

Aug. 9, 1949.

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2,478,290

APPARATUS FOR REMOVING FOREIGN MATTER FROM FLUID

Filed Oct. 18, 1946

FIG. 1

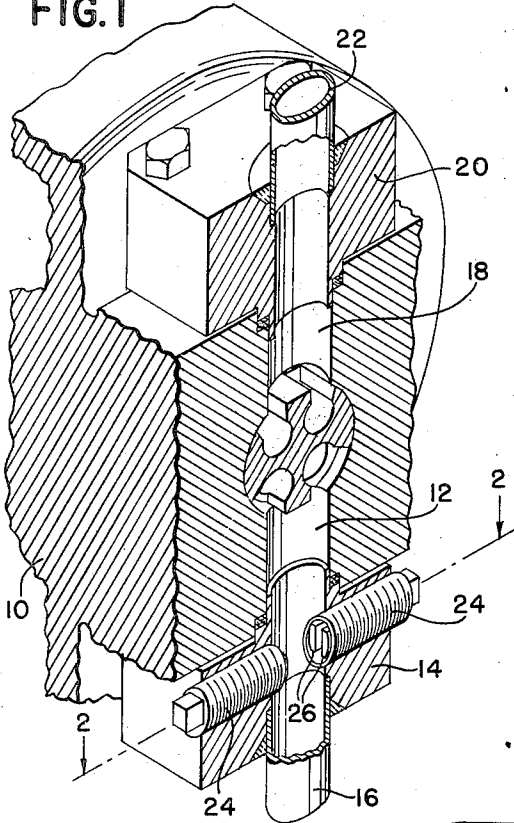


FIG. 3

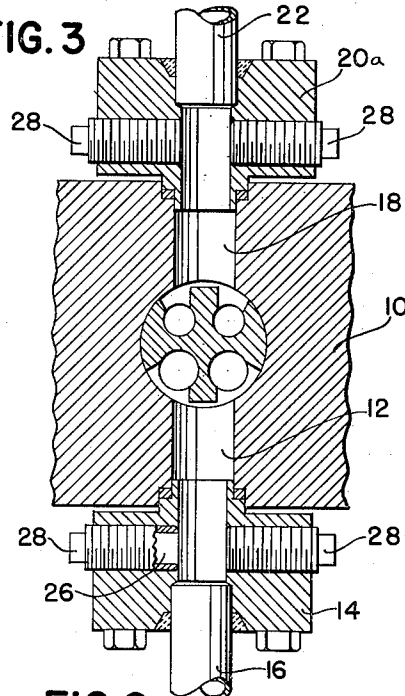


FIG. 2

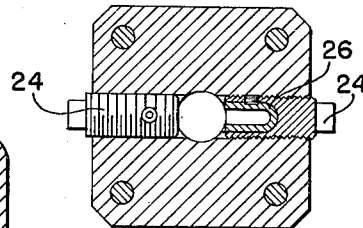


FIG. 4

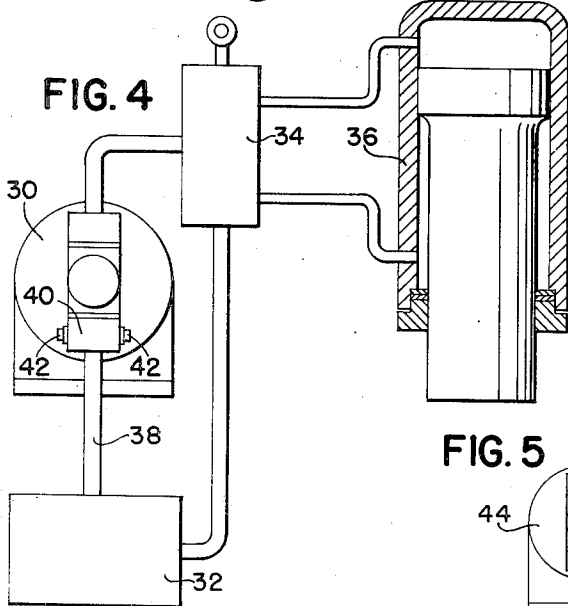
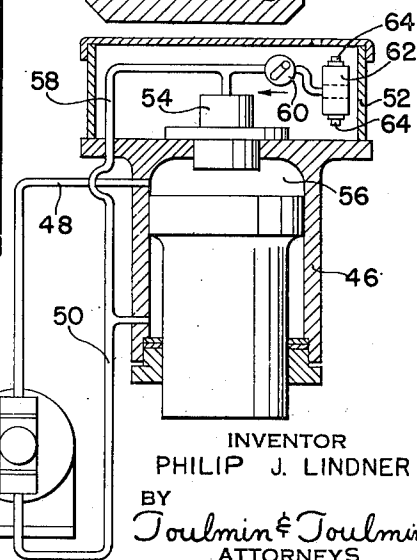


FIG. 5



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## UNITED STATES PATENT OFFICE

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MATTER FROM FLUID

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Application October 18, 1946, Serial No. 704,095

2 Claims. (Cl. 210—1.5)

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This invention relates to fluid operable apparatus and particularly to fluid pumps and motors.

In most fluid pumps and motors, it is necessary that there be good fits between the relatively moving parts in order to minimize the amount of fluid leakage or slippage therebetween. This is necessary in order to obtain efficiently operating mechanisms and to conserve power. In many instances the nature of the fluid circuit is such that there is a possibility that small metallic particles will be picked up in the oil stream and carried around the system. When such particles pass through a pump or motor, there is likelihood that the finely finished and closely fitting surfaces of the mechanism will become scratched and scored thereby promote wear and inefficiency. Such a situation may arise in a machine shop where there are a plurality of tools cutting or grinding and in which the oil being used by the pump or motor is in a reservoir or at one time or another is exposed to the atmosphere of the shop.

The primary object of the present invention is to provide a simple means for extracting from the oil stream passing to a pump or motor at least the most harmful of the metallic particles carried in the said stream.

Still another object is to provide a means for effectively filtering from an oil stream particles of metal and to do so without interfering with the flow of the said stream.

Still another object is the provision of a mechanism for withdrawing magnetic metallic particles from an oil stream, the said means being readily insertable in standard systems.

These and other objects and advantages will become more apparent upon reference to the following description taken in connection with the attached drawings in which:

Figure 1 is a sectional perspective view showing one type of pump or motor which has associated therewith the device of this invention;

Figure 2 is a plan section indicated by the line 2—2 on Figure 1 and shows more in detail the construction of the device for this invention;

Figure 3 is a sectional view showing a reversible pump or motor equipped with this invention;

Figure 4 is a diagrammatic view showing a circuit including a pump constructed according to Figure 1; and

Figure 5 is a view similar to Figure 4 but showing another manner of utilizing a device constructed according to this invention.

Referring to the drawings, Figure 1 shows the inlet and outlet connections for a fluid pump or

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motor. In Figure 1 the body of the pump or motor is indicated at 10 and there is an inlet port at 12 to which is secured a flange 14 that receives the inlet conduit 16. The outlet port is shown at 18 and there is connected with the said outlet port the flange 20 into which extends the discharge conduit 22.

For removing magnetic particles of metal or abrasive from the oil stream flowing to the pump or motor through the conduit 16, the flange 14 has a pair of threaded ports therein adapted for receiving the threaded plugs 24. As seen in Figures 1 and 2, the plugs 24 are hollow or recessed and receive within the said recesses the U-shaped magnets 26. The magnets may be retained in position in the recess by any of the several means, as by the set screws shown, by brazing, or by staking the periphery of the plug around the magnet. The magnets may be of any suitable type which create a strong magnetic field and, to this end, they are preferably formed of one of several compositions known in the trade as "Alnico." The material from which the plugs 24 are made is preferably non-magnetic in order to detract from the strength of the field set up by the U-shaped magnets 26. However, it will be understood, that due to the poor magnetic bond existing between the plugs and the magnets, that even if the material of the plugs 24 were magnetic, a strong field would still be established between the tips of the magnets which would link with the fluid in the flow channel and thereby effectively remove particles from the fluid.

On reference to Figure 2 it will be noted that the tips of the magnets 26 are substantially coincident with the surface of the flow path of the oil passing through the flange 14 so that they offer substantially no restriction to the fluid flow, and have no tendency to create a turbulent condition therein which would lead to inefficient operation of the pump or motor, cavitation in the oil supply and heating of the oil.

It will be evident upon reference to Figures 1 and 2 that the magnets 26 will create an intensive magnetic field extending substantially throughout the flow path of the oil and for some distance along the length thereof so that during the time required for the oil to flow past the magnets, there is sufficient opportunity for the magnetic particles to be withdrawn therefrom and to be retained on the magnetic surfaces.

When the magnets have become loaded with foreign material, or at predetermined intervals, they can readily be removed from the flange 14 and the material collected removed therefrom.

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It will be evident that the life of a pump or motor equipped with magnetic separators according to this invention will be enhanced because of the abrasive material which is withdrawn from the fluid stream before it reaches the sliding surfaces within the said pump or motor.

In Figure 3, there is shown an arrangement similar to that shown in Figure 1 except that in addition to the flange 14 the flange on the opposite side of the pump, indicated at 20a is also fitted with magnetic plugs as indicated at 28. The pump or motor illustrated in Figure 3 is of the reversible type so that one time the fluid is flowing therethrough in one direction and at another time is flowing in the opposite direction. By fitting both flanges by magnetic plugs according to this invention, it is possible to protect the interior of the mechanism from particles of metal entering from either direction.

In Figure 4, there is shown a diagrammatic hydraulic circuit wherein the pump 30 draws fluid from the reservoir 32 and discharges the fluid through the reversing valve 34 to the motor 36. The fluid passing through the motor is always drawn from the reservoir 32 through the conduit 38 and therefore it is only the flange indicated at 40 which carries magnetic plugs as indicated at 42.

In Figure 5, there is shown a somewhat different arrangement wherein the pump 44 is of the reversible type and is connected to both of the ports of the motor 46 as by the conduits 48 and 50. Mounted on the top of the motor 46 is a reservoir 52 and within the reservoir 52 is a surge valve 54 which provides for an exchange of fluid between the reservoir and the advancing means 56 of the motor. A conduit 58 is connected with the conduit 50 for piloting the surge valve 54 into open position at predetermined times in the cycle of the motor, and the conduit 58 further opens into the reservoir 52 through the check valve 60 in order to supply makeup fluid to the pump 44 during the downward stroke of the motor.

Since most of the fluid passing through the pump 44 at one time or another is drawn from the reservoir 52, the objects of this invention may be served by connecting the inlet side of the valve 60 with the tank through the flange 62 which has therein a pair of magnetic plugs 64.

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In this manner, any magnetic particles in the oil sooner or later must pass through the flange 62 whereupon the plugs 64 will extract the said particles from the said oil stream.

It will be understood that this invention is susceptible to modification in order to adopt it to different usages and conditions and, accordingly, it is desired to comprehend such modifications within this invention as may fall within the scope of the appended claims.

I claim:

1. In a fluid circuit; a flange adapted for receiving a conduit on one side, and to be secured to a fluid pump or motor or to receive a conduit on the other side thereof and having a passage therethrough defining a portion of the flow channel for the fluid passing through said conduit; diametrically opposite threaded bores in said flange; and a magnetic plug threaded into each of said bores with the magnetic end thereof toward the said flow channel, the ends of said plugs adjacent the said channel being substantially coplanar with the surface of said conduit whereby substantially no restriction is offered to the passage of fluid through the said flange.

2. As a new article of manufacture; a flange adapted for being secured to a fluid pump or motor or for being inserted in a conduit and comprising an axial bore; a pair of substantially coaxial bores opening substantially diametrically opposite from one another into the said axial bore; and magnetic plugs secured into said coaxial bores and having the magnetic end portions adjacent said bore and substantially coplanar with the surface of a conduit secured to said flange at one end of said bore.

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