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LIQUIP DRYBREAK COUPLER

API71X Series

SERVICE AND MAINTENANCE MANUAL

API LOADING COUPLER TO API RP1004 AND AS3664



January 2007
Issue: A



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API71x SERIES DRY BREAK COUPLERS

P7486

DATA SHEET

**PART N°: API710 / E
API712 / E
API712 VG**

- Title:** API bottom loading dry-break coupler with automatic latching.
- Operation:** Automatic push and latch operation with dry-break coupling and safety lock. Used for loading tank trucks.
- Features:** API71x series couplers are a major advance on previous designs, addressing well-known issues:
- - Advanced latching mechanism geometry for security and minimal wear.
 - Cast stainless steel collar for long operating life and to minimise operator damage.
 - Latch spindles are now precision machined and centred, not cast integrally.
 - Optional handle sizes, 150mm or 200mm swing, incorporates a ball-end for improved ergonomics and a carry-loop to ease the handling during parking.
- Dismantle:** Easiest of all couplers to dismantle. Simple, remove one "R" clip to enable shaft assembly and main poppet to be withdrawn.
- Adjustment Or Service:** None Required.
- Materials of Construction:** Aluminium bodies, hard anodised for wear resistance.
Cast stainless steel collar
High tensile steel shaft.
Super-tough die-cast and heat-treated stainless steel locking latches.
Viton seals throughout. EPDM and Viton GFLT available on request.
Replaceable bearings at both ends of shaft for support.
Coils springs replaced by wave washer.
- Mounting:** By Industry Standard 100mm (4") TTMA flange.
8 holes 11mm dia on 149mm PCD, 168 o/dia. (Ø7/16" on 5.8" PCD, 6.6" OD)
Use spring washers when mounting coupler.
- Weight:** 9.2kg (20.3lb)
- Technical Data:** API710 has 150mm long handle, API712 has 200mm long handle
API710E & API712E have EPDM seals for use with ethanol.
API712VG have Viton GFLT seals for increased chemical resistance.
Separate spindle on latch, with coil spring actuation, for improved smoothness and consistency.
Chamfered bore and moulded seal in nose for ease of coupling and drip-free operation.
Pressure-to-leak 2500kPa (363 PSI) uncoupled
Testing pressure 1500kPa (218 PSI) uncoupled.
Operating pressure 1000kPa (145 PSI)
Max coupling/uncoupling pressure 550kPa (80 PSI).
Max coupled pressure 2000kPa (290 PSI).
Min/Max operating temp -20° to +80°C (-4° to +176°F)
- Associated Equipment:** Liquip 'Velvet Touch' Loading Arms.

Overall dimensions shown on the drawing overleaf.

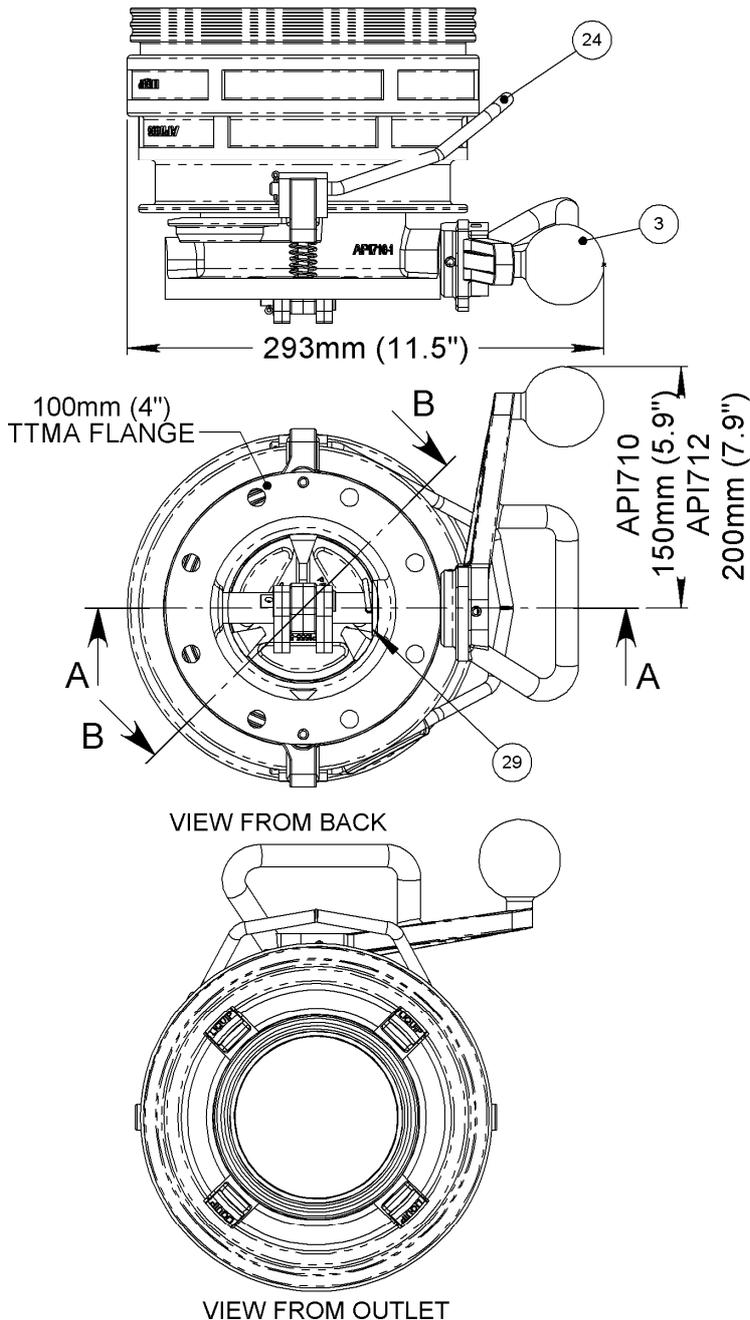


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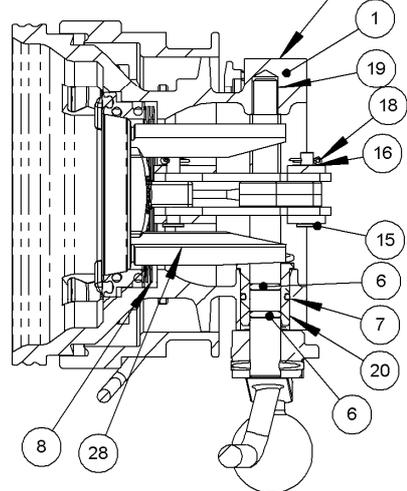
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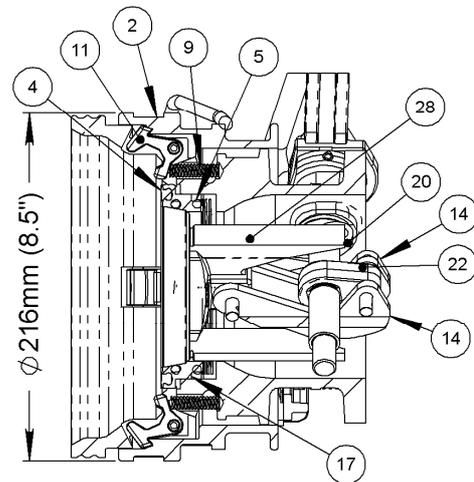
API71x Series Couplers



STAMP 'E' HERE TO INDICATE EPDM SEALS



SECTION A-A



SECTION B-B

X202106

Issue: B

Sheet 1 of 3

METERS - VALVES - VENTS - MANHOLES - PUMPS - HOSEREELS - OVERFILL PROTECTION - LOADING ARMS - ELECTRONIC DIPSTICKS



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LIQUIP

API71x Series Couplers

ITEM NO.	PART NUMBER	DESCRIPTION	API710	API712	API710E	API712E	API712VG	MATERIAL
1	API710-1	BODY API710 COUPLER	1	1	1	1	1	ALUMINIUM
2	API700-3	OUTER BODY (COLLAR)	1	1	1	1	1	ST STEEL
3	API555-2	HANDLE OPERATING	1	-	1	-	1	CAST ALUMINIUM
3	API700-2	LONG STYLE HANDLE OPERATING	-	1	-	1	-	CAST ALUMINIUM
4	4602VB	SEAL PRODUCT	1	1	-	-	-	VITON
4	4602EPDM	SEAL PRODUCT	-	-	1	1	-	EPDM
4	4602VG	SEAL PRODUCT	-	-	-	-	1	VITON GFLT
5	0203	O-RING	2	2	-	-	-	VITON
5	0203EPDM	O-RING	-	-	2	2	-	EPDM
5	0203VG	O-RING	-	-	-	-	2	VITON GFLT
6	0235	O-RING	2	2	-	-	-	VITON
6	0235EPDM	O-RING	-	-	2	2	-	EPDM
6	0235VG	O-RING	-	-	-	-	2	VITON GFLT
7	4501	O-RING	1	1	1	1	-	NITRILE
7	4574VG	O-RING	-	-	-	-	1	VITON GFLT
8	4449	SPRING SPIRAWAVE	1	1	1	1	1	SPRING STEEL
9	6171	SPRING COMPRESSION	4	4	4	4	4	ST STEEL
10	4497	SPRING - RETURN	2	2	2	2	2	SPRING STEEL
11	API725-4	LATCH COLLAR INTERLOCK	4	4	4	4	4	ST STEEL
12	0927	SPRING PIN	4	4	4	4	4	STEEL
13	0926	SPRING PIN	2	2	2	2	2	STEEL
14	API700-15	CAMPLATE FOR API COUPLERS	4	4	4	4	4	BISPLATE 80
15	6736	PIN CLEVIS	2	2	2	2	2	STEEL
16	5351	WASHER FLAT THIN	2	2	2	2	2	ST STEEL
17	API710-11	POPPET ADAPTOR RING	1	1	1	1	1	ALUMINIUM
18	0762	SPLIT PIN	4	4	4	4	4	ST STEEL
19	2698	TETRATAPE BEARING TO SUIT	1	1	1	1	1	TEFLON
20	API513-6	BUSH BEARING	1	1	1	1	1	ACETAL
21	API555-8	OPERATING SHAFT TO SUIT	1	1	1	1	1	STEEL
22	API513-7	CAM ECCENTRIC	1	1	1	1	1	CAST ST STEEL
23	0945	R-CLIP TO SUIT API450 SERIES	1	1	1	1	1	ST STEEL
24	API555-6	HANDLE - OUTER BODY RING	1	1	1	1	1	ST STEEL
25	API555-10	LEVER OUTER BODY	1	1	1	1	1	CAST ALUMINIUM
26	API555-7	PIN - SPRING RETURN	2	2	2	2	2	ST STEEL
27	0093	E-CLIP IMPERIAL	2	2	2	2	2	ST STEEL
28	API555-5H	POPPET TO SUIT 4"	1	1	1	1	1	CAST ALUMINIUM
29	5352	SHIM WASHER	1	1	1	1	1	ST STEEL
30	API555-9	SPACER TUBE TO SUIT 4"	1	1	1	1	1	ST STEEL
31	6306	LABEL FOR HANDLE RELEASE	1	1	1	1	1	PLASTIC
32	7476	INSTRUCTIONS	1	1	1	1	1	PAPER
33	7486	DATASHEET	1	1	1	1	1	PAPER

NOTES:

1- API710E & API712E ARE IDENTICAL TO BASE MODELS EXCEPT WETTED COMPONENTS ARE EPDM AND USE 7128 SILICONE GREASE. STAMPED WITH 'E' WHERE INDICATED TO IDENTIFY.

X202106

Sheet 2 of 3

Issue: B

METERS - VALVES - VENTS - MANHOLES - PUMPS - HOSEREELS - OVERFILL PROTECTION - LOADING ARMS - ELECTRONIC DIPSTICKS



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3. TEST PROCEDURES FOR API7XX DRY BREAK COUPLER

PRESSURE TIGHT TEST

Use the API7XX pressure test Rig shown below. (See API7XX test rig procedure).



FIG 28

Alternatively, the following method can be used in workshop or in the field.



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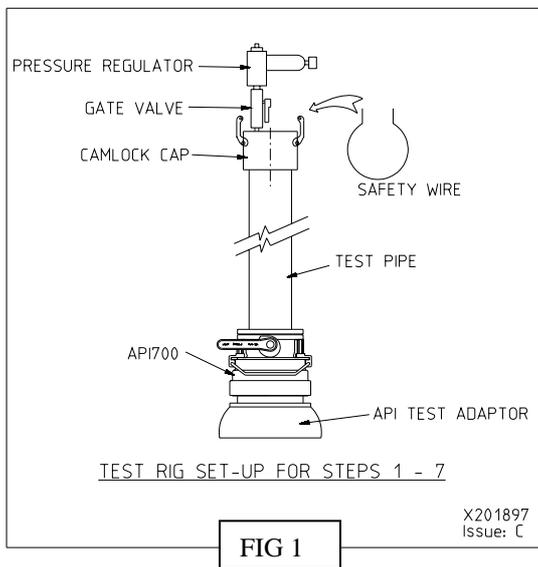
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TEST PROCEDURES FOR API7XX DRY BREAK COUPLER (in field testing)

PRESSURE TIGHT TEST

1. Place the API7XX coupler on the bench with the 8 hole flange facing up.
Bolt a suitable test pipe to the 4" TTMA mounting flange, with a gasket between the flanges.
2. Couple the API7XX onto a blanked and sealed API adaptor.
3. Lock test camlock cap onto camlock end of the test pipe.

**** BE SURE TO INSERT SAFETY WIRE THROUGH BOTH CAMLOCK LEVERS****



4. Connect gate valve to the air fitting on the test camlock cap. , Back off air pressure regulator to zero, connect the air supply. Connect air pressure regulator to the gate valve and adjust regulator to 200kPa. Open the gate valve and activate the API7XX handle 5 or 6 times and leave it in the open position. With soapy water, check for continuous leaks particularly where the operating shaft enters the body.

5. Adjust the regulator to zero and release any remaining pressure. Remove the camlock cap.

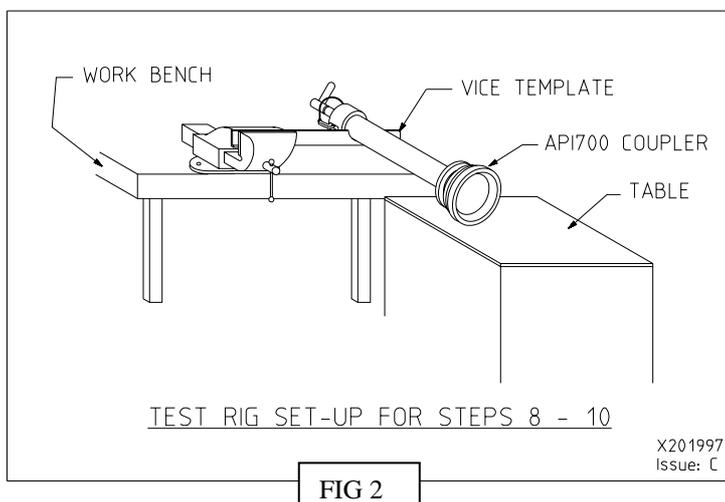
6. Fill the test pipe until full with inhibitor/water mixture. Replace the camlock cap and wipe the excess water from the test assembly.

7. Adjust the regulator to 100kPa. Open the gate valve and activate the API7XX handle 5 or 6 times and leave it in the open position. Check for continuous leaks particularly where

the operating shaft enters the body.

8. Reduce regulator to 50 kPa. Tilt test rig by resting the test pipe against the bench in a secure position. Activate the API7XX handle 2 or 3 times and leave it in the open position. Watch for continuous leaks.

Note: Allowable loss on disconnection is maximum 5mL. This is not a leak.



9. Adjust regulator to 300kPa. Activate handle 2 or 3 times and leave in the open position. Look for continuous leaks.

10. Adjust regulator to 500kPa. Activate handle 2 or 3 times and leave in the open position. Look for continuous leak

11. Back off regulator to zero. Close gate valve. Remove regulator and release air pressure inside test rig with gate valve. Disconnect API7XX from the API test adaptor.



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12. Arrange the vice template and table to support the API7XX and test pipe on an incline. Dry off excess water from around the API7XX coupler face and poppet.

13. Adjust regulator to 550kPa and open gate valve. Continuous leaks past the poppet and adaptor ring, or between the body and collar (indicate porous body).

Note: *Initial pressurisation will squeeze small water droplets from around seals. Again this is not a leak. Look for continuous leaks.*

14. Depressurise test rig. Drain water from test rig. Unbolt test pipe. Test is complete.



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4. API 7XX TROUBLE SHOOTING

LEAKS WHEN COUPLED WITH API450 ADAPTOR DURING LOADING

This indicates the coupler face seal may be damaged or worn. Check visually on disconnection from the truck valve. Also check the API adaptor (truck valve) seal face for damage or wear. If replacement of the coupler tee seal is required this can be carried out with out taking the coupler valve out of service. Refer to section 5

LEAKS AROUND OPERATING SHAFT

Leaks between the operating shaft and the bush are caused by worn or damaged o-rings on the operating shaft. Refer to section 5 for replacement of o-rings.

LEAKS AROUND PISTON POPPET

Leaks around the piston poppet are caused by worn or damaged o-rings in the adaptor ring. Refer to section 5 for replacement of o-rings.

LEAKS AROUND ACETAL BUSH

If a leak is suspected from between the Acetal bush and the body return the complete API7XX coupler to Liquip for removal and replacement of the Acetal bush. Inserting the Acetal bush requires use of a special tool.

SPARE PARTS

Part Number	Description	Quantity
0235VB	O-ring for shaft	2
0235EPDM	O-ring for shaft EPDM	2
0235VG	O-ring for shaft Viton GFLT	2
4602VB	Product seal	1
4602EPDM	Product seal EPDM	1
4602VG	Product seal Viton GFLT	1
0203VB	O-ring for inside & outside of poppet adaptor ring	2
0203EPDM	O-ring for inside & outside of poppet adaptor ring EPDM	2
0203VG	O-ring for inside & outside of poppet adaptor ring Viton GFLT	2

5. REPLACEMENT OF TEE SEAL (FACE SEAL)

The photos below show the tee seal fitted to a closed valve. With a suitable tool, i.e. a smooth flat tool with no sharp edges, pry under the inside of the tee seal until you reach the bottom of the tee seal groove.

Lever the tee seal gently up until you can pull the seal out with your fingers. Clean groove and poppet and replace seal ensuring you push the seal fully home to the bottom of the groove.

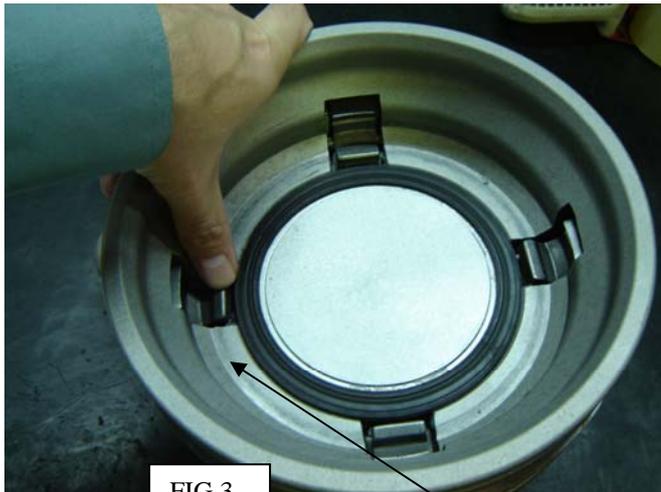


FIG 3



FIG 4

During the inspection, check this face for excessive wear both visually and by pressing each latch down and checking the latch face travels below the flat face by at less 0.5mm. If not measure the depth of wear on the face of the coupler. This cannot exceed 1.0mm. If the face of the coupler is worn more than 1.0mm then parts replacement will not stop it from leaking, the unit is worn out and should be replaced (see figure 8).



FIG 5

POPPET

FLAT
TOOL

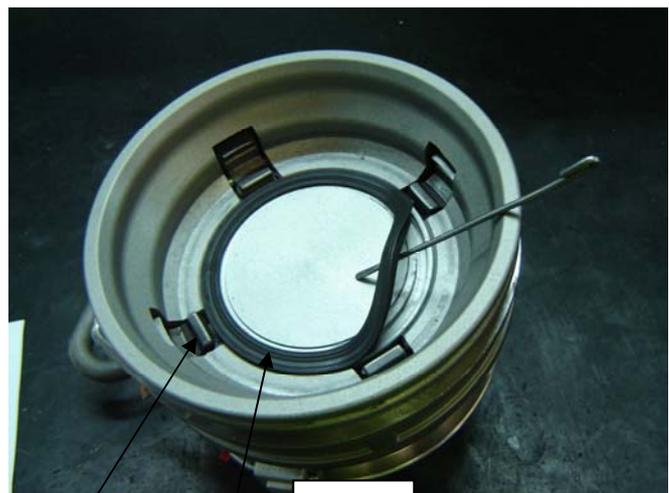


FIG 6

LATCH

SEAL

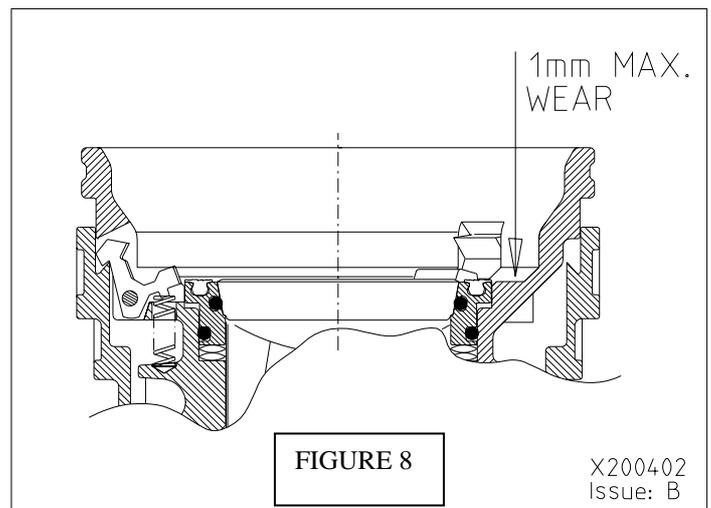
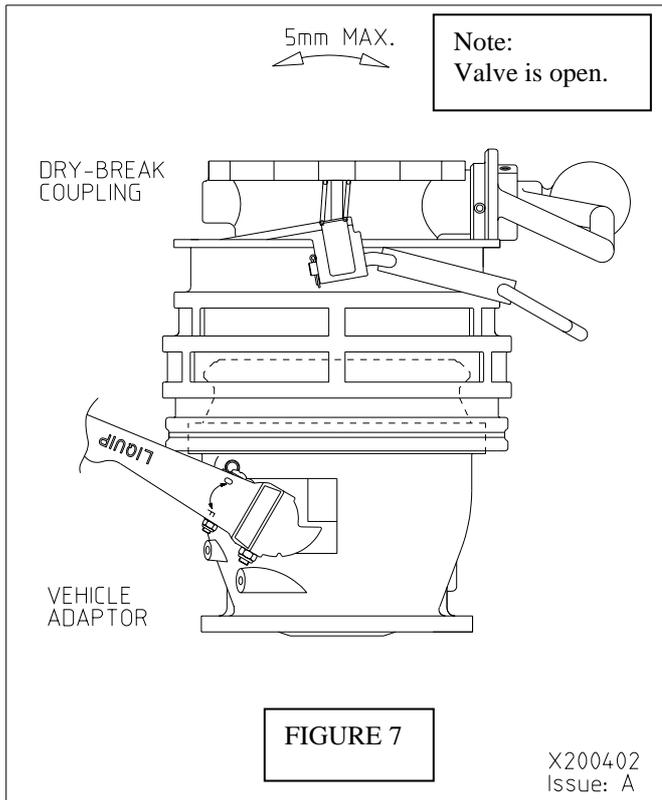


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6. TESTING FOR EXCESSIVE WEAR

Connect the coupler to a new API vehicle adaptor and open the coupler. With the vehicle adaptor clamped securely in a vice try to rock the coupling in relation to the vehicle adaptor. Be sure to rock the coupler about the axis which it would normally receive the most wear and tear. If there is any more than 5mm lateral movement at the back end of the coupler it is worn out and unserviceable. See figure 7.





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7. DISASSEMBLY FOR POPPET SEAL REPLACEMENT

- 1- Place the API7XX coupler on a bench. Using a truck adaptor or just a nose cone (see FIG's 9 & 10) connect the API7XX so that the collar is in its locked position. (If no truck adaptor or jig as shown is available turn the API7XX face up and depress the 4 latches by hand and the outer collar will slide forward automatically. Turn the coupler over and place it on the bench with the 8 - hole flange facing up. But note, this is not recommended practice).

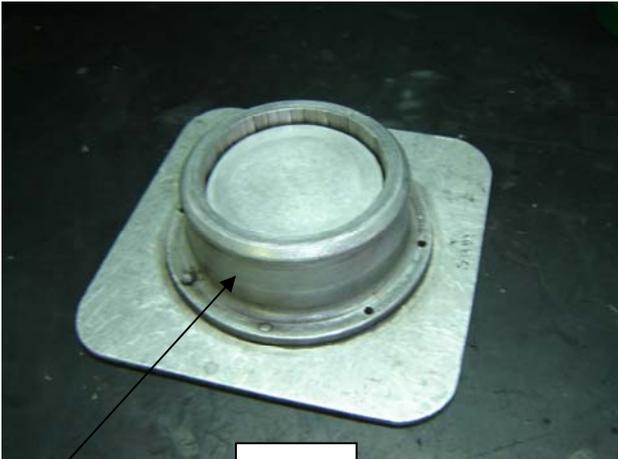


FIG 9

API NOSE CONE

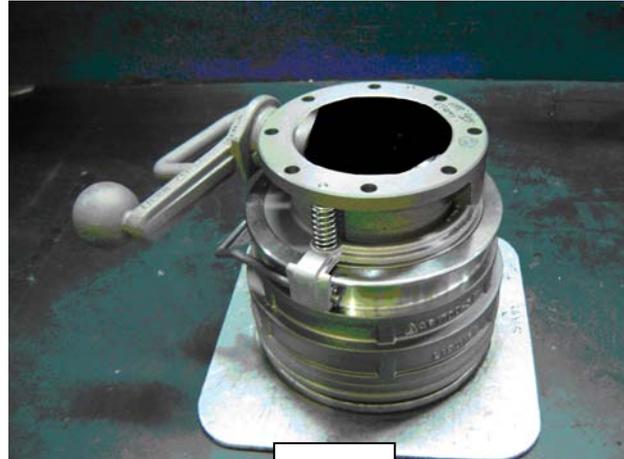


FIG 10

- 2- Open the coupler and remove the R-clip (0945) from the operating shaft (see FIG 11). Pull the operating shaft assembly out of the body. The spacer tube, cam, washer, poppet and adaptor ring will fall free of the shaft. (see FIG 12) Inspect shaft and ensure it is not bent. Remove and check the tetra bush in the body that supports the small end of the shaft.

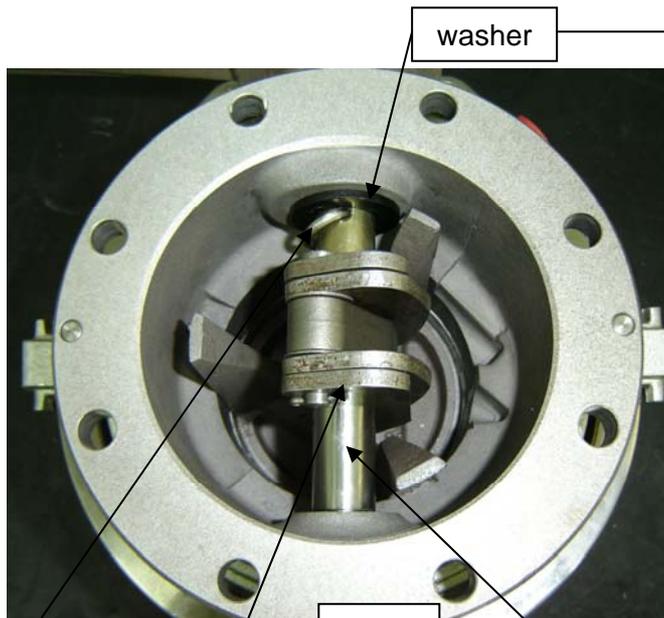


FIG 11

R-clip

Cam & camplates

washer



FIG 12

Spacer Tube



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3- Remove the piston poppet assembly, remove both the clevis pins and check for wear or part shear, indicated by a small step in the pin. If any damage, replace both pins and split pins.

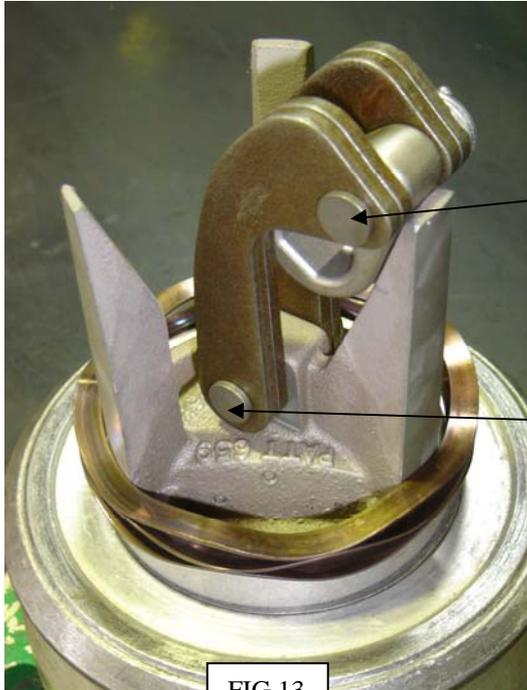


FIG 13

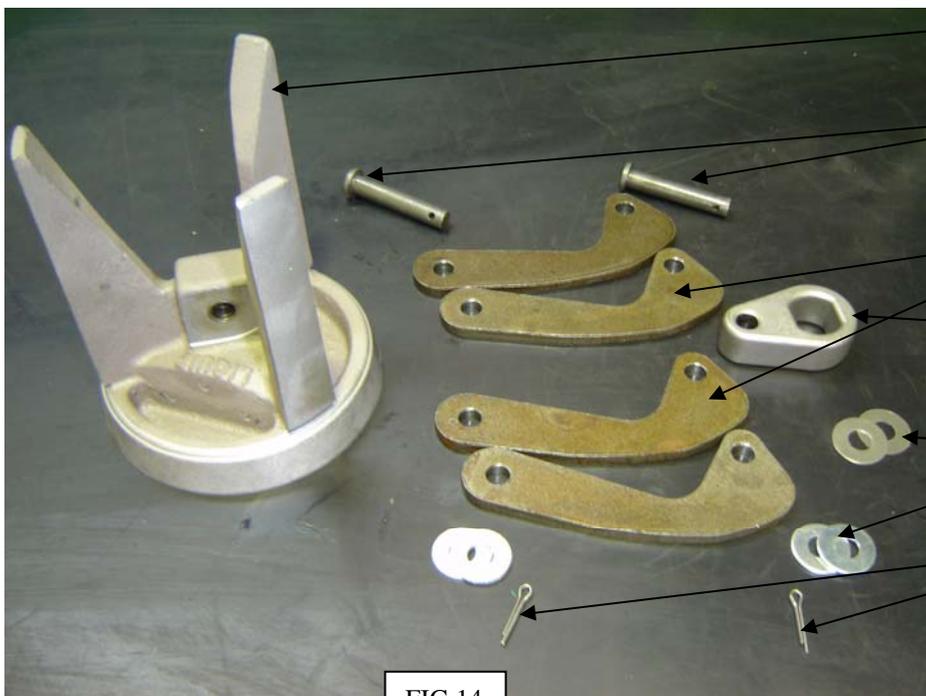


FIG 14

- POPPET (API555-5H)
- CLEVIS PINS (7138)
- CAM PLATES (API700-15)
- CAM (API513-7)
- WASHERS (5351)
- SPLIT PINS (0762)



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4- Adaptor ring will fall free. You have now removed all replaceable seals. Check seals for damage. Should you need to replace the bush and seal in the body, we recommend that the assembly be returned to your Liquip Distributor.



REASSEMBLY AFTER SEAL REPLACEMENT

To reassemble reverse the above procedure with the following important points

- Replace all worn, bent or damaged parts.
- Replace all seals removed with new Liquip parts.
- Use only Solvent Resistant grease when assembling.
- When fitting the O rings ensure they are not twisted i.e. do not roll the seals into place, stretch and snap into place
- Ensure camplates & poppet are installed with the correct orientation; see pages 14 & 15 for alignment indicator details.
- Ensure R-clip is in the correct way.

REINSTALLING POPPET ADAPTOR RING API555-11

Ensure the two o-rings are greased with solvent resistant grease and fitted into grooves without being twisted.

API555-11 Adaptor ring
With O-rings (0203,
0203EPDM or 0203VG)

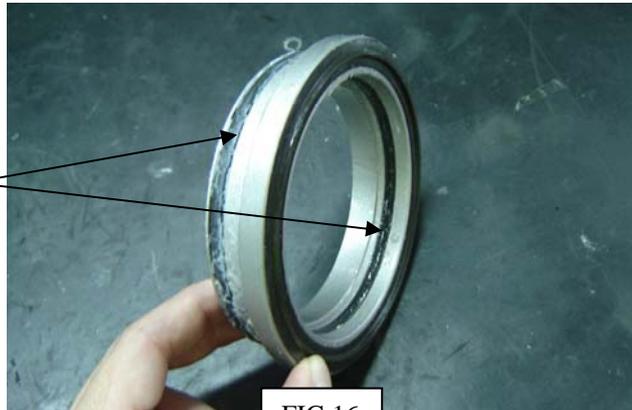


FIG 16

- Place the poppet assembly complete with camplates, pins and eccentric cam on top of a truck adaptor or nosecone placed on a bench.

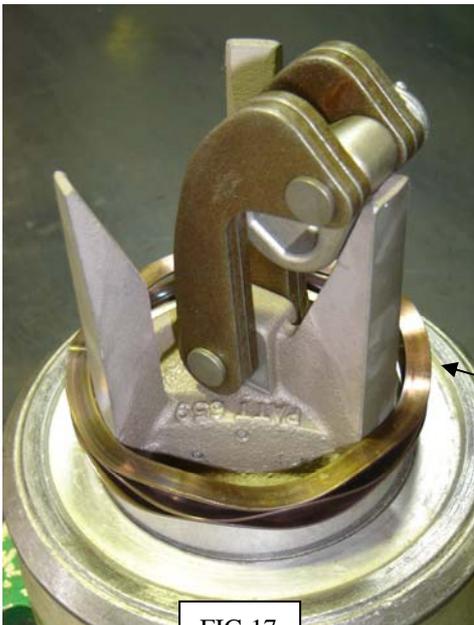


FIG 17

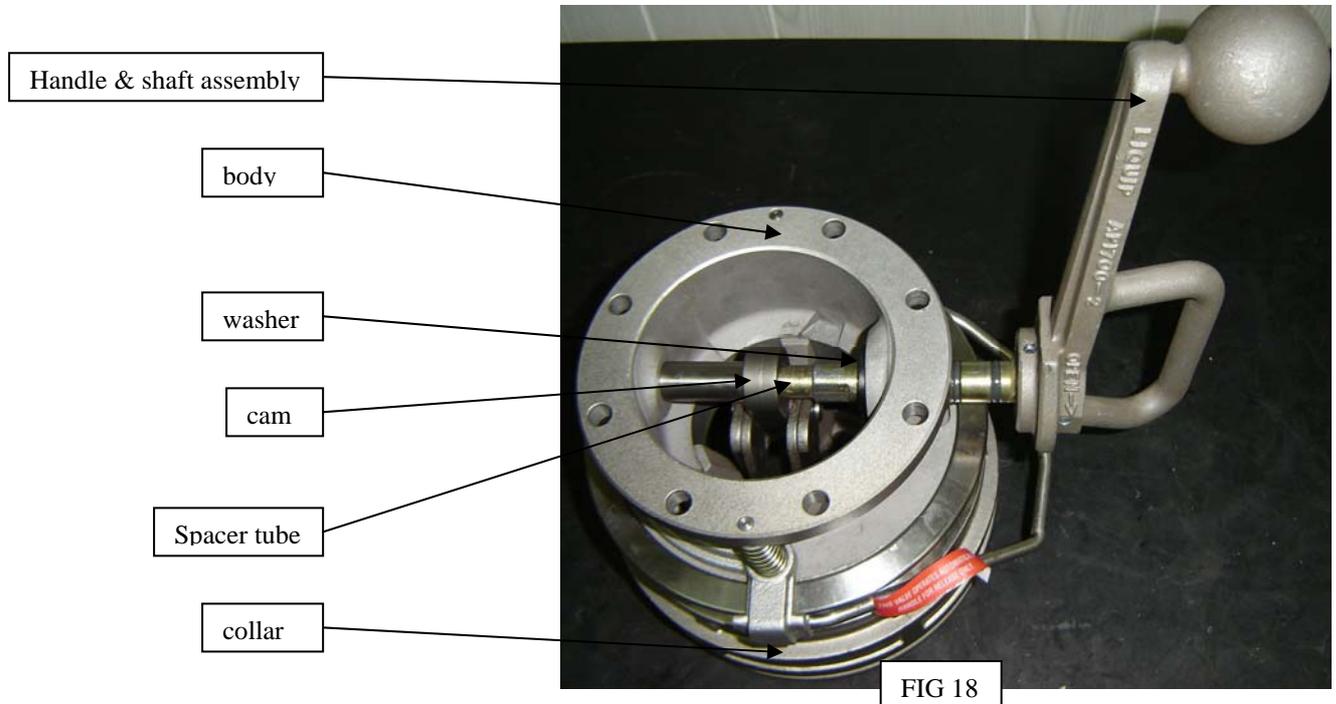
Start of assembly:
Poppet assembly, adaptor
ring and wave washer
placed on top of nose cone



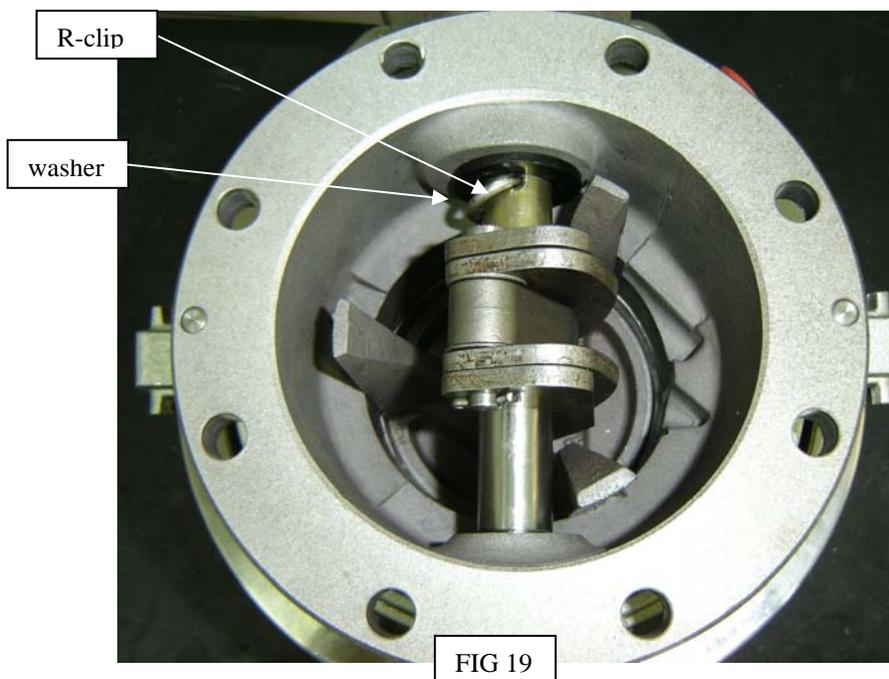
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2. Sit the coupler body over the poppet assembly on the nosecone.
3. Place the outer collar over the coupler body and press down to engage the coupler.
4. Slide the shaft through eccentric cam and fit spacer tube.



5. Fit R-clip to shaft and close valve. Make sure R-clip is in the correct way as shown (Fig 19).

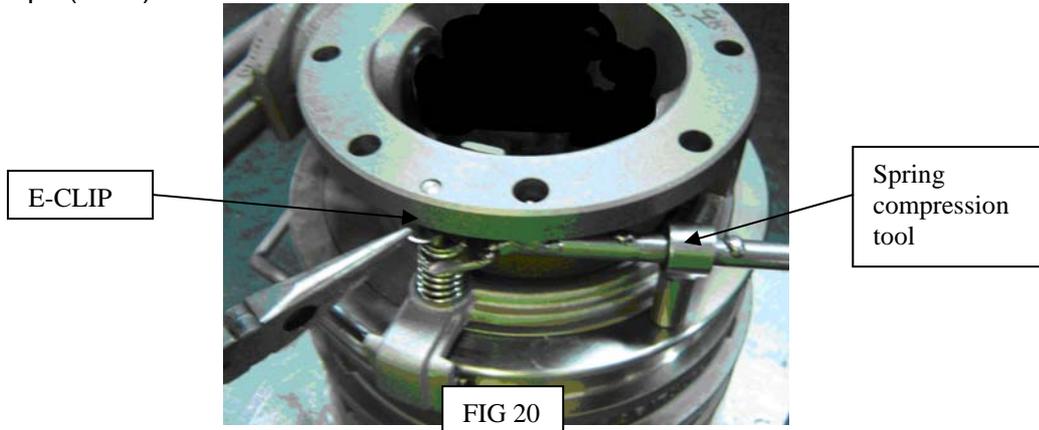




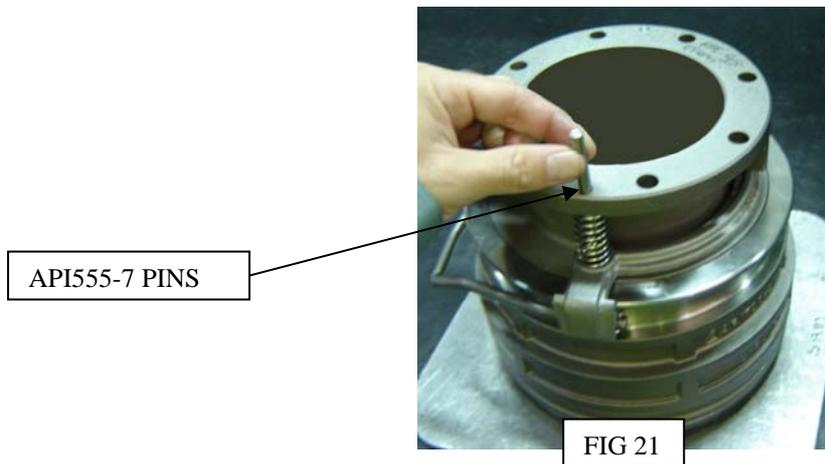
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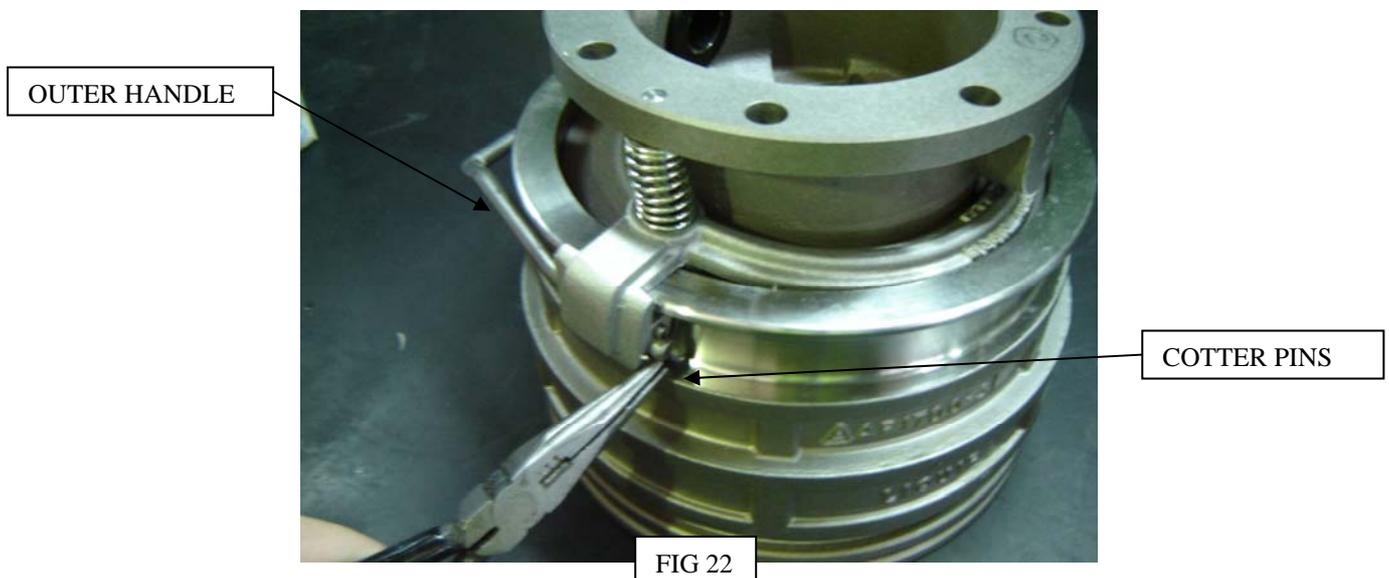
1- Remove e-clips (0093)



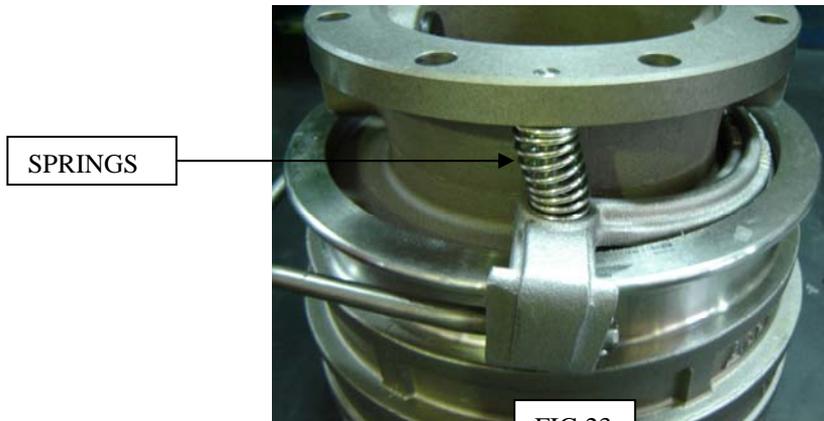
2- Turn the body over and ensure the 2 pins (API555-7) are free and they will fall free.



3- Remove the 2 cotter pins (5764) from the ends of the outer handle (API555-6).



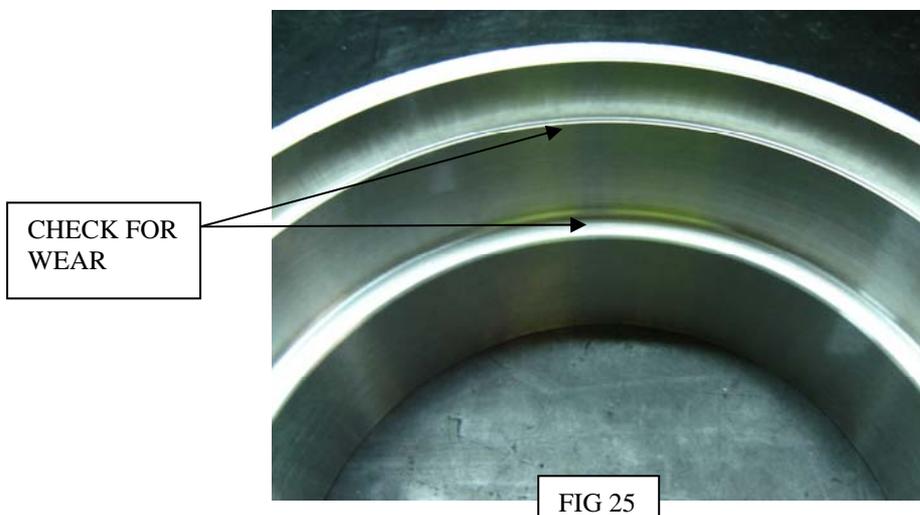
4- Remove the springs and outer handle (API555-6) from the outer body lever (API555-10) and slide the lever from the outer body ring.



5- To allow the collar to fall free of the body turn the valve so the 8 hole flange face is down then depress the 4 off latches together and the collar will fall free.



6- Inspect the collar for wear, in particular check these areas.



7- The remaining parts are the latches and latch return springs, these can be removed by knocking the roll pin out until the latch falls free. There should be no reason to remove these latches, as they will not wear significantly to require changing.



FIG 26



FIG 27

- API710-1 BODY
- API700-3 COLLAR
- API555-7 HANDLE RELEASE
- API725-4 LATCH
- 0927 ROLL PIN
- 4497 COLLAR RETURN SPRING
- API555-7 GUIDE PIN
- API555-10 LEVER OUTER



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8. ASSEMBLY PROCEDURES FOR API7XX DRY BREAK COUPLING

1. Fit o-ring (4501 or 4574VG) onto outside of Acetal bush API 513-6 and lightly smear outside of bush and bore in the body API 7XX-1 with SR grease. Using Jig number 374 fit bush

****ENSURE THAT HEAD OF BUSH IS FLUSH WITH CAST BOSS INSIDE BODY****

2. Fit tetra bearing 2698 into hole in body on opposite side. Bush to be pushed to bottom of hole.
3. Sit body on bench with flange (8 hole) on bench.
4. Fit four (4) springs 6171, into drilled hole in body. Fit the four (4) latches API725-4. Check for movement and operation of the latch.

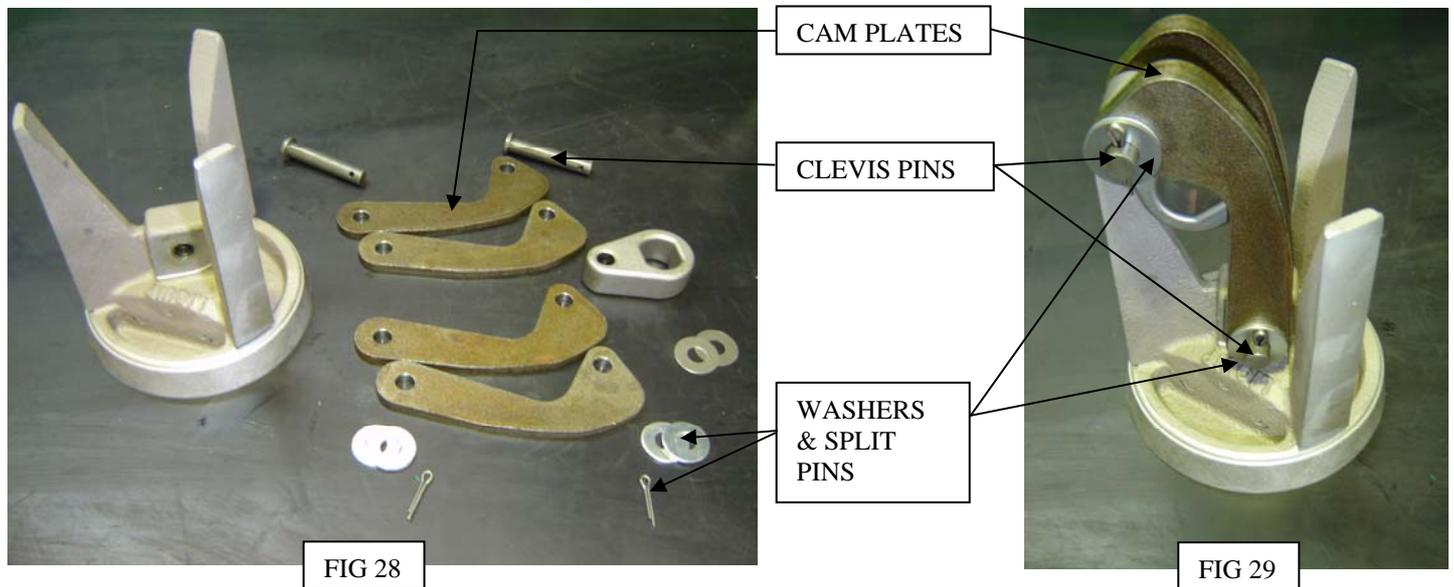
NOTE: Latch should not rub on the sides of the latch hole.

5. Fit 2 off o-rings (0235, 0235EPDM or 0235VG) onto shaft & handle assembly API 700-2 (long handle) or API555-2 (short handle) and smear top of o-rings with Shell SR grease 3395.
6. Fit two (2) o-rings (0203, 0203EPDM or 0203VG) and seal (4602VB, 4602EPDM or 4602VG) to poppet adaptor ring and smear top of o-rings with Shell SR grease or equivalent.

Note: Leave o-rings in hot water for 15 minutes to soften and allow easier insertion. The "T" seal (4602VB, 4602EPDM or 4602VG) is to be fitted to top face of poppet adaptor ring. Fit o-rings 0203, 0203EPDM or 0203VG to inside & outside diameter groove of poppet adaptor ring.

****MAKE SURE O-RINGS ARE NOT TWISTED WHEN FITTED TO GROOVES****

7. Fit components to piston poppet API 555-5 as per below figure



8. Sit body assembly on bench with flange (8 hole) facing up slide over outer body ring API 555-3 depressing all four latches to allow ring to slide over and lock.
9. Fit wave washer 4449 and poppet adaptor ring API 555-11 over poppet piston assembly (make sure that legs do no damage the o-ring on the inside of the poppet ring).

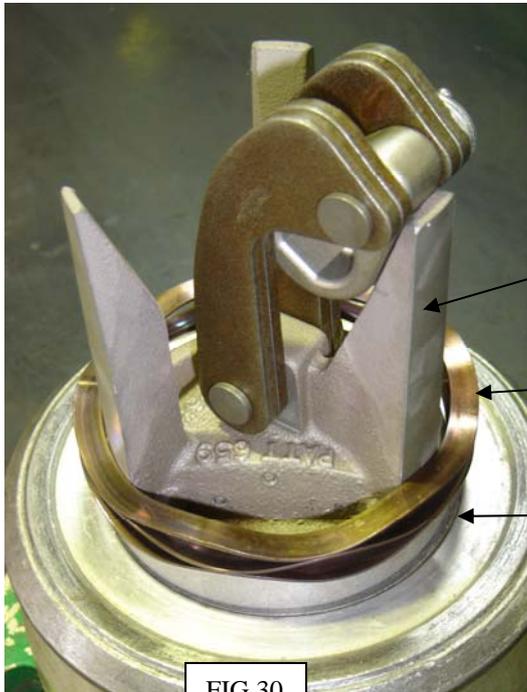
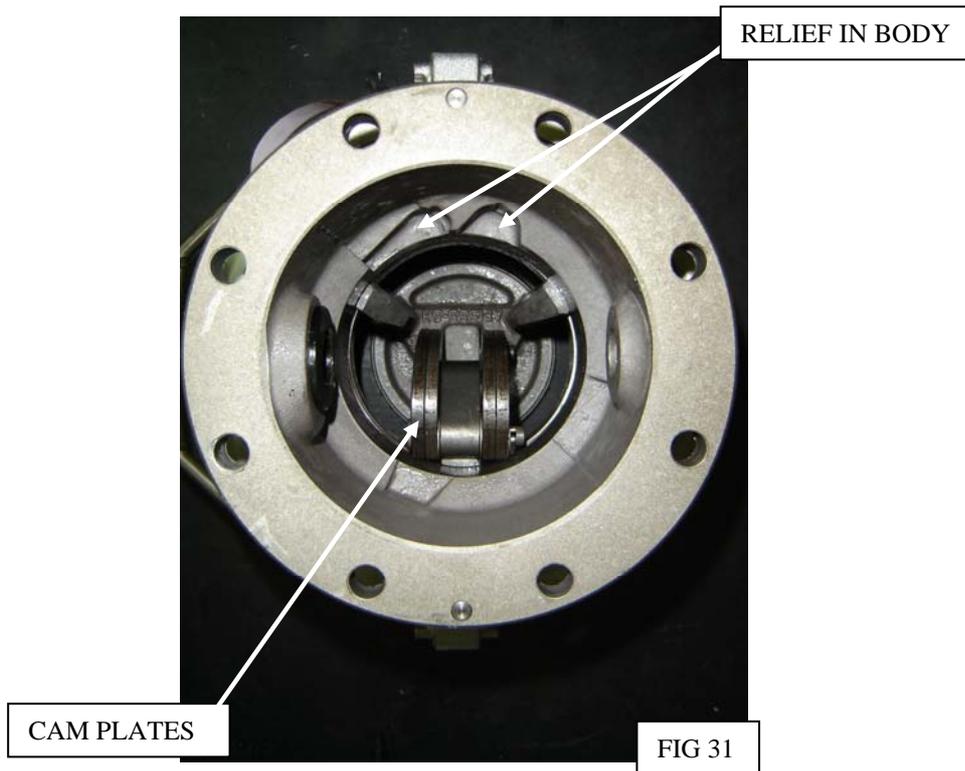
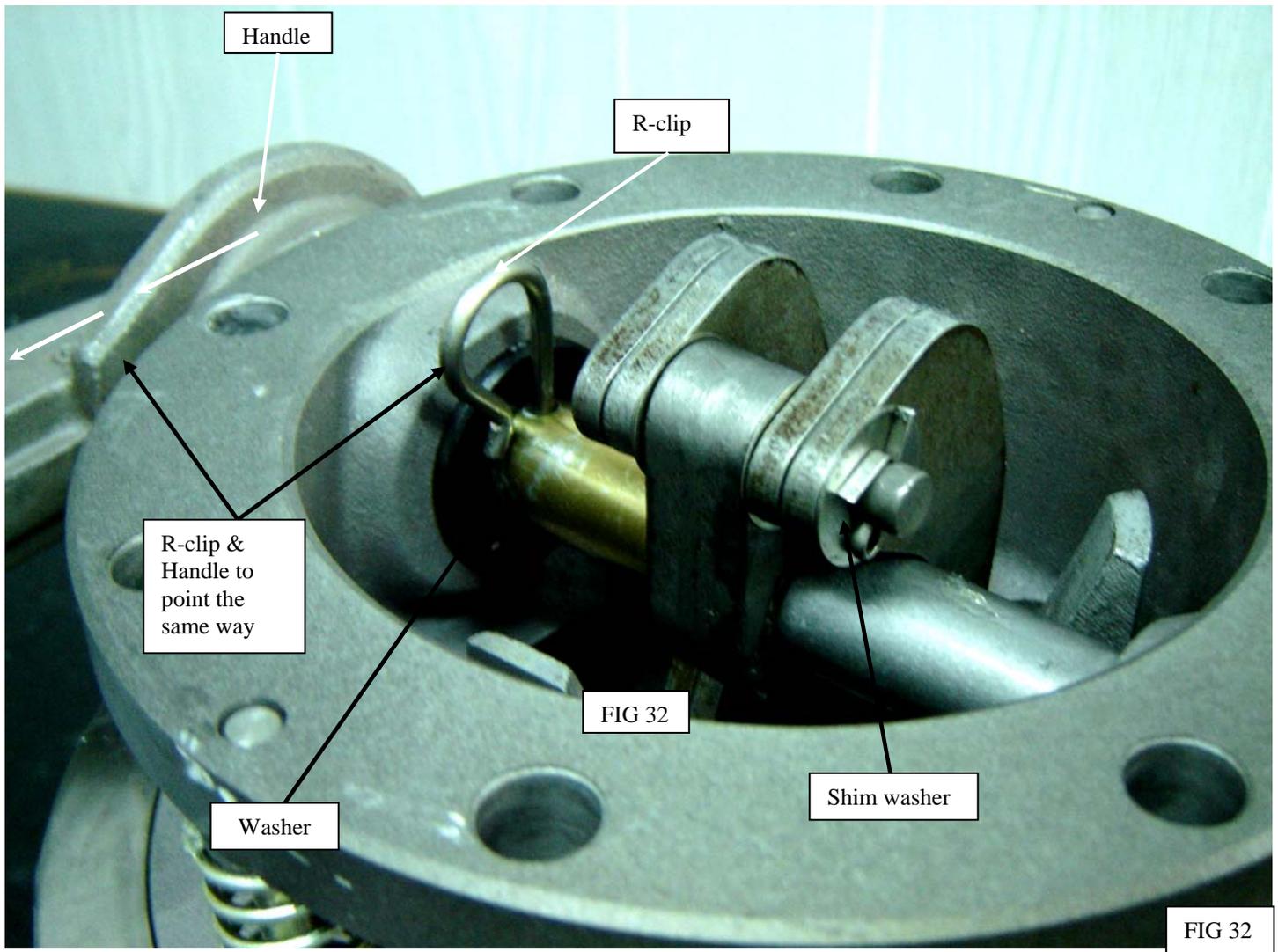


FIG 30

10. Sit the poppet adaptor ring sub assembly into Nose cone Jig with the cam plates facing away from you. Fit body sub assembly onto Jig with the cam plates lined up with relief in the body casting. Then slide collar down to attach onto the Nose cone Jig (Fig 23).





11. Smear shaft and o-rings of shaft sub-assembly with Shell SR grease and start to enter Acetal bush in body assembly. Slide shaft through the washer, cam API 513-7 and spacer tube API 555-9. Push shaft through spacer tube holding Acetal bush inside body. Before engaging flats on operating shaft to cam make sure ball on handle is up and vertical. Tap shaft fully home (ensure the tetra bush is not damaged) if difficulty is experienced pushing the shaft home check the tetra bush. Pull handle over towards you and fit R-clip 0946 ensuring that leg of R-clip that wraps around outside of shaft is facing you. Refer to fig 32. Check a couple of times for correct operation.

12. Fit outer body lever and release handle, fit collar return springs, guide pins and e-clips. Check pressure tightness as described in section 3 before putting back into service.



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9. PERIODIC CHECKS

Recommended MONTHLY checks:

1. Visually inspect coupler & loading arm for damage & leaks, particular at the face seal & poppet o-ring, handle shaft & mounting flange.

Recommended SIX MONTHLY checks:

1. Visually inspect coupler & loading arm for damage & leaks, particular at the face seal & poppet o-ring, handle shaft & mounting flange.
2. Check tightness of mounting bolts. Re-torque to 24-27Nm.
3. Check operation of coupler to ensure smooth operation of the collar & handle.
4. After loading, close poppet & un-couple. Check leak is less than 5mL when disconnecting from adaptor.

Recommended ANNUAL checks:

1. Visually inspect coupler & loading arm for damage & leaks, particular at the face seal & poppet o-ring, handle shaft & mounting flange.
2. Check tightness of mounting bolts. Re-torque to 24-27Nm.
3. Check operation of coupler to ensure smooth operation of the collar & handle.
4. After loading, close poppet & un-couple. Check leak is less than 5mL when disconnecting from adaptor.