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AIR PURGING APPARATUS FOR PUMPS

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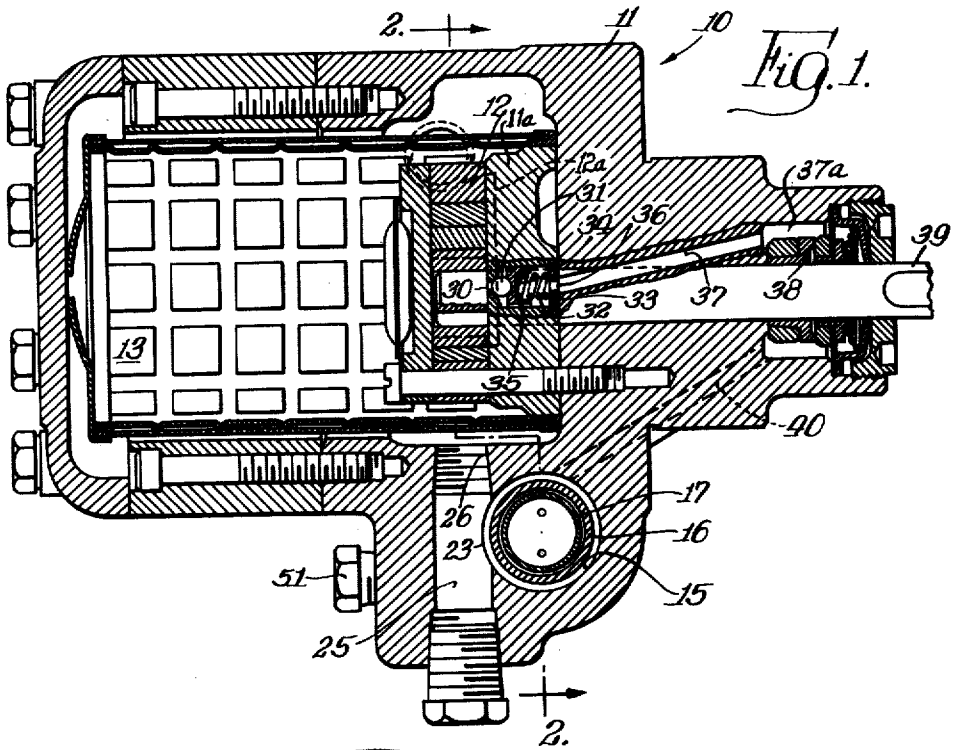


Fig. 1.

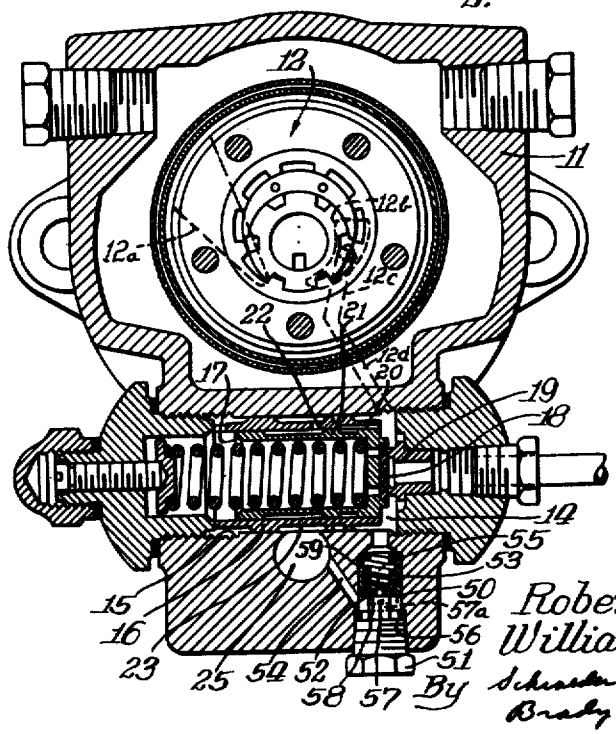


Fig. 2.

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AIR PURGING APPARATUS FOR PUMPS

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6 Claims. (Cl. 103—203)

This application relates to a liquid pumping system, and more particularly, to apparatus for purging air from an oil burner pump.

It is the general object of the present invention to produce a new and improved air purging apparatus for pumps.

It is a more specific object of the present invention to provide an air purging means for oil burner pumps, which is operable effectively to purge air entrapped in the oil burner system.

A feature of the present invention is the provision of a by-pass passage interconnecting the high pressure discharge of an oil burner pump with the intake of the pump, and to provide in said passage a by-pass valve effective to close the passage when the pump is pumping air (thereby permitting the air to be expelled from the system), and in which the by-pass valve may be moved to a position opening the passage after air has been purged from the system.

In our copending application, Serial Number 508,394 filed May 16, 1955, we disclosed and claimed an air purging system for oil pumps wherein the purging means is positioned on the downstream or low pressure side of the pressure regulating valve which controls the pump burner port. Such location of the air purging is necessary to the apparatus disclosed in said copending application because of the provision in the pressure regulating valve of constantly open bleed slots interconnecting the high pressure discharge of the pump with the low pressure return so as to permit rapid closing of the valve. Because of this, air purging cannot be effected with the pressure regulating valve shown in said copending application by simply removing the plug for the gauge port as the effect of such removal would be to draw air into the system via the bleed slots of the valve rather than expel air from the system.

According to the present invention, however, no bleed slots are provided in the pressure regulating valve, and thus no leakage path is provided through such valve, when it is in closed position. Because of the absence of such leakage path, purging may be accomplished simply by removing the plug for the gauge port.

As pointed out in our copending application, however, the bleed slots provided in the pressure regulating valve there shown perform an important function, in that the valve may move rapidly to closed position upon shutdown of the pump. A similar advantage is achieved with the present invention, inasmuch as bleed slots or bleed passages are provided in the pump between the high pressure discharge and the pump return, although such bleed passages are provided elsewhere than in the pressure regulating valve.

The foregoing objects and advantages will be readily apparent from the following description and drawings, in which:

Fig. 1 is a vertical sectional view through an oil burner pump embodying the present invention, and

Fig. 2 is a transverse sectional view taken generally

at the location of the line 2—2 of Fig. 1 and showing a slightly modified form of the invention.

While this invention is susceptible of embodiments in many different forms, there is shown in the drawings and will herein be described in detail several embodiments, with the understanding that the present disclosure is to be considered as an exemplification of the principles of the invention and is not intended to limit the invention to the embodiments illustrated. The scope of the invention will be pointed out in the appended claims.

While as previously noted, Figs. 1 and 2 of the drawing show modified forms of the present invention, both forms are embodied in an oil burner pump, and thus parts which are common to both figures (and function in identical manners) will be given similar reference numerals. Thus, there is shown a pump **10** having a casing **11** enclosing a crescent type gear pump **12**, whose intake **12***a* opens as through end plate **11***a* to a reservoir **13** and whose high pressure outlet **12***b* in plate **11***a* communicates with a passage **12***c* in plate **11***a*, in turn connecting with a passage **12***d* in casing **11**, which opens to a valve chamber **14** at one end of a bore **15** formed in casing **11**. A sleeve **16** is press fitted into the bore **15** and reciprocably carries a piston **17**, having a valving portion **18** at one end controlling a discharge port **19** which communicates with the burner of the oil furnace. The sleeve **16** is provided with a plurality of slots **20** opening at one end to the valve chamber **14** and at the other end to the outer face of the piston valve **17**. The piston valve is provided with an annular ring **21** controlling a plurality of openings, such as the one shown at **22**, which communicate through the sleeve and with an annular groove **23** formed on the exterior surface of the sleeve.

As pressure accumulates in the valve chamber **14** the pressure responsive valve piston is moved to the left (as seen in Fig. 2) againt the bias of its spring until the ring **21** uncovers the opening **22**, thereby establishing communication between the valve chamber **14** and the return groove **23**. The groove **23** opens into a return chamber **25** which communicates via a port **26** with the reservoir **13**.

As previously pointed out, the pressure regulating valve just described is provided with no bleed slots or openings which provide or establish a constant communication between the valve chamber **14** and the return groove **23**. Such bleed slots, however, are not omitted from the pump structure shown, but are included as a part of a by-pass system hereinafter to be described.

Referring to the embodiment of the invention illustrated in Fig. 1, there is provided air purging means comprising a port **30** exposed to the high pressure discharge of the pump **12**, which port is adapted to be opened and closed by a ball valve **31** urged to the position shown (closing port **30**) by a spring **32**. The spring has one end bearing against a disk **33** secured in the casing, and at its other end bears against an open-ended cylindrical member **34**. The member **34** is provided along its exterior surface with a plurality of bleed slots **35** and the disk **33** is provided with a bleed opening **36**.

On pump start-up, the spring **32** holds the ball **31** in a position closing the port **30**. In this position, no bleed slots are provided in the system, and air may be purged simply by removing the plug **50** from the gauge port normally provided in the casing (and hereinafter described). When the pump **12** begins to pump oil rather than air, the gauge port plug is replaced and then the increased pressure developed by the pump, acting against a portion of the ball **31**, serves to unseat the ball and thus permit a bleed connection between the high pressure discharge of the pump, slots **35** and opening **36**, into a by-pass passage **37** which connects at one end

with a space 37*a* in the casing enclosing the seal 38 for the pump shaft 39, which space in the casing is connected by a second passage 40 with the annular return groove 23.

In the embodiment of the invention shown in Fig. 2, the air purging means comprises a by-pass valve located in the gauge port. As previously noted, the pump of the present invention is provided with a gauge port 50 closed at its outer end by an exterior gauge plug 51. The gauge plug may be solid or it may carry a suitable pressure gauge. Located within the gauge port is a by-pass valve 52 having cylindrical side walls 53 controlling the end of a by-pass passage 54 opening into the gauge port. The passage 54 communicates at its other end with the return chamber 25. A spring 55 bears at one end against the pump casing and at its other end against the by-pass valve 52 to urge the same against a snap ring 56 located in the gauge port, and thus urges the valve 52 to move to a position wherein the side walls 53 close the by-pass passage 54.

In the modification of Fig. 2, the gauge plug 51 is provided at its inner end with a stem 57 of reduced diameter adapted to contact the valve 52 and move the same to the position shown in the drawings (opening the by-pass passage 54) when the gauge plug is fully positioned in the casing. The end of the stem 57 which contacts the valve is slotted as at 57*a* to permit leakage of oil through an opening 59 provided in the base 58 of the by-pass valve.

In operation, when it is desired to purge air from the pump in Fig. 2, the gauge plug 51 is removed. When this occurs, the spring 55 moves the by-pass valve 52 downwardly (as seen in Fig. 2) to a position closing off the by-pass passage 54. When this condition obtains and the pump is started, air in the system will be driven out the gauge port through the opening 59 and the opening left by removal of the plug 51. When air has been purged from the system as evidenced by the appearance of oil, the gauge plug may be replaced and in replacing the plug, its stem will contact the by-pass valve to move the same to a position uncovering or opening the by-pass passage 54 and the small hole 59 in the by-pass valve provides a bleed connection between the valve chamber 14 and the return chamber 25.

From the foregoing, it will be seen that the air purging means of the present invention provides a system whereby purging can be accomplished on the upstream or high pressure side of the pressure regulating valve and the air expelled out of the gauge port normally provided on oil burner pumps. This arrangement is possible, according to the present invention, while retaining in the pump the advantages of bleed connections between the high pressure and low pressure side of the pump, with such bleed connections permitting the pressure regulating valve to close rapidly. It will be readily apparant to those skilled in the art that the air purging apparatus of the present invention will be readily adaptable for use in a one-line oil burner system of the type described in said copending application.

We claim:

1. In an oil burner pump having a casing, a pump in the casing having a low pressure intake and a high pressure discharge, a burner port in the casing, a passage in the casing connecting the high pressure discharge and the burner port, and a pressure responsive valve in the passage adapted to establish communication between the high pressure discharge and the burner port upon the build-up of a predetermined discharge pressure, air purging means comprising a purge port in the casing for connecting said first recited passage and the pump discharge to atmosphere, a closure plug removably positionable in the purge port, a bleed passage in the casing in parallel with said pressure responsive valve for establishing communication between the high pressure discharge and said intake, a bleed valve controlling said bleed passage, and means engaging and yieldably biasing the bleed valve to a first position closing said bleed passage when the closure plug is removed from the purge port, said bleed valve having a portion exposed to said high pressure discharge to be moved thereby to a second position opening the bleed passage when the closure plug is positioned to close the purge port, said closure plug being removable on pump startup to permit purging of air to atmosphere with said bleed valve closed, and said bleed valve opening on positioning the closure plug in the purge port to permit rapid closure of the pressure responsive valve on pump shutdown.

2. In an oil burner pump having a casing, a pump in the casing having a low pressure intake and a high pressure discharge, a gauge port in the casing constantly exposed to said high pressure discharge, a burner port in the casing, a passage in the casing connecting the high pressure discharge and the burner port, and a pressure responsive valve in the passage adapted to establish communication between the high pressure discharge and the burner port upon the build-up of a predetermined discharge pressure, air purging means comprising a by-pass passage in the casing in parallel with the pressure responsive valve communicating at one end with said intake and opening at its other end to said gauge port, a by-pass valve in the gauge port and movable to control said opening, means biasing the by-pass valve to move to a first position closing said opening to close the by-pass passage, and a gauge plug threadedly received in the casing gauge port and having a portion engageable with the by-pass valve to move it to a second position opening the by-pass passage.

3. In an oil burner pump having a casing, a pump in the casing having a low pressure intake and a high pressure discharge, a gauge port in the casing constantly exposed to said high pressure discharge, a burner port in the casing, a passage in the casing connecting the high pressure discharge and the burner port, and a pressure responsive valve in the passage adapted to establish communication between the high pressure discharge and the burner port upon the build-up of a predetermined discharge pressure, air purging means comprising a by-pass passage in the casing in parallel with the pressure responsive valve communicating at one end with said intake and opening at its other end to said gauge port, a by-pass valve in the gauge port and movable to control said opening, means biasing the by-pass valve to move to a first position closing said opening to close the by-pass passage, a gauge plug threadedly received in the casing and having a portion engageable with the by-pass valve to move it to a second position opening the by-pass passage, and a bleed opening extending through the by-pass valve to provide restricted communication between the gauge port and the by-pass passage when said by-pass valve is in said second position.

4. In an oil burner pump having a casing, a pump in the casing having a low pressure intake and a high pressure discharge, a burner port in the casing, a passage in the casing connecting the high pressure discharge and the burner port, and a pressure responsive valve in the passage adapted to establish communication between the high pressure discharge and the burner port upon the build-up of a predetermined discharge pressure, air purging apparatus including means in the casing providing a bleed passage in parallel with the pressure responsive valve and communicating at one end with the high pressure discharge of the pump and communicating at its other end with the low pressure intake, valve means in the bleed passage movable to one position for closing said bleed passage and movable to a second position for opening the bleed passage, a purge port for connecting the first recited passage and the high pressure discharge to atmosphere, a closure plug removably positionable in the purge port, means engaging and yieldably biasing the bleed valve means to closed position when the purge

port closure plug is removed, and means for opening the bleed valve means in response to placement of the closure plug to close the purge port.

5. In an oil burner pumping mechanism having a casing, a pump in the casing having a low pressure intake and a high pressure discharge, a burner port in the casing, a passage in the casing connecting the high pressure discharge and the burner port, and pressure responsive valve means in the passage adapted to establish communication between the high pressure discharge and the burner port upon the build up of a predetermined discharge pressure and adapted to establish communication between the high pressure discharge and the low pressure intake upon the build up of a predetermined higher discharge pressure, air purging apparatus comprising a bleed passage in parallel with the pressure responsive valve means and communicating at one end with the high pressure discharge of the pump and communicating at its other end with the low pressure intake, a valve member in said bleed passage movable to a first position for opening the bleed passage to establish communication between the high pressure discharge and the low pressure intake and movable to a second position for blocking the bleed passage, a purge port for connecting the first recited passage and the high pressure discharge to atmosphere when said valve member is in the second, closed position, a closure plug removably mounted in the purge port for closing the same, means engaging and yieldably biasing said valve member to closed position to block communication between the high pressure discharge and the low pressure intake through said bleed passage when the closure plug is removed from the purge port to purge air from the pump and means responsive to placement of the closure plug in purge port closing position for moving said valve member to open position.

6. In an oil burner pumping mechanism having a casing, a pump in the casing having a low pressure intake and a high pressure discharge, a burner port in the casing, a passage in the casing connecting the high pressure discharge and the burner port, and a pressure responsive

valve means in said passage adapted to establish communication between the high pressure discharge and the burner port upon the build up of a predetermined discharge pressure and to also establish communication between the high pressure discharge and the low pressure intake upon the build up of a higher predetermined discharge pressure, air purging means comprising a by-pass passage in the casing connected in parallel with said pressure responsive valve means and connecting the high pressure discharge and the low pressure intake, a by-pass valve member controlling said by-pass passage, said by-pass valve member having a portion exposed to said high pressure discharge to be moved thereby to a position opening the by-pass passage, bleed means in said by-pass passage forming a restricted opening for bleeding oil through said passage only when the by-pass valve member is in open position, a purge port in the casing for connecting said first recited passage and said high pressure discharge to atmosphere, a closure plug removably threaded in the purge port for closing the port, and means engaging and yieldably biasing the by-pass valve member to a position closing said by-pass passage when the closure plug is removed from the purge port to purge air from the pump.

References Cited in the file of this patent

UNITED STATES PATENTS

2,071,800	Mock	Feb. 23, 1937
2,123,950	Lattner	July 19, 1938
2,149,969	Lattner	Mar. 7, 1939
2,159,720	Wahlmark	May 23, 1939
2,229,231	Weyenberg	Jan. 21, 1941
2,262,617	L'Orange	Nov. 11, 1941
2,346,398	Rohr et al.	Apr. 11, 1944
2,442,361	Hulman	June 1, 1948
2,635,620	Deardorff	Apr. 21, 1953
2,657,632	Kiefer	Nov. 3, 1953
2,763,336	Erickson	Sept. 18, 1956

Disclaimer

2,931,314.—*Robert W. Erikson* and *William Ray Kiefer*, Rockford, Ill. AIR PURGING APPARATUS FOR PUMPS. Patent dated Apr. 5 1960. Disclaimer filed June 5, 1968, by the assignee, *Sundstrand Corporation.*

Hereby enters this disclaimer to claims 4 and 5 of said patent.

[*Official Gazette November 19, 1968.*]