

Oct. 2, 1951

A. ARUTUNOFF

2,569,741

PROTECTING UNIT FOR OIL FILLED SUBMERSIBLE MOTORS

Filed Feb. 9, 1950

2 Sheets-Sheet 1

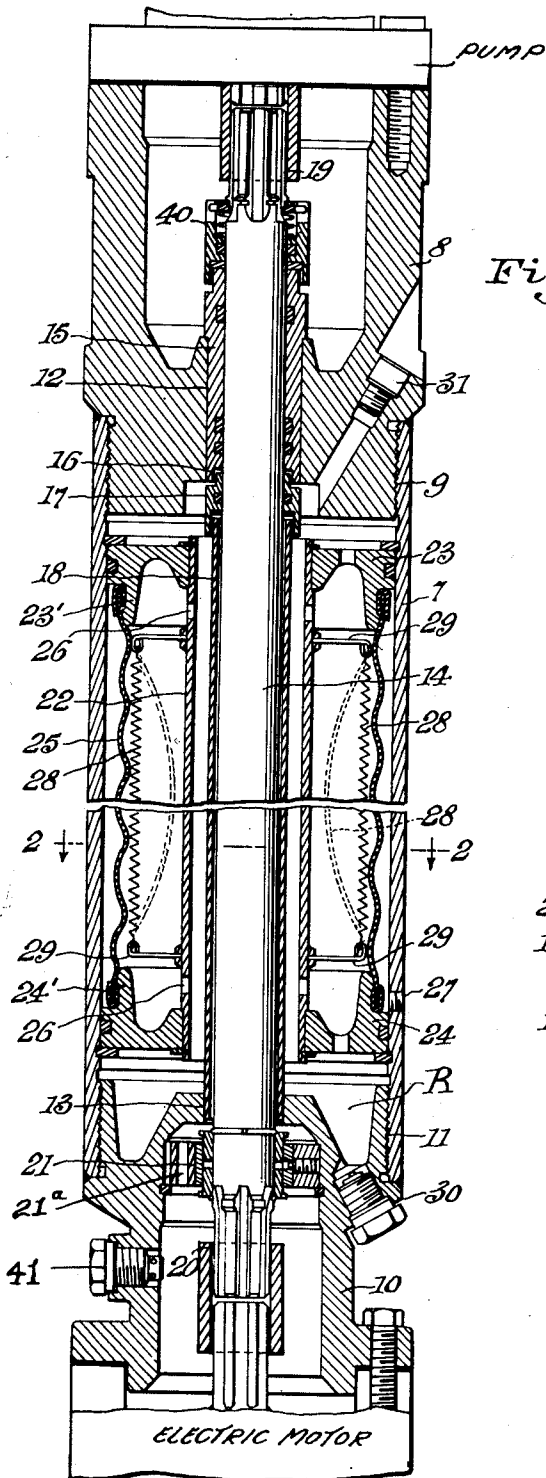


Fig. 1.

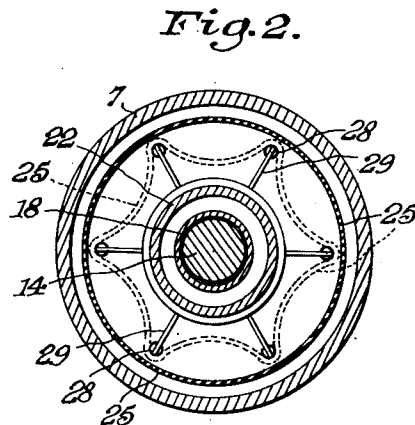


Fig. 2.

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2 Sheets-Sheet 2

Fig. 3.

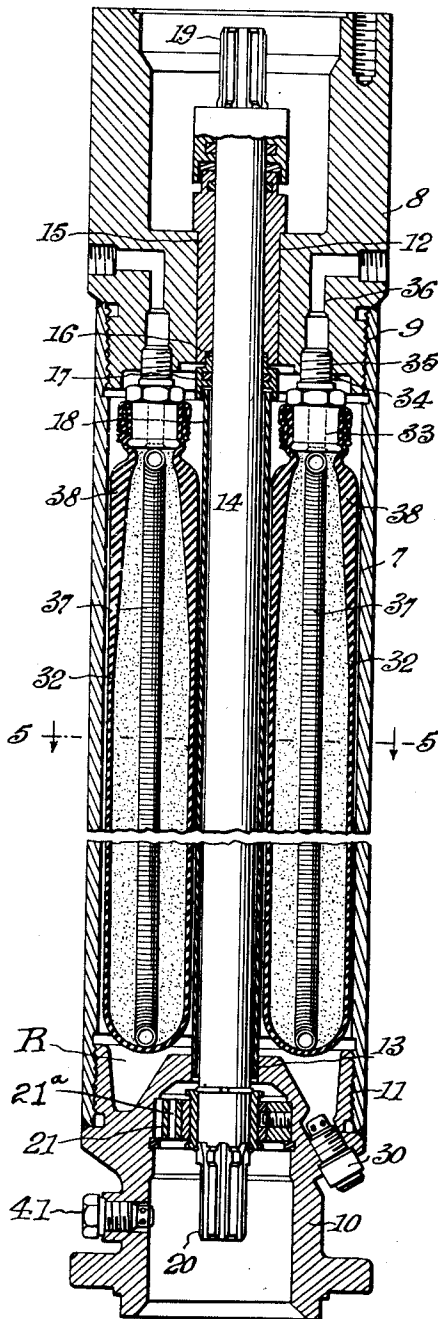


Fig. 4.

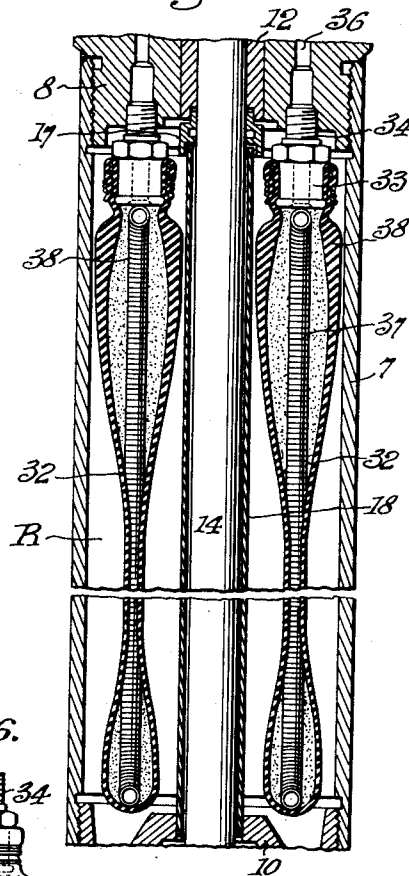


Fig. 6.

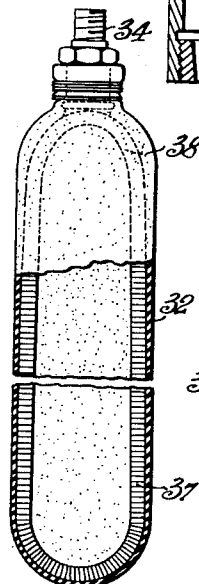
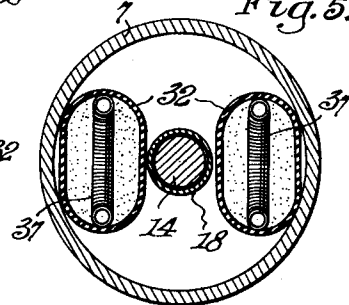


Fig. 5.



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UNITED STATES PATENT OFFICE

2,569,741

PROTECTING UNIT FOR OIL FILLED
SUBMERGIBLE MOTORS

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1

This invention consists in improvements in a protecting unit for oil filled submergible electric motors and is primarily directed to an assembly for use in connection with electric motors employed in oil well operations such as the pumping of deep wells, where the motor is disposed in the well, at the lower end of a casing which houses the coaxial pumping and motor protecting units.

With submergible motors in this type of operation, there is usually employed an oil filled lubricating and protecting unit or reservoir which is interposed between the pumping unit and the motor, such, for example, as those illustrated in my former U. S. Patents Nos. 1,855,264 and 1,970,484. As explained in those patents, 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 the successful operation of the system, to provide some means for insuring against the entrance of damaging moisture into the motor structure, two such means being illustrated and described in my said former United States patents.

It is the primary object of my present invention to provide a motor protecting unit which is a marked improvement over structures previously known to me, including my former units, and which will afford a maximum of protection against moisture from the surrounding well fluid, gaining access to the motor by traveling along the motor shaft.

To this end, I have devised a novel arrangement of one or more collapsible elements disposed in the lubricating reservoir and defining therein, separate pressure zones, respectively subjected to the pressure existing in the reservoir and that of the well fluid surrounding the reservoir. The collapsible element or elements are sealed between the respective zones and are responsive to variations in the pressure differential of the lubricating medium in the reservoir and the well fluid surrounding the reservoir so as to compensate for contraction and expansion of the lubricant resulting from such variations and thus prevent access of the surrounding well fluid to the motor shaft.

In one form of the invention, the protecting element comprises a single collapsible cylinder of suitable material to withstand chemical attack either by the lubricant or the well fluid, and

2

arranged concentrically in the reservoir surrounding the motor shaft. The extremities of this cylinder are sealed to provide two separate zones, one in communication with the interior of the reservoir and the other, with the area surrounding the reservoir.

Another form of the invention embodies one or more collapsible breathing bags or receptacles which are disposed within the protecting and lubricating fluid in the protecting unit, with their interiors in communication with the surrounding well fluid, and their external surfaces responsive to the expansion and contraction of the fluid in the protecting unit. Thus, any well fluid with its contained moisture, which would normally be drawn into the protecting unit by variations in differential pressure when the motor is stopped, will be retained in the collapsible receptacle and expelled therefrom into the well, when the motor is again started.

In connection with both forms of the invention, I provide resilient means to maintain a normally fixed reserve capacity in the zone or zones containing the lubricating medium so as to allow for breathing when the motor is initially started and stopped and to prevent complete collapse of the zone-defining element. These means may comprise a series of taut springs longitudinally supported at spaced intervals around the inner wall of the collapsible cylinder in the first form of the invention, while in the second form, portions of the walls of the individual collapsible receptacles may be thickened or provided with spring inserts, to accomplish this function.

The foregoing as well as other objects, will be made more apparent as this description proceeds, especially when considered in connection with the accompanying drawings which illustrate two forms of my invention and wherein numerals of like character designate similar parts throughout the several views.

In the drawings:

Figure 1 is a vertical sectional view through a motor protecting and lubricating unit embodying one form of my invention wherein a single collapsible cylinder is employed for defining the separate zones;

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

Figure 3 is a vertical sectional view through a motor protecting and lubricating unit constructed in accordance with the second form of my invention, the collapsible receptacles therein being shown in expanded condition;

Figure 4 is a similar view showing the collapsible receptacles in contracted condition;

Figure 5 is a transverse sectional view taken on line 5—5 of Figure 3; and

Figure 6 is a detailed view of one of the collapsible receptacles, shown partly in section to illustrate the interior thereof.

Referring to Figure 1 of the drawings, 7 designates a cylindrical housing for the lubricating and protecting unit, said housing being closed at its upper end by a head 8, reduced and threaded at its lower extremity 9 to engage complementary threads in the housing 7. The lower end of the housing 7 is closed by a base 10, similarly reduced and threaded at its upper end 11, to engage complementary threads in the housing 7. The central portions of the head 8 and base 10 are provided with co-axial openings 12 and 13 respectively, to accommodate the shaft section 14 which connects the shaft of the pump unit with the motor shaft. Fragmentary sections of a pump unit and motor unit are shown connected to the top and bottom respectively of the protecting unit.

A bushing 15 is fitted into the opening 12 in the head 8 and rotatably supports the upper end of the shaft section 14, the lower end of said bushing being provided with an annular recess 16 which receives the reduced upper end of a shedder 17, mounted on and rotatable with the shaft 14. The lower end of the shedder 17 is in the form of an apron which envelopes and overhangs the top of a stand tube 18 which surrounds the intermediate portion of the shaft section 14 in spaced relation, and is supported at its lower end in the opening 13 in the base 10. Thus, the stand tube 18 forms within the housing 7, an annular chamber, separated from and surrounding the shaft 14.

The upper end of the shaft section 14 is splined as at 19 or otherwise suitably formed for operative connection to the lower end of the pump unit shaft (not shown in the drawing), and the lower end of the shaft section 14 is similarly splined as at 20 for connection to the vertical motor shaft. The lower end of the shaft section is preferably rotatably supported in a bearing member 21, mounted in the base 10, said bearing being provided with at least one vertical passageway 21^a whereby the area surrounding the shaft section 14 is in communication with the interior of the motor casing connected to the base 10.

At the upper end of the shaft section 14, I may provide a spring loaded seal 40 adjacent the bushing 15, for the purpose of minimizing the intermingling of the liquids in the motor and reservoir, with those in the pump unit above the shaft section 14. However, as will later appear, if a sufficiently high pressure is developed in the reservoir to overcome the spring load of seal 40, a certain amount of escape along the shaft 14 will be permitted.

Coaxial with the stand tube 18 and spaced outwardly therefrom is an annular partition 22 supported at opposite ends in annular retaining discs or rings 23 and 24, sealed transversely within the housing 7, at predetermined points spaced longitudinally respectively, from the head 8 and base 10. Also coaxial with the shaft 14 and stand tube 18, is a collapsible cylinder 25, the extremities of which embrace oppositely disposed, longitudinally extending flanges 23' and 24', inwardly spaced on the retaining rings 23 and 24 respectively, where the ends of the cylinder are secured

by any suitable means such as wrapping with linen thread or the like to afford a sealed connection.

Inasmuch as the cylinder 25 is subjected to contact with the lubricating fluid within the protecting reservoir as well as the surrounding well fluid, as will hereinafter appear, it must be composed of a flexible material which is not vulnerable to chemical attack by either of these fluids. 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 annular partition 22 is provided with one or more apertures 26 placing the area within the cylinder 25 in communication with the reservoir R which contains the lubricating medium, and if desired the rings 23 and 24 may be apertured as shown in Figure 1. Likewise, the housing 7 is provided with one or more openings 27 placing the area surrounding the cylinder 25 and within the housing, in communication with the surrounding well fluid in which the housing is disposed. Thus the collapsible cylinder 25 is responsive to the pressure differential of these areas.

In order to prevent the complete collapse of the cylinder 25 and to maintain over a period of years of operation, a normally fixed reserve capacity within the cylinder, so as to allow for breathing when the motor is started and stopped, I preferably provide a series of resilient members such as coil springs 28, normally stretched taut between radially disposed arms 29, fastened as by welding to the outer wall of the annular partition 22. Opposite ends of these springs are secured in eyes on the ends of respective arms 29, so that normally the springs 28 lie parallel with the inner face of the collapsible cylinder 25 as shown in the full lines in Figure 1. It will be apparent that the springs 28 offer a resistance to inward pressure on the cylinder 25 which neutralizes the pressure differential on the two sides of the cylinder, yet the springs are sufficiently resilient to compensate for the contraction of the oil in the reservoir, due to a stopping of the motor without creating more than a negligible overpressure of the surrounding well fluid on the outside of the cylinder versus lubricant on the inside of the cylinder.

As the original expansion of the lubricant may create excessive pressure inside the motor structure and in the reservoir R, I may provide a relief valve 30, adjacent the lower portion of the reservoir. In actual practice, I have found this arrangement more practical than relying on the spring loaded seal 40 previously referred to.

The upper end of the housing is provided with a vent plug 31 preferably located in the head 8, to permit escape of air during the filling operation which is accomplished through a combined fill and drain plug 41 situated in the base 10.

The operation of this form of my invention will be apparent. The motor and the reservoir R are first filled with a suitable lubricant through the valve 41, the vent plug 31 being opened for this purpose. The lubricant entering through plug 41, fills the motor unit and rises through the passageway 21^a in bearing 20, until the reservoir R, comprising the area surrounding the shaft 14, is filled, any surplus lubricant being automatically discharged through relief valve 30. When the motor starts the oil in the reservoir R gradually

expands and the cylinder 25 is extended to limits of the inner wall of the housing 7. Upon stoppage of the motor, the fluid in the reservoir R naturally contracts and reduces in volume, and the water or other surrounding well fluid, which would otherwise be drawn into the reservoir and mixed with the oil or protecting fluid, enters the space within the housing 7 surrounding the cylinder 25 and forces the cylinder inwardly to compensate for the loss of volume in the reservoir. However, this water or surrounding well fluid is retained in the space around the cylinder 25 and is prevented from communicating with the oil in the reservoir, so as to contaminate the shaft and ultimately the motor structure, by gaining access to those points along the shaft.

As before pointed out, the taut springs 28 prevent complete collapse of the cylinder 25 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 R naturally expands and with it, the flexible cylinder 25, which forces a volume of the surrounding fluid back into the well, equal to that previously drawn into the housing. It may be stated that if, during the operation of the motor and pump, a slight over-balance of the pressure inside the cylinder 25 occurs, and some oozing of oil takes place along the shaft, the elasticity of the springs 28 tends to establish an equilibrium or balance of pressures inside and outside the cylinder. Thereafter, the structure is in permanent operating condition.

Referring to Figures 3 to 6 which illustrate a second embodiment of my invention, it will be seen that within the reservoir R formed by the housing 7, I provide one or more breathing bags or collapsible receptacles 32, the form of my invention illustrated, embodying two such receptacles. Inasmuch as the receptacles 32 are disposed within the protecting and lubricating fluid with which the reservoir R is filled, they must, as in the case of cylinder 25 be composed of a flexible material which is not vulnerable to chemical attack either by the oil or the well fluid. 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. These bags 32 may be cylindrical in cross section or oval as shown in Figure 5, their upper ends terminating in an open neck adapted to be secured to the lower end 33 of an adapter 34 which is threaded to engage a complementary threaded opening 35 in the head 8, a passageway 36 through the head 8, placing the opening 35 and the adapter 34 in communication with the area surrounding the protecting unit housing 7. The neck of the bag 32 may be secured to the adapter 34 in any suitable manner, in the present instance, a series of wrappings of waxed linen string being employed, as clearly shown in the drawings.

In order to fill the reservoir R with a lubricating and protecting fluid, a drain and fill valve 41 of any suitable design, is provided at the lower end of the reservoir, in the base 10 as shown in Figure 3 and, although it is not shown in this figure, a vent plug may be provided at the upper end of the reservoir preferably extending through the head 8, as shown in Figure 1, to permit the escape of air during the filling operation.

When the reservoir R is filled with lubricating and protecting fluid through the drain and fill

valve 41, the bag or bags 32 naturally collapse and, in order to prevent a complete collapse of these bags so that their inner surfaces have a tendency to adhere to one another, I provide an endless coil spring 37 which is vertically disposed in each bag and rests upon the bottom of the bag, extending substantially to the upper extremity of the bag. Thus, when the bags are collapsed as shown in Figure 4, there is maintained throughout the longitudinal extent of each bag, an open area for the admission of the surrounding well fluid, as will be later explained.

Furthermore, as in the first form of my invention, it is desirable to constantly prevent the bag or bags 32 from becoming completely collapsed, and particularly when the reservoir R is first filled, so as to allow for breathing due to variations in static pressure inside and outside the reservoir. To this end, the upper portion of each bag is provided with a thickened or stiffened area 38 the lower end of which gradually tapers to the normal thickness of the bag wall. This thickened or stiffened area has sufficiently resistant properties to prevent complete collapse of the bag and to provide a normally fixed reserve capacity in the upper portions of each bag so as to allow for breathing necessitated by minor variations in static pressure within the reservoir R and in the area surrounding the protection unit. While I have shown and described these bags as being provided with thickened portions for the purpose set forth, it will be understood that I do not intend to confine myself to this particular embodiment. Obviously, other means such as resilient springs may be interposed in or operatively associated with the upper portions of the bags to maintain this fixed reserve breathing capacity.

While I have shown a reservoir embodying two collapsible receptacles it will be obvious that I may employ more or less, according to the requirements of successful operation of the unit in compensating for variations in the probable pressure differential involved. Likewise, the shape of the receptacles may be varied to meet different conditions of structure and operation.

The operation of this form of my invention will be obvious from the above description of the structure involved. However, this operation may be briefly described as follows:

At the time the pump unit, protecting unit and motor unit are assembled for lowering into the well, the motor casing and reservoir R are filled with suitable lubricating and protecting fluid through the drain and fill valve 41, the vent plug (not shown) being open for this purpose. The filling of the reservoir collapses the bag or bags 32 with the exception of the fixed reserve space in the upper portions of the bags, the endless coil spring preventing complete collapse to maintain a continuous air space on either side, from top to bottom of the bag. This prevents the bag walls from adhering together and interfering with the proper breathing operation.

When the motor starts the oil or other protecting fluid in the reservoir R gradually expands and oozes along the shaft 14, thus losing some of its volume. The interior of each bag is in communication with the fluid surrounding the housing 7, through the adapter 34 and passageway 36. Thus, when the motor is stopped, and the fluid in the reservoir R naturally contracts and reduces in volume, the water or other surrounding well fluid, which would otherwise be drawn into the reservoir and mixed with the oil or pro-

7
tecting fluid, enters the bag or bags through passageway 36 and adapter 33, replacing the lost volume in the reservoir R. This water or surrounding well fluid is retained in the bags and prevented from comingling with the oil in the reservoir, so as to contaminate the shaft and ultimately the motor structure by gaining access to those points along the shaft.

When the motor is again started the oil in the reservoir R naturally expands and expels the well fluid which has been previously drawn into the bags, to the extent of the remaining volume of oil in the reservoir. Thus, if any oil has been lost during the preceding operating period of the pump, an equivalent volume of water will remain in the bag. However, this will not jeopardize the lubricating and protecting functions of the remaining oil for, due to the displacement of partially filled bags, the area of said reservoir will be completely filled on the exterior of said bags.

In both forms of the invention, as an added precaution against foreign substances descending along the shaft 14 from the upper end of the stand tube 18, the skirt of the shedder 17 overhangs the top of the stand tube as shown in Figures 1, 3 and 4, so that any material floating on top of the oil in the reservoir R is excluded from the stand tube and cannot gain access to the motor.

With either form of my invention, surplus lubricant is discharged through a relief valve 30 at the initial start and thereafter, differential pressures of negligible intensity compensate for all expansion and contraction of volume of the lubricant in the motor and reservoir. Although some over-pressure may exist at the commencement of operation, if some protecting fluid escapes along the shaft the flexibility of the collapsible element or elements, soon causes the pressure to become equal to the difference in specific gravity of the surrounding well fluid, against that of the lubricant in the reservoir, for a height of column equal to the height of the protecting unit. The pressure differential in my improved structure normally amounts to a few inches of water column when length of the protecting section, measured from the packing around the shaft to the bottom of the protecting chamber is two or three feet and when the unit is submerged in the surrounding well fluid. As soon as the resilient stiffened areas 38 have neutralized that small pressure, equilibrium is established and the motor can operate uninterruptedly for an indefinite period.

Briefly stated, my design is fundamentally a low pressure protecting unit which, after some period of operation, becomes a permanent protection which is independent of the length of the motor below the protecting means.

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 of structure without departing from the spirit of the invention as set forth in the following claims.

I claim:

1. In a protecting unit for an oil filled, electric motor assembly adapted to be submerged in a surrounding well fluid for driving a pump located above, and including a casing, a vertical motor and motor shaft extension concentrically disposed in said casing, and a closed reservoir in said casing surrounding said shaft extension

above said motor, for containing a protecting and lubricating medium; means to compensate for expansion and contraction of said medium, incident to starting and stopping said motor, said means comprising at least one collapsible element disposed in said reservoir and defining therein, two laterally separated pressure zones, extending longitudinally substantially from end to end of said reservoir, the zone on one side of said element being in communication with the medium in the reservoir and the zone on the other side of said element being in communication with the fluid surrounding said casing, whereby said element is responsive to variations in the pressure differential of said fluid, so as to permit the entrance into one of said pressure zones, of a volume of fluid equal to the volume of medium lost from said other zone by contraction of said medium and to thereafter expel a proportionate volume of said fluid on expansion of said medium.

2. In a protecting unit for an oil filled, electric motor assembly adapted to be submerged in a surrounding well fluid and including a casing, a vertical motor and motor shaft concentrically disposed in said casing, and a closed reservoir in said casing surrounding said shaft above said motor, for containing a protecting and lubricating medium; means to compensate for expansion and contraction of said medium, incident to starting and stopping said motor, said means comprising a collapsible cylinder disposed in said casing, concentric with said shaft with its longitudinal extremities sealed to form in said casing, the peripheral boundary of said reservoir, the outer surface of said cylinder being exposed to the pressure of the well fluid surrounding said casing, through an aperture in the latter, whereby said cylinder is responsive to variations in the pressure differential of the medium in said reservoir and said surrounding fluid, so that the area in said casing encircling said cylinder, receives a volume of fluid equal to the volume of medium lost in said reservoir by the contraction of said medium and to thereafter expel a proportionate volume of said fluid on the expansion of said medium.

3. Apparatus as claimed in claim 2 wherein said collapsible cylinder is secured in place by a pair of longitudinally spaced annular retainers fixed adjacent the extremities of said casing in concentric spaced relation to said shaft.

4. In a protecting unit for an oil filled, electric motor assembly adapted to be submerged in a surrounding well fluid and including a casing, a vertical motor and motor shaft concentrically disposed in said casing, and a closed reservoir in said casing surrounding said shaft above said motor, for containing a protecting and lubricating medium; means to compensate for expansion and contraction of said medium, incident to starting and stopping said motor, said means comprising a pair of longitudinally spaced annular retainers fixed adjacent the extremities of said casing in concentric spaced relation to said shaft, said retainers being provided with oppositely disposed annular flanges intermediate the radial extremities thereof, a collapsible cylinder disposed in said casing concentric with said shaft with its longitudinal extremities sealed around respective annular flanges of said retainers, to form in said casing the peripheral boundary of said reservoir, the outer surface of said cylinder being exposed to the pressure of the well fluid surrounding said casing, through an aperture in the latter, whereby said cylinder is responsive to variations in the

pressure differential of the medium in said reservoir and said surrounding fluid, so that the area in said casing encircling said cylinder, receives a volume of fluid equal to the volume of medium lost in said reservoir by the contraction of said medium and to thereafter expel a proportionate volume of said fluid on the expansion of said medium.

5. In a protecting unit for an oil filled, electric motor assembly adapted to be submerged in a surrounding well fluid and including a casing, a vertical motor and motor shaft concentrically disposed in said casing, and a closed reservoir in said casing surrounding said shaft above said motor, for containing a protecting and lubricating medium; means to compensate for expansion and contraction of said medium, incident to starting and stopping said motor, said means comprising a pair of longitudinally spaced annular retainers fixed adjacent the extremities of said casing in concentric spaced relation to said shaft, said retainers being provided with oppositely disposed annular flanges intermediate their extremities, a cylindrical partition supported between said retainers in spaced relation to said shaft, a collapsible cylinder disposed in said casing concentric with said shaft and partition, with its longitudinal extremities sealed around the respective annular flanges of said retainers, to form in said casing, the peripheral boundary of said reservoir, the outer surface of said cylinder being exposed to the pressure of the well fluid surrounding said casing, through an aperture in the latter, whereby said cylinder is responsive to variations in the pressure differential of the medium in said reservoir and said surrounding fluid, so that the area in said casing encircling said cylinder, receives a volume of fluid equal to the volume of medium lost in said reservoir by the contraction of said medium and to thereafter expel a proportionate volume of said fluid on the expansion of said medium.

6. Apparatus as claimed in claim 5 including resilient means cooperating with said collapsible cylinder to prevent complete collapse thereof.

7. Apparatus as claimed in claim 5 including a series of spring elements extending longitudinally parallel to the walls of said cylinder, said springs being secured at their opposite ends between respective pairs of radially disposed supporting arms fixed at intervals around the periphery of said cylindrical partition, to prevent complete collapse of said collapsible cylinder.

8. A self-contained protecting unit for submergible, oil filled, vertical electric motors, comprising a closed cylindrical casing adapted to be coaxially interposed between a pumping unit and a motor unit, a shaft section concentrically disposed in said casing, for connection to the respective adjacent ends of the shafts of the motor and pump units, said casing forming a reservoir for a protecting and lubricating medium, at least one collapsible receptacle depending in said reservoir alongside said shaft section and disposed in the medium within said reservoir, with its interior sealed with respect to the reservoir but in communication with the fluid surrounding the reservoir, said receptacle being responsive to variations in the pressure differential within and without said reservoir, whereby any of said surrounding fluid which enters said reservoir in replacement of lost volume due to contraction of said medium, will be confined within said collapsible receptacle until ejected therefrom by expansion of said medium.

9. A protecting unit as claimed in claim 8, including resilient means associated with the walls of said collapsible receptacle to resist complete collapse thereof under predetermined pressure variations and to thereby maintain a normally fixed reserve breathing capacity within the reservoir.

10. A protecting unit as claimed in claim 8, wherein a portion of walls of said collapsible receptacle is thickened to form an area having sufficiently resistant properties to prevent complete collapse of the receptacle under predetermined pressure variations, to thereby maintain a normally fixed reserve breathing capacity in the receptacle.

11. A protecting unit as claimed in claim 8, wherein the upper area of the walls of the collapsible receptacle is thickened to form an annular section having sufficiently resistant properties to resist complete collapse of the receptacle under predetermined pressure variations, to thereby maintain a normally fixed reserve breathing capacity in the upper portion of the receptacle.

12. A protecting unit as claimed in claim 8, including means within the collapsible receptacle for preventing complete collapse thereof.

13. A protecting unit as claimed in claim 8, including an endless coil spring disposed vertically within said collapsible receptacle to prevent complete collapse thereof.

14. A protecting unit for submergible, oil filled, vertical electric motors, comprising a cylindrical casing, a head closing the upper end of said casing, a base closing the lower end of said casing, means associated with said head and base respectively, for coaxially interposing said casing between a pump unit and a motor unit, said casing forming a reservoir surrounding a portion of the motor and pump shaft and adapted to receive a protecting and lubricating medium, a passageway extending through said head from the area surrounding said casing to the interior of the reservoir, an adapter mounted in the inner extremity of said passageway, a collapsible receptacle carried by said adapter and suspended from said head into said reservoir, said receptacle communicating with the area surrounding said casing, through said passageway and adapter, with its interior sealed with respect to the interior of the reservoir, said receptacle being responsive to variations in the pressure differential within and without said reservoir, whereby any of said surrounding fluid which enters the reservoir in replacement of lost volume due to contraction of said medium, will be confined within said collapsible receptacle until ejected therefrom by expansion of said medium.

15. A self-contained protecting unit for submergible, oil filled, vertical electric motors, comprising a cylindrical casing, a head closing the upper end of said casing, a base closing the lower end of said casing, a central shaft section rotatably mounted in coaxial openings in said head and base, means associated with said head and base, respectively, for coaxially interposing said casing between a pump unit and a motor unit, means at the extremities of said shaft section for interposing the same between the pump shaft and the motor shaft, said casing forming a reservoir surrounding said protecting unit shaft section, and adapted to receive a protecting and lubricating medium, and a collapsible receptacle disposed in said reservoir with its exterior exposed to the medium therein and its interior in

communication with the fluid surrounding said casing, whereby said receptacle is responsive to variations in the pressure differential of said medium and said fluid, so as to receive a volume of fluid equal to the volume of medium lost by contraction of the latter and to thereafter expel a proportionate volume of said fluid on expansion of said medium.

16. A self-contained protecting unit for submergible oil-filled, vertical electric motors, comprising a cylindrical casing, a head closing the upper end of said casing, a base closing the lower end of said casing, a central shaft section, having its opposite ends projecting through and rotatably mounted in respective coaxial openings in said head and base, means respectively associated with said head and base, for coaxially interposing said casing between a pump unit and a motor unit, means at the projecting extremities of said shaft section for concentrically connecting the latter between the respective shafts of said pump and motor units, said casing forming a reservoir surrounding said central shaft section, and adapted to receive a protecting and lubricating medium, means in said reservoir to compensate for expansion and contraction of said medium, incident to starting and stopping said motor, said means comprising at least one collapsible element disposed in said reservoir and defining therein, a medium receiving zone in communication with the interior of the reservoir, and a separate well fluid receiving zone in communication with the fluid surrounding the reservoir and sealed against the medium in the latter, said collapsible element being responsive to the pressure of the medium in said reservoir and that of the surrounding well fluid, whereby any variations in the pressure differential of said medium and said surrounding fluid is compensated for and access of said surrounding fluid to said shaft section is prevented.

17. In combination with a submergible oil-filled vertical electric motor unit and a coaxial pump unit, a self-contained protecting unit adapted to be coaxially interposed therebetween and comprising a cylindrical casing, a head closing the upper end of said casing, a base closing

the lower end of said casing, a central shaft section having its opposite ends projecting through and rotatably mounted in respective coaxial openings in said head and base, means respectively associated with said head and base for connecting said casing to the pump and motor units, means at the projecting extremities of said shaft section for concentrically connecting the latter between the respective shafts of said pump and motor units, said casing forming a reservoir surrounding said central shaft section, and adapted to receive a protecting and lubricating medium, means in said reservoir to compensate for expansion and contraction of said medium, incident to starting and stopping said motor, said means comprising at least one collapsible element disposed in said reservoir and defining therein, a medium receiving zone in communication with the interior of the reservoir, and a separate well fluid receiving zone in communication with the fluid surrounding the reservoir and sealed against the medium in the latter, said collapsible element being responsive to the pressure of the medium in said reservoir and that of the surrounding well fluid, whereby any variations in the pressure differential of said medium and said surrounding fluid is compensated for and access of said surrounding fluid to said shaft section is prevented.

18. The combination as claimed in claim 17 wherein said pump unit is mounted above and said motor unit is mounted below said protecting unit.

19. A self-contained protecting unit as claimed in claim 16, including means to prevent the complete collapse of said collapsible element.

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