	HSL 729	HSL 729	HSL 725	HSL 725
Clutch Sleeve (not shown)							HSA 116[2]
29. Axle 146 mm 5¾"							HSA 173
152 mm 6"		HSA 538	HSA 466	HSA 405		HSA 313	
159 mm 6¼"				HSA 419		HSA 314	HSA 174
163 mm	HSA 539	HSA 539	HSA 467	HSA 427			
175 mm	HSA 645						
30. Axle Key	HSA 295	HSA 295	HSA 295	HSA 295		HSA 295	HSA 124[2]
31. Clutch	HSA 536	HSA 536	HSA 468	HSA 418		HSA 294	HSA 117[2]
Thrust Ring (not shown)							HSA 283[2]
32. Gear Indicator							
146 mm 5¾" axle							HSA 125[2]
152 mm 6" axle		HSA 126[2]	HSA 126[2]	HSA 126[2]		HSA 126[2]	
159 mm 6¼" axle				HSA 315		HSA 315	HSA 126[2]
163 mm axle	HSA 316	HSA 316	HSA 316	HSA 316			
175 mm axle	HSA 420						
Complete Internal Assy							
152 mm axle		HSX 116					
163 mm axle	HSX 118	HSX 118					
175 mm axle	HSX 145						

**STURMEY-ARCHER S3C
3-SPEED COASTER BRAKE
DISASSEMBLY AND ASSEMBLY**

1 DISASSEMBLY

Loosen but *do not remove* cone locknut and brake arm nut.



Adjust bearing and lock brake arm nut in place with locknut.

ASSEMBLY 7

Next Step

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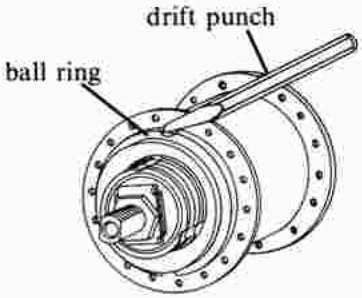
2 DISASSEMBLY

Next Step

The right-hand ball ring may have a double start thread. If the ball ring is replaced in the opposite position, the wheel may need retruing. To facilitate proper reassembly, mark the ball ring at the point nearest the lubricator.

Place a drift punch as shown and loosen the ball ring by rapping the punch firmly with a hammer. *Do not try to unscrew it completely.*



Tighten right-hand ball ring with a hammer and drift punch.

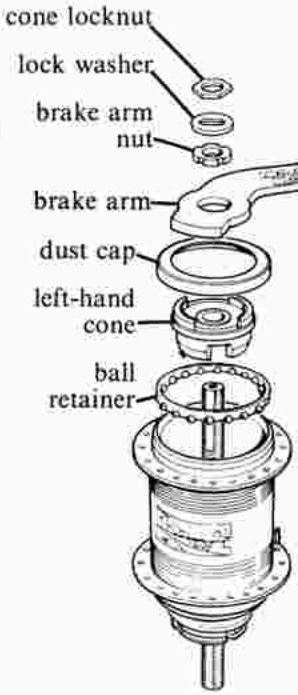
ASSEMBLY 6

Next Step

---

3 DISASSEMBLY

Remove cone locknut, lock washer, and brake arm nut. The brake arm, dust cap and left-hand cone may come off separately or as a unit. They can easily be pressed apart if required. Remove ball retainer.



Next Step
Next Page

Next Step

Install brake arm nut, lock washer and cone locknut finger tight.

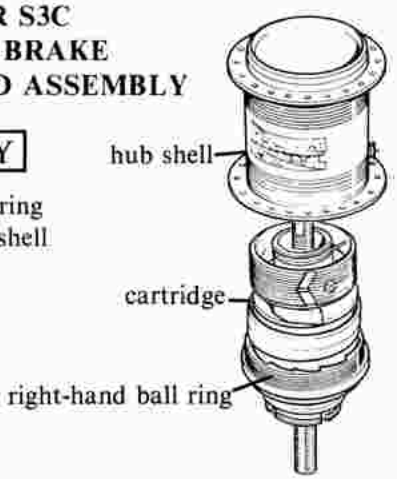
Replace ball retainer *flat side up*. If retainer will not seat properly, check thrust plate and pawl ring installation (step 3). Install cone, dust cover and brake arm (brand name facing out). The inward face of the cone has three slots; the two wide slots engage the brake band tabs, the narrow slot engages the brake actuating spring. It may be necessary to rotate the spring before installing the cone.

ASSEMBLY 5

STURMEY-ARCHER S3C 3-SPEED COASTER BRAKE DISASSEMBLY AND ASSEMBLY

4 DISASSEMBLY

Unscrew right-hand ball ring from the *bottom* of hub shell and remove cartridge.



Next Step

Next Step
Preceding Page

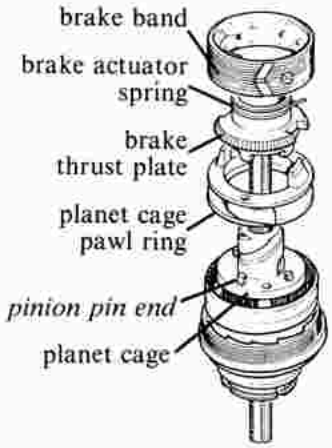
Without inverting cartridge, slip it into the hub shell and thread ball ring finger tight. If the mark made during disassembly is not beside the lubricator, remove and restart cartridge. Do not tip or invert hub until left-hand locknut has been installed in the next step.

ASSEMBLY 4

---

5 DISASSEMBLY

Remove brake band, thrust plate and planet cage pawl ring. If required brake actuating spring can be pried off thrust plate with a thin-bladed screwdriver.



Next Step

Turn assembly over. Install brake actuating spring on thrust plate if it was removed. *Viewed as shown hooked end of spring must be clockwise from gap.* Incorrect installation will cause excessive drag and wear.

Rotate pinion pins so the flats face outwards. Insert tabs of planet cage pawl ring into slots on thrust plate. Screw the pawl ring and thrust plate onto the planet cage until pawl ring seats on the planet cage. Install brake band, *tabs up.*

ASSEMBLY 3

---

6 DISASSEMBLY

Hold down ball ring while removing right-hand locknut, lock washer, cone clutch spring, spring cap and driver[1] (rotate driver to disengage driver pawls). If driver catches on ball ring, remove both parts together; be careful not to damage pawl springs when separating them. Lift off ball ring, ratchet ring and gear ring pawl ring.

Next Step

Install ball ring. Push pawls in and rotate ring until seated over pawls. Install driver.[1] Push pawls in and turn driver clockwise until it seats in ball ring. Install spring and spring cap.[1] Install cone, lockwasher and locknut. Adjust bearing. If bearing runs rough, check spring cap.[1]

Replace gear ring pawl ring *beveled edge down.* Pawls must point clockwise when viewed from above. Top face of ring should be flush with top of gear ring tabs.

Install ratchet ring. Ratchet ring keys must be engaged in *keyways* of the gear ring tabs. If the keys are positioned *beside* the gear ring tabs, low gear may not engage properly.

ASSEMBLY 2

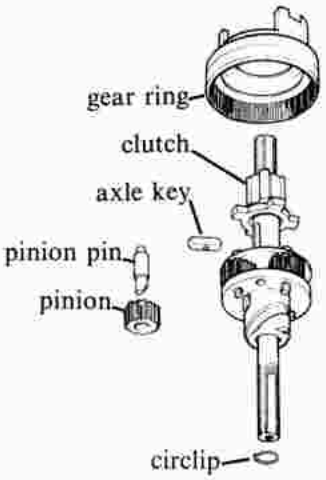
---

[1]Old model spring caps are too large to fit through the driver. On these hubs, the spring and cap are removed *after* and installed *before* the driver. Otherwise the spring cap will be compressed between the cone and the bearing with dam[illegible]to both. Upon installation the driver must be held in place against the spring until the cone is installed.

7 DISASSEMBLY

Remove gear ring, clutch and axle key. Push out pinion pins and remove pinions.

Pry off planet cage circlip and remove planet cage.



Next Step
Preceding Page

Slide planet cage over left end of axle past circlip groove and replace circlip.

Replace pinions and pinion pins. Orient the pins as shown. Center axle key in the bottom of the axle slot with threaded hole parallel to axle. Slide clutch over axle key. Clutch should contact face of planet cage and engage pinion pins. Install gear ring.

ASSEMBLY 1

SUBASSEMBLIES

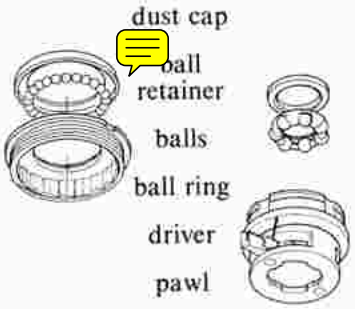
DISASSEMBLY

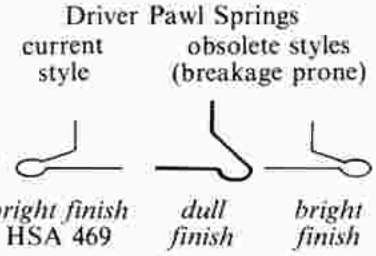
Ball Ring, Driver and Pawl Rings

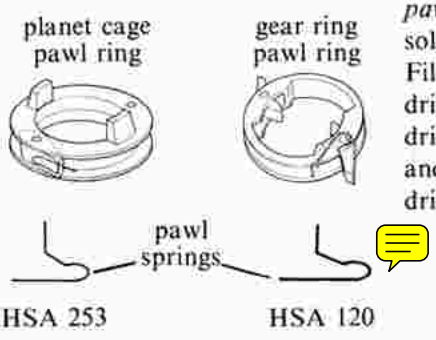
Bearings. Remove dust cover with a thin-bladed screwdriver. Work slowly around cover to avoid deforming it. Lift out balls or ball retainer.

Pawls. Pawl springs can be removed with the pawls in place, although some deformation usually results. Ease the hooked end of the spring over the side or long end of pawl to the other side. Spread the ends of spring and slide out.

If pawls are to be removed, springs are best removed at that time. Riveted pawl pins can be removed only by drilling. Hollow pawl pins can be driven out with the correct size drift punch. Some drivers use removable pawl pins held in place by a circlip. *Do not mix up pawl springs.*







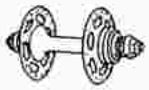
Ball Ring, Driver and Pawl Rings

Bearings. Install balls or ball retainer. *Orient retainer as shown.* Start dust cover straight by hand and tap home with a soft hammer.

Pawls. If only pawl springs have been removed, springs may be fitted with pawls in place. Use only new style pawl springs. Early types tend to break. Holding spring by hooked end, hook straight end around pawl pin beside pawl. Ease hooked end over the side or long end of pawl. Straight end must come to bear on piece body and hooked end on inside surface of pawl slightly behind driving edge.

If pawls were removed, install pawl, pawl spring and pin together. *Make sure pawls are oriented as shown.* Straight solid pins must be lightly riveted over. File end of pin flush. Hollow pins are driven in with a soft hammer. Grooved driver pawl pins are installed groove first and retained by a circlip around the driver.

ASSEMBLY



STURMEY-ARCHER S3C 3-SPEED COASTER BRAKE DISASSEMBLY AND ASSEMBLY (cont.)

CLEANING

Clean all parts, including outside of hub shell and axle bore, in a suitable solvent. Be very careful not to introduce dirt or grit after cleaning.

POINTS TO CHECK

Part numbers followed by * refer to AW parts chart, others to S3C or TCW-III parts chart.

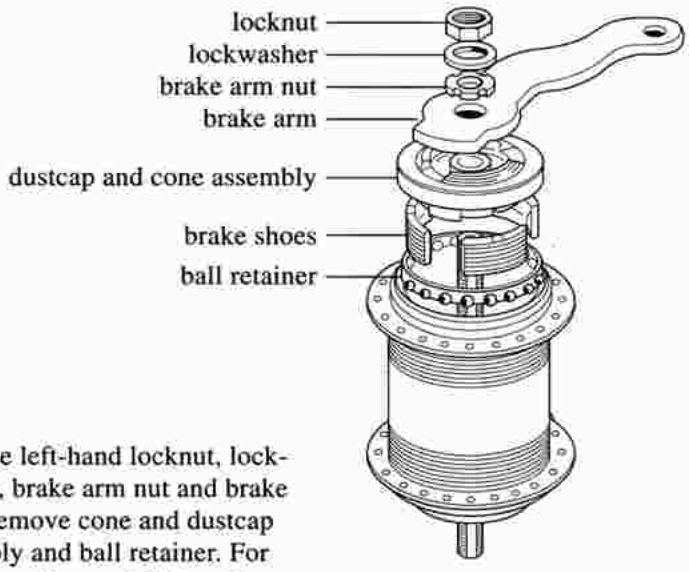
1. Clutch (26) and gear ring dogs (14) for rounded or chipped driving edges (rounding to a radius of even 1/64" (0.4 mm) at the corners can cause hub to slip out of gear)
2. Pawls (12*, 19, 21*), ball ring (18), left-hand ball cup (5) and ratchet ring (17) for rounded or chipped driving edges
3. Sun pinion (24), planet pinions (11) and gear ring (14) for worn or chipped teeth
4. Bearing surfaces of left-hand cone (3), left-hand ball cup (5), ball ring (18), driver (19), right-hand cone (5*) and pinion pins (12) for wear and pitting
5. Axle key (25) and indicator for stripped threads
6. Clutch spring (32*) and brake actuating spring (7) for size and tension
7. Dustcaps and ball retainers for straightness
8. All threaded parts for worn or damaged threads
9. Axle (24) for straightness
10. Planet cage (13) and thrust plate (8) threads for wear or roughness
11. Thrust plate (8) and brake band (6) serrations for wear
12. Brake band (6) and hub shell (5) for wear or glazing

LUBRICATION

Lubricate ball retainers by filling the spaces between balls with grease. Lubricate hub shell and brake band liberally with a high-temperature grease. Be careful not to grease pawls. Lightly oil other internal parts with a *good* cycle oil. (WD-40 is too light for lasting lubrication, 3-in-1 Oil gums up with age.) Add about two teaspoons (8 ml) of oil when assembled.

STURMEY-ARCHER AWC
3-SPEED COASTER BRAKE
DISASSEMBLY AND ASSEMBLY

1 DISASSEMBLY



Remove left-hand locknut, lockwasher, brake arm nut and brake arm. Remove cone and dustcap assembly and ball retainer. For hubs manufactured 5/91 and after, cone and dustcap assembly are one piece. Turn upside down so the brake shoes fall out.

Space the brake shoe segments evenly between brake actuator assembly and hub shell. Slotted edge of shoe segments should be facing up. Place ball cage assembly (ballside down) inside the hub. Note the slot in the brake cone and align it with the drag spring on the brake actuator.

Gently place dustcap and cone assembly onto the hub, turning gently so that shoe segments will line up into proper position, allowing a tight fit without forcing it. Attach brake arm (label face up) into slot on dustcap. Screw on brake arm nut, lock washer and locknut.

Next Step

ASSEMBLY 5

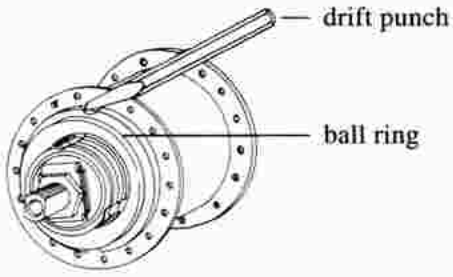
---

2 DISASSEMBLY

Next Step

The right-hand ball ring has a double start thread. If the ball ring is replaced in the opposite position, the wheel may need retruing. To facilitate proper reassembly, mark the ball ring and hub shell.

Place a drift punch as shown and loosen the ball ring by rapping the punch firmly with a hammer.



Tighten right-hand ball ring with a hammer and drift punch.

Next Step
Next Page

ASSEMBLY 4

STURMEY-ARCHER AWC
3-SPEED COASTER BRAKE
DISASSEMBLY AND ASSEMBLY (cont.)

3 DISASSEMBLY

Unscrew right hand ball ring and remove the entire internal gear assembly. Remove the brake actuator assembly by turning it counterclockwise.

Next Step
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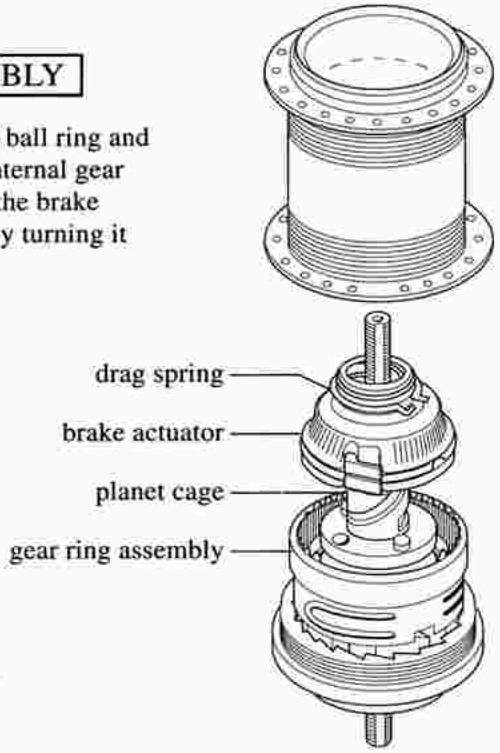


Turn the cartridge over. Screw brake actuator assembly clockwise onto planet cage. Slide axle assembly into the hub shell, then screw ballring to hub shell.

Next Step

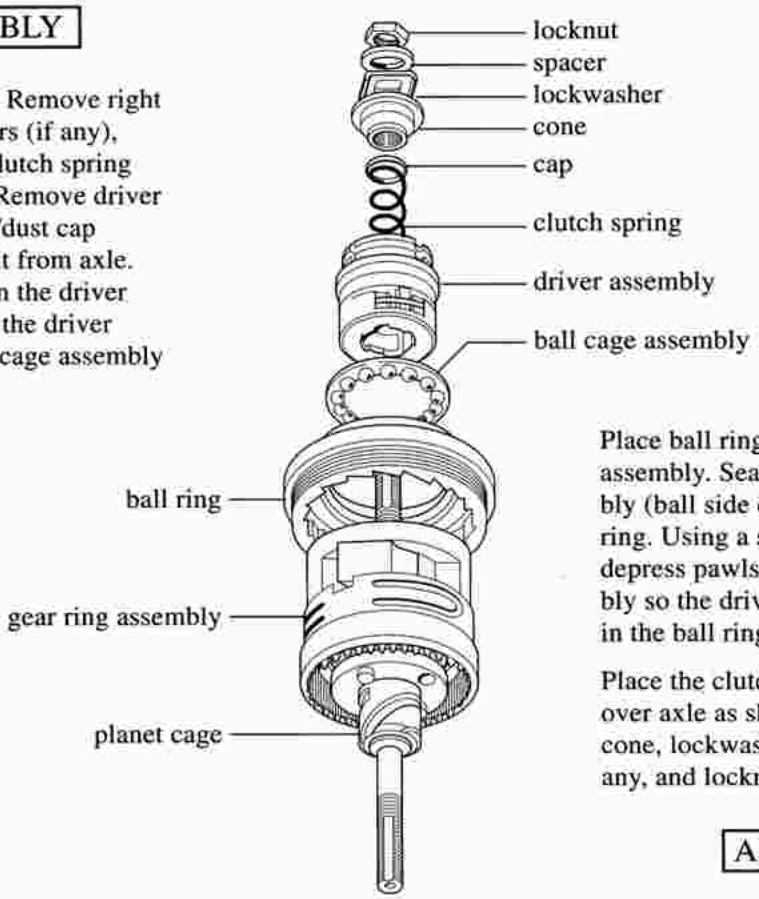
ASSEMBLY 3

---

4 DISASSEMBLY

Turn cartridge over. Remove right hand locknut, spacers (if any), lockwasher, cone, clutch spring and cap from axle. Remove driver assembly, ball cage/dust cap assembly as one unit from axle. Depress the pawls in the driver assembly to release the driver assembly from ball cage assembly and ball ring.

Next Step



Place ball ring on gear ring assembly. Seat ball cage assembly (ball side down) into ball ring. Using a screwdriver, depress pawls of driver assembly so the driver assembly seats in the ball ring.

Place the clutch spring and cap, over axle as shown. Screw on cone, lockwasher, spacer, if any, and locknut .

Next Step
Next Page

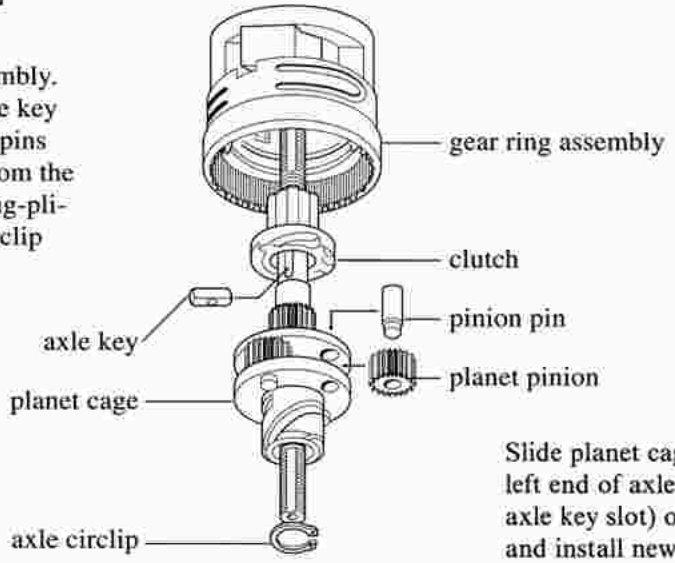
ASSEMBLY 2

STURMEY-ARCHER AWC
3-SPEED COASTER BRAKE
DISASSEMBLY AND ASSEMBLY (cont.)

(5) DISASSEMBLY

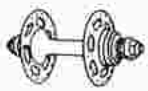
Next Step
Preceding Page

Remove the gear ring assembly. Remove the clutch and axle key from axle. Remove pinion pins to release planet pinions from the planet cage. Using snap ring-pliers, remove planet cage circlip and remove planet cage.



Slide planet cage assembly over left end of axle (side without axle key slot) over circlip groove and install new circlip. Clamp left end of axle in a vise (axle key slot up). Replace pinions and pinion pins. Orient the pins as shown. Center axle key into bottom of axle slot with threaded hole visible when looking down into slot. Install clutch over end of axle. Install gear ring assembly so that planet pinions mesh with the gear ring.

ASSEMBLY (1)



STURMEY-ARCHER AWC 3-SPEED COASTER BRAKE DISASSEMBLY AND ASSEMBLY (cont.)

CLEANING

Clean all parts, including outside of hub shell and axle bore, in a suitable solvent. Be very careful not to introduce dirt or grit after cleaning.

POINTS TO CHECK

1. All threaded parts for worn or damaged threads. If hub shell is marked 88-8 or earlier, both clutch and driver assembly must be replaced at the same time.
2. Pinions (13), axle (29) and gear ring assembly (16) for worn gear teeth.
3. Axle (29) for straightness.
4. Gear ring assembly (16) and driver assembly (22) for wear and chipping. Drag spring on gear ring assembly assembly should move freely. Clutch (31) should slide easily into driver assembly. Manufacturer recommends replacing either assembly entirely with new factory-fitted assembly if any part of sub-assembly is not suitable.
5. Hub shell (11) for condition of LH ball track, ratchet and braking surface.
6. Ball cage assembly (4) should have 24 bearings if assembly is separate from dustcap, 14 bearings if ball cage and dustcap seal are integral.
7. Pawl (9) and pawl spring (10) in brake actuator assembly (6). Drag spring (7) should easily turn clockwise and have great resistance when rotated counterclockwise.
8. Brake arm (1). Replace if damaged.
9. Brake band or shoe segments (5) for wearing and glazing.

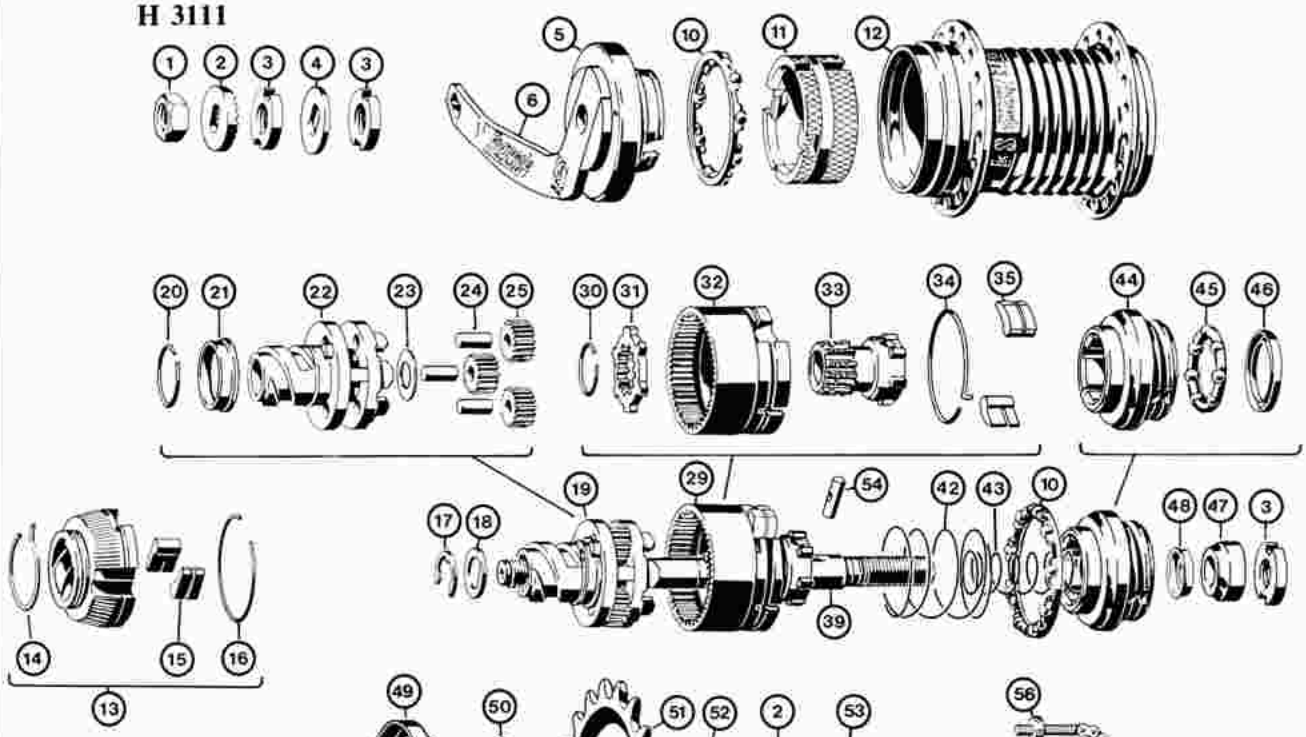
LUBRICATION

Lubricate ball retainers by filling the spaces between balls with grease. Lubricate hub shell and brake shoes liberally with a high-temperature grease. Be careful not to grease the pawls. Lightly oil other internal parts with a good cycle oil, (WD-40 is too light for lasting lubrication, 3-in-1 Oil gums up with age.) Add about two teaspoons (8 ml) of oil when assembled.

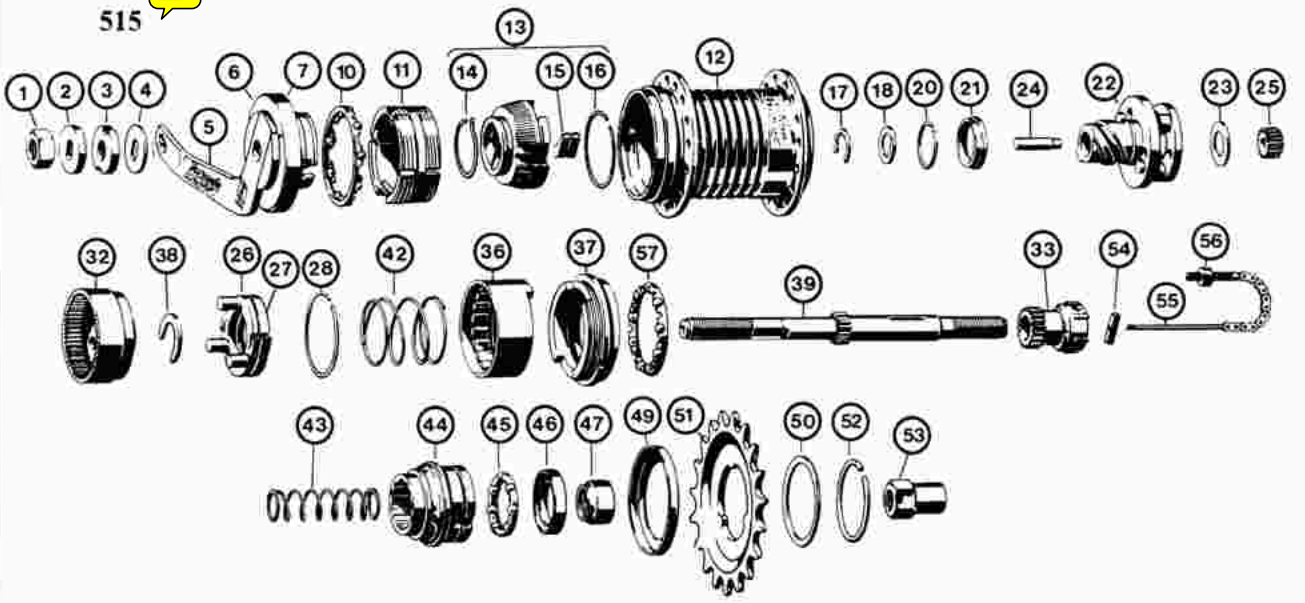
HUBS

SACHS (F & S) TORPEDO 3-SPEED HUBS WITH COASTER BRAKE

H 3111



515



| Vertical line between numbers indicates parts are not interchangeable.

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[1] Interchanges with Duomatic 102 and 101.
[2] Interchanges with Automatic R 2110.
[3] Interchanges with Duomatic A 2110.
[4] See Sprocket Interchangability at beginning of Hub section.

SACHS 3-SPEED HUB PARTS INTERCHANGEABILITY

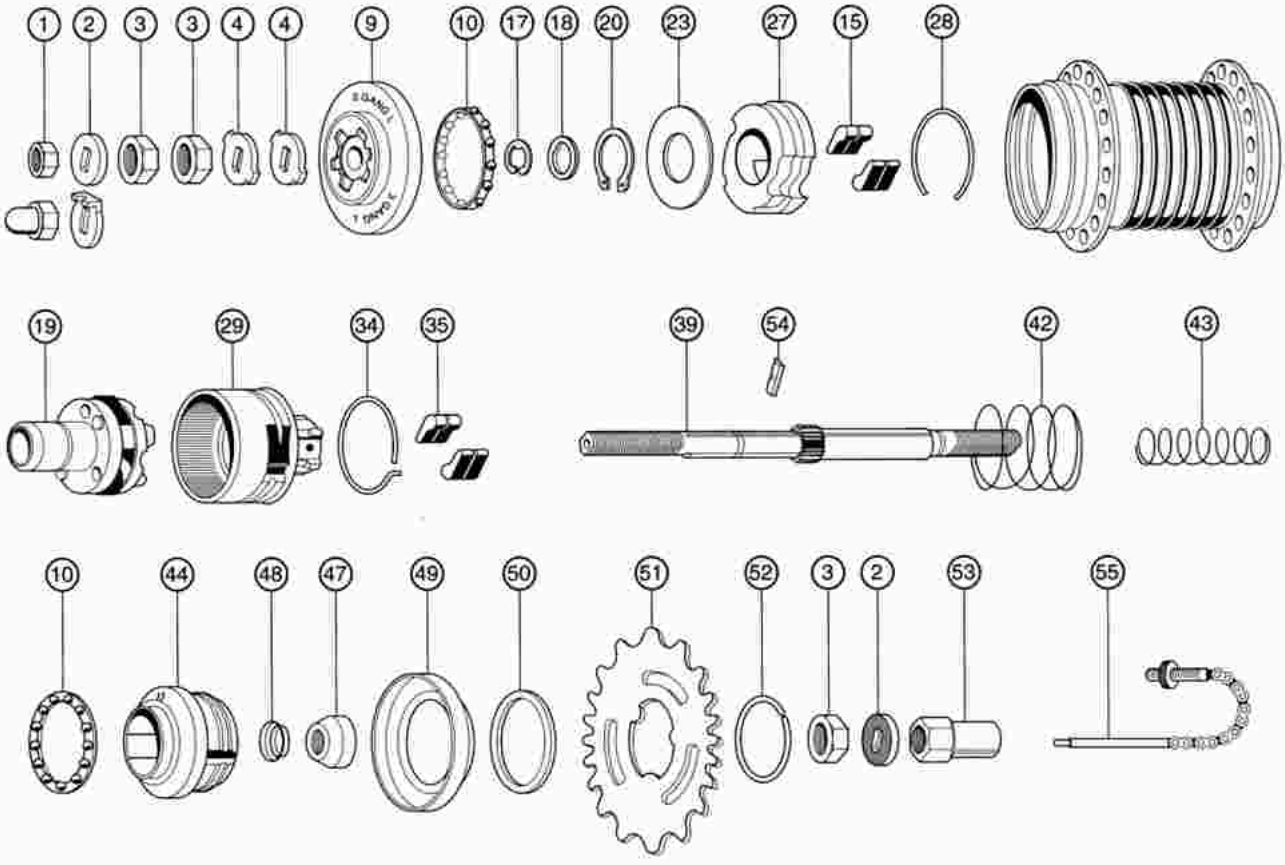
Blue lines indicate different or same part numbers not shown in print edition. Some differences may be only cosmetic.

Red lines indicate differences which were shown on page 31. This page now covers everything which was on page 31, which is now omitted.

Item #		Type 415 without coaster brake	Type 515	Type H 3111	Type H 3102 without coaster brake illustration page 5-30
1. Hex Nut	(10.5 mm Ø)	0516 003 000[1]	0516 003 000[1]	0516 003 000[1]	0516 003 000[1]
2. Fixing Plate		0517 102 000[1]	0517 102 000[1]	0517 102 000[1]	0517 102 000[1]
3. Locknut	(10.5mm Ø)	0516 001 300[1]	0516 001 300[1]	0516 001 300[1]	0516 111 000
4. Lock Washer		0517 003 000[1]	0517 003 000[1]	0517 003 000[1]	0517 005 000[1]
5. Lever Cone Assembly			0574 107 100	0574 110 000	
6.	Brake Lever		0519 014 300	0519 014 300	
7.	Dust Cap		0521 103 100	0521 103 100	
8. Adjusting Nut		0516 023 000			
9. Adjusting Cone		0574 108 100			0574 112 100
10. Ball Cage		0576 104 100[1]	0576 104 100[1]	0576 104 100[1]	0576 104 200
11. Brake Shell	(Brake Cylinder)		0573 103 000	0573 103 100	
12. Hub Shell	36 holes	0501 108 200	0501 105 200	0501 118 000	
	28 holes	0501 108 203	0501 105 202	0501 118 001	
13. Brake Cone Assembly			0574 106 000[2]	0574 106 000[2]	
14.	Friction Spring		0513 102 000[23]	0513 102 000[23]	
15.	Pawls	0536 104 100[23]	0536 104 000[23]	0536 104 100[23]	0536 104 100[2]
16.	Circlip	0512 102 100[23]	0512 102 000[23]	0512 102 100[23]	
17. Axle Circlip		0517 002 000[1]	0517 002 000[1]	0517 002 000[1]	0517 002 000[1]
18. Thrust Washer		0518 103 000	0518 103 000	0518 103 000	0518 103 000
19. Planet Gear Carrier Assembly		0572 108 200	0572 105 200	0572 119 000	0572 120 100
20.	Circlip	0512 104 000	0512 104 000	0512 104 000	2512 007 000
21.	Locating Sleeve	0534 103 000	0534 103 000	0534 103 000	
22.	Planet Gear Carrier	0572 107 200	0572 104 200	0502 112 000	
23.	Thrust Washer	0518 106 000[1]	0518 106 000[1]	0518 106 000[1]	0518 111 000[1]
24.	Pivot Pins (Trunnions)	0514 102 200	0514 103 000	0114 101 000[23]	
25.	Planet Gear	0533 103 000[123]	0533 103 000[123]	0533 103 000[123]	
26. Pawl Carrier Assembly		0572 106 000	0572 106 000		
27.	Pawl Carrier	0504 101 000	0504 101 000		0504 102 100
28.	Circlip	0512 103 000	0512 103 000		0512 102 100
29. Gear Ring Assembly				0581 104 001	0581 104 101
30.	Circlip			0312 003 000	
31.	Dog Washer			0518 109 000	
32.	Gear Ring	0533 105 100	0533 105 200	0581 104 000	
33.	Clutch Gear	0533 104 000	0533 104 000	0533 111 000	
34.	Circlip			0512 115 000	0512 115 200
35.	Pawl			0536 109 000	0536 109 100
36. Dog Ring			0501 107 200		
37. Bearing Bush			0501 106 200		
38. Gear Change Plate		0518 104 000	0518 104 000		
39. Axle	146 mm	0509 106 200			
	152 mm				0509 111 000
	154 mm		0509 104 200	0509 111 000	
	159 mm	0509 107 200			
	164 mm				0509 112 000
	167 mm		0509 105 200	0509 112 000	
40. Ball Cup		0501 109 100			
~~41. Ball Retainer~~		~~0576 103 100~~	~~0576 103 100~~		
42. Pressure Spring	(large diameter)	0525 104 100	0525 104 100	0525 104 100	0525 104 100
43. Pressure Spring	(small diameter)	0525 013 200	0525 013 200	0525 013 200	0525 013 200
44. Driver Assembly		0572 103 200	0572 103 200	0572 118 000	0572 118 000
45.	Ball Cage	0576 102 000	0576 102 000	0576 102 000	
46.	Dust Cap	0121 108 000	0121 108 000	0121 108 000	
47. Fixed cone		0508 102 100	0508 102 100	0508 105 000	0508 105 100
48. Cap				0521 108 000	0521 108 000
49. Dust Cap	(sprocket)	0521 104 000	0521 104 000	0121 109 000	0121 109 000
50. Spacer Washer[4]		0518 018 000	0518 018 000	0518 018 000	0518 018 000
51. Sprockets[4]					
52. Circlip[4]		0512 011 000	0512 011 000	0512 011 000	0512 011 000
53. Chain Guide Nut		0579 100 000	0579 100 000	0579 100 000	0516 100 102
54. Axle Key	(sliding block)	0527 100 100	0527 100 100	0527 100 100	0527 100 200
55. Small Pull Rod		0587 100 101	0587 100 101	0587 100 101	0587 102 000
56.	Knurled Nut	0516 027 000	0516 027 000	0516 027 000	
57. Ball Cage		0576 103 100	0576 103 100		
Adjuster Sleeve Assembly					0570 117 000

HUBS

TYPE H 3102



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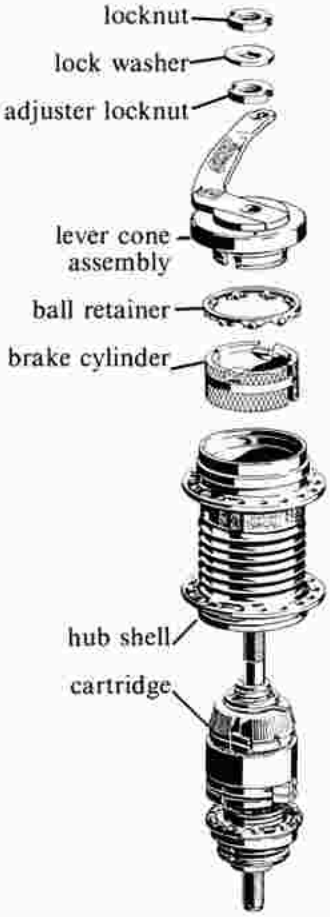
SACHS (F & S) TORPEDO H 3111 3-SPEED COASTER BRAKE DISASSEMBLY AND ASSEMBLY

(1) DISASSEMBLY

Remove left-hand locknut, lock washer and second locknut. Remove lever cone assembly. The brake lever, lever cone and dust cap are press fit together and should not be forced apart. Lift out ball retainer and brake cylinder. Lift hub shell off cartridge.



Next Step

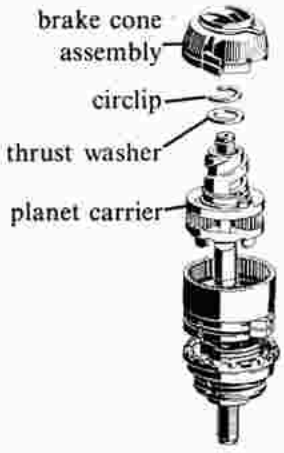
Install ball retainer *flat side up*. Install lever cone assembly. If the brake arm, lever cone and dust cap were forcibly separated, they may have been damaged and should be replaced. If serviceable, press together with brand name on brake arm facing out. Slots in lever cone engage tabs on brake cylinder. Install adjuster locknut, lock washer and locknut. Adjust bearing, locking the first nut in place with the second.

Position hub shell with *long end up*. Slip hub shell over assembly. Install brake cylinder with tabs up. Rotate until one of the narrow slots in the brake cylinder engages hooked end of friction spring.

ASSEMBLY 3

(2) DISASSEMBLY

Rotate brake cone assembly counter-clockwise and remove. Remove circlip and thrust ring. Lift off planet carrier.



Next Step
Next Page

Next Step

Invert assembly. Install planet carrier and thrust washer (washer flat must be started on *long* axle flat). Push down and rotate carrier to expose circlip groove. Install axle circlip. Install brake cone assembly *wide end down*.

ASSEMBLY 2

SACHS (F & S) TORPEDO H 3111 3-SPEED COASTER BRAKE DISASSEMBLY AND ASSEMBLY (cont.)

(3) DISASSEMBLY

Invert assembly. Remove right-hand locknut, fixed cone, small diameter spring and spring cap. Remove driver, ball retainer and large diameter spring.

Rotate clutch gear until horizontal holes line up with axle keyway. Push axle key out large hole. Lift off gear-ring/clutch-gear assembly.

Position axle assembly vertically with right (hollow) end up. Slip gear-ring/clutch-gear assembly over axle with gear ring facing down.

Rotate clutch gear until horizontal holes line up with axle keyway. Insert sliding key *rounded side down* through large hole. When key is fully inserted, clutch gear and gear ring rotate freely. Slip both springs over axle, install spring cap on small spring. Slip retainer *flat side up* and driver over axle. Install fixed cone and start locknut. While tightening locknut hold driver down against gear ring. Tighten locknut until cone bottoms on axle shoulder.

ASSEMBLY (1)

SUBASSEMBLIES

DISASSEMBLY

Brake Cone

Remove friction spring only if it is to be replaced. Ease spring out of groove with a thin-bladed screw driver.

To remove pawls, pull outward until end of circlip clears groove, then ease circlip off the end of brake cone.

Brake Cone

Install friction spring *with hooked end clockwise from gap.* Incorrect installation will cause excess drag, wear and possible brake failure.

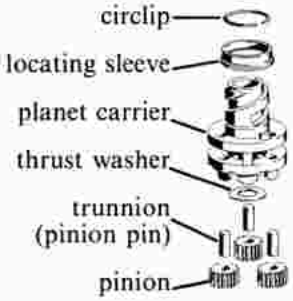
Install pawls under straight-ended circlip Position ends of circlip near indentations that close circlip groove. *Viewed as shown, pawls must point counter-clockwise.*

ASSEMBLY

DISASSEMBLY

Planet Carrier

Remove circlip and locating sleeve. Push out trunnions (pinion pins) and remove pinions. Extract thrust washer from inside planet carrier.



Planet Carrier

Install thrust washer, planet pinions and trunnions (pinion pins). *Install locating sleeve flange down.* Install circlip.

ASSEMBLY

SACHS (F & S) TORPEDO H 3111 3-SPEED COASTER BRAKE DISASSEMBLY AND ASSEMBLY (cont.) SUBASSEMBLIES (cont.)

DISASSEMBLY

Driver

Remove dust cover with a thin-bladed screwdriver. Work slowly around cover to avoid deforming it. Lift out ball retainer.

Driver

Install ball retainer flat side up. Start dust cover straight and tap home with a soft hammer.

ASSEMBLY

DISASSEMBLY

Gear-Ring/Clutch-Gear

To remove pawls, pry straight end of circlip out of groove and ease over end of gear ring. To separate clutch gear and gear ring use an awl to remove circlip. Remove dog washer and clutch gear.

Gear-Ring/Clutch-Gear

Install clutch gear and dog washer; lock in place with circlip. Position assembly with gear ring teeth down. Install pawls under hooked circlip. *Pawls must point clockwise when viewed from above.* Hooked end of circlip should lie in the slot that intersects circlip groove.

ASSEMBLY

CLEANING

Clean all parts, including outside of hub shell, in a suitable solvent. Be very careful not to introduce dirt or grit after cleaning.

POINTS TO CHECK

Numbers in parenthesis refer to parts chart and exploded drawing.

1. Pawls (15, 35) and ratchets for rounding or chipping
2. Gear teeth in gear ring (32), on planet pinions (25) and on axle (39) for worn or chipped teeth
3. Planet carrier (22), gear ring (32), dog ring (36), clutch gear (33) and driver (44) for worn or rounded teeth
4. Bearing surfaces of lever cone (5), hub shell (12), ball cup (40), driver (44), fixed cone (47) and pinion pins (24) for wear or pitting
5. Brake cylinder (11) and hub shell (12) for wear or glazing
6. Brake cone (13) for worn serrations
7. Friction spring (14), pressure springs (42, 43), circlips (16, 34) for size and tension (manufacturer recommends replacing circlips at overhaul)
8. Axle (39) for straightness
9. Dust caps (7, 46, 49), bearing retainers (10, 41) for straightness
10. All threaded parts for worn or damaged threads
11. Axle key (54) for stripped threads

LUBRICATION

Lubricate ball bearings by filling the spaces between balls with grease. Be careful not to grease pawls. Lubricate hub shell, brake cylinder and friction spring liberally with a high-temperature grease for *steel* brake shoes. Oil, never grease, brake cone and gear ring with a *good* cycle oil. (WD-40 is too light for lasting lubrication, 3-in-1 Oil gums up with age.)

GEAR TABLE FOR INTERNALLY GEARED HUBS

Multiply by gear value obtained from chainwheel and rear sprocket gear charts.

GEAR	1	2	3	4	5
HUB					
Bendix					
Red Band	0.68	1.00			
Yellow Band	0.68	1.00			
Blue Band	1.00	1.47			
Sachs (F&S)					
2-Speed	1.00	1.36			
3-Speed	0.73	1.00	1.36		
Shimano 3-Speed	0.75	1.00	1.33		
Sturmey-Archer and imitations					
3-Speed	0.75	1.00	1.33		
4-Speed	0.67	0.79	1.00	1.27	
5-Speed	0.67	0.79	1.00	1.27	1.50

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