

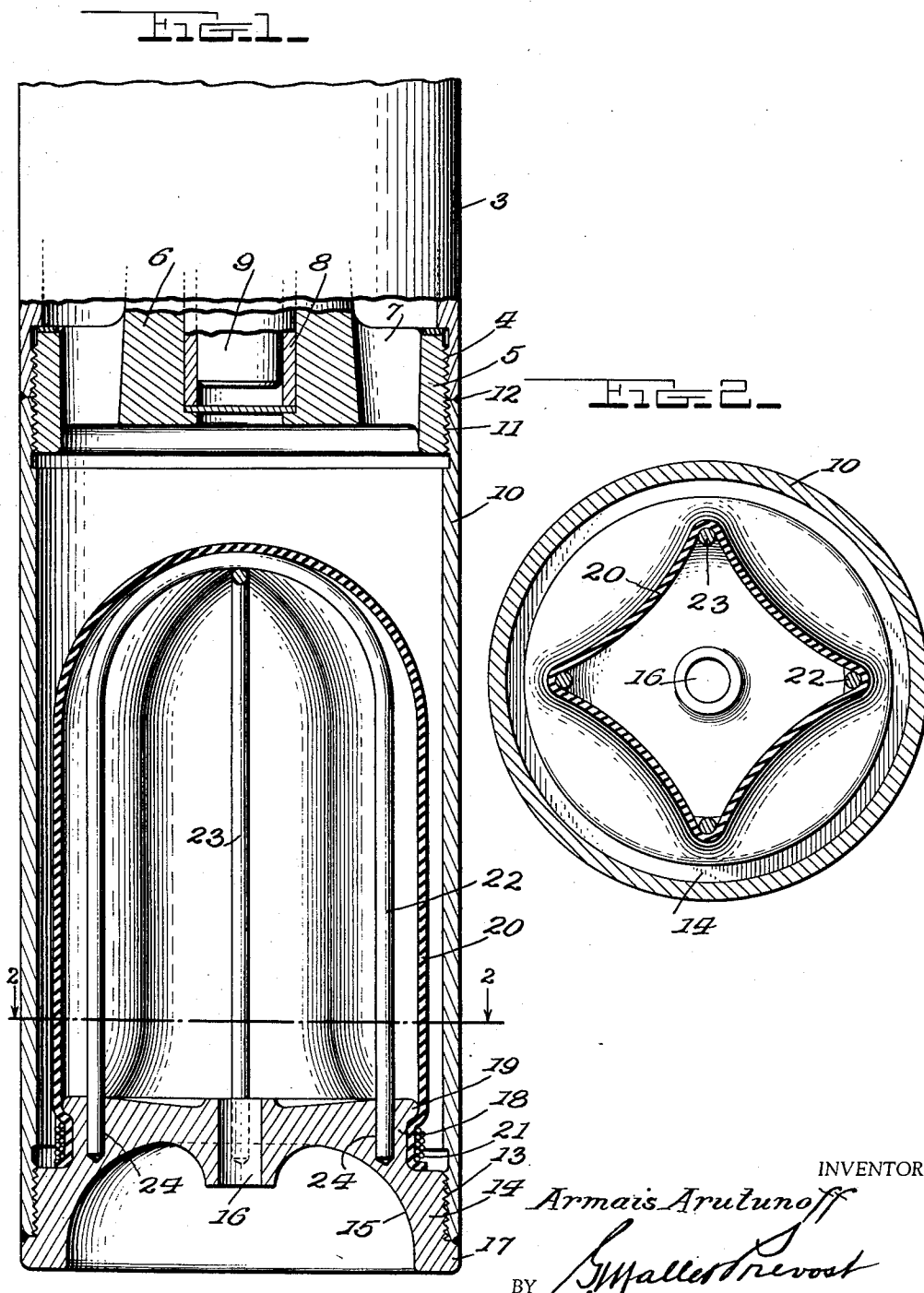
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PROTECTING UNIT FOR OIL FILLED SUBMERGIBLE MOTORS

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PROTECTING UNIT FOR OIL FILLED
SUBMERGIBLE MOTORSArmais Arutunoff, Bartlesville, Okla., assignor to
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This invention relates to improvements in a protecting unit for oil filled, submergible, electric motors used in connection with liquid pumping apparatus and although adaptable to various pumping operations, is primarily directed to a protecting unit for centrifugal pumping assemblies designed for use by owners of farms, suburban acreage, and small industries.

With pumping assemblies of the type where the electric motor is submerged in a well and operably connected to the lower end of the casing which houses a coaxial pumping unit, an oil filled lubricating and protecting unit or reservoir is usually interposed between the pumping unit and the motor, such for example, as those illustrated and described in my prior Patent No. 2,569,741. As explained in that patent, due to the normal expansion and contraction of the oil in the motor and motor protecting unit, resulting from the starting and stopping of the motor, there is a tendency for the surrounding well fluid to leak into the protecting and lubricating reservoir and ultimately to find its way along the motor shaft to the motor unit. Hence, it is necessary to a successful operation of the system, to provide some means for insuring against the entrance of damaging moisture into the motor structure, two embodiments of such means being illustrated and described in my said former United States patent.

The present invention operates on the same basic principle as that disclosed in said former patent and was designed both for use as the sole protecting unit, in generally similar pumping apparatus, or as an auxiliary protecting unit for use in connection with a breather unit of the type described in my said former patent.

The principal object of the present invention is to provide a protecting unit for attachment to the lower extremity of the oil-filled motor casing of a submergible pump assembly, and comprising a collapsible breather diaphragm, composed of rubber-like material, surrounded by transformer oil or the like and adapted to equalize pressure between the oil in the motor assembly and the water or other fluid in the well in which it is submerged.

A further object of the invention is to provide a protecting unit of this type, having a wicket-like frame or support for the diaphragm, comprising the breather and adapted to prevent the complete collapse of the latter, so as to maintain a normally fixed reserve capacity in the surrounding reservoir or lubricant containing por-

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tion of the casing, and to allow for breathing when the motor is initially started and stopped.

A still further object of the invention is to provide a protecting unit of the character described, which is extremely simple in construction and may easily be installed in connection with conventional submergible pumping assemblies, without requiring any major alterations.

With the above and other objects in view which will appear as the description proceeds, the invention consists in the novel features hereinafter set forth, illustrated in the accompanying drawings, and more particularly pointed out in the appended claims.

Referring to the drawings in which numerals of like character designate similar parts throughout both views,

Figure 1 is a vertical sectional view of the improved protecting unit, showing a portion of the motor casing in elevation and

Figure 2 is a transverse sectional view taken on line 2—2 of Figure 1.

In the drawings, referring first to Figure 1, 3 represents a cylindrical motor casing which is coaxially mounted at the lower end of a pumping unit (not shown). The lower extremity of the casing 3 is internally threaded as at 4 to engage the complementary threads of an annular connecting ring or adapter 5, which serves both as a means for connecting the casing of the protecting unit as hereinafter described, and as a bearing support for the lower end of the vertical shaft of the motor in casing 3.

The adapter 5 is provided with a centrally disposed boss which forms a bearing support 6, preferably connected to the ring of the adapter by means of a series of radiating arms 7, the central portion of the support 6 being longitudinally drilled to receive an annular bushing 8 which serves as a bearing for the lower end 9 of a vertical electric motor shaft.

Immediately below the motor casing 3, a protecting unit casing 10 is coaxially mounted, said casing 10 being internally threaded at its upper end as at 11, for engagement with complementary threads on the connecting ring 5. The adjacent ends of the casings 3 and 10 are screwed onto the threads of the ring 5 until they are in abutting relation and thereafter they may be welded as at 12 to insure a fixed connection.

The lower extremity of the protecting unit casing 10 is also internally threaded as at 13, to engage complementary threads on a bottom closure member 14 adapted to be inserted in the lower end of the casing 10. The closure member

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14 is preferably provided with a concave recess 15 in its lower surface and its central portion is drilled as at 16, to provide a communicating passageway between the interior of the casing and the surrounding well fluid. As will be seen from Figure 1, because of the concave shape of the under surface of the closure member 14, the communicating passageway is located in a horizontal plane which is elevated with respect to the lower end of the casing, in order to prevent said passageway from becoming clogged by direct contact with the bottom of the well.

The upper portion of the closure member 14 is reduced to form a relatively short, upstanding neck 18, the upper edge of which extends laterally in an annular flange or shoulder 19, to facilitate the mounting of a collapsible diaphragm or breather bag 20.

The bag 20 is normally, substantially dome-like in cross section and is composed of any suitable flexible material which is not vulnerable to attack by either the oil to be used in the protecting unit or the fluid in which the pumping assembly is submerged. Various materials are adaptable for this purpose and in the preferred form of my invention, I employ a material such as neoprene which has the desirable properties of flexibility and will withstand chemical attack. The inverted lower end of the bag 5 is slipped over the upstanding neck 18 of the closure 14 and is secured thereto in any suitable manner, such for example, as by the use of a series of wrappings of waxed linen string 21, engaging the lower end of the bag 20 below the shoulder 19. This arrangement insures the tight sealed fit of the bag over the shoulder 19 and prevents it from slipping up off of the neck 18.

In order to prevent the complete collapse of the bag 20 and to maintain a normally fixed oil reserve capacity within the area of the casing 10 which surrounds the bag, so as to allow for breathing when the motor is started and stopped, I preferably provide a pair of wicket-like supports 22 and 23 which are vertically supported within the bag by means of drilled holes 24 in the upper surface of the closure neck 18, adapted to receive the lower ends of the wickets 22 and 23.

As shown in the drawings the wickets are preferably arranged crosswise or at right angles to one another, to effect a more uniform internal support for the bag 20, and they extend vertically to a height to constantly engage the upper extremity of the bag 20, so as to maintain the latter in an upright position at all times.

When the various units of the pumping assembly are connected, a suitable lubricating and protecting fluid such as transformer oil, is introduced at the top of the motor unit by means of a filling hole (not shown). A sufficient quantity of protecting fluid is employed to completely fill that area of the protecting unit 10 which surrounds the collapsible bag 20 and the area in the motor casing 3 which surrounds the motor, communication between the casings 3 and 10 being afforded by the series of spaces between the radial fins or arms 7 of the connecting ring 5 and, under static conditions, the weight of this protecting fluid will cause the walls of the bag 20 to collapse to a certain degree into contact with the supporting wickets 22 and 23, as shown in Figure 2.

When the motor starts the oil in the casings 3 and 10 gradually expands and the flexible bag 20 is caused to further collapse at the points between the crossed wickets 22 and 23. Upon

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stoppage of the motor the fluid in the casing 10 naturally contracts and reduces in volume, and the water or other surrounding well fluid, which would otherwise be drawn into the casing and mixed with the oil or protecting fluid, enters the interior of the bag 20 through passageway 16 and forces the bag outwardly to compensate for the loss of volume in the cylinder 10. However, this water or surrounding well fluid is retained in the space within the bag 20 and is prevented from contaminating the oil in the casing, so as to have a deleterious effect upon the motor shaft and ultimately the motor structure.

As before explained the wickets 22 and 23 prevent complete collapse of the bag 20 and permit breathing not only during the initial starting and stopping operation, but for a prolonged period. When the motor is again started the oil in reservoir portion of the cylinder 10, surrounding the bag, naturally expands and with it, the flexible bag 20 collapses inwardly and under the pressure of the expanding oil, forces the volume of surrounding fluid within the bag, back into the well, in an amount equal to that previously drawn into the bag 20. It should also be noted that the higher specific gravity of the water from the well over the oil, creates a slight over-pressure in the oil in the motor which further prevents entrance of the water into the motor.

From the foregoing it is believed that my invention may be readily understood by those skilled in the art, without further description, it being borne in mind that numerous changes may be made in the details disclosed, without departing from the spirit of the invention as set forth in the following claims.

I claim:

1. A self-contained motor protecting unit, comprising a cylindrical casing having means at its upper end for coaxial attachment to the lower end of a motor housing to form the terminal unit of a submergible, oil-filled, vertical electric motor and pump assembly, means placing the interior of said casing in communication with the interior of the motor housing, said casing forming a reservoir for a protecting and lubricating medium, a collapsible diaphragm of substantially dome-shape, arranged concentrically in said casing, in spaced relation to the walls of the latter, with its interior sealed with respect to the reservoir but in communication with the fluid surrounding the casing, said diaphragm being responsive to variations in the pressure differential within and without said casing, whereby any of said surrounding fluid which enters said casing in replacement of lost volume, due to contraction of said medium, will be confined within said diaphragm until ejected therefrom by expansion of said medium, and a rigid supporting frame, fixed within said diaphragm, to prevent complete collapse thereof under pressure variations and to thereby maintain a normally fixed reserve breathing capacity within said casing.

2. A protecting unit as claimed in claim 1 wherein said supporting frame comprises at least one vertically disposed wicket.

3. A protecting unit as claimed in claim 1 wherein said supporting frame comprises a pair of transversely crossed, vertical wickets.

4. A self-contained motor protecting unit, comprising a cylindrical casing having means at its end for coaxial attachment to the lower end of a motor housing to form the terminal unit of a submergible, oil-filled, vertical electric motor

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and pump assembly; means placing the interior of said casing in communication with the interior of the motor housing, the bottom of said casing being closed by a base member, having a passageway connecting the interior of the casing with the surrounding oil fluid, a dome-shaped, collapsible diaphragm, having its lower extremity concentrically fixed to said base member, surrounding said passageway, in spaced relation to the walls of said casing and defining therein, an outer reservoir for a protecting and lubricating medium and a concentric inner well fluid receiving zone, communicating with the surrounding well fluid through said passageway, said diaphragm being responsive to variations in the pressure differential within and without said casing, whereby any of said surrounding fluid which enters said casing in replacement of lost volume, due to contraction of said medium, will be confined within said diaphragm until ejected therefrom by expansion of said medium, and a rigid supporting frame, fixed within said diaphragm, to prevent complete collapse thereof under pressure variations and to thereby maintain a normally fixed reserve breathing capacity within said casing.

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5. A protecting unit as claimed in claim 4, wherein said base member is concave on its under side and extends into the lower end of said casing, said passageway being disposed above and surrounded by the lower extremity of the casing.

6. A protecting unit as claimed in claim 4, wherein said base is provided with an upstanding concentric neck which projects into said casing and means for securing said diaphragm to said neck.

7. A protecting unit as claimed in claim 4 wherein said frame comprises a wicket, vertically supported on said upstanding neck.

8. A protecting unit as claimed in claim 4 wherein said supporting frame comprises a pair of transversely crossed wickets, vertically supported on said upstanding neck.

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