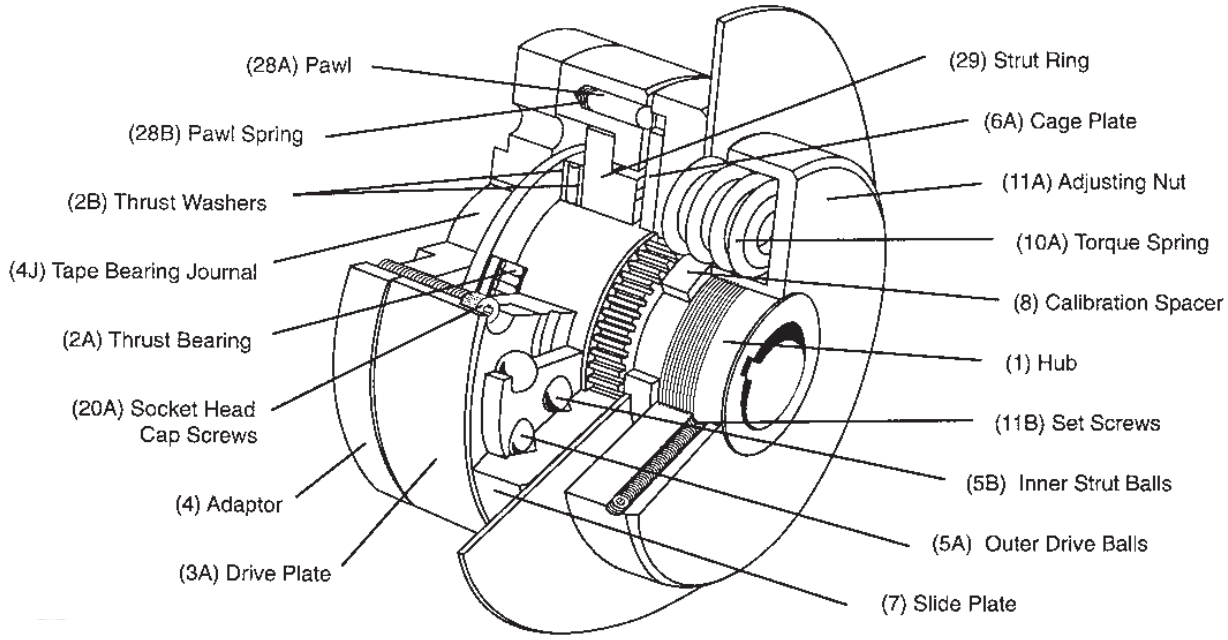

OPERATION:

The Autogard 400 Series torque limiters disengage the drive completely on overload in both directions of rotation.

After disengagement the drive is running free, which permits high speed operation (at or above normal electric motor speeds). A shut down switch must be incorporated as the unit is not designed to run continuously disengaged.

PRIOR TO INSTALLATION

1. Mounting Sprocket or Sheave on Model 401 (see Fig. 3).

   A. Mounting with tapered bushing. (Taper-lock, Q.D., etc.)

   A sprocket, sheave, or timing belt pulley may be mounted directly on Model 401 by using a tapered bushing. Select a sprocket or sheave to fit "M" dia. of the Autogard (Table 1). No key is used with the bushing when mounting on the torque limiter. Thoroughly clean all grease and oil from "M" dia. with solvent prior to mounting the bushing. Be certain that the bushing is properly mounted and tightened according to the instructions accompanying each bushing.

CAUTION: It is possible to overtighten the bushing capscrews to an extent that will deform the adapter (4) and prevent its free rotation on the hub (1). Make sure that the adapter and bushing assembly is free to rotate on the hub after the bushing is fully tightened. To check this, the adjusting nut (11) must be backed off to release all pressure from the spring (10). Re-tighten adjusting nut to original position after free-rotation check is completed.

(continued on page 2)

B. Mounfing with bolts.

A sprocket, sheave, etc., may also be mounted on Model 401 by bolting as shown in Fig. 3. The adapter (4) must be removed for drilling and tapping the mounting holes (Table 1) if they were not ordered with the unit. See Disassembly Procedure, page 5.

Table 1

Size	No. of Bolts	Bolt Size	Dimensions - Inches			
			Max. Bolt Depth In Adapter	Bolt Circle Dia.	Sprocket Bore	M Dia.
1	6	#8-32	.25	1.750	1.376/1.378	1.375
2	6	#10-24	.31	2.500	2.126/2.128	2.125
3	6	1/4x20	.38	3.375	2.876/2.878	2.875
4	6	5/16x18	.50	4.125	3.5015/3.5035	3.500
5	6	3/8x16	.62	5.687	5.0015/5.0035	5.000

Attach sprocket, sheave, etc., onto adapter prior to reassembly. Use bolts of a length that provides no more engagement in the adapter (4) than the maximum shown in Table 1. Make sure there are no protrusions inside the adapter which might interfere with the hub.
The unit may then be reassembled per instructions on page 6 and 7.

2. Mounting Sprocket or Sheave on Models 402 and 409 (see Fig. 4, 5A and 5B).

The sprocket or sheave (14) on these models usually will have been supplied by Autogard and fitted to the hub (1) at the factory.

3. Proper Spring.

Check to see that the correct number of springs are being used to release torque (Table 4). DO NOT TIGHTEN THE SPRINGS BEYOND ITS MINIMUM OPERATING LENGTH (with the torque limiter engaged) or the springs will not allow sufficient movement of the slide plate to let the balls leave their seats during an overload. Damage to the machinery or to the Autogard will result. See Dimension Y, Table 4 on page 4.

4. Lubrication.

The needle bearing, spline surfaces, plate faces and balls have the proper type and amount of lubricant applied during assembly at the factory. No further lubrication should be required at initial installation.

Note: Fig. 3, 4, 5A & 5B show typical sprocket in top half of drawing and typical V-belt sheave and timing belt pulley in bottom half of drawing.

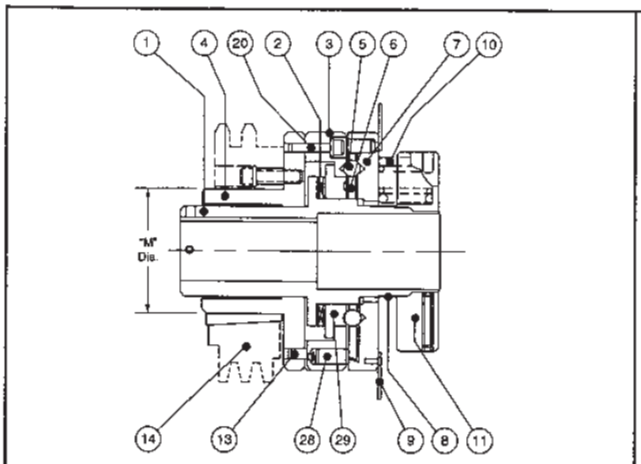

Fig. 3 Model 401

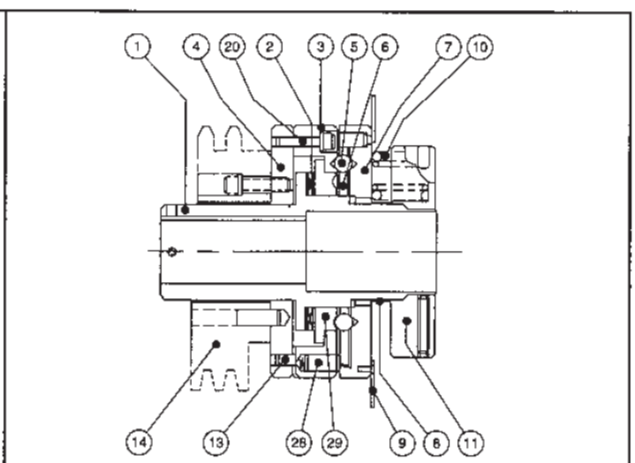

Fig. 4 Model 402

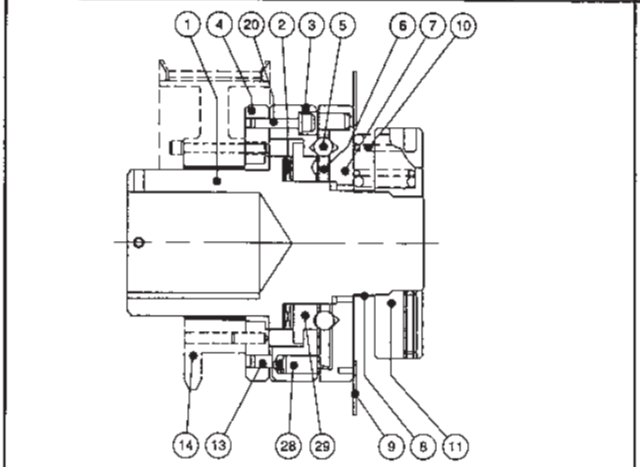

Fig. 5A Model 409 SB

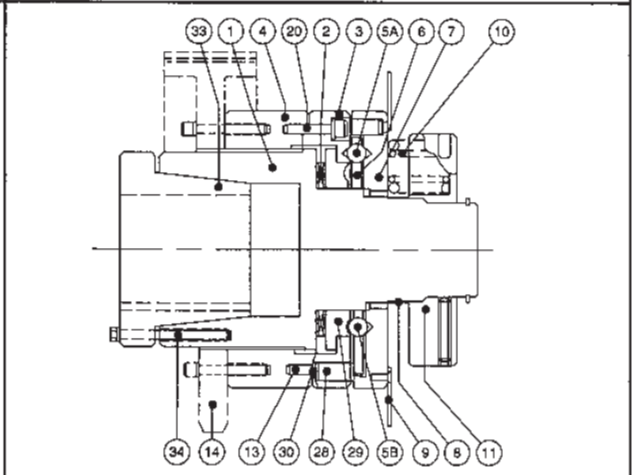

Fig. 5B Model 409 QD

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MOUNTING TORQUE LIMITER ON SHAFT

Models 401, 402 & 409

See Figs.3,4, 5A, 5B page 2

With the torque limiter completely assembled, carefully engage hub (1) on shaft. The standard clearance-fit bore in the hub should permit the hub to be pushed or lightly tapped in place on the shaft. DO NOT STRIKE HEAVY HAMMER BLOWS ON THE HUB AS THIS COULD DAMAGE THE TORQUE LIMITER.

The torque limiter may be moved axially on the shaft to some degree to obtain proper alignment of the sprocket or sheave with the chain or belt.

Models 403*, 404, 405, & 406

See Figs. 6, 7, 8, 9 below

Mount the torque limiter hubs on the shafts in the same manner as described for Models 401, 402, and 409 on this page. For coupling units, Models 404, 405, and 406, mount the torque limiter assembly on one of the shafts and the coupling hub, part 15, 16 or 18 on the other shaft. Bring the shafts together and align the coupling carefully, checking with a dial indicator. For optimum life,maintain alignment within the limits shown in Table 3.

Table 3

Model	Size	Allowable Angular Misalignment	Allowable Parallel Misalignment	Gap Between Hub and Adaptor	
				Min.	Max
403*	1-5	0	0		
404	1-5	0	0		
405	1-5	.5 deg.	0		
406	1		.005"	.08"	.16"
	2		.008"	.08"	.16"
	3		.010"	.08"	.25"
	4	.10 deg.	.013"	.08"	.25"
	5		.017"	.12"	.31"
	6		.020"	.12"	.31"
	7		.028"	.20"	.39"

*For Model 403, the driven member is supplied by customer. If used for offset drive, the sheave, gear, etc., must be mounted on its own bearing.

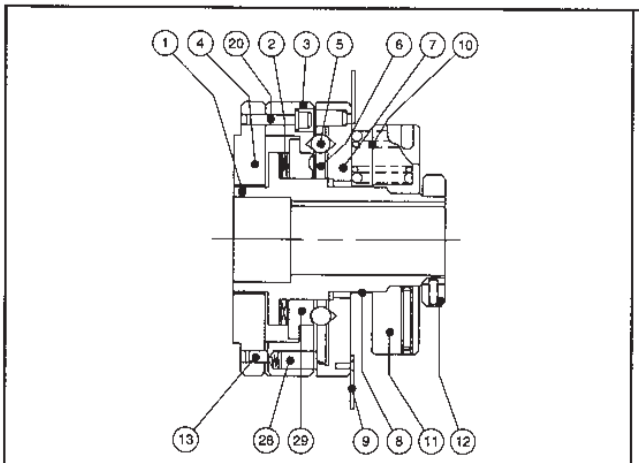


Fig. 6 Model 403

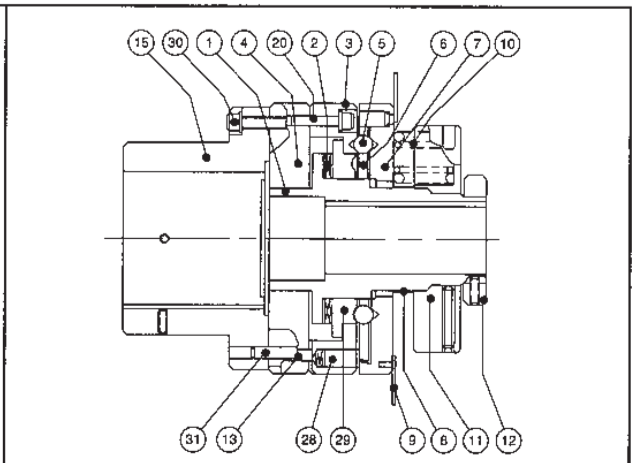


Fig. 7 Model 404

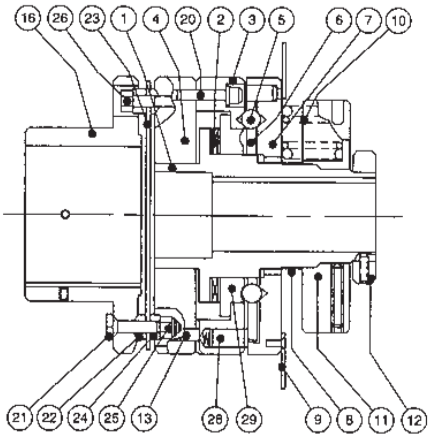


Fig. 8 Model 405

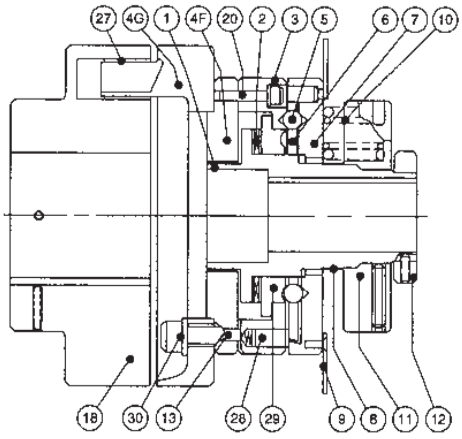
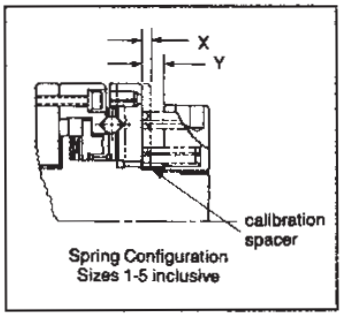


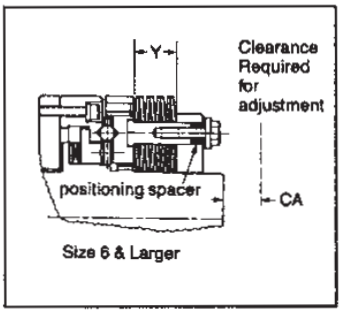
Fig. 9 Model 406

TORQUE ADJUSTMENT DATA

TABLE 4

Size	Standard Torque Adjustment Springs: Spring Assembly Qty.	Positions	Torque Range Lb. In.	Y-Inches Min Allowable	Clearance CA In.	Movement to disengage X
1	8	Outer	100-250	.075	None Required	.059
	6	Outer	75-188	.075		
	4	Outer	50-125	.075		
	2	Outer	25-63	.075		
2	8	Outer	400-2,000	.20	None Required	.112
	6	Outer	300-1,500	.20		
	4	Outer	200-1,000	.20		
3	6	Inner & Outer	1,700-6,000	.20	None Required	.137
	6	Outer	1,200-3,000	.20		
	4	Outer	800-2,100	.20		
	3	Outer	600-1,600	.20		
4	8	Inner & Outer	2,500-10,000	.20	None Required	.137
	8	Outer	2,000-6,800	.20		
	6	Outer	1,500-5,100	.20		
	4	Outer	1,000-3,400	.20		
5	8	Inner & Outer	8,000-22,500	.40	None Required	.173
	8	Outer	6,000-17,000	.40		
	6	Outer	4,500-12,750	.40		
	4	Outer	3,000-8,500	.40		
6	8	Spring Stacks	12,000-50,000	1.05	3/8	.210
	6	Spring Stacks	9,000-37,500	1.05		
	4	Spring Stacks	6,000-25,000	1.05		





INITIAL STARTUP

Prior to startup, examine torque limiter to make sure it is fully engaged with the balls seated correctly in both plates.

Obtain initial torque setting by one of the following methods:

A. Torque limiter set at factory.

The setting as furnished will be within ±10% of the torque value specified on the order. If the factory adjustment has been altered during assembly procedure, be sure to reposition the adjusting nut in its original location as measured during the first step of the disassembly procedure. Secure nut in place with setscrews.

B. Torque limiter to be set at job site, Sizes 1 thru 5.

1. Setting by trial adjustments:

Start up the drive at minimum torque setting. If the torque limiter disengages before normal operating load level is reached, progressively tighten the adjusting nut until the drive will start and operate under normal load without tripping.

Starting torque is usually the highest torque that the torque limiter must transmit, but occasionally the torque limiter must be set to accommodate higher peak operating torques.

After desired torque setting is obtained, secure adjusting nut with setscrews.

2. Setting to an established specified torque:

An approximate setting can be made from a Torque Adjustment Chart furnished with the torque limiter if requested at the time of the order.

CALIBRATION SPACERS

The torque limiter is shipped from the factory either with the torque setting pre-adjusted as specified at the time of the order, or furnished unset for adjustment at the time of installation.

All units are supplied with minimum spacer only to prevent from locking up (unless required otherwise by customer).

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TORQUE ADJUSTMENT

Size 6 and Larger

To facilitate adjustment under the high loads, these larger units use a number of adjusting bolts. See Fig. 12, pg. 7.

When building, assemble all components as Fig. 12, but *omit the adjustment spacer.* Be careful to stack the disc springs correctly. This is generally as shown in Fig. 12, but reference should be made to the assembly drawing as the number and method of stacking can vary.

Assemble the pillars (10B), springs (10A), washers (10C) and adjustment bolts (10E) into the adjusting nut (11A), and lightly tighten the bolts, so that the springs are just nipped. Screw the complete assembly onto the hub.

Note that the flanges of the spring guide pillars are hexagonal. Each pillar must be positioned so that as the adjusting nut is tightened the hexagon engages with the groove in the slide plate (7).

Tighten the adjusting nut as far as possible, using the bolts to equalize the length of each spring stack, so that all pillars are engaged with the groove on the slide plate.

To increase the torque tighten each bolt by an equal amount, but not enough to disengage the hexagons from the slide plate. One or two turns of the bolt is normally a convenient amount. Then tighten the adjusting nut without using excessive force. Shortening of the spring stack is by means of the bolts, not by the nut. Continue with this procedure of alternately tightening bolts and adjusting nut until the correct spring length is achieved, *then slacken the bolts.* THE UNIT WILL NOT OPERATE CORRECTLY UNTIL THIS IS DONE.

When the correct torque setting is achieved, remove the pillar bolts completely, replace the adjustment spacer, and retighten the bolts. There must be a gap between the thick washer and the adjusting nut. Lock the adjusting nut with the setscrews.

NOTE (ALL SIZES)
IT IS ESSENTIAL THAT ANY SET OF SPRINGS IS NOT USED ABOVE ITS CORRECT RANGE. IF THE SPRINGS ARE OVERTIGHTENED, THE BALLS WILL BE PREVENTED FROM ROLLING FROM THE SEATINGS. IF SLACKENED TOO FAR, SO THAT A POSITIVE LOAD IS NOT APPLIED TO THE BALLS AT ALL TIMES, IT IS POSSIBLE THAT ONE OR MORE BALLS MAY REMAIN IN THEIR SEATINGS DURING TRIPPING. IN BOTH CASES IT IS PROBABLE THAT DAMAGE WILL OCCUR TO THE MACHINERY OR TO THE AUTOGARD TORQUE LIMITER.

RESETTING PROCEDURE

1. Shut down the drive.
2. Investigate and remove cause of overload or jam.
3. Reset.

   This is achieved either by reversing the driving side of the drive or by taking the driven side forward.

   Note that these units will trip at an accurate torque setting in both directions. Re-engaging must, therefore, be carried out at a speed slow enough to allow the unit to fully re-engage and then accelerate the mass of the driven machine.

   If this is attempted at too high a speed (e.g. by directon-line starting) the set torque of the unit can be exceeded, causing tripping in the opposite direction.

   The limiting re-engaging speed depends on factors such as the inertia of the driven plant, elasticity of the drive, and the torque setting of the Autogard, so it is not possible to give exact limiting re-engaging speeds. However, as a guide for most applications it should be under rather than over 100 RPM. Many drives incorporate a jogging facility which can be used for re-engaging.

DISASSEMBLY PROCEDURE

1. Measure and make note of the position of the adjusting nut on the hub before proceeding with disassembly.
2. With spring end up, loosen the setscrews and remove adjusting nut, spring, spacers, limit switch plate, slide plate and drive balls.
3. On Model 401, remove sprocket or sheave from adapter.
4. On Models 401 and 404:
   a) Tap drive pins free of drive plate.
   b) Remove capscrews which join drive plate to adapter or to coupling hub.
5. Carefully work drive plate (or drive plate together with sprocket or sheave on Models 402 and 409) over spline so as not to damage bearing material on I.D. of drive plate.
6. On Model 401,slide adapter off of hub carefully so as not to damage bearing material on I.D.
7. Clean all parts thoroughly, and inspect the bearing surfaces. Carefully blend out any scratches.
8. For reassembly, see page 6 and 7.

MAINTENANCE

The frequency of maintenance will depend on the operating environment and number of trips, but once every 2,000 operating hours should be adequate in most applications. Proceed as follows:

If requested a grease fitting is located at either the end of the hub or the outer diameter of the adaptor. Apply a good quality lithium grease to all grease points. A general inspection of the unit should also be performed at this time, checking that all fasteners are tight etc.

For unusual conditions such as very high RPM, high ambient temperatures, high vibration or dirty environment, more frequent or special maintenance may be required.

It is a good practice when other equipment in the drive train is down for service to make a general inspection of the torque limiter. Check for tightness of the torque limiter on its shaft, tightness of the sprocket, etc. and check for appearance of adequate lubrication. This may be done by backing off the adjusting nut and separating the plate set to permit viewing the interior components. If there is any indication that further servicing may be desirable the torque limiter should be disassembled and inspected as described above under DISASSEMBLY PROCEDURE.

NOTE: If, after the drive has been in operation for some time and the torque limiter suddenly starts disengaging for no apparent reason, check to see whether something in the drive train or driven machine, such as normal wear, a bad bearing, damaged sprocket, misalignment, change in machine duty, etc., may be the cause of the problem.

A visual inspection of the drive and slide plate is then recommended. Follow disassembly procedure above. Note that although a ball path between the ball seats should normally be visible, excessive wear on the seats themselves may require replacement of the drive plate.

Reassemble and follow INITIAL STARTUP procedure on page 4.

BUILDING PROCEDURE

If the components being used are not new they should be inspected for accidental damage or wear. Particular attention should be paid to bearing surfaces. Any slight damage marks should be carefully blended out.

Any components showing substantial damage or wear should be replaced.

GREASE

Use a good quality grease. Units operating in conditions of high or low temperatures may require the appropriate special grease.

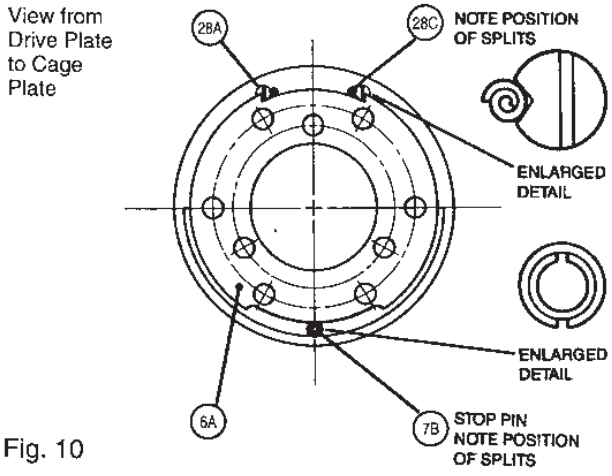

Fig. 10

REFER TO FIGS. 6, 10 & 11
TO ASSIST THE FOLLOWING PROCEDURE:

a. Check the hub thread by running the adjusting nut (11A) down its full length on the hub.

b. Grease the needle bearing (2) and assemble onto the hub in this order:

1. Thrust washer (2B).
2. Needle bearing (2A).
3. The second thrust washer (2B).

c. Assemble the strut ring (29A) onto the hub, with the flat face against the thrust bearing. Check that it can rotate freely.

d. Drive plate/pawl sub-assembly.

Lightly oil the pawls and pawl springs (28A and 28B) and assemble into the drive plate (3).

Check that the pawls can move freely. It must be possible to push them into the drive plate flush with the surface and they must move easily from that position due to the spring pressure.

e. Additional Notes for SR units

If the pawl locating pins (28C) are not already in place they should now be carefully fitted after removal of the pawls and springs. Note, the pins must be positioned with the seam away from the pawl, see Fig. 10, (28C). Re-assemble pawls and springs and check that they still have free movement.

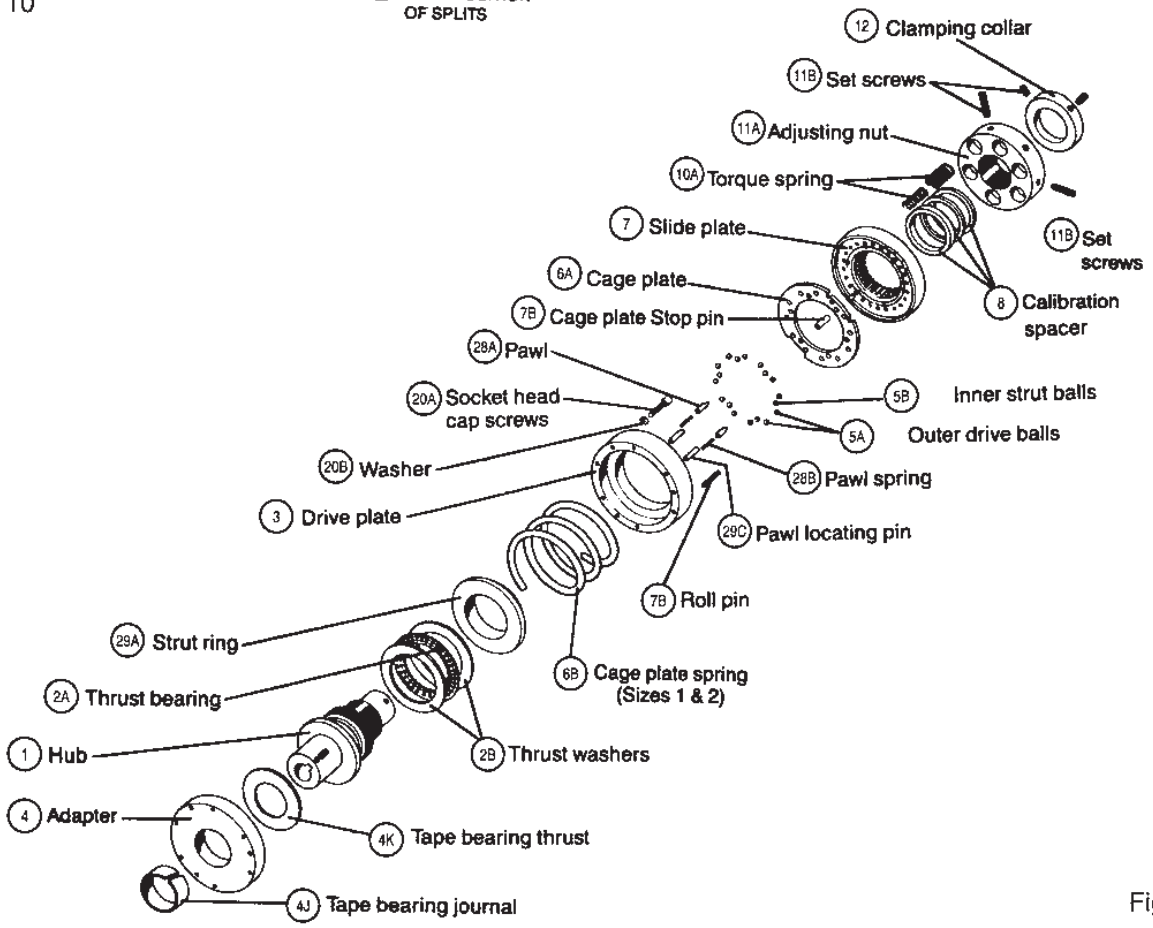

Fig. 11

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f. Assemble the drive plate onto the strut ring.

g. Lightly grease the bearing surface of the hub, and assemble the tape thrust bearing (4K) against the flange. If tape journal bearing (4J) is included, carefully position in the bore of the adapter (4), and assemble onto the hub. Make sure the tape bearing stays in position during this assembly, and check that the adapter can then turn freely on the hub.

   Connect the adapter to the drive plate with capscrews (20A) and roll pins (7B).

   Check that the drive plate/adapter assembly can rotate freely on the hub.

h. On size 1 and 2 SR units, assemble the cage plate spring (6B) onto the hub, ensuring that it is housed in the counterbore in the strut ring, and that the coils are not intertwined. On size 3 and larger, a bayonet type of cage plate retention is used. The cage plate is placed in the slide plate with the stop pin notch 90° to the proper location. The stop pin (7B) should now be installed per Fig. 10. (Note position of splits in rollpins).

i. Check that the stop pin (7B) is correctly positioned in the slide plate (7) and is not loose or damaged. It should lie flush with the top of the flange of the slide plate.

   Size 1 uses a single pin, all other sizes use double pins, see Fig. 10.

   Place the slide plate (7) on the bench with the flange and ball seat face upwards. Lightly grease the cage plate (6A) and place it on the slide plate with the shallow recess in the bore upwards.

   The correct angular positioning of this plate relative to the ball seats and pins is most important, see Fig. 10. The cage plate holes must be directly over the ball seatings, and the stop pin (7B) in the slide plate must be central in the cage plate cut-out. Ensure that the plate is not 180 degrees out of position—the stop pin must be centrally positioned in the wider slot.

j. Insert some grease into each of the cage plate holes, and place drive balls (5A) and strut balls (5B) in these holes. There should be sufficient grease to hold these balls in position when the assembly is inverted.

k. Insert springs (10A) into the adjusting nut (11A). Some grease in the holes will help hold these in position for the next stages of assembly.

l. Carefully holding the cage plate in position, invert the slide plate, and pass it over the hub thread to engage with the splines on the hub. As soon as the splines are engaged, rotate the drive plate until the pawls are symmetrically facing the cutout in the slide plate flange. Then push the slide plate fully home, holding the cage plate until the last possible moment.

   The drive balls should now be engaged with the seatings in the drive plate, and the pawls pushed almost completely into the drive plate by the flange on the slide plate.

   There should be a small gap, about 0.010 inches (0.25mm) between the slide plate flange and the drive plate.

m. Hold the slide plate in this position against the cage plate spring pressure, and screw the nut/spring assembly onto the hub until the springs are against the slide plate with a positive pressure—more than the cage plate spring load so that the slide plate is held in position.

SIZE 6 AND LARGER. (See Fig. 12).

These units differ from the smaller sizes in three respects, and the assembly procedure is as for the smaller units apart from these features.

1. The tape bearings in the adapter are replaced by a ball bearing.
2. The torque springs are guided on pillars instead of being housed in the adjusting nut. Disc springs are normally used on these sizes.

   See notes on Torque Adjustment regarding assembly of the spring system on these larger units.

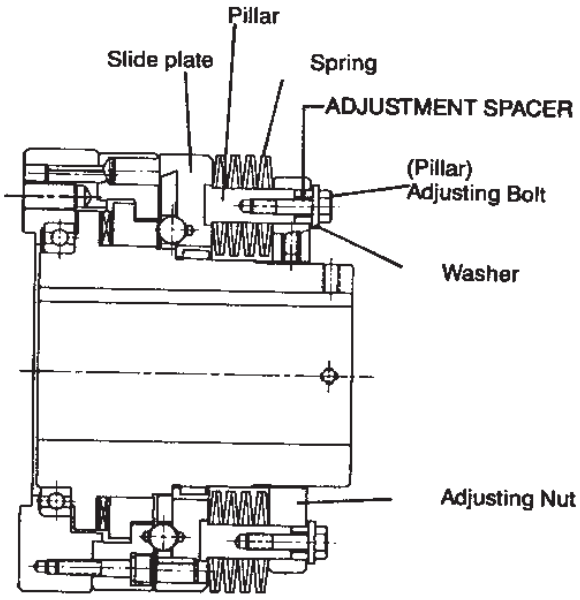

Fig. 12

NOTES

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