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Woods et al.

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[54] **PUMP FILTERS**

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[52] **U.S. Cl.** **210/136**, 210/416

[51] **Int. Cl.** **B01d 35/02**

[58] **Field of Search** 210/136, 416, 311, 445, 210/448, 452, 453; 137/527.8, 550

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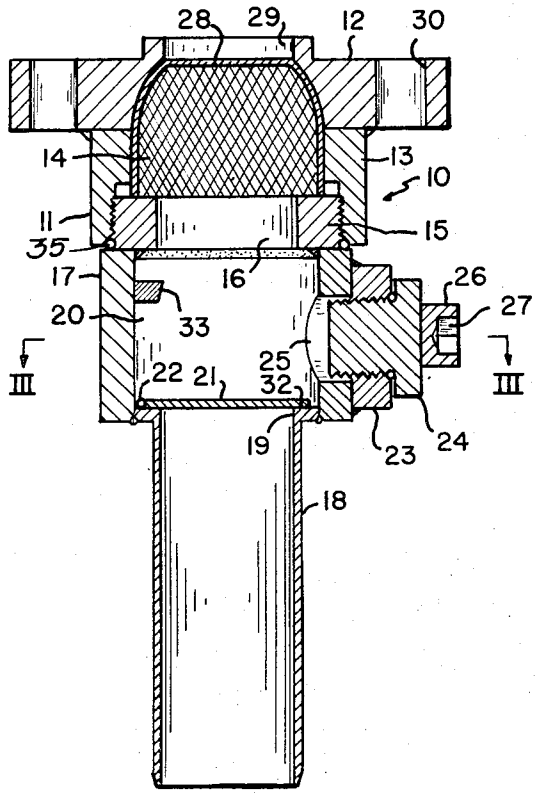
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[57] **ABSTRACT**

A pump filter comprises a housing having two independent chambers in communication with each other. The chambers are vertically spaced with the upper chamber being further defined by a mounting plate and the lower chamber communicating with a suction tube. A filter screen is positioned in the upper chamber and the lower chamber includes a swing valve which opens and closes the mouth of the suction tube. A removable plug communicates with the second chamber to permit access thereto.

5 Claims, 5 Drawing Figures



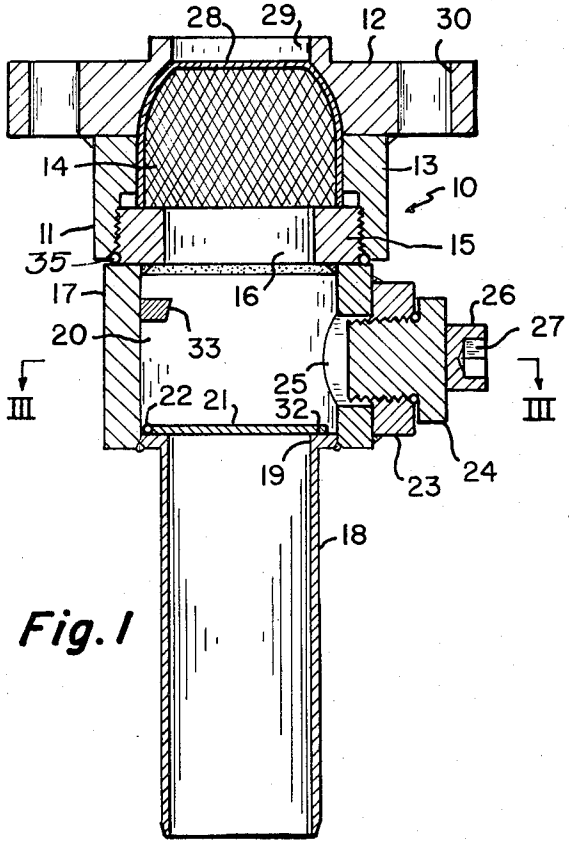


Fig. 1

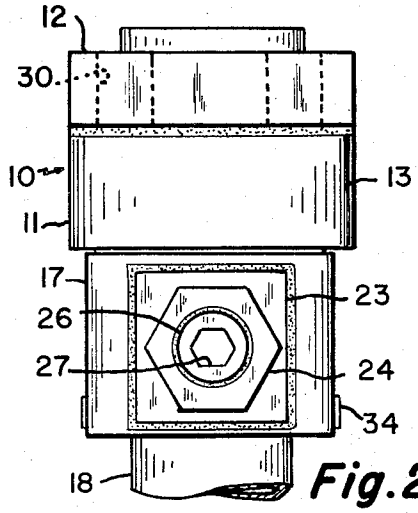


Fig. 2

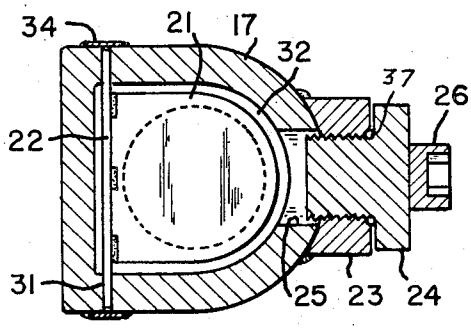


Fig. 3

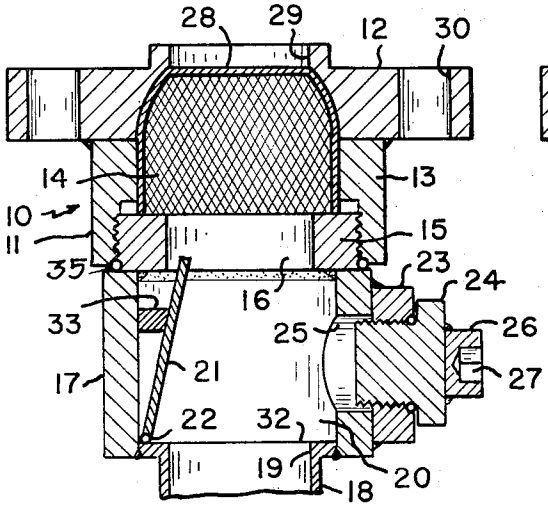


Fig. 4

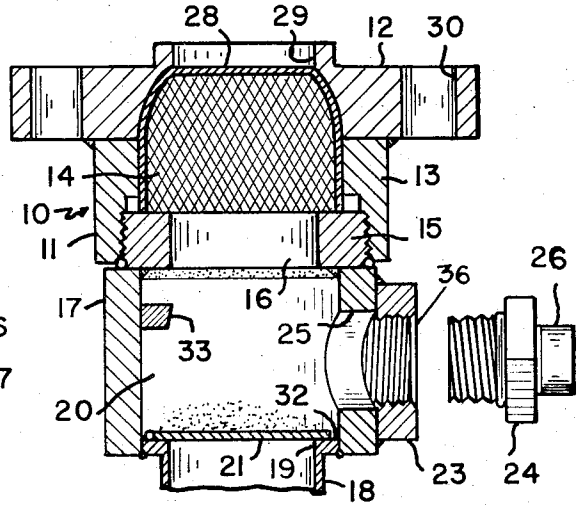


Fig. 5

PUMP FILTERS

This invention relates to pump filters and, more particularly, to pump filters positioned between a pump and a oil reservoir of the type found on heavy industrial equipment such as miners.

Large pieces of industrial equipment such as miners normally have a single pump and an oil reservoir to supply the various hydraulic components of the equipment. These oil reservoirs are continually being contaminated by the environment surrounding the equipment. For example, on miners, the reservoir becomes contaminated with coal dust and bits of coal which often reach peanut size. The various type covers used on the reservoirs are continually lost and often the screens which cover the openings to the reservoir are purposely removed to facilitate adding oil. These contaminants then get sucked into the intake side of the pump, thereby blocking the suction as well as decreasing the life of the pump and the other hydraulic components supplied thereby. Normally filters are not used on the suction side of the pump because of the space limitations, and also because of the problem with affecting pump suction. And, of course, filters on the return side of the hydraulic systems have no affect on contaminants entering the reservoir as previously described. As a practical matter, large pieces of equipment are routinely shut down for purposes of cleaning the pump systems and down time on a large piece of equipment is very costly.

Our pump filter solves the aforementioned problems by providing a filter which can be used on the suction side of the pump and which can be routinely cleaned by the simple removal of a plug. This then avoids down time delays and increases the life of the pump and the other hydraulic components by keeping the contaminants thereout of in the first instance.

Our invention is a pump filter which connects on the suction side of a pump and which extends into an oil reservoir. The pump filter housing contains two chambers in vertical alignment and cooperation with each other. The upper chamber includes a screen filter, and the lower chamber contains a swing valve which opens and closes the mouth of the suction tube communicating between the oil reservoir and the second chamber. A plug access means permits easy entry into the second chamber to clean the screen and remove the contaminants which fall off the screen and collect on the swing valve in the second chamber when the pump is not operating.

In the accompanying drawings, we have shown one preferred embodiment of our invention in which:

FIG. 1 is a section through the pump filter with the valve in the closed position;

FIG. 2 is a side elevation of the filter pump;

FIG. 3 is a section taken along lines III—III of FIG. 1;

FIG. 4 is a section through the pump filter in which the valve is in the open position; and

FIG. 5 is a section through the pump filter with the valve in the closed position and the access plug removed.

The pump filter, generally designated **10,** is mounted and is operable in the vertical position. The pump filter **10** includes a main housing **11** having several components, a mounting plate **12** secured to the upper part of

housing **11** and a suction tube **18** secured to the lower part of housing **11,** FIGS. **1** and **2.**

Specifically, housing **11** includes an annular first member **13** welded to the mounting plate **12.** Mounting plate **12** and annular member **13** define an internal chamber **14** which is frusto dome shaped and which includes a top opening **29** exiting therefrom.

Annular member **13** threadably engages a shoulder member **15** which extends inwardly of chamber **14** and provides a seat for a filter screen to be described hereinafter. Shoulder member **15** defines a central passageway **16** communicating with chamber **14.**

A cylindrical second member **17** is welded to the bottom of shoulder **15** and is maintained in sealable engagement with annular first member **13** by means of standard O-rings **35.** Member **17** defines internal chamber **20** which communicates with passageway **16.** Chamber **20** is arch shaped in cross section, FIG. **3,** but it can also be circular in cross section as is chamber **14.** An elongated suction tube **18** is welded to the bottom of second member **17** and communicates with chamber **20** at mouth **19** of suction tube **18.**

A swing valve **21** is welded intermittently along and to rod **22** which is pivotally mounted in openings **31** in the side walls which define chamber **20.** Stop plates **34** maintain rod **22** in place. Swing valve **21** and rod **22** may also be pivotally mounted in other ways, as for example, by means of end supports positioned on the upper surface of suction tube **18** and which contain bearing type openings to accommodate the rod ends. Swing valve **21** rests on the top of suction tube **18** which forms the valve seat **32** therefor, but is positioned sufficiently spaced from the top of suction tube **18** at the pivotal connection to permit free pivoting thereof. Swing valve **21** is arch shaped in cross section to conform with chamber **20,** but such a configuration can also be employed with a cylindrical chamber. A stop block **33** is welded to the interior of second member **17** so as to extend into chamber **20** and limit the upward movement of swing valve **21.**

A square plate **23** is machined to conform and is welded to cylindrical second member **17** to provide a flat surface along the outer surface thereof. A clearance opening **25** extends through the wall of member **17** and cooperates with a threaded opening **36** of smaller cross section in plate **23.** A plug **24** threadably engages with the opening **36** so as to shut off opening **36** with O-ring No. **37** but to permit access to chamber **20** by the removal thereof. Plug **24** terminates in a large hex nut and an extended knurled portion **26** welded thereto which is inset in the form of a standard socket **27,** FIG. **2.** Plug **24** can, therefore, be removed either by an end wrench on the hex nut or an Allen wrench used within the inset socket **27.**

A filter screen having either a flat, dome or frusto shape in conformity with chamber **14** is positioned in chamber **14** so as to rest on shoulder member **15.** The flat portion of screen **28** extends across the top opening **29** of the mounting plate **12.** The mounting plate **12** includes four bolt holes **30** which align with a standard pump (not shown).

The operation of our pump filter is as follows. The pump filter is vertically attached to the pump by means of bolts extending through bolt holes **30** in standard fashion. The pump filter **10** extends vertically downward from the pump so that the suction tube **18** is immersed in the oil reservoir (not shown). When the

pump is operating, the suction lifts the swing valve **21** into an upright position against stop **33.** The oil flows up suction tube **18,** out through mouth **19,** into chamber **20,** through passageway **16,** into chamber **14** through the screen **28** and out of top opening **29** into the pump. The contaminants collect on screen **28.**

When the pump is turned off, the swing valve **21,** by gravity, closes off mouth **19** as it seats itself on valve seat **32.** The larger contaminants which have been held against the screen **28,** fall onto the top surface of swing valve **21.** The contaminants can be cleaned out of chamber **20** by merely removing the plug **24** which provides access to chamber **20.** In addition, the screen can be cleaned off by insertion of a small instrument into chamber **26** and up through passageway **16** into chamber **14.** The screen can also be easily replaced by turnably disengaging annular chamber **13** from shoulder member **15.** The mouth **19** of suction tube **18** is sufficiently large in cross section so that if the swing valve **21** cannot open completely because of contaminants resting thereon from previous use, the pump can still get sufficient oil. Normally, at startup, a coarse mesh screen is employed to maximize the pump suction and remove coarser contaminants and this screen can then be replaced with a finer mesh screen.

Several of these pump filters have been in extended service and by cleaning the pump filter after every eight hour shift, no extended down time at all is required on the equipment. In addition, this has increased the life of the pump, as well as the hydraulic circuits and components operative therefrom.

We claim:

1. A pump filter for use on mine equipment hydraulic systems and the like comprising a vertically extending housing terminating at an upper end in a mounting plate adapted for securement to a pump, said housing including a first chamber exiting through the mounting plate to communicate with the pump and a second chamber positioned below the first chamber and communicating therewith, an elongated suction tube depending from the housing and having a mouth in communication with the second chamber, a swing valve pivotally connected at a lower portion of the second chamber and adapted to swing from a valve seat formed by the suction tube to open and close said mouth, filter means positioned within the first chamber and removable plug means communicating with the second chamber substantially adjacent the valve seat to permit access thereto.

2. The pump filter of claim **1** wherein an annular shoulder separates the first and second chambers, said annular shoulder defining a passageway between said chambers.

3. The pump filter of claim **1** wherein the first chamber is frusto dome or flat shaped.

4. The pump filter of claim **1** wherein the filter means includes a screen positioned on said shoulder and extending upward in the first chamber in substantial conformity therewith.

5. The pump filter of claim **1** wherein a stop block is mounted within the second chamber to an internal surface thereof to limit the upward movement of the swing valve.

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