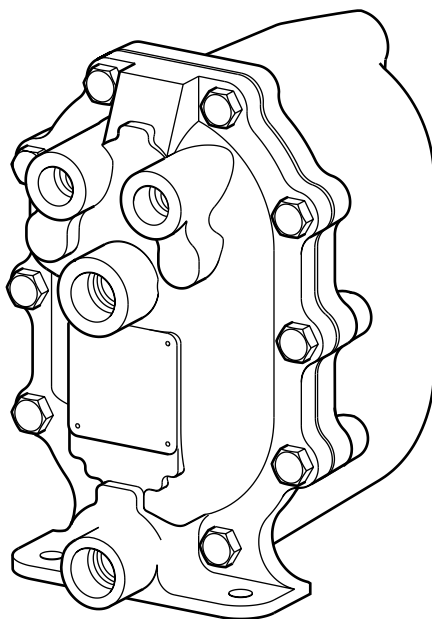


APT10-4.5**Automatic Pump Trap****Installation and Maintenance Instructions**

1. *General safety information*
2. *Product information*
3. *Installation*
 - *Closed loop steam systems only*
4. *Commissioning*
5. *Operation*
6. *Maintenance*
7. *Replacement of spares (1):*
 - *Cover gasket*
 - *Inlet swing check valve*
 - *Spring and actuator arm*
 - *Float*
8. *Replacement of spares (2):*
 - *Trap and outlet check valve mechanism*
 - *Steam inlet / exhaust valves and seats*
9. *Fault finding guide*

DECLARATION OF CONFORMITY

We, Spirax Sarco Ltd
Runnings Road
Cheltenham
Glos
GL51 9NQ
UK

declare under our sole responsibility that the product(s):

APT10-4.5 Automatic Pump Trap

to which this declaration relates is in conformity with the following standard(s) or other normative documents(s):

EN 13463-1
EN 50020
Pr EN 13463-5

following provisions of Directive(s):

94/9/EC ATEX Directive

Cheltenham, UK, 04



M. Gill
Product Director

ATTENTION!

The attention of the specifier, purchaser, installer or user is drawn to special measures and limitations to use which must be observed when the product is taken into service to maintain compliance with the above Directive(s). Details of these special measures and limitations to use are available on request and are also contained in the Installation and Maintenance Instructions.

RDXP313-C001 Issue 1.

1. General safety information

Safe operation of these units can only be guaranteed if they are properly installed, commissioned and maintained by a qualified person in compliance with the operating instructions. All work must be carried out or be supervised by a suitably competent person. Installation and operating personnel should be trained in the correct use of the product according to the Installation and Maintenance Instructions.

Where a formal 'permit to work' system is in force it must be complied with. Where there is no such system, it is recommended that a responsible person should know what work is going on and, where necessary, arrange to have an assistant whose primary responsibility is safety.

Post 'warning notices' if necessary.

General installation and safety instructions for pipeline and plant construction, as well as the proper use of tools and safety equipment must also be complied with.

Isolation

Consider whether closing isolating valves will put any other part of the system or personnel at risk. Dangers might include: isolation of vents, protective devices or alarms. Ensure isolation valves are turned off in a gradual way to avoid system shocks.

Pressure

Before attempting any maintenance consider what is or may have been in the pipeline. Ensure that any pressure is isolated and safely vented to atmospheric pressure before attempting to maintain the product, this is easily achieved by fitting Spirax Sarco depressurisation valves type DV (see separate literature for details). Do not assume that the system is depressurised even when a pressure gauge indicates zero.

Temperature

Allow time for temperature to normalise after isolation to avoid the danger of burns and consider whether protective clothing (including safety glasses) is required.

Disposal

These products are recyclable. No ecological hazard is anticipated with the disposal of these products providing due care is taken.

2. Product information

2.1 Description

The Spirax Sarco automatic pump trap is a displacement receiver pressure rated to PN10. The unit is capable of automatically trapping or pumping, depending on line conditions. The unit is operated by steam and is used to remove condensate from process and heating plant under all pressure conditions including vacuum.

2.2 Sizes and pipe connections

| Size | DN20 x DN20 | |
|----------------------|-----------------------------|----------------|
| Inlet | Fluid connections Outlet | Motive/Exhaust |
| DN20 (¾") | DN20 (¾") | DN15 (½") |
| BSP - BS 21 parallel | | BSP |
| NPT | | NPT |

2.3 Limiting conditions

| | | |
|---------------------------------------------------------|----------------|-----------------|
| Body design conditions | PN10 | |
| Maximum motive inlet pressure | 4.5 bar g | (65 psi g) |
| Maximum operating pressure | 4.5 bar g | (65 psi g) |
| Maximum backpressure | 4.0 bar g | (58 psi g) |
| Maximum operating temperature | 155°C | (311°F) |
| Minimum operating temperature | -10°C | (14°F) |
| Temperature limits (Ambient \otimes) | -10°C to 200°C | (14°F to 392°F) |
| Designed for a maximum cold hydraulic test pressure of: | 15.0 bar g | (217 psi g) |
| Minimum installation head (from base of pump) | 0.2 m | (8") |
| Recommended installation head (from base of pump) | 0.3 m | (12") |

2.4 Technical specification - Nominal capacities

For full capacity details for a specific application consult Spirax Sarco.

To accurately size the pump trap, the following data is required.

1. Installation head available, from the base of the pump trap to the centre line of the heat exchanger/ process condensate outlet (m). If the outlet is mounted vertically, then this should be from the base of the pump to the face of the outlet.
2. Motive steam pressure available to power the pump trap (bar g).
3. Total backpressure in the condensate return system (bar g). See note below.
4. Heat exchanger full load operating pressure (bar g).
5. Heat exchanger maximum steam load (kg/h).
6. Minimum temperature of secondary fluid (°C).
7. Maximum controlled temperature of secondary fluid (°C).

| Size | DN20 x DN20 |
|-------------------------------------------|-------------------------------------------------------------------------|
| Pump discharge/cycle | 2.1 litres |
| 1.0 metre installation head | Maximum trapping capacity 830 kg/h Maximum pumping capacity 650 kg/h |
| At: 4.5 bar g (65 psi g) motive | |
| 2.5 bar g (36.2 psi g) total backpressure | |

Note: Total lift or backpressure BP (static head plus pressure head in the return system) must be below the motive fluid inlet pressure to allow pump capacity to be achieved.

$$BP \text{ (backpressure)} = (H \times 0.0981) + (P) + (Pf)$$

Height (H) in metres x 0.0981 plus pressure (P) bar g in the return line, plus downstream piping friction pressure drop (Pf) in bar.

(Pf can be ignored if the downstream pipework is less than 100 metres to a non-flooded condensate return and has been sized to take into account the effect of flash steam at the heat exchanger's full load operating conditions.)

2.5 How to order

Example: 1 off Automatic pump trap, type APT10-4.5, DN20 x DN20, screwed BSP with BSP motive fluid connections.

2.6 Dimensions / weights (approximate) in mm and kg

| Size | A | B | C | D | E | F | G | H | I | Weight |
|-------------|-----|----|-----|-----|-----|-----|----|-----|-----|--------|
| DN20 x DN20 | 187 | 23 | 223 | 277 | 273 | 220 | 57 | 135 | 171 | 14 |

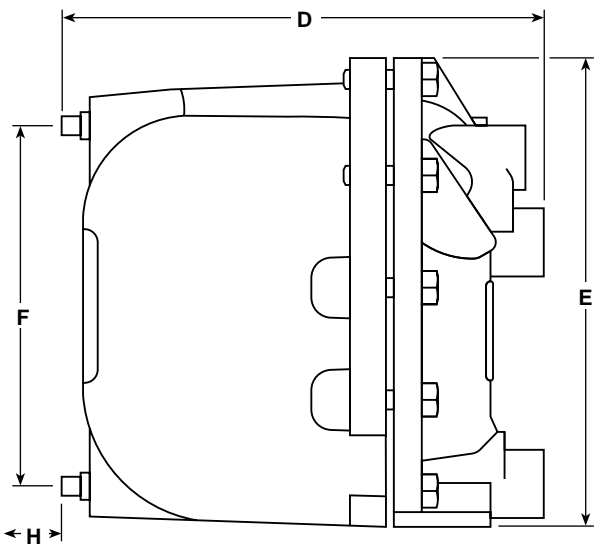


Fig. 1

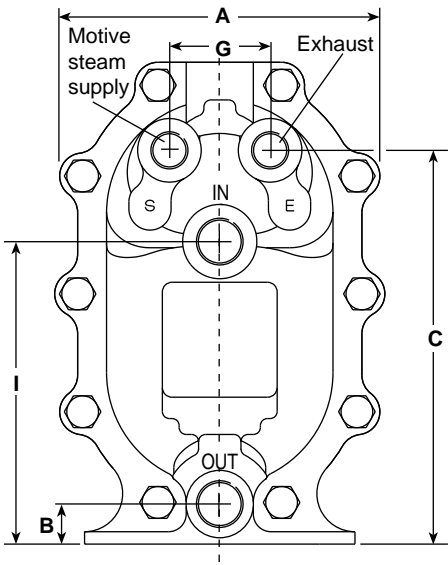


Fig. 2

2.7 Materials

| No. | Part | Material | |
|-----|-------------------------------|------------------------------------------------|--------------------------------|
| 1 | Cover | SG iron | DIN 1693 GGG 40.3 or ASTM A395 |
| 2 | Cover gasket | Graphite laminated with stainless steel insert | |
| 3 | Body | SG iron | DIN 1693 GGG 40.3 or ASTM A395 |
| 4 | Cover bolts | Stainless steel | BS EN ISO 3506 Gr. A2 70 |
| 5 | Pump trap lever | Stainless steel | BS 1449 304 S15 |
| 6 | Float | Stainless steel | BS 1449 304 S16 |
| 7 | Pivot shaft | Stainless steel | BS 970 431 S29 / ASTM A276 431 |
| 8 | Washer | Stainless steel | BS 1449 316 |
| 9 | Trap housing | Stainless steel | BS 970 431 S29 / ASTM A276 431 |
| 10 | Ball | Stainless steel | ASTM A276 440 B |
| 11 | Seat (inlet check valve) | Stainless steel | AISI 420 |
| 12 | Flap (inlet check valve) | Stainless steel | BS 3146 ANC 4B |
| 13 | Pump mechanism bracket | Stainless steel | BS 3146 ANC 4B |
| 14 | Spring (pump) | Stainless steel | BS 2056 302 S26 Gr. 2 |
| 15 | Split pin | Stainless steel | BS 1574 |
| 16 | Exhaust seat | Stainless steel | BS 970 431S29 / ASTM A276 431 |
| 17 | Inlet valve and seat assembly | Stainless steel | |
| 18 | Exhaust valve | Stainless steel | BS 3146 ANC 2 |
| 19 | Valve seat gasket | Stainless steel | BS 1449 409 S19 |
| 20 | Pump mechanism bolt | Stainless steel | BS EN ISO 3506 Gr. A2-70 |
| 21 | Float bolt | Stainless steel | BS EN ISO 3506 Gr. A2-70 |
| 22 | Trap 1st stage valve | Stainless steel | BS 970 431 S29 / ASTM A276 431 |
| 23 | Trap gasket | Stainless steel | BS 1449 409 S19 |
| 24 | Actuator arm | Stainless steel | BS 3146 ANC 2 |
| 25 | Name-plate | Stainless steel | BS 1449 304 S16 |
| 26 | Drain plug | Stainless steel | DIN 17440 1.4571 |

Disposal

There are no hazardous materials used in the construction of this product.
Any unwanted material should be recycled or disposed of in an environmentally friendly manner.

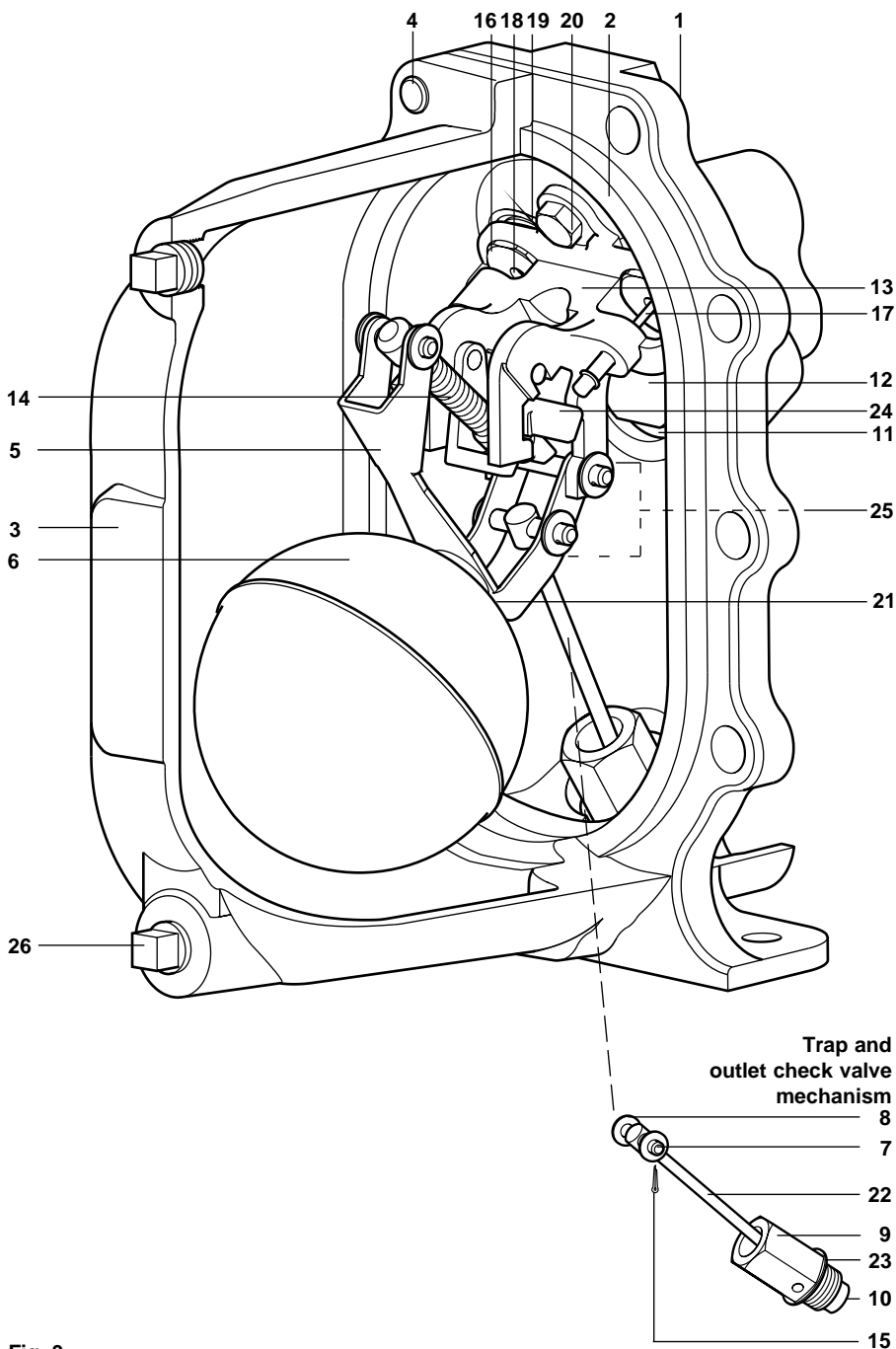


Fig. 3

3. Installation

Important - safety note

Before any installation or maintenance procedure, always ensure that all steam or condensate lines are isolated.

Ensure any residual internal pressure in the product or connecting lines is carefully relieved. Also ensure any hot parts have cooled to prevent risk of injury from burns. Always wear appropriate safety clothing before carrying out any installation or maintenance work. Always use suitable lifting gear and ensure the product is safely secured.

Note: If pumping a potentially explosive media, the motive supply media must be an inert gas with no oxygen present.

3.1 Inlet piping

To prevent condensate backing up into the equipment being drained, it is recommended that the inlet pipework is sufficiently sized to accumulate condensate during the pump's discharge cycle. Generally a length and diameter of pipe to accommodate 2.1 litres of condensate will be sufficient. It is recommended this condensate reservoir is situated at least 1 pipe diameter below the process outlet but as high as possible above the APT10-4.5 inlet. It is essential that a Spirax Sarco Y-type strainer with a maximum 0.8 mm perforation screen size is fitted at the condensate inlet of the APT10-4.5, as shown in Fig. 5.

3.2 Recommended installation head

An installation head of at least 0.3 m (12 ins) from the base of the unit is recommended. Minimum 0.2 m (8 ins) with reduced capacity. **Note:** During cold start-up conditions, it is possible for hydraulic pulsing of the inlet check valve to occur. It is advisable in this case to install a throttling isolation valve to reduce the filling pressure.

3.3 Connections (refer to installation diagram Fig. 4 opposite)

The APT10-4.5 has four connection ports. The DN20 (¾") port marked (IN) should be connected to the outlet of the equipment being drained. The DN20 (¾") port marked (OUT) should be connected to the condensate return line. A flow arrow indicates the correct direction of flow. The DN15 (½") port marked (S) - steam should be connected to a trapped motive steam supply. * **It is important to ensure this line is drained of condensate at all times using a Spirax Sarco steam trap and filtered using a 100 mesh strainer (see Fig. 5).** The screwed DN15 (½") port marked (E) - exhaust should be balanced back as close as possible to the condensate outlet of the equipment. This balance line must always be connected to the top of the condensate pipe; as shown in Fig. 5. **Note:** The APT10-4.5 can be secured to a level stable surface using the 2 x Ø12 mm holes drilled into the base of the cover.

3.4 Outlet piping

It is important for the outlet piping to be correctly sized to prevent excessive backpressure on the APT10-4.5. This pipework should be sized to take into account the effects of flash steam at the heat exchangers full load operating conditions. Refer to TR-GCM-05 for Spirax Sarco's method of sizing this pipe.

4. Commissioning

4.1 After ensuring the inlet and outlet pipe connections and steam motive/exhaust connections are coupled in accordance with Fig.4 and 5, slowly open the motive steam inlet line to supply pressure to the APT10-4.5. Ensure the exhaust /balance line is open and not restricted in any way.

4.2 Slowly open the isolation valves in the condensate inlet and discharge lines, allowing condensate to fill the body of the APT10-4.5.

4.3 The APT10-4.5 is now ready to operate.

4.4 When the process plant is operational, the APT10-4.5 will discharge condensate under all pressure conditions into the return line.

4.4 If any irregularities are observed, recheck the installation according to the recommendations. If the unit fails to operate, then consult the fault finding guide Section 9.

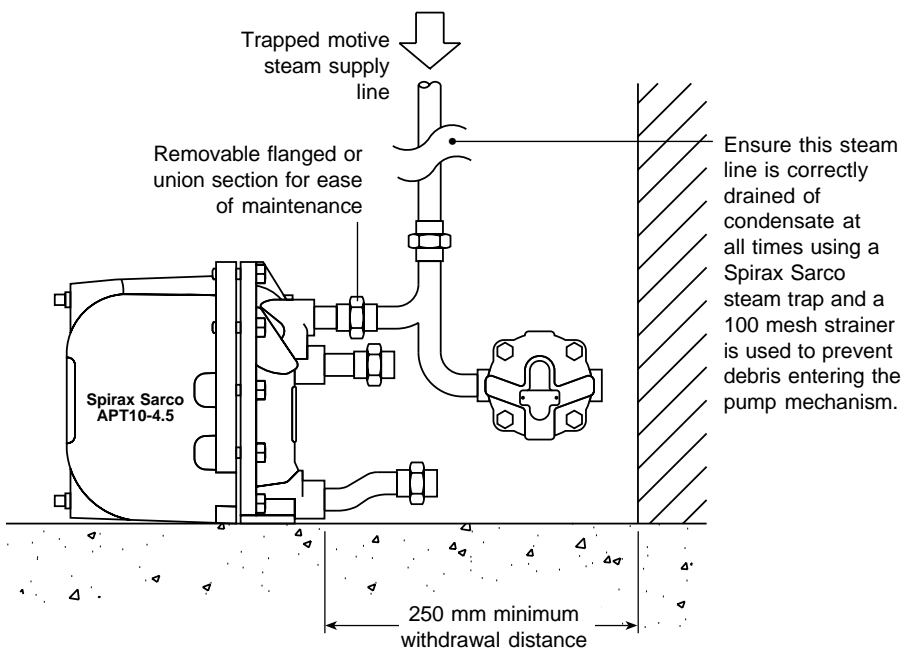


Fig. 4 Suggested coupling of motive supply and exhaust lines

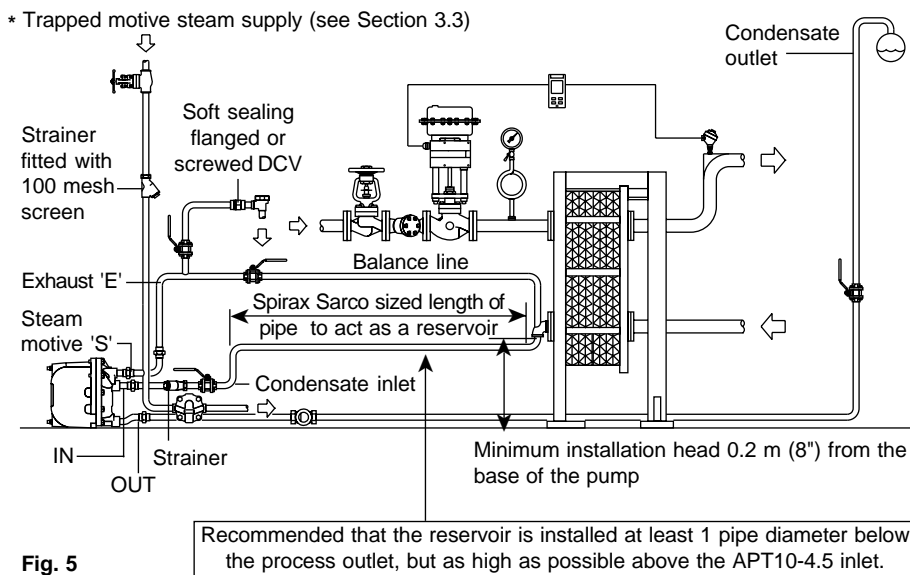


Fig. 5

5. Operation

Larger APT14
shown for illustration

Step 1 (Fig. 6)

The APT10-4.5 automatic pump trap operates on a positive displacement principle. Condensate enters the body through the inlet swing check valve causing the float to rise. The float is connected to the trap mechanism via a lever to pivot arrangement. If the upstream system pressure PS is sufficient to overcome the backpressure PB (Fig. 6), the build up of condensate will be discharged through the opening trap mechanism. In this way, the float will automatically modulate according to the rate of condensate entering the APT10-4.5, controlling the rate of opening and closure of the trap.

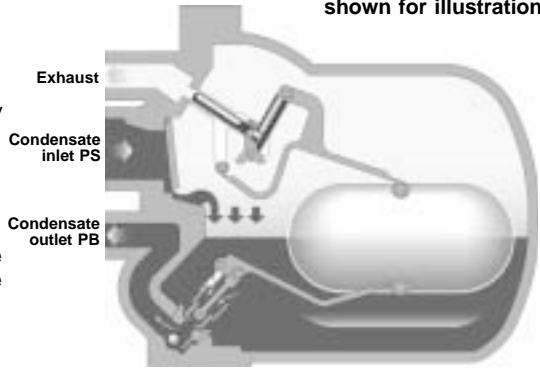


Fig. 6

Step 2 (Fig. 7)

With some temperature controlled equipment, it is possible for the system pressure PS to be lower than the backpressure at PB (Fig. 7). If this occurs a standard trap will stall allowing the condensate to flood the equipment being drained.

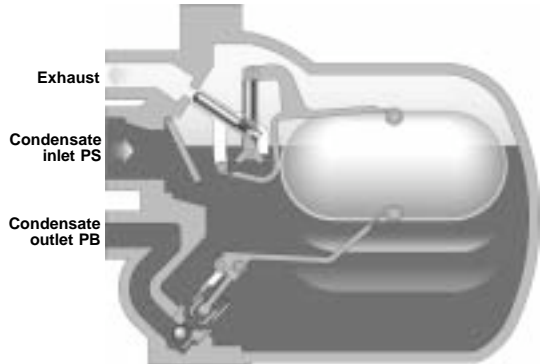


Fig. 7

Step 3 (Fig. 8)

However, with the APT10-4.5, the condensate simply fills the main chamber - lifting the float until the changeover linkage is engaged, opening the motive inlet and closing the exhaust valve.

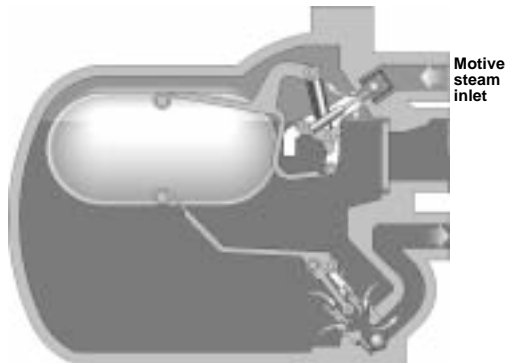


Fig. 8

Step 4 (Fig. 9)

The snap action mechanism ensures a rapid change from the trapping mode to the active pumping mode. With the motive inlet valve open, the pressure in the APT10-4.5 increases above the total backpressure and the condensate is forced out through the trap seat into the plant's return system.

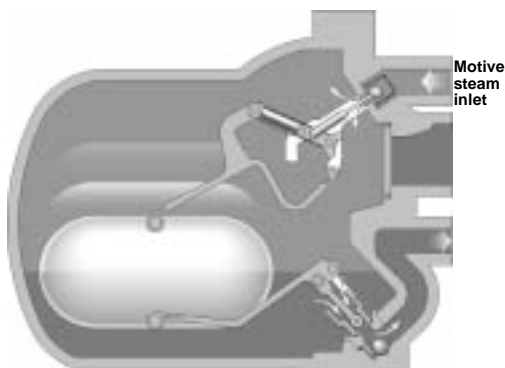


Fig. 9

Step 5 (Fig. 10)

As the condensate level falls within the main chamber, the float re-engages the change over linkage, causing the motive inlet to close and the exhaust valve to open.

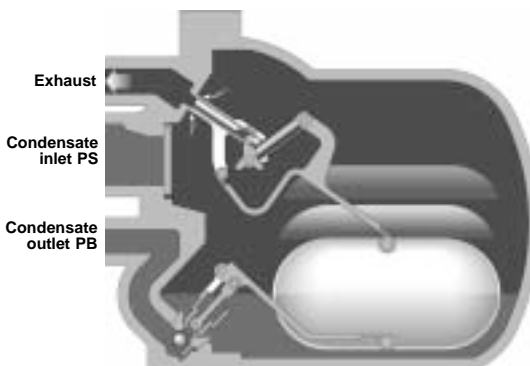


Fig. 10

Step 6 (Fig. 11)

As the pressure inside the APT10-4.5 equalises with the condensate inlet pressure through the open exhaust valve, condensate re-enters via the inlet swing check valve. At the same time the outlet ball check valve ensures no condensate can drain back into the main chamber and the trapping or pumping cycle begins again.

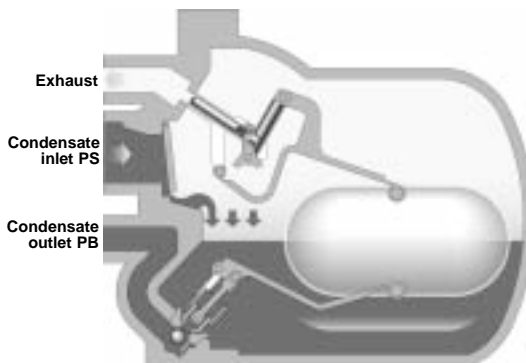


Fig. 11

Return to Step 1.

6. Maintenance

6.1 Mechanisms inspection and repair (Important - safety note)

Before any installation or maintenance procedure, always ensure that all steam or condensate lines are isolated.

Ensure any residual internal pressure in the product or connecting lines is carefully relieved. Also ensure any hot parts have cooled to prevent risk of injury from burns.

Always wear appropriate safety clothing before carrying out any installation or maintenance work.

Always use suitable lifting gear and ensure the product is safely secured.

When dismantling this product, care should be taken to prevent injury from the snap action mechanism. Always handle with care.

6.2 Removal and fitting of cover assembly

Please ensure the safety recommendations are observed before commencing with any maintenance of this product.

Tools required

19 mm A/F socket, Flat blade screw driver, Torque wrench.

6.3 To remove the cover assembly

1. Disconnect all connections to the cover. Remove the cover bolts using a 19 mm A/F socket, then carefully slide the cover assembly away from the body (225 mm (9") minimum withdrawal distance will be needed). Lift the cover assembly to a bench or other convenient working surface and clamp securely, avoiding contact with the gasket face.
2. Visually inspect the mechanism for obvious damage. Check that it is free of dirt and scale and operates freely when the float is moved up and down.
3. Inspect the spring assembly for damage. Make sure the valves slide freely and the spring loaded exhaust valve moves on its guide.
4. Inspect the float to ensure it is undamaged. Check it pivots smoothly on the pump trap lever and it is not waterlogged.
5. Ensure the inlet swing check valve is free to move and the sealing faces of both the seat and the flap are clean and undamaged. (If the seat is badly scored or damaged a new cover assembly may be required).
6. Check the integral trap module to ensure the 1st stage valve is free from dirt and debris. Ensure it slides open and closes smoothly.
7. It is not possible to visually check the outlet check valve without removing the trap module (refer to Section 8 of this manual for correct removal and fitting of this part).
8. If any of the parts appear damaged or fail to work correctly, then refer to Sections 7 and 8 of this manual for correct removal and fitting instructions.

6.4 If a new cover assembly is to be fitted

1. Ensure the gasket face in the body is clean and free from debris. Carefully slide the new cover assembly into the existing body, whilst ensuring the new gasket (item 2) is carefully aligned with the gasket faces and no parts of it are trapped or pinched outside the sealing areas.
2. Refit the cover bolts ensuring they are sequentially tightened in opposing pairs, gradually increasing torque to 63 ± 5 N m (46.5 ± 4 lbf ft).

| Bolt size | Socket size | Tightening torque |
|-----------|-------------|---------------------------------------|
| M12 x 40 | 19 mm A/F | 63 ± 5 N m (46.5 ± 4 lbf ft) |

3. Carefully reconnect the motive steam supply and the exhaust lines to the connections marked (S) and (E), and the condensate inlet and outlet to the connections marked (IN) and (OUT), then follow the start-up procedure in **Section 4 'Commissioning'** to bring the APT10-4.5 back into operation.

6.5 Spare parts

Available spares

| | |
|------------------------------------------------|-------------|
| A Cover gasket | See page 14 |
| B Inlet check valve | See page 14 |
| C Spring and actuator arm | See page 14 |
| D Float | See page 14 |
| E Trap and outlet check valve mechanism | See page 14 |
| F Inlet/exhaust valves and seat kit | See page 14 |

Note:

Refer to Fig. 3 (page 7) for component number details.

For customer convenience, spares are supplied in kits to ensure all the appropriate replacement parts are available.

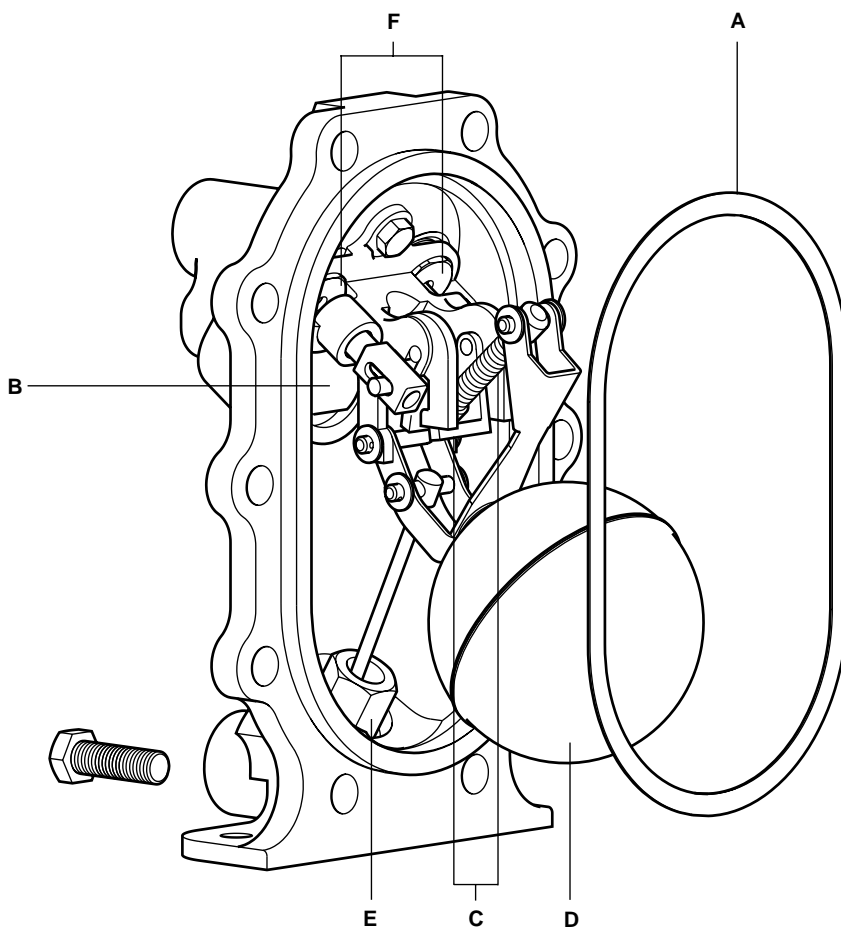


Fig. 12 Cover assembly

6.6 Spare parts

Available spares

| | | |
|----------|---------------------------------------|-------------------------------|
| A | Cover gasket | 2 |
| B | Inlet check valve | 2, 12 |
| C | Spring and actuator arm | 2, 14, 24 |
| D | Floats | 2, 5, 6, 21 |
| E | Trap and outlet check valve mechanism | 2, 7, 8, 9, 10, 22, 23 |
| F | Inlet/exhaust valves and seat kit | 2, 16, 17, 18, 19 |

Note:

Refer to Fig. 3 (page 7) for component number details.

For customer convenience, spares are supplied in kits to ensure all the appropriate replacement parts are available.

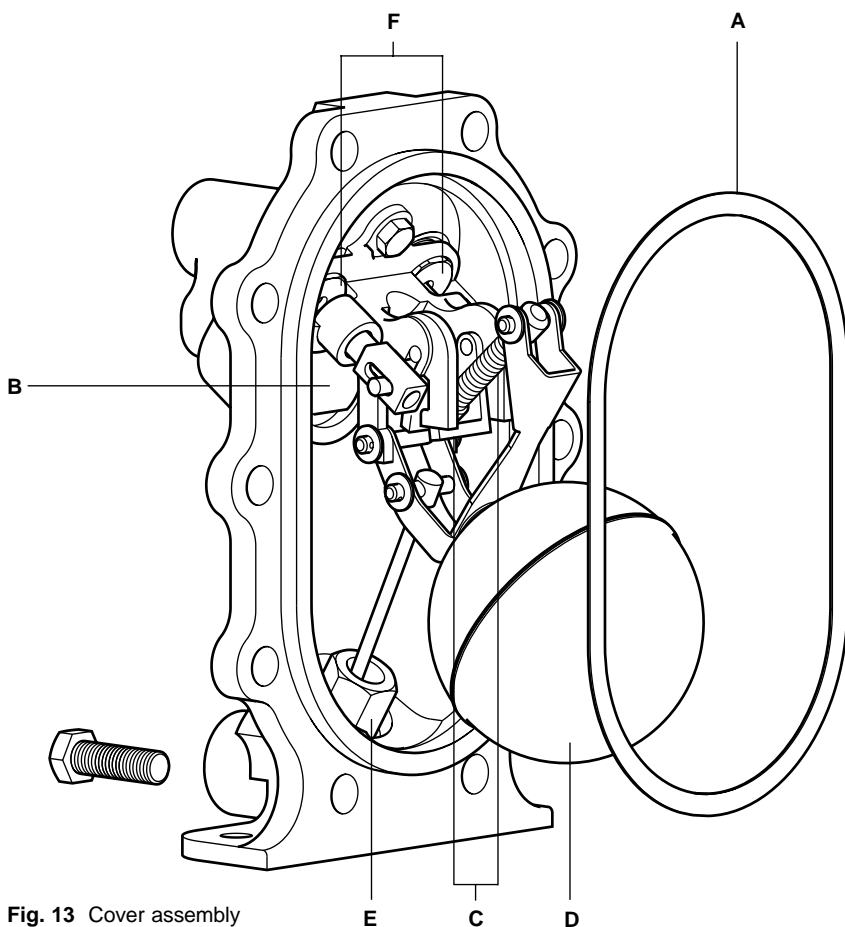
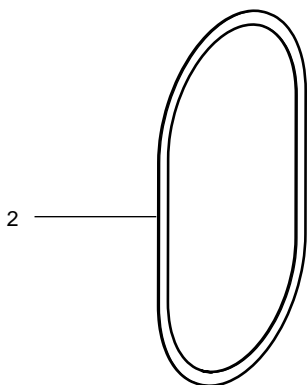
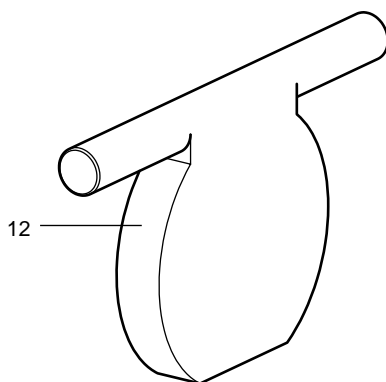


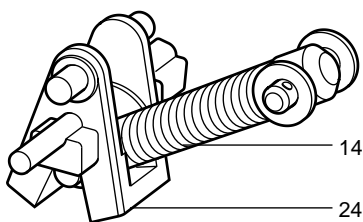
Fig. 13 Cover assembly



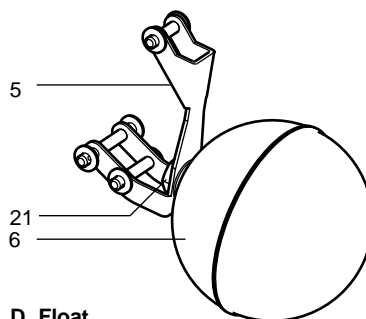
A Cover gasket



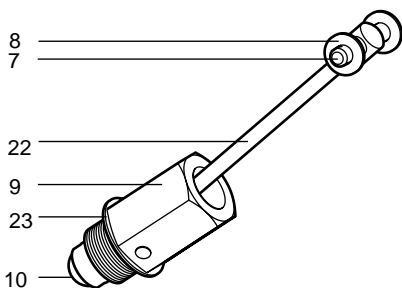
B Inlet check valve



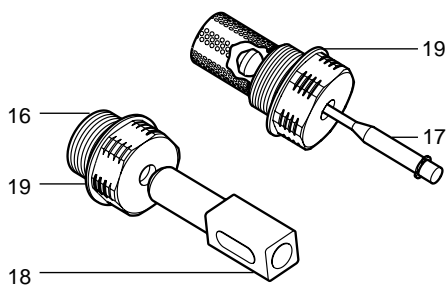
C Spring and actuator arm



D Float



E Trap and outlet check valve mechanism



F Inlet / exhaust valve and seat kit

Fig. 14 A - F Spares kits

7. Replacement of spares (1)

**Section 7. covers the replacement of the following spares:-
cover gasket, inlet swing check valve, spring and actuator arm
and float.**

Important - safety note

Before any installation or maintenance procedure, ensure that all steam or condensate lines are isolated.

Ensure any residual internal pressure in the product or connecting lines is carefully relieved. Also ensure any hot parts have cooled to prevent risk of injury from burns.

Always wear appropriate safety clothing before carrying out any installation or maintenance work.

Always use suitable lifting gear and ensure the product is safely secured.

When dismantling this product, care should be taken to prevent injury from the snap action mechanism.

Always handle with care.

7.1 Replacement of cover gasket

Please ensure the safety recommendations are observed before commencing with any maintenance of this product.

Tools required

19 mm A/F socket, Flat blade screw driver, Torque wrench

To fit the new cover gasket

1. Disconnect all connections to the cover. Remove the cover bolts using a 19 mm A/F socket, then carefully slide the cover assembly away from the body (225 mm (9") minimum withdrawal distance will be needed). Lift the cover assembly to a bench or other convenient working surface and clamp securely, avoiding contact with the gasket face (See Fig. 15).
2. Gently remove used gasket material from the body and cover, being careful not to damage the gasket sealing faces.
3. Carefully fit a new gasket (item 2) into the existing body (See Fig. 16).
4. **Refit the cover assembly to the body**, ensuring the gasket faces are carefully aligned and no parts of the gasket are trapped or pinched outside the sealing areas.
5. Refit the cover bolts ensuring they are sequentially tightened in opposing pairs, gradually increasing torque to $63 \pm 5 \text{ N m}$ ($46.5 \pm 4 \text{ lbf ft}$).

| Bolt size | Socket size | Tightening torque |
|------------------|--------------------|--------------------------------------------------------|
| M12 x 40 | 19 mm A/F | $63 \pm 5 \text{ N m}$ ($46.5 \pm 4 \text{ lbf ft}$) |

6. Carefully reconnect the motive steam supply and the exhaust lines to the connections marked (S) and (E), and the condensate inlet and outlet to the connections marked (IN) and (OUT). The APT10-4.5 is now ready to recommission.

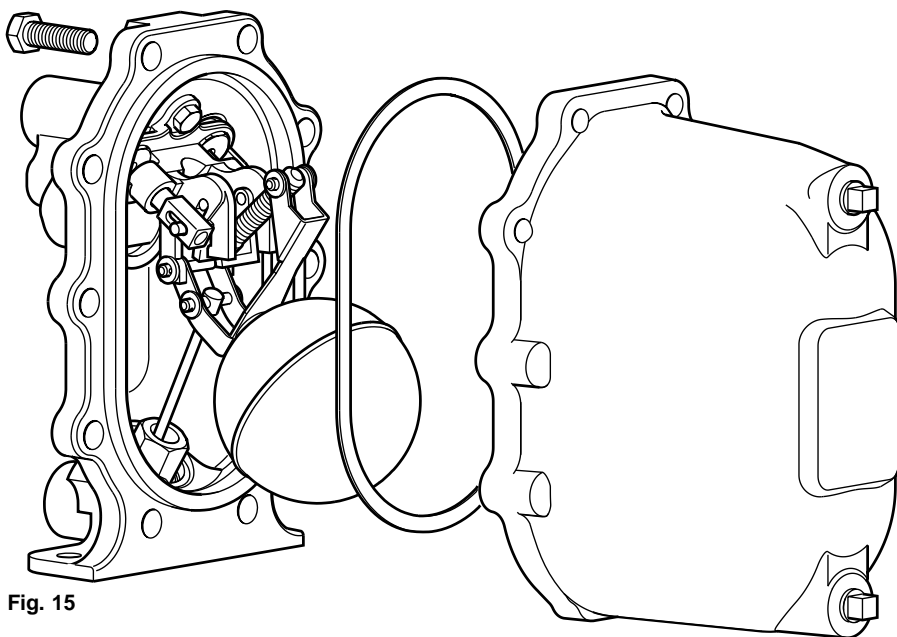


Fig. 15

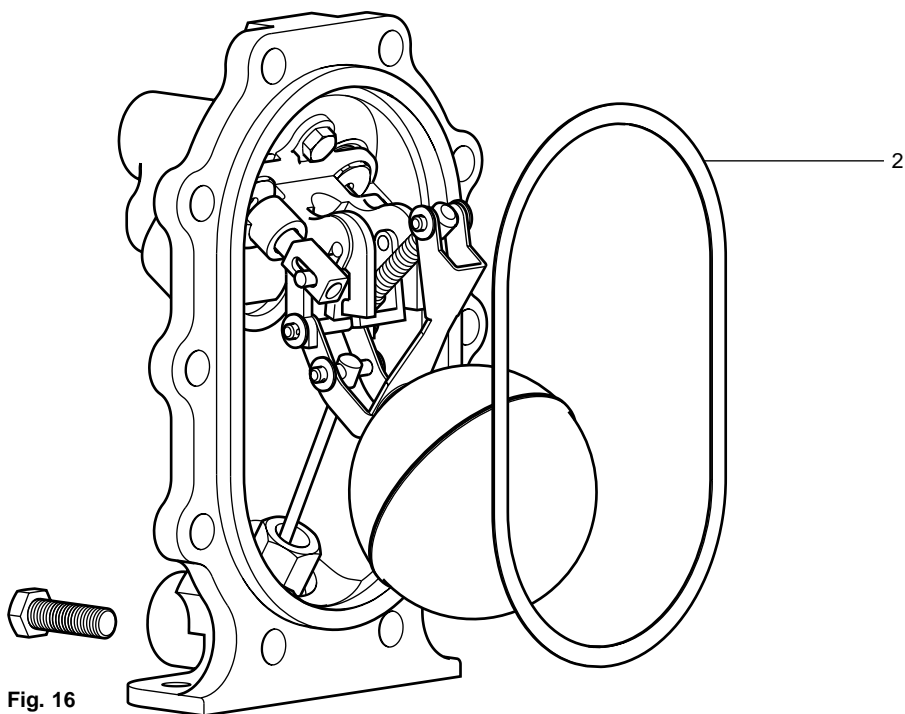


Fig. 16

7.2 Replacement of inlet swing check valve

Please ensure the safety recommendations are observed before commencing with any maintenance of this product.

Tools required

19 mm A/F socket, 13 mm A/F socket, Flat blade screw driver, Torque wrench, Long nose pliers

To replace the inlet swing check valve

1. Remove the cover and old gasket (see cover gasket replacement procedure, Section 7.1).
2. Lift the cover assembly to a bench or other convenient working surface and clamp securely, avoiding contact with the gasket face.
3. Carefully remove the circlip from the end of the steam inlet valve (item 17).
4. Remove the three M8 bolts that secure the pump mechanism bracket using the 13 mm A/F socket.

5. Lift away the pump bracket assembly (See Fig. 17). This will allow access to the inlet swing check valve (item 12).

Note: Do not allow the spring in the pump mechanism to bend back on itself as this may damage the coils and shorten the life of the spring.

6. The swing check valve flap can now easily be withdrawn.
7. Fit a new flap, ensuring the face of the check valve flap and seat are clean and free from damage.

8. Reassembly is the opposite to removal.

9. Tighten the three M8 bolts using the 13 mm A/F socket to 18 ± 2 N m (13 ± 1.5 lbf ft).
10. It is important to ensure a new circlip is refitted to the steam inlet valve.
11. With the mechanism fully assembled, refit the cover assembly to the body, ensuring the gasket faces are carefully aligned and no parts of the gasket are trapped or pinched outside the sealing areas.
12. Refit the cover bolts ensuring they are sequentially tightened in opposing pairs, gradually increasing torque to 63 ± 5 N m (46.5 ± 4 lbf ft).
13. Carefully reconnect the motive steam supply and the exhaust lines to the connections marked (S) and (E), and the condensate inlet and outlet to the connections marked (IN) and (OUT). The APT10-4.5 is now ready to recommission.

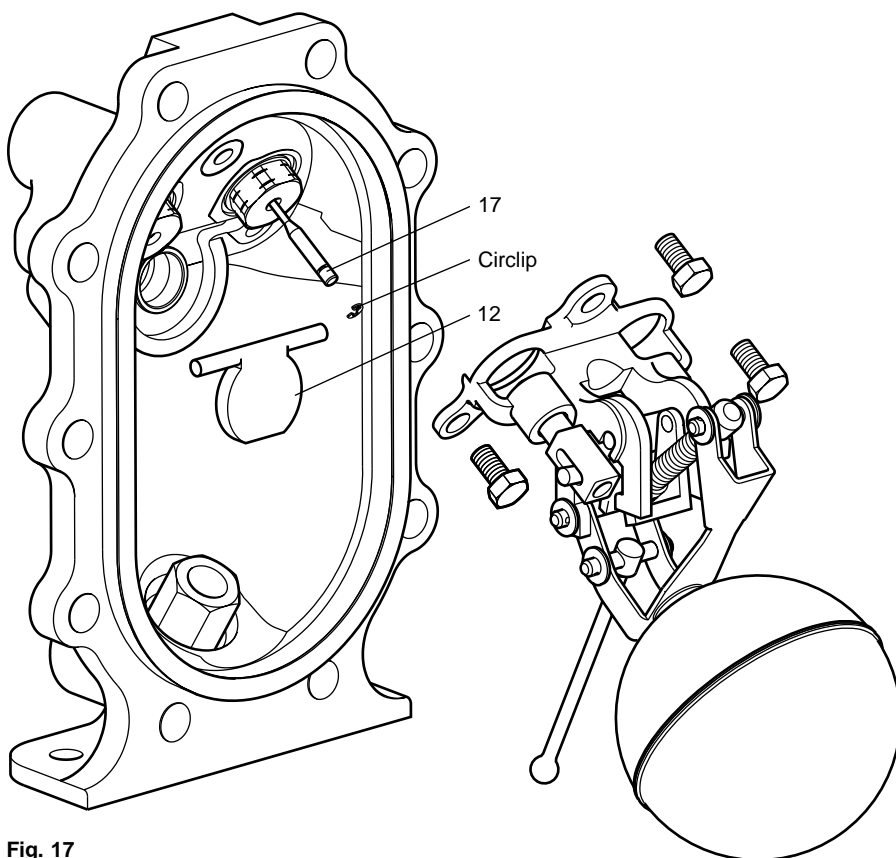


Fig. 17

7.3 Replacement of spring and actuator arm

Please ensure the safety recommendations are observed before commencing with any maintenance of this product.

Tools required

19 mm A/F socket, Flat blade screw driver, Torque wrench, Long nose pliers

To replace the spring and actuator arm

1. Remove the cover and old gasket (see cover gasket replacement procedure, Section 7.1).
2. Lift the cover assembly to a bench or other convenient working surface and clamp securely, avoiding contact with the gasket face.
3. Ensure the float is at the bottom of its travel.
4. Remove the split pin and washer, from the spring retaining shaft (Y). (See Fig. 18).
5. Remove the shaft and allow the spring to drop free.
6. Draw the actuator arm downwards within its slots until the whole spring and actuator arm assembly with the exhaust valve comes free. It may be necessary to slide the exhaust valve (item 18) backwards against its internal spring to free it from the pump bracket guide (item 13).
7. Align the slot in the exhaust valve with the tang of the actuator arm.
8. Gently rotate the exhaust valve away from the tanged spigot of the actuator arm (item 24, shown in Fig. 18) being careful not to damage or lose the small exhaust valve compression spring.
9. The spring and actuator arm can both be replaced.
Note: There is no need to remove the spring from the actuator arm, as both these items are supplied fully assembled in the spares kit (See Fig. 19).
10. **Fitting the new spring and actuator arm is the opposite to removal.** Remember to compress the small spring within the exhaust valve (item 18) before refitting to the tanged spigot of the new actuator arm.
11. Ensure the actuator is correctly aligned and located within the slots of the pump bracket (item 13).
12. Once this is correctly located, ensure the exhaust valve can slide easily within its guides.
13. Always use new split pins and washers when refitting the spring retaining shaft (Y).
14. With the mechanism fully assembled, reposition the cover assembly with the body, ensuring the gasket faces are carefully aligned and no parts of the gasket are trapped or pinched outside the sealing areas.
15. Refit the cover bolts ensuring they are sequentially tightened in opposing pairs, gradually increasing torque to $63 \pm 5 \text{ N m}$ ($46.5 \pm 4 \text{ lbf ft}$).
16. Carefully reconnect the motive steam supply and the exhaust lines to the connections marked (S) and (E) and the condensate inlet and outlet to the connections marked (IN) and (OUT). The APT10-4.5 is now ready to recommission.

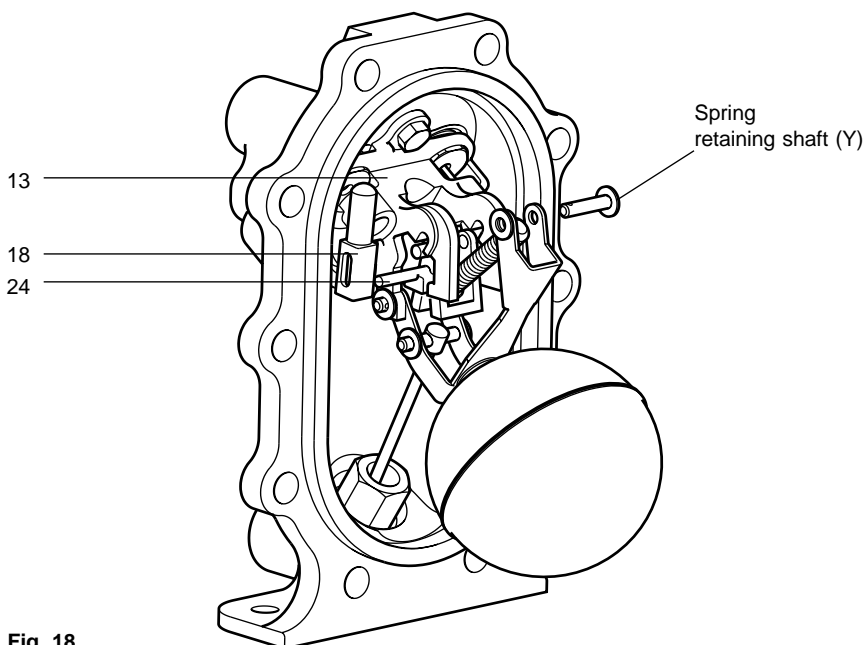


Fig. 18

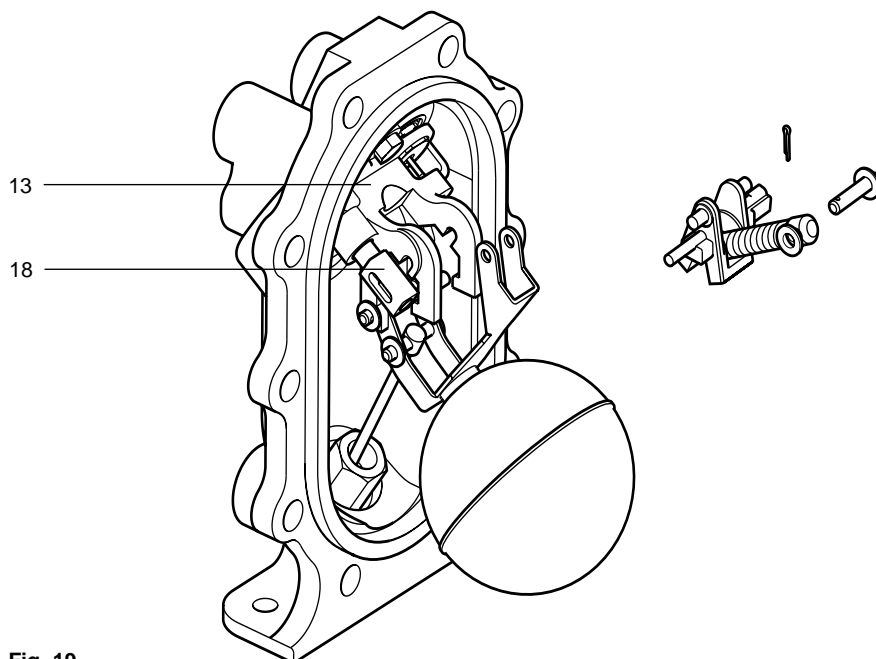


Fig. 19

7.4 Replacement of float

Please ensure the safety recommendations are observed before commencing with any maintenance of this product.

Tools required

19 mm A/F socket, 13 mm A/F socket, Flat blade screw driver, Torque wrench, Long nose pliers

To replace the float and lever

1. Remove the cover and old gasket (see cover gasket replacement procedure, Section 7.1).
2. Lift the cover assembly to a bench or other convenient working surface and clamp securely, avoiding contact with the gasket face.
3. Remove the split pin and washer from one side of the spring retaining shaft (Y) and carefully remove. (See Fig. 20).

Note: It is extremely important this is done first to prevent over stressing the spring during Step 4.

4. Remove the split pin and washer from one side of trap pivot retaining shaft (Z) and carefully remove.
5. Carefully slide the shafts out from their respective positions observing the orientation of the spring and actuator arm (item 14, 24) within the pump bracket (item 13) as these will need to be refitted later.
6. Remove the split pin and washer from one side of pump pivot retaining shaft (X).
7. To remove shaft (X), the whole pump bracket (13) will need to be separated from the cover. This can be done by unscrewing the three M8 retaining bolts, and **removing the circlip from the steam inlet valve** (17). Remove the pump pivot retaining shaft (X).
8. The float and lever assembly can now be removed and discarded as the replacement float and lever is supplied fully assembled in the spares kit.
9. **Assembly is the opposite to removal.** Always fit new split pins and washers.
10. It is easier to fit the replacement shafts in the following sequence:- (See Fig. 21).
 - X. **Pump pivot** (shaft length 52 mm)

Refit pump bracket (13) to cover and tighten the three M8 bolts using the 13 mm A/F socket to 18 ± 2 N m (13 ± 1.5 lbf ft). Refit the new circlip to the steam inlet valve.

Z. Trap pivot (shaft length 40 mm)

Y. Spring retainer (shaft length 30 mm)

leaving the spring retaining shaft until after the spring and actuator arm have been correctly aligned and located within the slot of the pump bracket (item 13).

Ensure the tanged spigot of the actuator arm is correctly engaged with the exhaust valve.

11. When all the shafts have been secured using new split pins and washers, move the float to its upper and lower limit to ensure the mechanism operates smoothly and the spring and actuator arm snaps over to operate the motive steam inlet and exhaust valves (items 17, 18).

Note: The mechanism has been designed to be adjustment-free, simplifying the fitting of new parts. If after assembly the mechanism does not operate correctly, check all the parts are assembled and aligned as per the diagram.

12. With the mechanism fully assembled, refit the cover assembly to the body, ensuring the gasket faces are carefully aligned and no parts of the gasket are trapped or pinched outside the sealing areas.

13. Refit the cover bolts ensuring they are sequentially tightened in opposing pairs, gradually increasing torque to $63 \pm 5 \text{ N m}$ ($46.5 \pm 4 \text{ lbf ft}$).
14. Carefully reconnect the motive steam supply and the exhaust lines to the connections marked (S) and (E) and the condensate inlet and outlet to the connections marked (IN) and (OUT). The APT10-4.5 is now ready to recommission.

Fig. 20

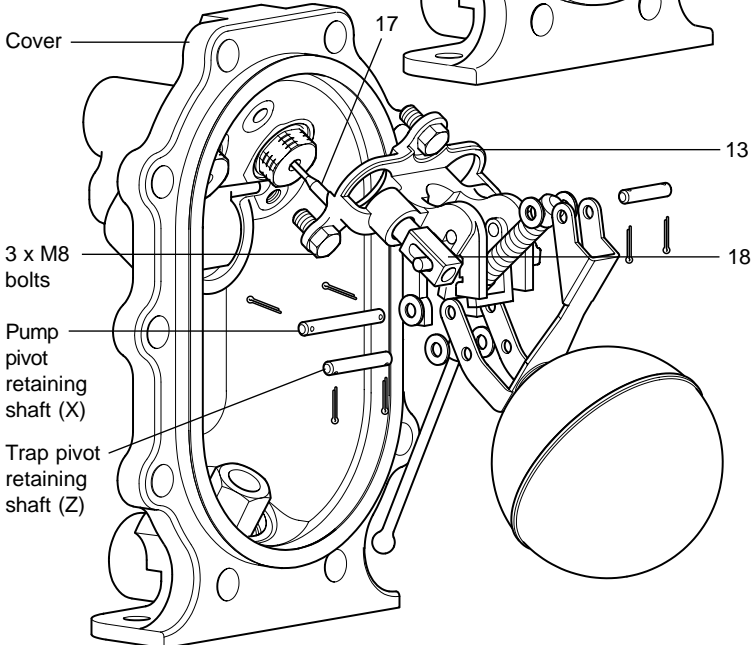
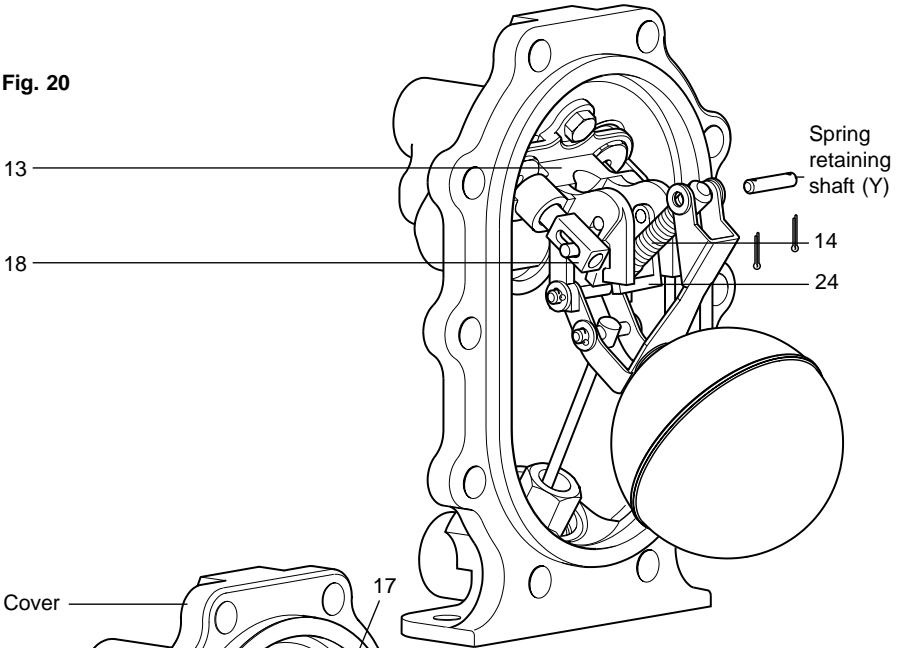


Fig. 21

8. Replacement of spares (2)

**Section 8. covers the replacement of the following spares:-
trap and outlet check valve mechanism
and steam inlet /exhaust valves and seats.**

Important - safety note

Before any installation or maintenance procedure, ensure that all steam or condensate lines are isolated.

Ensure any residual internal pressure in the product or connecting lines is carefully relieved. Also ensure any hot parts have cooled to prevent risk of injury from burns.

Always wear appropriate safety clothing before carrying out any installation or maintenance work.

Always use suitable lifting gear and ensure the product is safely secured.

When dismantling this product, care should be taken to prevent injury from the snap action mechanism.

Always handle with care.

8.1 Replacement of trap and outlet check valve mechanism

Please ensure the safety recommendations are observed before commencing with any maintenance of this product.

Tools required

19 mm A/F socket, 24 mm A/F socket, Flat blade screw driver, Torque wrench, Long nose pliers.

To fit the new trap and outlet check valve mechanism

1. Disconnect all connections to the cover. Remove the cover bolts using a 19 mm A/F socket, then carefully slide the cover assembly away from the body (225 mm (9") minimum withdrawal distance will be needed). Lift the cover assembly to a bench or other convenient working surface and clamp securely, avoiding contact with the gasket face.
2. Gently remove used gasket material from the body and cover being careful not to damage the gasket sealing faces.
3. Carefully fit a new gasket (item 2) into the existing body.
4. Remove split pin, washer and shaft from the trap pivot (Z) (See Fig. 22).
5. Remove trap valve stem (item 22) from the mechanism.
6. The float and lever (items 5, 6) can now be swung up out of the way leaving access to the trap and check valve assembly.
7. Using the 24 mm A/F socket unscrew the trap and check valve housing (item 9).
8. The whole trap and check valve assembly can now be carefully withdrawn from the cover.
9. There are no serviceable parts within this assembly; the replacement spares kit contains all new parts.
10. Before fitting a new mechanism, clean the trap housing bore within the cover ensuring any sludge or scale is carefully removed. Remember to fit a new gasket (item 23).

11. Assembly is the opposite to removal.

12. Tighten the 24 mm A/F trap housing to 125 ± 7 N m (92 ± 5 lbf ft).

13. Refit the trap valve stem and trap pivot shaft (Z) (length 40 mm) remembering to use new split pins and washers - to the trap lever (item 5).

14. Move the float to its upper and lower limits to ensure the trap mechanism operates smoothly and the valve stem (item 22) slides smoothly within its guide.

15. With the mechanism fully assembled, refit the cover assembly to the body, ensuring the gasket faces are carefully aligned and no parts of the gasket are trapped or pinched outside the sealing areas.

16. Refit the cover bolts ensuring they are sequentially tightened in opposing pairs, gradually increasing torque to 63 ± 5 N m (46.5 ± 4 lbf ft).

| Bolt size | Socket size | Tightening torque |
|------------------|--------------------|----------------------------------------|
| M12 x 45 | 19 mm A/F | 63 ± 5 N m (46.5 ± 4 lbf ft). |

17. Carefully reconnect the motive steam supply and the exhaust lines to the connections marked (S) and (E), and the condensate inlet and outlet to the connections marked (IN) and (OUT). The APT10-4.5 is now ready to recommission.

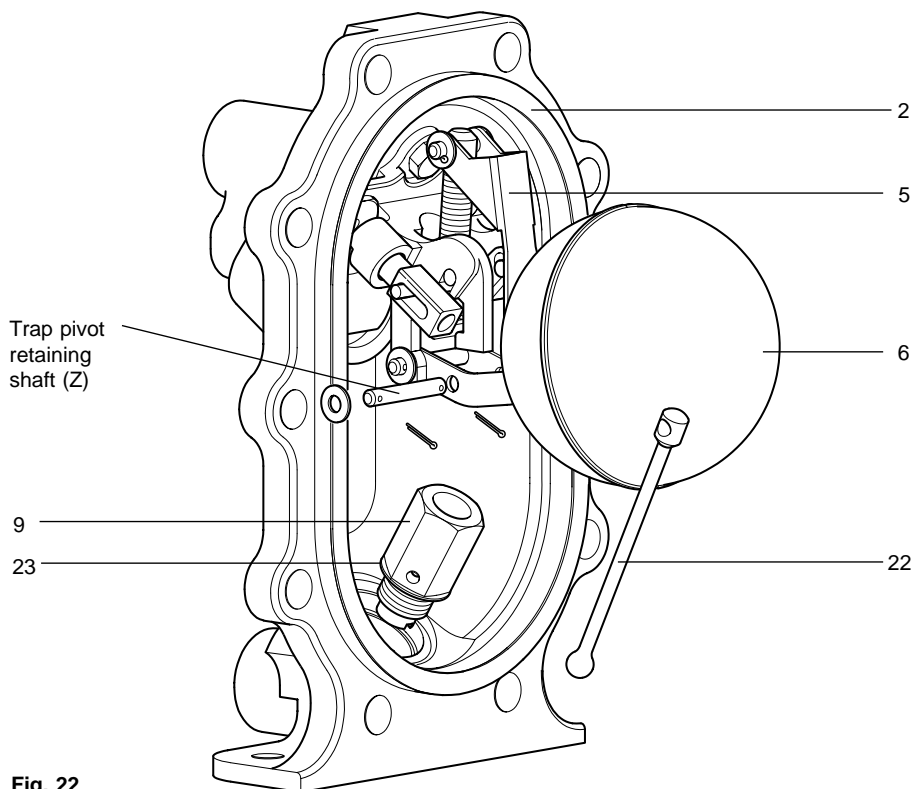


Fig. 22

8.2 Replacement of steam inlet/exhaust valves and seats

Please ensure the safety recommendations are observed before commencing with any maintenance of this product.

Tools required

13 mm, 19 mm A/F sockets, 24 mm Deep series A/F socket, Flat blade screw driver, Torque wrench, Long nose pliers

To replace the steam inlet and exhaust valve and seats

1. Remove the cover and old gasket (see cover gasket replacement procedure Section 7.1).
2. Lift the cover assembly to a bench or other convenient working surface and clamp securely, avoiding contact with the gasket face.
3. Carefully remove the circlip from the end of the steam inlet valve (item 17).
4. Remove the three M8 bolts (items 20) using the 13 mm A/F socket.
5. Lift away the whole pump bracket assembly as this will allow access to the valve seats.
Note: Do not allow the spring in the pump mechanism to bend back on itself as this may damage the coils and shorten the life of the spring.
6. Using the 24 mm socket unscrew both the steam inlet and exhaust seats.
7. The seats, metal gaskets and steam inlet valve can now be removed.
8. Carefully clean the threads and gasket faces within the cover assembly ensuring all residues are removed.
9. Insert the replacement steam valve assembly (item 17) and exhaust valve (item 16) according to Fig. 23.
10. Place a new metal gasket (item 19) onto the threads of the seat before tightening into the cover.
11. Tighten the seat using the 24 mm socket to 125 ± 7 N m (92 ± 5 lbf ft).
12. The exhaust seat can be replaced in a similar way.
13. Refit the whole pump bracket to the cover and tighten the three M8 bolts using the 13 mm A/F socket to 18 ± 2 N m (13 ± 1.5 lbf ft).
14. It is important to ensure a new circlip is fitted to the steam inlet valve after the bracket has been bolted in place.
15. To remove the exhaust valve (item 18), remove split pins, washers, and shaft (Y) from the top spring pivot point. (See Fig. 24).
16. Allow the spring and actuator to drop free.
17. Draw the actuator arm downwards within its slots until the whole spring and actuator arm assembly with the exhaust valve comes free. It may be necessary to slide the exhaust valve backwards against its internal spring to free it from the pump bracket guide (item 13).
18. Align the slot in the exhaust valve (item 18) with the tang of the actuator arm (item 24) (See Fig. 24).
19. Gently rotate the exhaust valve away from the tanged spigot of the actuator arm.
20. **Fitting the replacement exhaust valve is the opposite to removal**, remembering to compress the small spring within the new valve before refitting to the tanged spigot of the actuator arm.

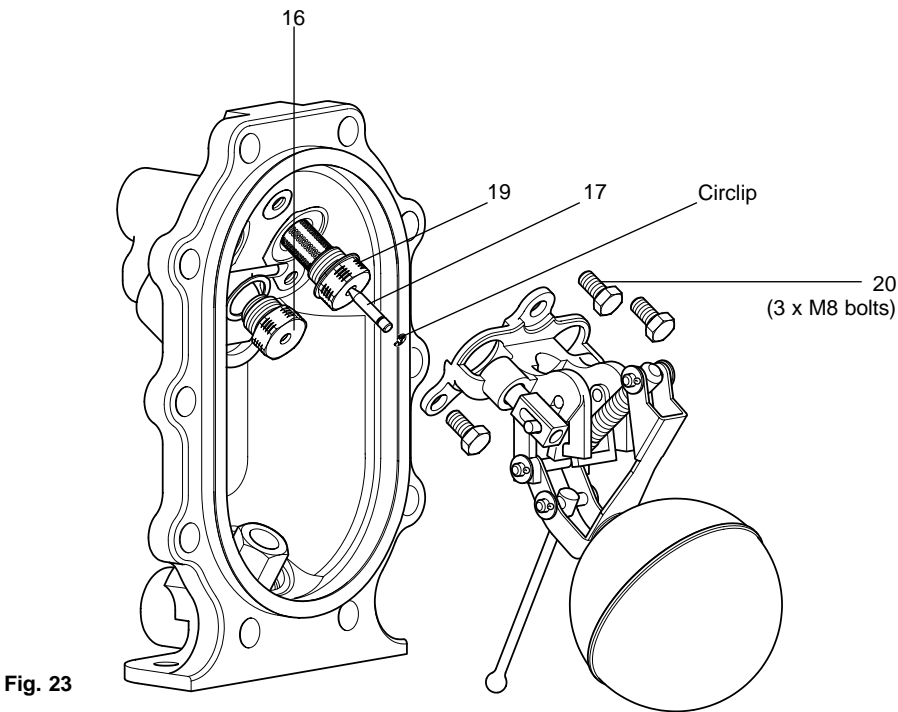


Fig. 23

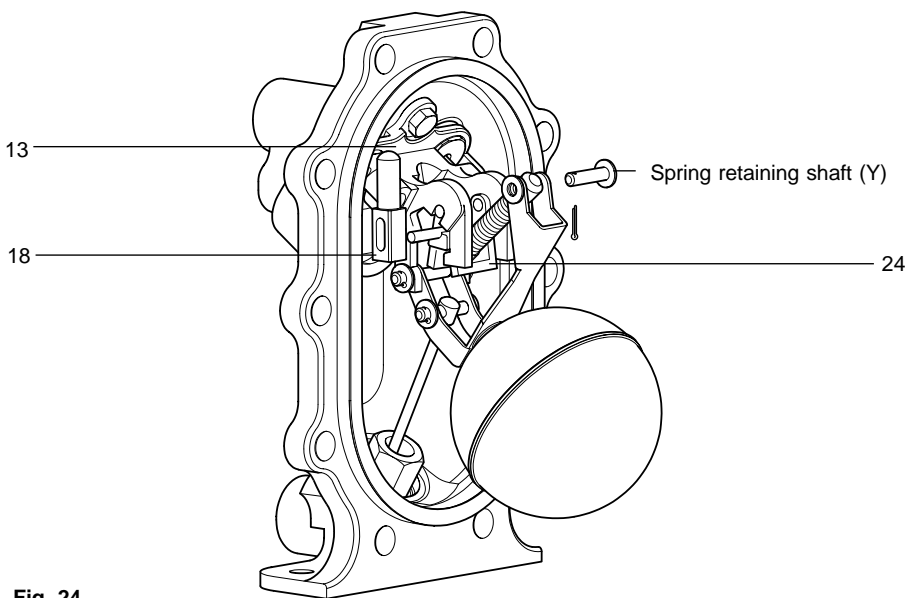


Fig. 24

-
19. Ensure the actuator is correctly aligned and located within the slots of the pump bracket (item 13).
 20. Once this is correctly located, ensure the exhaust valve can slide easily within its guides.
 21. Always use new split pins and washers when refitting the spring retaining shaft (Y) (30 mm long).
 22. Check that the mechanism snaps over and opens and closes the valves by moving the float to its upper and lower limit of travel.
Note: The valve gear has been designed to be adjustment-free, simplifying the fitting of new parts. If after assembly the mechanism does not operate correctly, check all the parts are assembled and aligned as per Fig. 25.
 23. With the mechanism fully assembled, refit the cover assembly to the body, ensuring the gasket faces are carefully aligned and no parts of the gasket are trapped or pinched outside the sealing areas.
 24. Refit the cover bolts ensuring they are sequentially tightened in opposing pairs, gradually increasing torque to $63 \pm 5 \text{ N m}$ ($46.5 \pm 4 \text{ lbf ft}$).
 25. Carefully reconnect the motive steam supply and the exhaust lines to the connections marked (S) and (E) and the condensate inlet and outlet to the connections marked (IN) and (OUT). The APT10-4.5 is now ready to recommission.

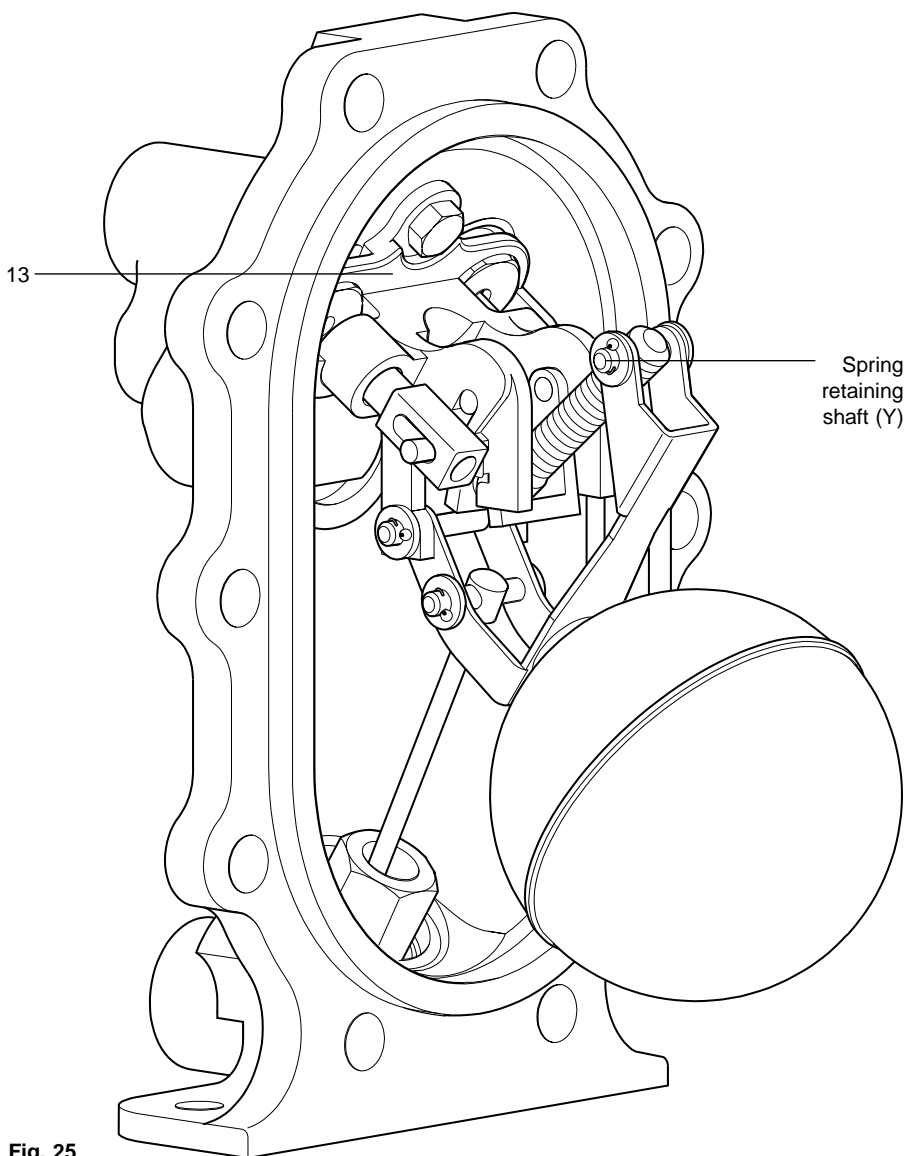


Fig. 25

9. Fault finding guide

Caution

Installation and trouble shooting should only be performed by qualified personnel. Before any maintenance is attempted, ensure any residual internal pressure in the product or connecting lines is carefully relieved. Also ensure any hot parts have cooled to prevent risk of injury from burns. Always wear appropriate safety clothing before carrying out any installation or maintenance work.

Always use suitable lifting gear and ensure the product is safely secured. When dismantling this product, care should be taken to prevent injury from the snap action mechanism. Always handle with care.

The APT10-4.5 has been thoroughly tested before it leaves the factory. This includes a comprehensive functional test. If the unit has failed to operate it is likely that an installation problem could exist. Please check the following before commencing with the trouble-shooting chart.

9.1 Trouble areas to check first:-

- Are all isolating valves open?
- Is the condensate inlet strainer (as recommended in Fig. 5 page 9) clean and free from debris?
- Does the installation head available exceed 0.2 m (8") from the base of the pump?
- Is the available motive pressure higher than the total backpressure (not exceeding 4.5 bar g (65 psi g))
- Is the exhaust balance line (E) connected to the outlet of the equipment being drained and is it free from obstruction (refer to installation diagram Fig. 5, page 9)?
- Is the direction of flow through the unit correct, indicated by the flow arrow?

9.2 Quick reference trouble-shooting guide

| SYMPTOM | APT10-4.5 fails to operate on start-up |
|-----------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| CAUSE 1 | No motive pressure. |
| CHECK and CURE | Motive supply pressure exceeds total backpressure. |
| CAUSE 2 | Inlet isolation valve maybe closed. |
| CHECK and CURE | Inlet pipe is free from obstructions and the isolation valve is open. |
| CAUSE 3 | Motive inlet and exhaust lines incorrectly connected. |
| CHECK and CURE | Motive = S, Exhaust = E. |
| CAUSE 4 | The rate of condensate produced by the process maybe very low, causing the APT to cycle slowly. |
| CHECK and CURE | The process being drained is operating correctly. |
| SYMPTOM | Equipment flooded - but APT10-4.5 appears to cycle normally |
| CAUSE 1 | The APT10-4.5 is undersized for the application. |
| CHECK and CURE | Check system parameters agree with the custom sizing sheet / graph. |
| SYMPTOM | Equipment flooded and APT10-4.5 has stopped cycling |
| CAUSE 1 | Blocked exhaust line. |
| CHECK and CURE | Balance line is free from obstruction and is not waterlogged. Refer to installation diagram Fig. 5 page 9. |
| CAUSE 2 | Blocked condensate inlet line. |
| CHECK and CURE | Inspect and clean the strainer mesh, check for blockages. |
| CAUSE 3 | Blocked condensate outlet line. |
| CHECK and CURE | Inspect line for blockages. |
| CAUSE 4 | Damaged mechanism. |
| CHECK and CURE | Mechanism operates as per Section 6. Replace malfunctioning part. |
| CAUSE 5 | No motive steam available. |
| CHECK and CURE | Steam supply to APT10-4.5 is available and at the correct pressure. Motive pressure must exceed total backpressure. |
| CAUSE 6 | Leaking motive inlet valve. |
| CHECK and CURE | If APT10-4.5 body is hot (observe safety note), this indicates the APT10's mechanism is stuck on the discharge cycle. Check mechanism for excessive friction as per Section 6. Check motive inlet valve - replace malfunctioning part as per Section 8. |
| CAUSE 7 | Broken spring. |
| CHECK and CURE | If APT10-4.5 body is cold, this indicates the APT10's mechanism is stuck on the filling cycle. Check pump mechanism spring - replace malfunctioning part as per Section 7. |
| CAUSE 8 | Blocked condensate inlet line. |
| CHECK and CURE | Inspect and clean the filter, check for blockages. |
| SYMPTOM | Chattering or banging of the APT10-4.5 during cold start-up |
| CAUSE 1 | Hydraulic pulsing of the inlet check valve. |
| CHECK and CURE | Reduce installation head to APT - install throttling valve on APT10-4.5 condensate inlet. |
| SYMPTOM | Chattering or banging in the return line after APT10-4.5 discharges |
| CAUSE 1 | Live steam entering discharge line. |
| CHECK and CURE | Ensure steam traps draining the motive supply line are discharging to a non-flooded condensate return. Condensate return is adequately sized according to TR-GCM-05. |

