



AURORA[®]

MODELS 151, 152, 153 and 154 **APCO-CHEM PUMP**

INSTRUCTION AND REPAIR MANUAL

NOTE! To the installer: Please make sure you provide this manual to the owner of the equipment or to the responsible party who maintains the system.

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CALIFORNIA PROPOSITION 65 WARNING:

Warning: This product and related accessories contain chemicals known to the State of California to cause cancer, birth defects or other reproductive harm.

NOTE

This repair manual is applicable to pump Models 151, 152, 153, 154. All photos illustrate Model 153.

SERVICE

Your Aurora pump requires no maintenance other than periodic inspection, lubrication and occasional cleaning. The intent of inspection is to prevent breakdown, thus obtaining optimum service life.

LUBRICATION OF BEARINGS

The 150 series pumps are available with two options for lubricating the shaft bearings:

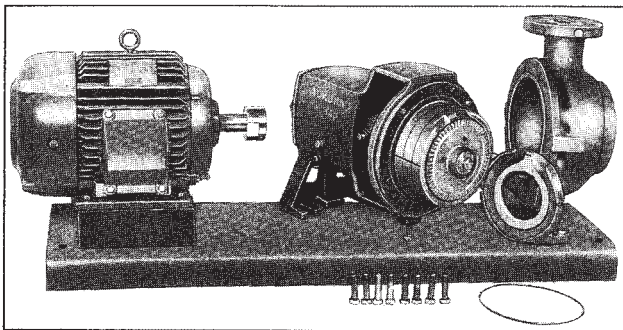
1. Oil Lubrication
2. Regreasable

Oil lubricated bearings are standard on all 150 series pumps. A fixed oil level is maintained within the power frame of an oiler which allows visual indications of reserve oil.

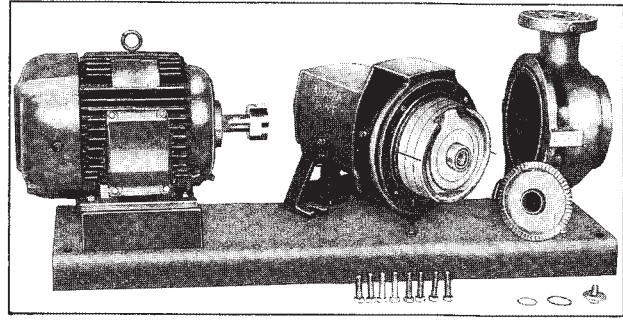
At initial installation and before starting a unit that has been shut down for repairs or for any extended length of time, run enough 10W-30 weight motor oil through the oiler to maintain a constant oil level to insure that the bearing will never be without an oil supply. Oil will have to be added at intervals to maintain a constant level in the oiler. This interval can only be determined by experience.

Under working conditions, oil will breakdown and need to be replaced at regular intervals. The length of these intervals will depend on many factors. Under normal operation, in clean and dry locations, the oil should be changed about once a year. However, when the pump is exposed to dirt contamination, high temperatures (200° F. or above) or a wet location, the oil may have to be changed every 2 or 3 months.

Regreasable bearings will require periodic lubrication and can be accomplished by using the zerk or lubrication fittings



A. Channel ring and casing o-ring removed.



B. Lock nut, o-rings and impeller removed.

in the cartridge cap and power frame. Lubricate the bearings at regular intervals using a grease of high quality. Lithium, lithium soda or calcium base grease is recommended as lubricants for pumps operating in both wet and dry locations. Mixing of different brands of grease should be avoided due to possible chemical reactions between the brands which could damage the bearings. Accordingly, avoid grease of vegetable or animal base which can develop acids, as well as grease containing rosin, graphite, talc and other impurities. Under no circumstances should used grease be reused.

Over lubrication should be avoided as it may result in overheating and possible bearing failure. Under normal application, adequate lubrication is assured if the amount of grease is maintained at 1/3 to 1/2 the capacity of the bearing and adjacent space surrounding it.

In dry locations, each bearing will need lubrication at least every 4,000 hours of running time or every 6 to 12 months, whichever is more frequent. In wet locations the bearings should be lubricated at least after every 2,000 hours of running time or every 4 to 6 months, whichever is more frequent. A unit is considered to be installed in a wet location if the pump and motor are exposed to dripping water, to the weather, or to heavy condensation such as is found in unheated and poorly ventilated underground locations.

At times it may be necessary to clean the bearings due to accumulated dirt or deteriorated lubricants. This can be accomplished by flushing the bearing with a light oil heated to 180 to 200°F. While rotating it on a spindle, wipe the bearing housing with a clean rag soaked in a cleaning solvent and flush all surfaces.

Dry bearing thoroughly before relubricating. Compressed air can be used to speed drying, but care should be taken not to let bearings rotate while being dried.

CAUTION

Use normal fire caution procedures when using any petroleum cleaner.

The motor which drives your Aurora pump may or may not require lubrication. Consult the manufacturer's recommendations for proper maintenance instructions.

REPAIRS

The pump may be disassembled using the illustrations and text provided. Although complete disassembly is covered, it will seldom be necessary to completely disassemble your Aurora pump.

The illustrations accompanying the disassembly instructions show the pump at various stages of disassembly. The illustrations are intended to aid in the correct identification of the parts mentioned in the text.

Inspect removed parts at disassembly to determine their reusability. Cracked castings should never be reused. All packing and gaskets should be replaced with new ones at reassembly simply as a matter of economy; they are much less expensive to replace routinely than to replace as the need occurs. In general it is economical to return to the manufacturer for repair only the motor and motor controller.

Disassembly of Apco-Chem 150 Series (Figure 1 thru 7).

Repair of Model 152 is discussed and illustrated in this manual. Model 152-153-154 pumps use different casings (1), but otherwise all components are interchangeable. Model 151 disassembly is the same as larger models.

1. Break the electrical connections to motor; so pump will not be accidentally energized during disassembly.

2. Close all valves or flow devices that regulate flow of liquids to or from pump.

3. Remove any external flushing or cooling lines from pump.

4. Remove four capscrews from each hub of spacer type coupling and remove coupling flange and rubber insert. This leaves a 3-1/2" space between end of motor shaft and pump shaft to facilitate back pull out of pump.

5. If possible drain and/or flush pump to remove any corrosive or toxic liquid before attempting further disassembly. Many units will not have drain taps.

6. Unscrew two capscrews holding frame foot to the base. Remove eight capscrews (47) which hold frame (6) to casing (1). The frame and rotating assembly can be pulled away from the casing and taken to a work bench for further disassembly.

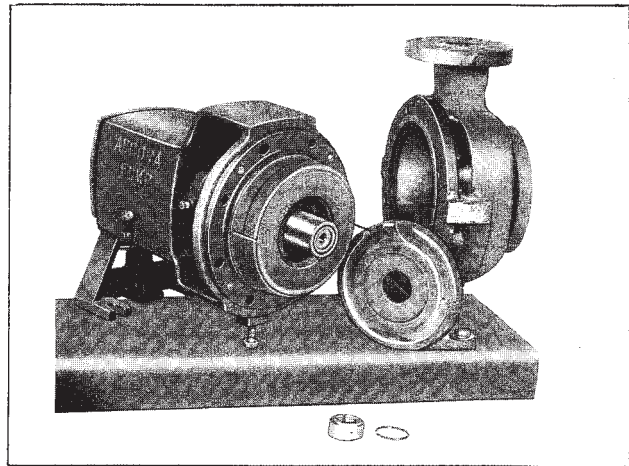
NOTE

If difficulty in withdrawing the frame and rotating element is encountered, remove any two capscrews (46) that are 180 degrees apart. Thread two longer capscrews into their holes. These longer capscrews will act as jackscrews to aid with the disassembly.

7. Right hand channel ring (2) will remain in casing (1). If the ring can not be readily removed by hand, a simple puller can be used incorporating the slots on inside diameter of channel ring.

NOTE

For customer's convenience, a special tool is optionally available from Aurora Pump to remove this ring.



C. Sleeve extension, o-ring and channel ring removed.

8. Impeller screw (20) and "O" ring (18) can be removed. Impeller (3) and impeller key (74) can be removed at this point.

9. Remove left hand channel ring (4), interstage bushing (72), channel ring (2), shaft sleeve extension (16) on Model 153 and 154 pumps.

10. Remove impeller (3), channel ring (4), impeller key (74), and pin (33) for all models.

11. Remove four capscrews (46) and pipe plug (69) which will allow the stuffing box along with the gland, shaft sleeve, sleeve key (21), and packing or mechanical seal (whichever the case may be) to be separated from shaft (10) and bracket (35) or frame (6) depending upon pump model. Remove "O" ring (17).

12. For complete disassembly of the various stuffing boxes, refer to the specific type below.

Single Inside Unbalanced Mechanical Seal (Figure 1, 2 or 3)

- a. Remove nuts (39) from studs (38) and slide gland (11) off shaft sleeve (12).
- b. The stationary seat, part of the mechanical seal (13), will remain in gland (11). Remove this seat if necessary, using caution not to crack or scratch lapped face. Also remove gaskets (40 and 70) from the gland.

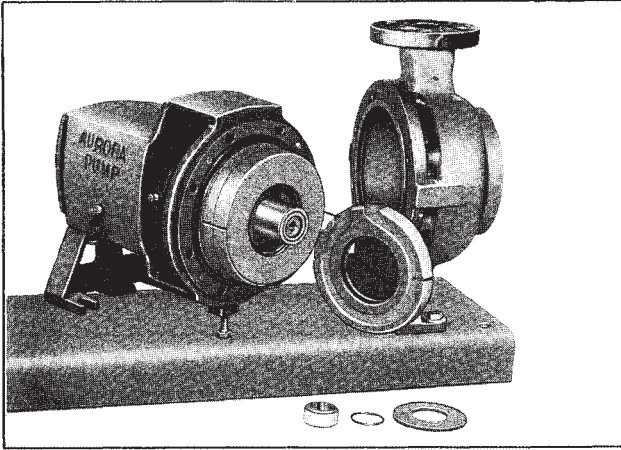
NOTE

Gasket (70) is not used with all types of single inside unbalanced seals, refer to the drawing of your particular seal.

- c. The balance of mechanical seal parts can be slid out of stuffing box (5) along with shaft sleeve (12). The seal's washer, retainer ring, flexible bellows, and spring are loose and may be removed from the shaft sleeve.
- d. After scribing the sleeve to locate the position of the seal on reassembly, the seal collar (58) can be removed by loosening setscrews (59).

Standard Packing (Figure 4)

- a. Remove nuts (39) from studs (38) and slide gland (61) off shaft sleeve (12).
- b. Withdraw shaft sleeve (12) from stuffing box (5). Remove packing (65) and lantern ring (66) from the stuffing box.



D. Channel ring, sleeve extension, o-ring and bushing removed.

- c. Gland (61) can be separated into two halves by removing capscrews (63) and nuts (64). This exposes gland packing (62) which can be removed.

Single Inside Balanced Mechanical Seal (Figure 5)

- a. Remove nuts (39) from studs (38) and slide gland (11) from stuffing box (5).
- b. The mechanical seal's stationary seat and gaskets (40 and 70) can be removed from the gland.

NOTE

Gasket (70) is not used with all types of single inside balanced seals, refer to the drawing of your particular seal.

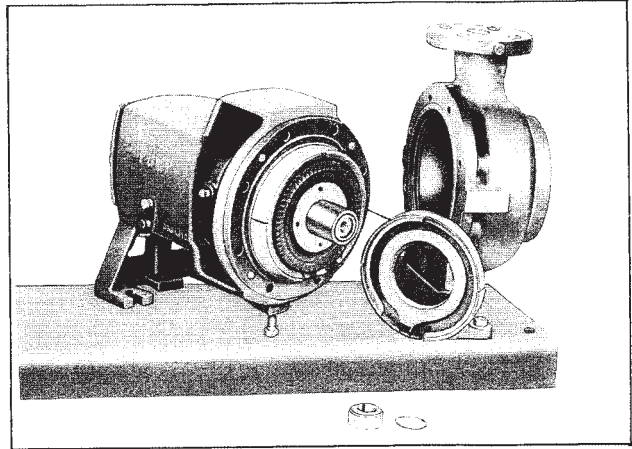
- c. Shaft sleeve (12) and mechanical seal (13) can be removed from the stuffing box (5). The loose seal parts can then be removed. After scribing the sleeve to locate the position of the seal on reassembly, the seal lock collar (58) is removed from shaft sleeve by loosening setscrews (59) and sliding it off.

Double Inside Unbalanced Mechanical Seal (Figure 6)

- a. Remove nuts (39) from studs (38) and slide gland (11) off shaft sleeve (12).
- b. One mechanical seal (13) stationary seat will remain in the gland cavity and the other will stay in the stuffing box (5).
- c. Withdraw shaft sleeve (12) from stuffing box (5). The loose parts of mechanical seal (13) can be removed and the lock collar taken off the shaft sleeve. (Scribe the shaft sleeve before removal to facilitate reassembly of seal.)
- d. The stationary seats can be removed if necessary.

Double Inside Balanced Mechanical Seal

Disassembly of a double inside balanced seal is basically the same as for a double inside unbalanced seal.



E. Right hand channel ring removed.

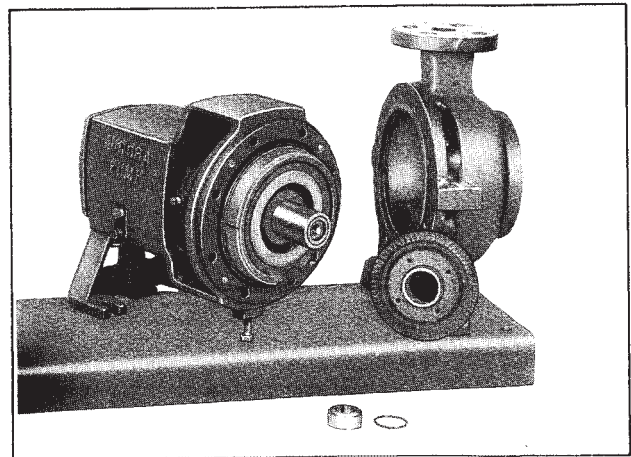
Single Outside Balanced Mechanical Seal (Figure 7)

- a. Scribe the shaft sleeve to locate position of seal on reassembly. Then remove mechanical seal (13), except for the stationary seat which held in the gland, by loosening the setscrews in its lock collar.
- c. Withdraw shaft sleeve (12) from stuffing box (5).
- d. Remove nuts (39) from studs (38) which allows gland (11) to be removed. Remove the seal's stationary seat and gaskets (40 and 70) from the gland (11).

CAUTION

The parts of any mechanical seal are easily damaged if they are not properly handled. The ceramic and carbon parts can be chipped or cracked by being allowed to slide loose on the shaft. Care should also be taken not to scratch lapped faces of a seal.

- 13. For Model 152, 153 and 154 pumps, foot (8) may be removed by unscrewing capscrews (44). Bracket (35) may be removed by unscrewing capscrews (19).



F. Impeller removed. Note position of left hand channel ring opening.

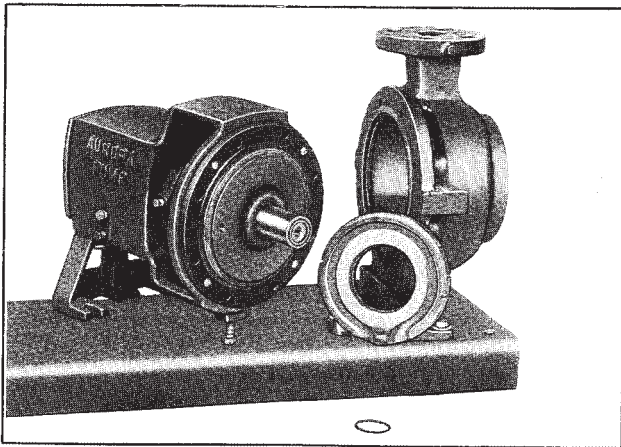
- 14. Also on Model 152, 153 and 154 pumps frame cooling cover (34) and gasket (42) may be removed by unscrewing capscrews (45).

15. Remove slinger (31) from inboard end of shaft (10). Key (28) and slinger (32) are then removed from outboard end of shaft.

16. Remove capscrews (37). When this is done the shaft and bearing assembly can be withdrawn from frame (6).

17. Use a pair of truarc pliers to remove retainer ring (22) from bearing cartridge (7). Slide bearing cartridge and oil seal (29) off shaft. The oil seal can be tapped from its cavity if necessary. Remove "O" ring (23) from bearing cartridge (7).

18. If pump is oil lubricated, plug (30) can be removed or if it is grease lubricated, zerk fittings can be removed from bearing cartridge (7). On the oil lubricated frame remove constant level oiler (48), nipple (49), plug (67), and breather (50).



G. Left hand channel ring removed.

On the grease lubricated frame, zerk fittings can be removed from the inboard end of the frame. On either frame option, oil seal (29) can be tapped from its cavity on the inboard end of frame (6).

19. Remove retaining ring (24) with a pair of truarc pliers.

20. Bearings (14 and 15) are pressed on the shaft and must be pulled or pressed off shaft (10).

Reassembly of Apco-Chem 150 Series

1. Position gasket (42) and frame cooling cover (34) to frame (6) with capscrews (45) on Model 152, 153 and 154 pumps.

2. Fasten foot (8) to frame (6) with capscrews (44). Position bracket (35) on frame (6) and secure with capscrews (19) on Model 152, 153 and 154 pumps.

3. Press bearing (14) onto inboard end of shaft (10). Press bearing (15) onto outboard end of shaft. Snap retaining ring (24) into its groove by bearing (15) with a pair of truarc pliers.



This ring is beveled on its inside diameter. This beveled side must always be away from the bearing.

4. Press grease seals (29) into their cavities in bearing cap (7) and frame (6).

5. Place "O" Ring (23) in its groove on bearing cap (7). Slide the bearing cap over outboard bearing (15). The bearing is held in place in the bearing cap by retaining ring (22). Use a pair of truarc pliers to set this ring.



This ring is beveled on its outside diameter. This beveled side must always be away from the bearing.

6. The assembly from steps 3, 4, 5 is placed through the outboard opening of power frame (6) and is held in place by turning capscrews (37) into frame (6) until tight. Impeller adjustment is not required due to a floating impeller design.

7. Place slinger (32) on outboard end of shaft (10) and slinger (31) on the inboard end. Set key (28) in the keyway on the shaft's outboard end. Place plug (30) in bearing cap (7). Put breather tube (50) and constant oiler parts (48 and 49) on frame (6). Also put drain plug (67) back in the power frame.

If pump has grease lubrication option, place grease zerk fitting in bearing cap (7), grease zerk fitting in the inboard end of frame (6).

8. Reassemble the various types of stuffing boxes as follows:

NOTE

Thoroughly clean all metal parts of any residue that may be on them. Pay particular attention to the seal faces so that they are not scratched or damaged by improper handling.

Do not return any mechanical seal to service unless the stationary seat and washer have been replaced or their faces lapped. If shaft sleeve (12) is corroded or badly worn, it should be replaced.

NOTE

Be sure to check the proper position of stuffing box (5). On Model 151 and 152 pumps the internal bypass opening in the face should be on the horizontal center line to the RIGHT of the shaft extension when facing the pump end. On Model 153 and 154 pumps the internal bypass opening in the face should be on the horizontal center line to the LEFT of the shaft extension when facing the pump end.

Standard Packing (Figure 4)

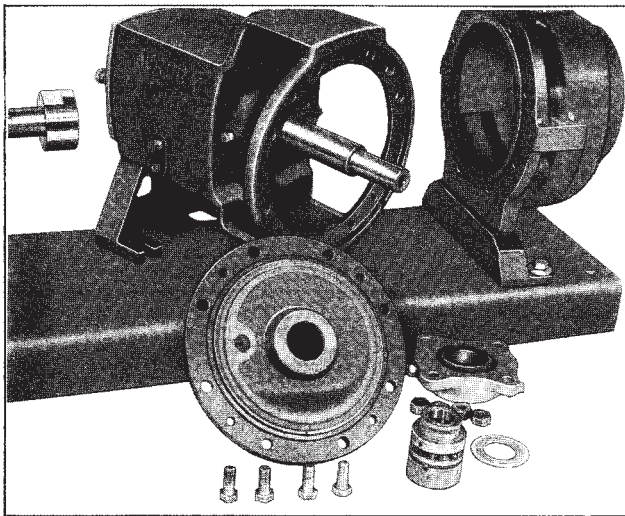
- a. Insert sleeve (12) in stuffing box (5). Carefully place two pieces of packing (65) around the sleeve, then insert lantern ring (66) and three more pieces of packing.
- b. Place gland packing (62) in the groove of the two split gland halves (61) and join these halves together with capscrews (63) and nuts (64).
- c. Place assembled gland over studs (38) and lightly tighten nuts (39).

NOTE

Do not over tighten packing, final adjustment must be made after pump is operating.

When adjusting packing, turn both nuts down evenly a flat or two at a time. Let packing work in, then tighten the gland nut another flat or two. This process should be continued until drip rate is approximately 20 to 30 drops per minute. Over tightening a gland will cause the stuffing box to heat up and will also cause excessive wear on the shaft sleeve.

- d. Take the above assembly and slide it onto shaft (10). Capscrews (46) are used to fasten stuffing box (5) to bracket (35). Be sure the by-pass is properly oriented. See NOTE on page 4.



H. Stuffing box and mechanical seal removed from power frame.

Single Inside Unbalanced Mechanical Seal (Figure 1, 2 or 3)

- a. Set seal collar (58) on shaft sleeve (12) with setscrews (59). Refer to drawing of your specific seal for the location of seal collar or at location scribed on the sleeve during disassembly.
- b. Place gasket (70) in the gland if used with your seal arrangement. Insert the stationary seat in gland (11). Place gasket (40) in the groove formed by the stationary seat and gland.
- c. Carefully place gland (11) and stationary seat on the shaft. With the balance of mechanical seal (13) parts in place on shaft sleeve (12), slide the sleeve onto the shaft.
- d. Carefully position stuffing box (5) over shaft sleeve (12). Be sure the by-pass is properly oriented. See NOTE on page 4. Secure the stuffing box to bracket (35) or frame (6) on Model 151 with capscrews (46).
- e. Slide gland (11) over shaft sleeve (12) and studs (38). Tighten nuts (39) onto the studs until the gaskets are compressed.



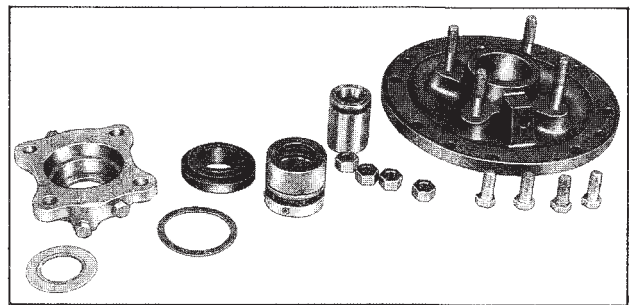
Do not over over tighten gland as this will distort the mechanical seal's stationary face and cause excessive leakage.

Single Inside Balanced Mechanical Seal (Figure 5)

The same instructions apply to single balanced mechanical seals as to single unbalanced mechanical seals.

Double Inside Unbalanced Mechanical Seal (Figure 6)

- a. Place the mechanical seal's collar on shaft sleeve (12). Refer to the drawing of your specific seal for the location of seal collar or at location scribed on the sleeve during disassembly.
- b. Insert one stationary seat in gland (11) and the other in stuffing box (5).



I. Disassembly of stuffing box and mechanical seal.

- c. Place gland (11) on shaft (10). After the balance of the mechanical seal's parts have been properly placed on the shaft sleeve, slide it onto the shaft.
- d. Carefully position stuffing box (5) over shaft sleeve (12). Be sure the by-pass is properly oriented. See NOTE on page 4. Secure stuffing box to bracket (35) or frame (6) on Model 151 with capscrews (46).
- e. Set gland (11) over studs (38) and tighten nuts (39) only enough to compress gasket (40), which was placed in the gland earlier. Over tightening will cause the seal to leak.

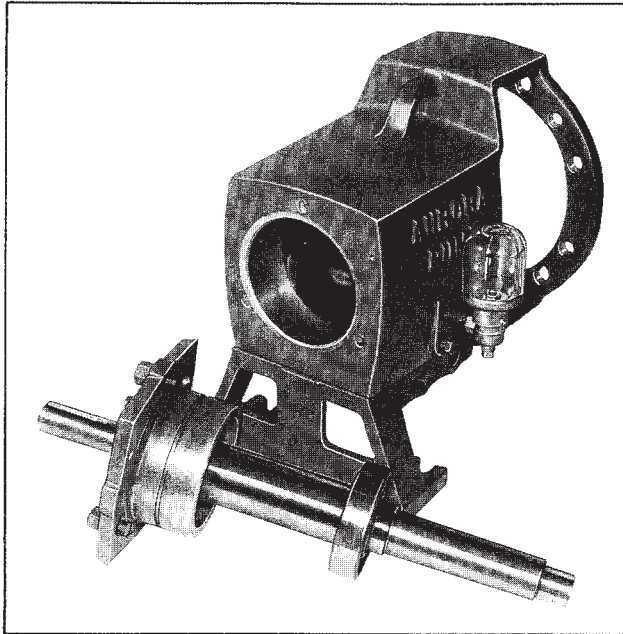
Double Inside Balanced Mechanical Seal

The same instructions apply to the double inside balanced mechanical seal as to the double inside unbalanced seal.

Single Outside Balanced Mechanical Seal (Figure 7)

- a. Place gasket (70) in gland (11). Insert the stationary seat, part of mechanical seal (13), in the gland and set gasket (40) on it. Position gland on stuffing box (5) and tighten nuts (39) on stud (38) finger tight.
- b. Secure the mechanical seal's lock collar on shaft sleeve (12) with the setscrews furnished with it at location scribed on the sleeve during disassembly.

- c. Place the shaft sleeve on shaft (10) and slide the remaining seal parts onto it as shown on drawing of your seal.
- d. Place gland (11), stationary seat, and the stuffing box assembly from step a, on shaft sleeve (12).
- e. Position stuffing box (5) on shaft sleeve (12) and secure it to bracket (35) or frame (6) on Model 151 with capscrews (46). Be sure the by-pass is properly oriented. See NOTE on page 4.
- f. Tighten nuts (39) only enough to compress gaskets (70 and 40). Over tightening of the gland will cause seal to leak.

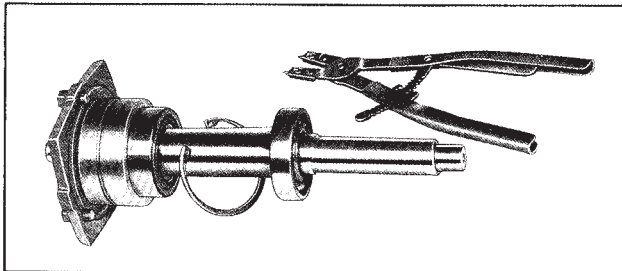


J. Power frame with rotating element removed.

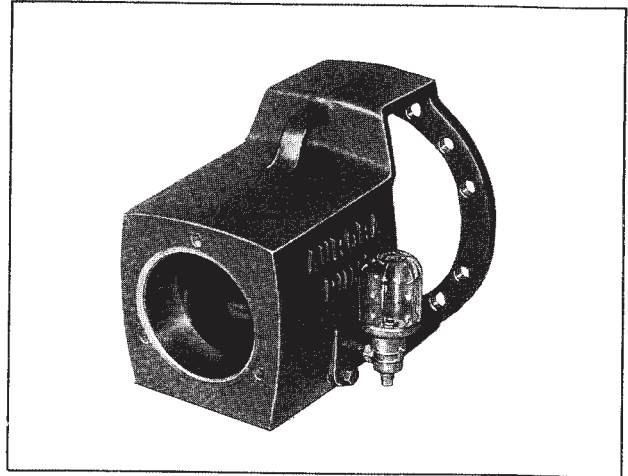
9. For Model 153 and 154, place pin (33) in position on right hand side of stuffing box (5). For Model 151 and 152 place pin (33) in position on LEFT hand side of stuffing box (5). Place channel ring (4) in its rabbeted groove on stuffing box (5). The discharge opening must be at the bottom with the pin in place.

10. Set "O" ring (18) in the groove in shaft sleeve (12).

11. Slide key (21) into the keyway on shaft (10) and the shaft sleeve (12).



K. Remove retainer ring from bearing cap with trware pliers.



L. Constant oiler connection to power frame.

12. Place impeller key (74) in sleeve (12) and slide impeller (3) on sleeve.

13. Slide sleeve extension (16) onto shaft (10) and against the shaft sleeve (12) on Model 153 and 154.

14. Place a channel ring (2), channel ring (4) and interstage bushing (72) on shaft (10). The discharge opening of channel ring (4) should face up. Also note that pin (71) is in place in ring (4) on Model 153 and 154.

15. Place impeller key (74) in sleeve (16) and slide impeller (3) on sleeve. Insert "O" ring (18) in the groove provided in the sleeve extension and secure with impeller screw (20).

16. "O" Ring (17) can be set in its groove in casing by applying a light coat of oil and sticking it in place.

17. Channel ring (2) is placed over the rabbet face of channel ring (4).

18. Slide the pump into casing (1). Secure with capscrews (47).

19. Place the spacer coupling back on pump and motor. Tighten capscrews holding frame foot (8) to base.

20. Connect all flushing and cooling lines that were removed from pump.

21. Open all valves or flow devises that control flow of liquids to or from the pump.

22. Check pump to make sure alignment between pump and motor has not been disturbed.

23. Read the starting instructions before attempting to put your Apco-Chem pump back in operation.

24. Before starting, double check for free rotation of impeller with no bind. If a rub is noted, recheck all assembly steps.

MODELS 151-152-153-154

Model 151 List of Parts (See Figures 1 and 4 thru 7)

1. Casing	17. "O" Ring	37. Capscrew	59. Setscrew
2. Channel Ring RH	18. "O" Ring	38. Stud	60. Pin
3. Impeller	20. Screw	39. Nut	61. Packing Gland
4. Channel Ring LH	21. Key - Sleeve	40. Gasket	62. Gland Packing
5. Stuffing Box	22. Ring	41. Drip Cup	63. Capscrew
6. Frame	23. "O" Ring	46. Capscrew	64. Nut
7. Cartridge	24. Ring	47. Capscrew	65. Packing
10. Shaft	28. Key	48. Oiler	66. Lantern Ring
11. Gland	29. Seal	49. Nipple	67. Plug
12. Sleeve	30. Plug	50. Breather	69. Plug
13. Seal	31. Slinger	51. Nameplate	70. Gasket
14. Bearing	32. Slinger	52. Screw	74. Key - Impeller
15. Bearing	33. Pin	58. Seal Collar	

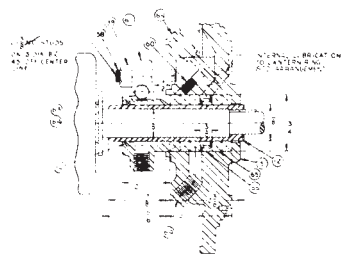
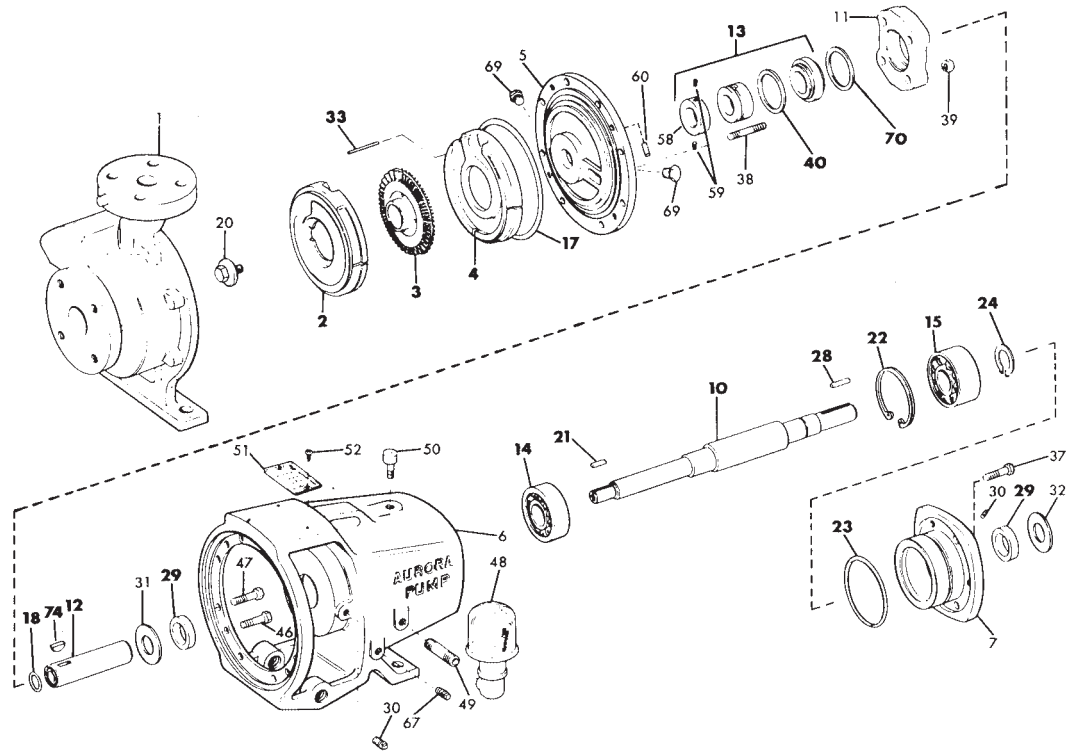
Model 152 List of Parts (See Figures 2 and 4 thru 7)

1. Casing	18. "O" Ring	37. Capscrew	54. Casing Foot LH
1A. Casing (C/L MTD)	19. Capscrew	38. Stud	55. Capscrew
2. Channel Ring RH	20. Screw	39. Nut	56. Eye Bolt
3. Impeller	21. Key - Sleeve	40. Gasket	58. Seal Collar
4. Channel Ring LH	22. Ring	41. Drip Cup	59. Setscrew
5. Stuffing Box	23. "O" Ring	42. Gasket	60. Pin
5A. Stuffing Box (Water JKTD)	24. Ring	43. Capscrew	61. Packing Gland
6. Frame	25. Capscrew	44. Capscrew	62. Gland Packing
7. Cartridge	26. Nut	45. Capscrew	63. Capscrew
8. Frame Foot	27. Nut	46. Capscrew	64. Nut
9. Casing Foot	28. Key	47. Capscrew	65. Packing
10. Shaft	29. Seal	48. Oiler	66. Lantern Ring
11. Gland	30. Plug	49. Nipple	67. Plug
12. Sleeve	31. Slinger	50. Breather	68. Plug
13. Seal	32. Slinger	51. Nameplate	69. Plug
14. Bearing	33. Pin	52. Screw	70. Gasket
15. Bearing	34. Cover	53. Casing Foot RH	74. Key - Impeller
17. "O" Ring	35. Bracket		

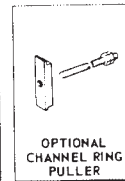
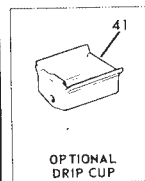
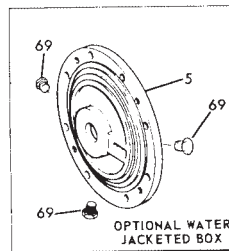
Model 153-154 List of Parts (See Figures 3 and 4 thru 7)

1. Casing	17. "O" Ring	35. Bracket	54. Casing Foot LH
1A. Casing (C/L MTD)	18. "O" Ring	37. Capscrew	55. Capscrew
2. Channel Ring RH	19. Capscrew	38. Stud	56. Eye Bolt
3. Impeller	20. Screw	39. Nut	58. Seal Collar
4. Channel Ring LH	21. Key - Sleeve	40. Gasket	59. Setscrew
5. Stuffing Box	22. Ring	41. Drip Cup	60. Pin
5A. Stuffing Box (Water JKTD)	23. "O" Ring	42. Gasket	61. Packing Gland
6. Frame	24. Ring	43. Capscrew	62. Gland Packing
7. Cartridge	25. Capscrew	44. Capscrew	63. Capscrew
8. Frame Foot	26. Nut	45. Capscrew	64. Nut
9. Casing Foot	27. Nut	46. Capscrew	65. Packing
10. Shaft	28. Key	47. Capscrew	66. Lantern Ring
11. Gland	29. Seal	48. Oiler	67. Plug
12. Sleeve	30. Plug	49. Nipple	69. Plug
13. Seal	31. Slinger	50. Breather	70. Gasket
14. Bearing	32. Slinger	51. Nameplate	71. Pin
15. Bearing	33. Pin	52. Screw	72. Bushing
16. Sleeve Extension	34. Cover	53. Casing Foot RH	74. Key - Impeller

MODEL 151



PACKING BOX
(STANDARD)

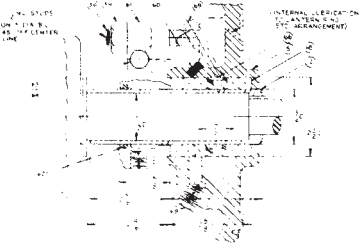
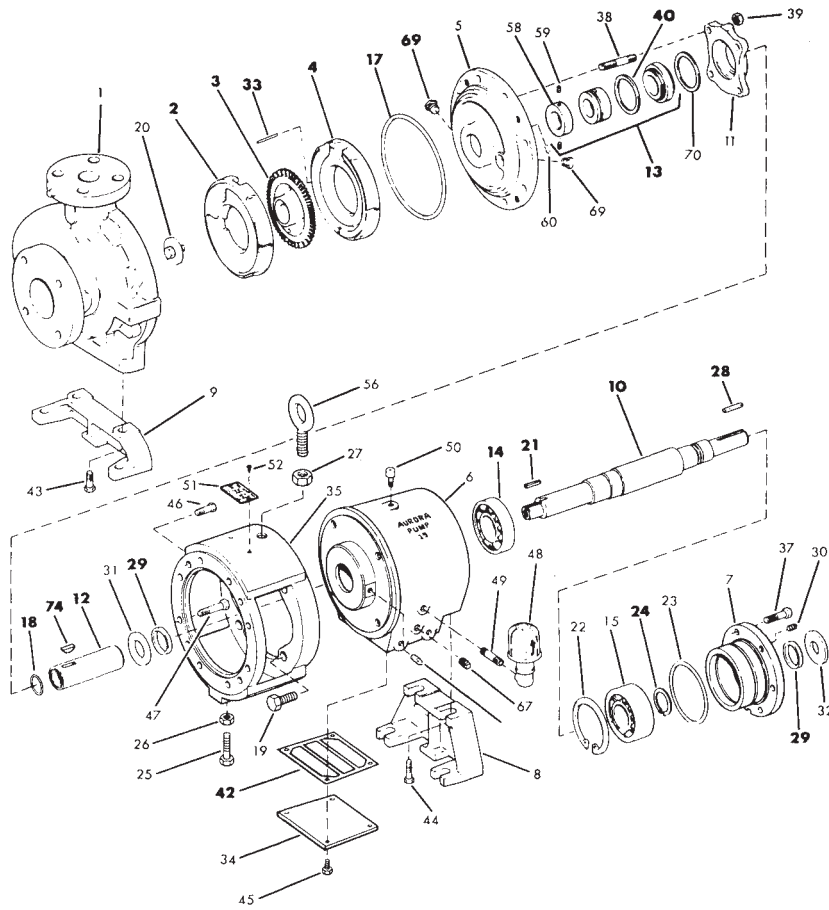


NOTE

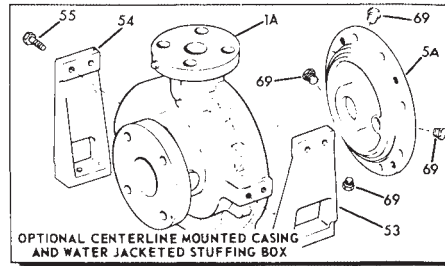
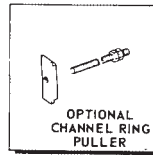
WHEN ORDERING SPARE PARTS ALWAYS INCLUDE THE PUMP TYPE, SIZE, SERIAL NUMBER, AND THE PIECE NUMBER FROM THE EXPLODED VIEW IN THIS MANUAL.
ORDER ALL PARTS FROM YOUR LOCAL AUTHORIZED DISTRIBUTOR, FACTORY BRANCH SALES OFFICE OR THE FACTORY AT NORTH AURORA, ILLINOIS.

Figure 1. Apco-Chem Model 151 Exploded View

MODEL 152



PACKING BOX
(STANDARD)

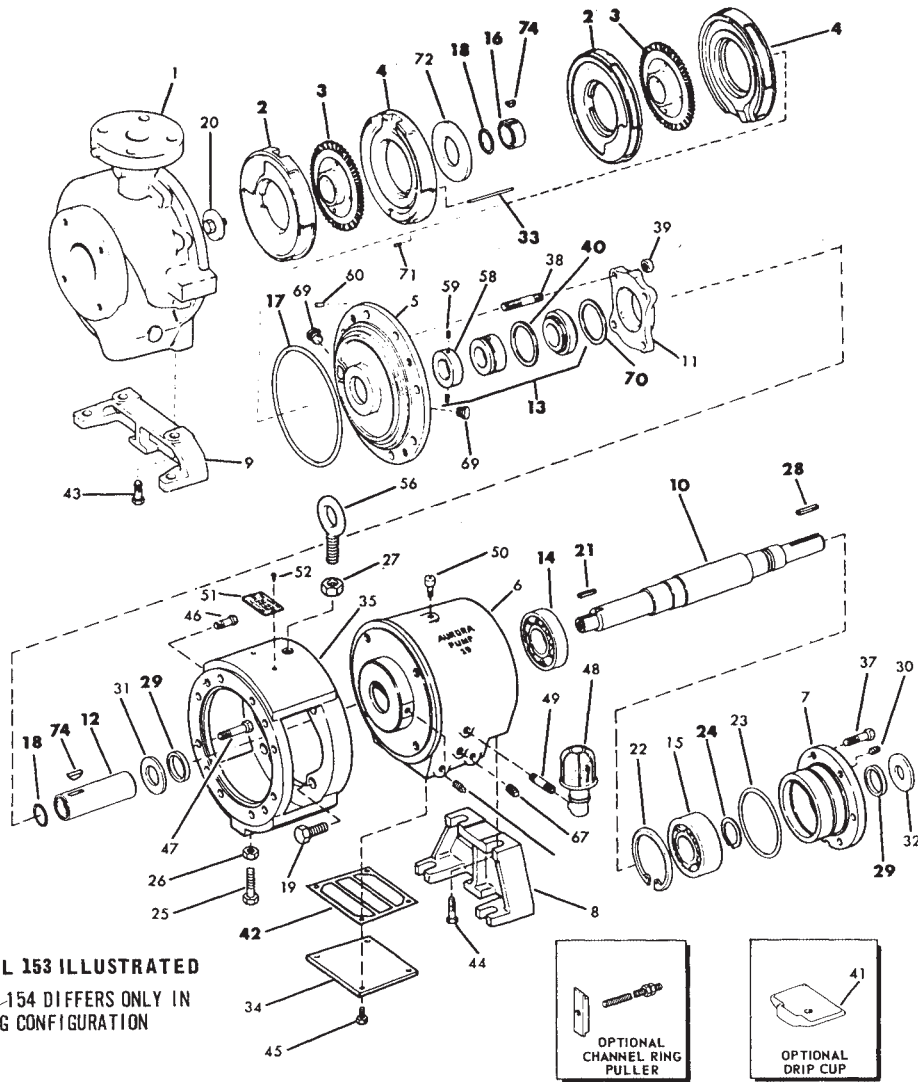


NOTE

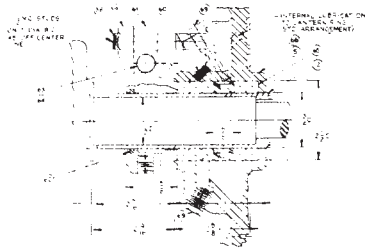
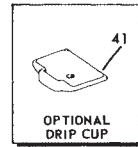
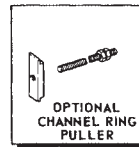
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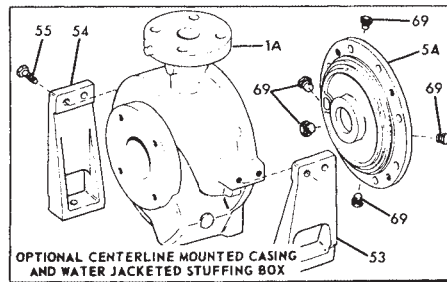
Figure 2. Apco-Chem Model 152 Exploded View



MODEL 153 ILLUSTRATED
MODEL 154 DIFFERS ONLY IN
CASING CONFIGURATION



PACKING BOX
(STANDARD)



OPTIONAL CENTERLINE MOUNTED CASING
AND WATER JACKETED STUFFING BOX

NOTE

WHEN ORDERING SPARE PARTS ALWAYS INCLUDE THE PUMP
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THE EXPLODED VIEW IN THIS MANUAL.

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BRANCH SALES OFFICE OR THE FACTORY AT NORTH AURORA, ILLINOIS.

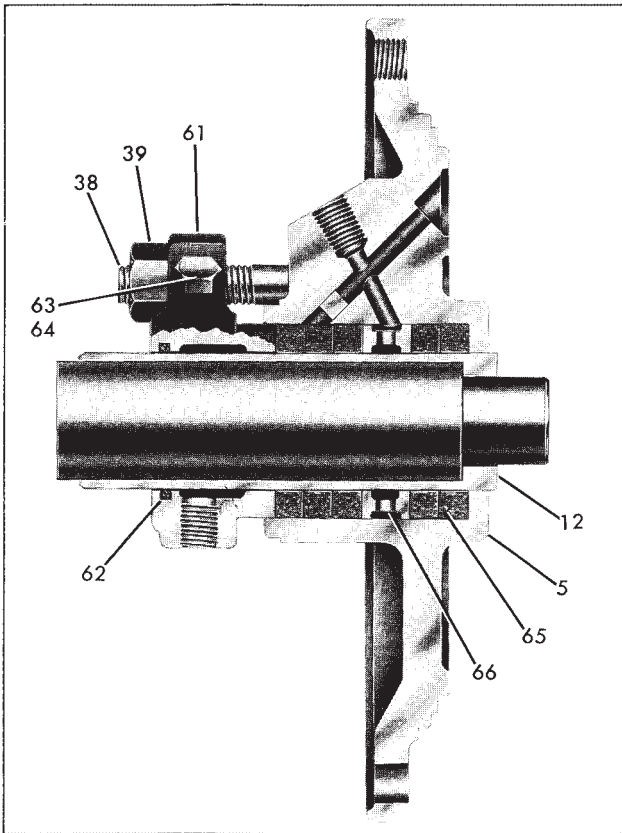


Figure 4. Standard Packing With Lantern Ring

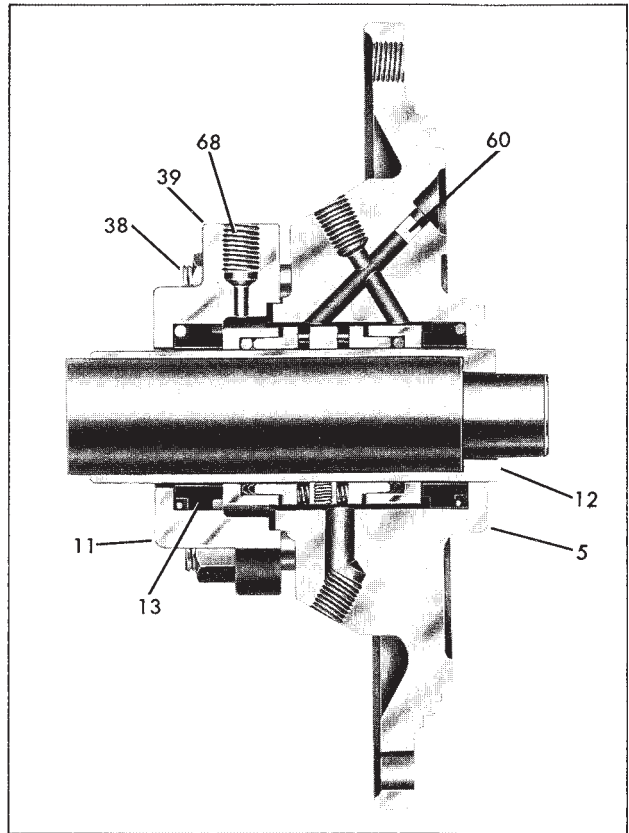


Figure 6. Double Inside-Unbalanced Mechanical Seal

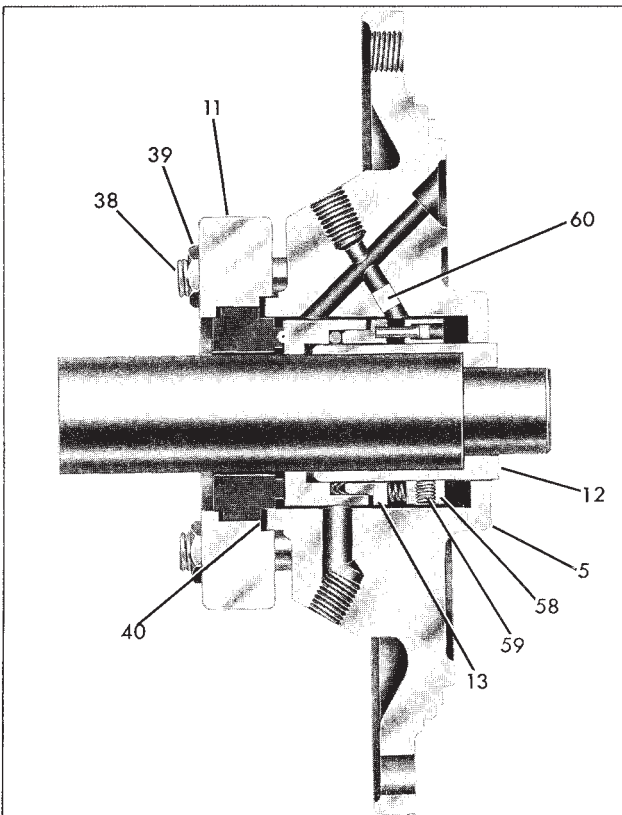


Figure 5. Single Inside-Balanced Mechanical Seal

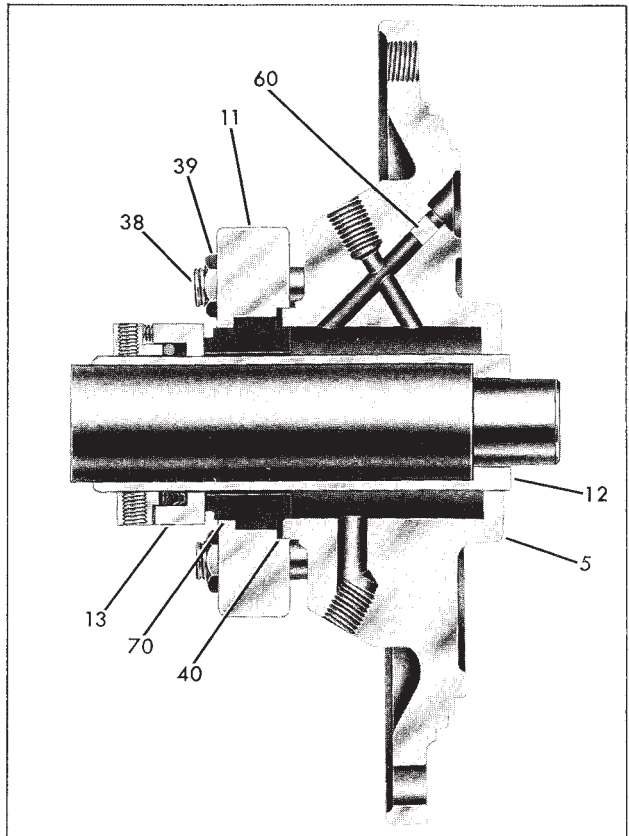


Figure 7. Single Outside-Balanced Mechanical Seal

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WARRANTY

Seller warrants equipment (and its component parts) of its own manufacture against defects in materials and workmanship under normal use and service for one (1) year from the date of installation or start-up, or for eighteen (18) months after the date of shipment, whichever occurs first. Seller does not warrant accessories or components that are not manufactured by Seller; however, to the extent possible, Seller agrees to assign to Buyer its rights under the original manufacturer's warranty, without recourse to Seller. Buyer must give Seller notice in writing of any alleged defect covered by this warranty (together with all identifying details, including the serial number, the type of equipment, and the date of purchase) within thirty (30) days of the discovery of such defect during the warranty period. No claim made more than 30 days after the expiration of the warranty period shall be valid. Guarantees of performance and warranties are based on the use of original equipment manufactured (OEM) replacement parts. Seller assumes no responsibility or liability if alterations, non-authorized design modifications and/or non-OEM replacement parts are incorporated. If requested by Seller, any equipment (or its component parts) must be promptly returned to Seller prior to any attempted repair, or sent to an authorized service station designated by Seller, and Buyer shall prepay all shipping expenses. Seller shall not be liable for any loss or damage to goods in transit, nor will any warranty claim be valid unless the returned goods are received intact and undamaged as a result of shipment. Repaired or replaced material returned to customer will be shipped F.O.B., Seller's factory. Seller will not give Buyer credit for parts or equipment returned to Seller, and will not accept delivery of any such parts or equipment, unless Buyer has obtained Seller's approval in writing. The warranty extends to repaired or replaced parts of Seller's manufacture for ninety (90) days or for the remainder of the original warranty period applicable to the equipment or parts being repaired or replaced, whichever is greater. This warranty applies to the repaired or replaced part and is not extended to the product or any other component of the product being repaired. Repair parts of its own manufacture sold after the original warranty period are warranted for a period of one (1) year from shipment against defects in materials and workmanship under normal use and service. This warranty applies to the replacement part only and is not extended to the product or any other component of the product being repaired. Seller may substitute new equipment or improve part(s) of any equipment judged defective without further liability. All repairs or services performed by Seller, which are not covered by this warranty, will be charged in accordance with Seller's standard prices then in effect.

THIS WARRANTY IS THE SOLE WARRANTY OF SELLER AND SELLER HEREBY EXPRESSLY DISCLAIMS AND BUYER WAIVES ALL OTHER WARRANTIES EXPRESSED, IMPLIED IN LAW OR IMPLIED IN FACT, INCLUDING ANY WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE. Seller's sole obligation under this warranty shall be, at its option, to repair or replace any equipment (or its component parts) which has a defect covered by this warranty, or to refund the purchase price of such equipment or part. Under the terms of this warranty, Seller shall not be liable for (a) consequential, collateral, special or liquidated losses or damages; (b) equipment conditions caused by normal wear and tear, abnormal conditions of use, accident, neglect, or misuse of said equipment; (c) the expense of, and loss or damage caused by, repairs or alterations made by anyone other than the Seller; (d) damage caused by abrasive materials, chemicals, scale deposits, corrosion, lightning, improper voltage, mishandling, or other similar conditions; (e) any loss, damage, or expense relating to or resulting from installation, removal or reinstallation of equipment; (f) any labor costs or charges incurred in repairing or replacing defective equipment or parts, including the cost of reinstalling parts that are repaired or replaced by Seller; (g) any expense of shipment of equipment or repaired or replacement parts; or (h) any other loss, damage or expense of any nature.

The above warranty shall not apply to any equipment which may be separately covered by any alternate or special warranties.

PERFORMANCE: In the absence of Certified Pump Performance Tests, equipment performance is not warranted or guaranteed. Performance curves and other information submitted to Buyer are approximate and no warranty or guarantee shall be deemed to arise as a result of such submittal. All testing shall be done in accordance with Seller's standard policy under Hydraulic Institute procedures.

LIABILITY LIMITATIONS: Under no circumstances shall the Seller have any liability under the Order or otherwise for liquidated damages or for collateral, consequential or special damages or for loss of profits, or for actual losses or for loss of production or progress of construction, regardless of the cause of such damages or losses. In any event, Seller's aggregate total liability under the Order or otherwise shall not exceed the contract price.

ACTS OF GOD: Seller shall in no event be liable for delays in delivery of the equipment or other failures to perform caused by fires, acts of God, strikes, labor difficulties, acts of governmental or military authorities, delays in transportation or procuring materials, or causes of any kind beyond Seller's control.

COMPLIANCE WITH LAW: Seller agrees to comply with all United States laws and regulations applicable to the manufacturing of the subject equipment. Such compliance shall include: The Fair Labor Standards Acts of 1938, as amended; Equal Employment Opportunity clauses of Executive Order 11246, as amended; Occupational Safety and Health Act of 1970 and the standards promulgated thereunder, if applicable. Since compliance with the various Federal, State, and Local laws and regulations concerning occupational health and safety, pollution or local codes are affected by the use, installation and operation of the equipment and other matters over which Seller has no control, Seller assumes no responsibility for compliance with those laws and regulations, whether by way of indemnity, warranty, or otherwise. It is incumbent upon the Buyer to specify equipment which complies with local codes and ordinances.



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