Dec. 21, 1937. H. ALLEN 2,102,665

PUMP

Filed May 14, 1934

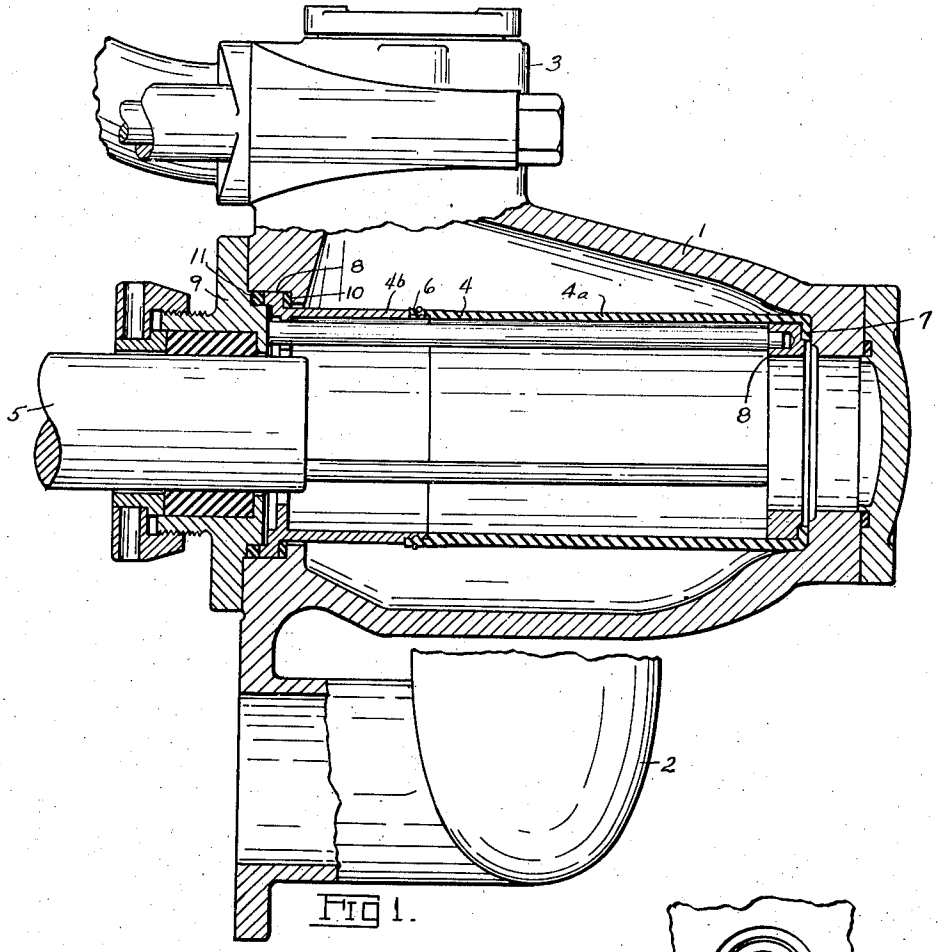


FIG 1.

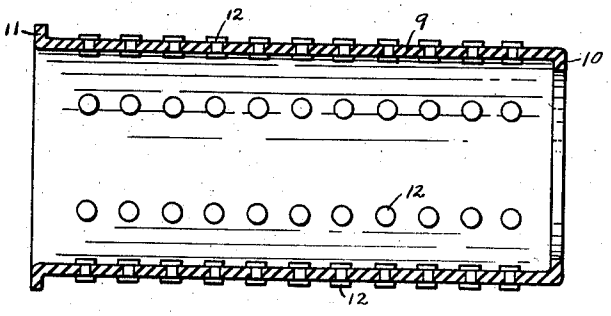


FIG 2.

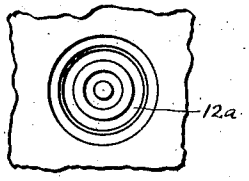


FIG 4.

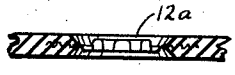


FIG 3.

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PUMP

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Application May 14, 1934, Serial No. 725,567

14 Claims. (Cl. 103—44)

This invention relates generally to pumps.

It will be found particularly useful in pumps designed for pumping abrasive and corrosive fluid of the general type disclosed by Letters Patent of the United States to Stephens No. 1,848,441 of March 8, 1932. A conventional pump of this type adapted for use as a mud or slush pump in deep well drilling includes a barrel; inlet and outlet valves therefor; a hollow expansible member within the barrel, and a reciprocable piston to actuate pumping fluid confined within the expansible member to cause expansion and contraction thereof whereby pumped fluid is drawn into and forced out of said barrel.

In pumps of other types the pumped fluid is in contact with the piston and rod and carries away the heat generated by the reciprocation of the piston and rod through conventional packings. In the type of pump to which this invention relates, however, the piston and rod are sealed off from the fluid being pumped and the heat so generated is therefore transferred to the pumping fluid within the expansible member. These expansible members are usually made of rubber, which is a very good heat insulator, and the pumping fluid within the expansible member is in contact with very little metal. Under certain conditions, such as when the packings are inadvertently made too tight, the heat is not dissipated as rapidly as it is generated. And so, under such conditions, the pumping fluid in the expansible member will reach a very high temperature whereby the expansible member will be injured; and when the pressure on the pumping fluid is reduced on the suction stroke of the piston, the pumping fluid will boil so that the pumping member will remain expanded, which renders the pump inoperative.

This invention has for its general object the provision of new and improved means to prevent heating of the pumping fluid to an objectionably high temperature.

The pumped fluid is in most instances at a low enough temperature to be used as a cooling medium and this invention has for one of its specific objects the utilization thereof as such, the heat of the pumping fluid being transferred by the means provided to the pumped fluid.

A further specific object of the invention is to provide a new and improved hollow pumping member, the expansible part only of which need be replaced upon failure thereof.

Other objects will hereinafter appear.

In the accompanying drawing wherein the preferred embodiments of the invention are illustrated, Fig. 1 is a fragmentary sectional elevation of a pump with one embodiment of the pumping member therein; Fig. 2, a sectional elevation of another embodiment of the pumping member; and Figs. 3 and 4, fragmentary sectional and plan views of a modification of the metal inserts of the embodiment shown by Fig. 2.

As the operation of pumps of this type is clearly set forth in said patent to Stephens 1,848,441, it will be but briefly referred to herein as follows:

In the drawing the barrel is indicated at 1, and the inlet and outlet means at 2 and 3, the latter including valves not shown. Within the barrel 1 is the pumping member 4, and reciprocable through packings of any conventional type is the piston or plunger 5 which serves to actuate the pumping fluid confined within the member 4 to effect the expansion and contraction of the latter to draw the pumped fluid into the barrel 1 through the inlet means 2, and to expel it from the barrel 1 through the outlet means 3.

Now it will be observed that the pumping member 4 is made in two sections, one section 4a of which is of rubber, and the other section 4b of which is of metal, the two sections being connected by suitable means such as that indicated at 6. The rubber section 4a has on its end an internal annular flange 7 held in sealing engagement with one end of the barrel 1 by the ring 8. The metal section 4b has an external annular flange 18 which is secured to the other end wall of the barrel 1 by the ring 9. On either side of the flange 18 may be placed sealing gaskets 10 and 11.

The means whereby the ends of the pumping member 4 are sealed to the barrel 1, and the piston 5 is packed, may, of course, be varied without departing from the present invention. The construction herein disclosed for that purpose forms the subject matter of another application, Serial No. 733,079, filed June 29, 1934.

Now when the piston or plunger 5 is at the end of its suction stroke, as shown by the drawing, the shape of the pumping member 4 is substantially cylindrical and the barrel 1 is filled with pumped fluid. When the piston 5 moves to the right on its discharge stroke, it displaces the pumping fluid in the rubber section 4a of the pumping member and causes said section 4a to expand. During such expansion the inlet valve (not shown) of the means 2 remains closed and the outlet valve (not shown) of the means 3 opens to permit the pumped fluid to be expelled from the barrel 1 through the outlet means 3.

And when the piston moves to the left on its suction stroke back into its position shown by the drawing, the section 4a of the pumping member contracts; and as the valve (not shown) of the outlet means 3 then remains closed, and the valve (not shown) of the inlet means 2 opens, a fresh charge of pumped fluid is thereby drawn into the barrel 1. It will be obvious that as the piston 5 reciprocates the pumped fluid will be alternately drawn into and expelled from the barrel.

The heat generated by the plunger in the pumping fluid will obviously be transferred through the heat conducting metal section 4b into the pumped fluid; and when the rubber section 4a fails, it may be replaced and the original metal section 4b used with the new rubber section.

Referring now to Fig. 2 in this embodiment, the pumping member 9 is preferably made of rubber, and has an internal annular flange 10 at one end, and an external annular flange 11 at the other. In this member a number of metal inserts 12 are embedded. These inserts 12 pass through the sleeve and have internal and external caps to form efficient heat transferring elements to effect the transfer of the heat of the pumping fluid to the pumped fluid.

In Figs. 3 and 4 a modification of the inserts 12 is indicated at 12a. In this form the inserts 12a are corrugated to provide a larger area for heat transfer.

This invention is not limited to the preferred embodiments herein disclosed. Various changes will occur to those skilled in the art, and may be made within the scope of the following claims.

I claim:

1. A pump having a barrel; inlet and outlet means for said barrel; a hollow pumping member in said barrel; said member being substantially cylindrical, and made in separable sections; each of said sections being connected to one of the end walls of said barrel; one of said sections being made of rubber and the other of said sections being made of metal; pumping fluid in said member; and means to actuate said pumping fluid to effect the expansion and contraction of said rubber section to draw pumped fluid into said barrel through said inlet means and to expel it from said barrel through said outlet means; said metal section serving to effect the transfer of heat from said pumping fluid to said pumped fluid.

2. A pump having a barrel; inlet and outlet means for said barrel; a hollow pumping member in said barrel; said member being made in separable sections; each of said sections being connected to one of the end walls of said barrel; one of said sections being made of rubber and the other of said sections being made of metal; pumping fluid in said member; and means to actuate said pumping fluid to effect the expansion and contraction of said rubber section to draw pumped fluid into said barrel through said inlet means and to expel it from said barrel through said outlet means; said metal section serving to effect the transfer of heat from said pumping fluid to said pumped fluid.

3. A pump having a barrel; inlet and outlet means for said barrel; a hollow close pumping member in said barrel; said member being made in sections; one of said sections being made of rubber and the other of said sections being made of metal; pumping fluid in said member; and means to actuate said pumping fluid to effect the expansion and contraction of said rubber section to draw pumped fluid into said barrel through said inlet means and to expel it from said barrel through said outlet means; said metal section serving to effect the transfer of heat from said pumping fluid to said pumped fluid.

4. A pump having a barrel; inlet and outlet means for said barrel; a hollow expansible pumping member in said barrel; pumping fluid in said member; and means to actuate said pumping fluid to effect the expansion and contraction of said member to draw pumped fluid into said barrel through said inlet means, and to expel it from said barrel through said outlet means; said member being closed and made of rubber and having openings therein, and corrugated metal inserts in said openings to transfer the heat from said pumping fluid to said pumped fluid.

5. A pump having a barrel; inlet and outlet means for said barrel; a hollow expansible pumping member sealed in said barrel; pumping fluid in said member; and means to actuate said pumping fluid to effect the expansion and contraction of said member to draw pumped fluid into said barrel through said inlet means, and to expel it from said barrel through said outlet means; said member being made of rubber and having metal inserts embedded therein and extending therethru to transfer the heat from said pumping fluid to said pumped fluid.

6. A pump having a barrel; inlet and outlet means for said barrel; a hollow expansible pumping member in said barrel; pumping fluid in said member; and means to actuate said pumping fluid to effect the expansion and contraction of said member to draw pumped fluid into said barrel through said inlet means, and to expel it from said barrel through said outlet means; said member being made of rubber and having metal inserts therein to transfer the heat from said pumping fluid to said pumped fluid.

7. A hollow expansible pumping member adapted to separate two fluids of different character, said member having a body of rubber with heat transferring metal inserts embedded therein each of said inserts having portions thereof exposed to both the interior and the exterior of said member.

8. A hollow expansible pumping member having a body of rubber with openings therein and corrugated heat transferring metal inserts in said openings each of said inserts having parts exposed to both the interior and the exterior of said member.

9. A hollow pumping member having a substantially cylindrical rubber section and a substantially cylindrical heat transferring metal section joined to and forming a continuation of said rubber section.

10. A pump having a barrel, inlet and outlet means for said barrel, a hollow pumping member in said barrel, said member being substantially cylindrical and connected to the end walls of said barrel, one portion of said member being made of rubber and another portion of said member being made of metal, pumping fluid in said member, and means to actuate said pumping fluid to effect the expansion and contraction of said rubber portion to draw pumped fluid into said barrel through said inlet means and to expel it from said barrel through said outlet means, said metal portion serving to effect the transfer of heat from said pumping fluid to said pumped fluid.

11. A pump having a barrel, inlet and outlet means for said barrel, a hollow pumping member sealed in said barrel, said member being expansible, pumping fluid in said member, and means to

actuate said pumping fluid to effect the expansion and contraction of said member to draw pumped fluid into said barrel through said inlet means and to expel it from said barrel through said outlet means, said pumping member consisting in part of heat transferring material, and the part consisting of heat transferring material being arranged to effect the transfer of heat from said pumping fluid to said pumped fluid.

12. A hollow expansible pumping member adapted to confine a pumping fluid and be immersed in a fluid to be pumped, said member having a body of rubber with heat transferring metal inserts imbedded therein and extending from the interior to the exterior of the expansible portion thereof.

13. The combination with a reciprocable plunger, of a fixed hollow pumping member surrounding the same and adapted to contain a pumping fluid and be immersed in a fluid to be pumped, said member having a flexible expansible section, and a heat transferring metal section joined to and forming a continuation of said expansible section.

14. The combination with a hollow expansible pumping member adapted to confine a pumping fluid and be immersed in a fluid to be pumped, of a reciprocable plunger arranged to enter said pumping member and displace the fluid confined therein, said member comprising in its structure heat transferring means forming part of the opposite surfaces of said member and positioned to be exposed to both of said fluids.

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