April 5, 1932. R. L. WHITE 1,852,867

AUTOMATIC SUCTION BELL AND CURRENT CONTROL

Filed Jan. 26, 1931

FIG. 1

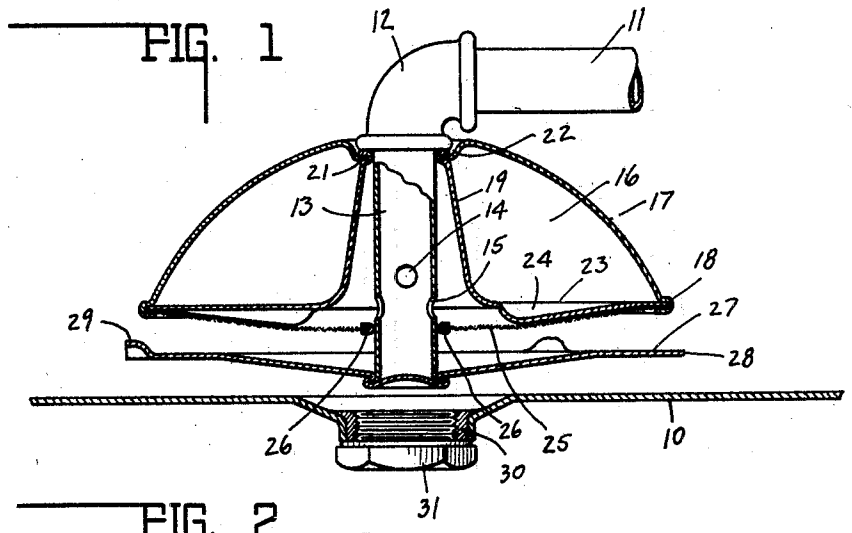


FIG. 2

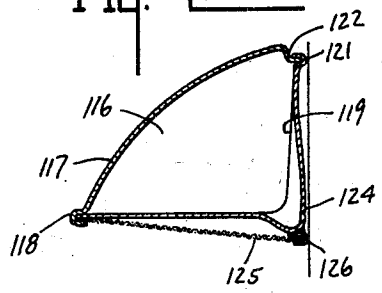


FIG. 3

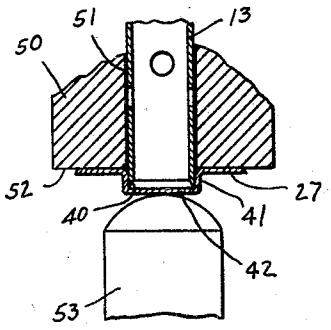
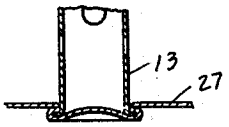


FIG. 4



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UNITED STATES PATENT OFFICE

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AUTOMATIC SUCTION BELL AND CURRENT CONTROL

Application filed January 26, 1931. Serial No. 511,198.

This invention relates to an automatic suction bell and current control device.

This application is similar to my copending application, similarly entitled, filed January 20, 1930, and bearing Serial No. 422,107, now Patent No. 1,790,563, dated January 27, 1931.

The chief object of this invention is to provide a buoyant mechanism which, in addition to accomplishing substantially all that the before mentioned application structure accomplishes, has the advantage of remaining relatively inactive in regard to low velocity intake but which for large quantity displacement becomes active for securing predetermined directional flow of the lubricant.

The chief feature of the invention is the automatic clearing of the screen by lateral surging during low intake, other portions of the device removing the suspended matter from the oil prior to screen engagement during large quantity displacement.

Another feature of the present invention consists in the bowl shape of the screen, whereby the central portion of the same serves as a bumper or stop to limit lowering movement of the bell if and when ice forms or collects above the current control plate.

Another feature of the present invention consists in the dished or depressed shape of the current control plate so that the plate will permit the depressed screen to nest therein and allow peripheral stops to become effective.

Another feature of the invention consists in the gutter formation adjacent the upper guide for retaining a sufficient quantity of liquid for air sealing the upper end of the bell chamber during the circulation of the oil, thereby insuring certainty of operation without undue closeness of fit between the guide and its support which would impair the operation of the device and particularly its responsiveness to varying conditions.

The full nature of the invention will be understood from the accompanying drawings and the following description and claims:—

In the drawings, Fig. 1 is a central, sectional view of one embodiment of the invention.

Fig. 2 is a similar view of a portion of a modified form of the invention shown in Fig. 1.

Fig. 3 is a sectional view showing the association of several parts preliminary to securing the same together.

Fig. 4 illustrates the parts when secured together.

In the drawings, 10 indicates the bottom of a reservoir, such as the oil pan of an internal combustion engine, such engine including a pump which is connected to the line 11, in turn connected to the elbow 12, and depending therefrom, is the inlet pipe 13. Inlet pipe 13 has a pair of upper holes, or inlet passages 14, and a pair of lower holes, or inlet passages 15. The size of these holes may be that required or desired and the upper and lower holes may vary in size.

A float indicated by the numeral 16 has a dome-shaped outer bell surface 17 with an outer, lower and largest periphery 18. The inner wall of the float is formed by the inwardly and upwardly tapered conical portion 19, which is connected at the upper end to the upper end of the dome-shaped bell portion 17 at 21 by a peripheral groove arrangement. The bell 17, as at 22, forms a small groove adjacent the connection and said groove forms a gutter adjacent the upper guide ring formed by the connection 21. Lubricant trapped in the gutter will seal whatever minute air space there is between the upper guide 21 and the inlet pipe 13.

The lower wall of the float is indicated by the numeral 23 and it is suitably connected to the outer periphery of the bell as at 18 by a crimp connection and is herein shown formed integral with the conical inner wall 19. In Fig. 1 the bottom wall 23 is shown downwardly enlarged as at 24 to form bearing supports against which bears a wire cloth screen 25 of the desired mesh. The screen 25 is secured to the outer periphery of the bell at the joint 18 by any suitable means. The inner periphery of the screen supports a lower guide ring 26 which is slidably mounted upon the inlet pipe 13.

The screen is dished downwardly toward

the lower guide bearing and the screen moves with the bell and float, said bell and float being combined in the present embodiment. Suitably secured to the lower end of the inlet pipe and herein forming a closure therefor, is the current control plate 27. This is dished upwardly so that its outer periphery 28 is at the highest elevation and the periphery is at a greater distance from the pipe than the periphery 18 of the bell, so that the plate overlaps the bell. The plate at its periphery and at a plurality of spaced portions is struck upwardly, as at 29, to form stops for engagement by the periphery 18 of the bell so that complete closure of the annular passage between the plate and the bell is prevented.

In the present form of the invention, the bottom of the reservoir 10 is shown provided with a threaded fixture 30 which is closed by a drain plug 31, whereby the sediment may be readily removed from the bottom of the reservoir.

In Fig. 2, a modified form of the invention is illustrated and in this form of the invention, similar parts are indicated by the numerals of the one-hundred series. The abutment 124, similar to the abutment 24, not only supports the screen but in this instance supports the inner end of the screen and is spot-welded or otherwise secured to the annular lower guide 126 carried by the inner end of the screen 125. Otherwise, the construction may be the same as that shown in Fig. 1.

In Figs. 3 and 4, there is illustrated the formation of the inlet pipe closure and the anchorage of the current control plate. The plate is indicated by the numeral 27 and the pipe is indicated by the numeral 13. Lower end of the pipe 13 is beveled inwardly as at 40 and the plate 27 includes a recessed portion having the side wall 41 and the bottom 42 substantially parallel to the plate portion 27. The diameter of the well or recess 41 is just sufficient to receive the end of the pipe 13. A perforated die or anvil member 50 having the opening 51 therein and the face 52, is adapted to receive the pipe 13 and permit the same to project through the opening 51 and below the face 52 of the anvil 50. Plate 27 rests upon plate 52 and with the pipe held against longitudinal displacement in the opening, a partially spherical member 53 is coaxially forced upwardly toward the anvil and in so doing forces the side walls 41 outwardly at right angles to plate 27, and moves the entire bottom portion 42 upwardly and into the inwardly tapered end 40 of the inlet pipe. At the same time said tapered side wall of the pipe at the end is flared outwardly as shown clearly in Fig. 4, thereby mechanically anchoring and sealing the control plate 27 to the low end of the pipe 13 and forming a closure for the latter.

The float in the present disclosure should be of sufficient buoyancy to remain at its upper level when the pump connected to line 11 is displacing at a low rate. Its relation to the lower inlet holes is such that the lines of liquid flow are substantially parallel to the lower surface of the float or the outer periphery 18 or lower edge of the bell. These parallel currents of liquid under these conditions do not have sufficient influence on the bell to make the same descend. However, when the lower inlet passages 15 are running full or nearly approach complete capacity, the suction applied through the upper passages or openings 14 also become active and the increased displacement influences the bell and causes its downward movement in opposition to the floating effect or tendency of the bell to remain elevated by reason of the float or other equivalent means having an equal effect.

Such an equivalent means may constitute a spring or a counterweight lever connection to the bell. Under the aforesaid load displacement conditions, the bell, therefore, remains in its upper position but descends to its lower position when the liquid displacement approaches or is increased beyond the capacity of the lower inlet passages 15. The timing for the descent of the bell may be governed in direct relation to the displacement rate by variation of the location or capacity of the lower inlet passages and the size of the upper inlet passages.

The purpose of this controlled action of the bell's descent is to allow for parallel surging action of the liquid being handled at the low displacements, so that such surging will wash the screen clear of foreign matter. Low displacement is obtained at speeds below thirty miles per hour but the average engine below thirty miles per hour has an R. P. M. of one thousand and the oil pump has an R. P. M. of five hundred. While traveling at this speed, and the same is generally utilized for city traffic, it has been found that ninety-five percent of the brake applications occur in said city traffic, so that when the brakes are applied, the oil in the reservoir surges forward and then returns, etc. It is this surging at the low speeds which clears or cleans the screen. This action, therefore, constitutes the automatic or self-cleaning effect and permits the employment of a minimum screen area for operation, and allows warmer oil nearer the top to be circulated at the lower speeds of the engine.

Surging at high speeds will secure the same effect but as a general rule, there is sufficient surging by reason of variation in the speed of a vehicle at speeds under twenty-five or thirty miles per hour, so that the screen will be maintained clean. Therefore, the worst operating condition, that is cleaning of the screen at low speeds, is provided with the aforesaid construction.

To insure substantially as frictionless operation as possible, the gutter 22 is provided. This remains filled with oil and seals the upper portion or upper guide and inlet pipe substantially lined contact. Thus, the bell and combined float are rendered more susceptible to the suction effect without requiring such a closeness of fit, that a considerable portion of the suction would be necessary to overcome the friction at the substantially lined contact of the upper guide. With this substantially lined contact, the possibility of grit and the like sticking between the guide surface and the pipe is minimized. The term "substantially lined" is intended to include as wide a bearing surface between the inlet pipe and guide as is practical without introducing the possibility of sticking the bell due to possible sediment accumulation between the guide and inlet pipe.

The shape of the bell is such that oil circulation tends to lower the bell and the "floating" action becomes less effective when the reservoir is full and the rate of circulation is relatively large.

When water is present in the oil and the same has frozen to ice, the dished form of screen, since it is reinforced by the abutment 24 or 124 respectively, will support the bell above the level of the ice so that there is an annular channel above the ice and below the periphery 18 and the oil stream above the ice can pass to the inlets and therefore danger of ice locking is eliminated. Irrespective of the position of the bell, the oil which passes to the inlets must pass through the screen. The greater proportion of the sediment, grit and the like, and the water, etc., other than oil will gradually settle to the bottom of the reservoir and below the plate and thus be kept out of circulation, since scouring of the reservoir bottom is prevented. The streams supplied to the inlet passages are all horizontal streams and generally above the lower most level of the oil so that the edge 28 of the plate forms a division plate for directing downwardly the heavier and grittier portions of the oil stream and permits the upper, lighter and cleaner portions of the oil stream to be recirculated. Likewise, this plate, since it projects beyond the periphery 18, does prevent scouring action that has heretofore been associated with the standard pump intakes now employed in internal combustion engines.

In warmer weather particularly and when traveling at high speeds, the present invention permits the bell to descend at high vehicle speeds, which means high pump and engine speeds, until the screen engages the abutments 29 upon the plate 27 and thus the annular intake opening beneath or adjacent the edge of the bell is at the lower portion of the major portion of the oil in the reservoir, so that the oil is taken from the lower and cooler portion thereof, thereby insuring better temperature control in the lubrication of the engine.

The invention claimed is:—

1. An automatic, suction actuated bell and current control device for suction pump inlets, in combination with a reservoir bottom, the inlets being positioned at different elevations above the reservoir bottom, of a suction responsive bell, a vertical pipe provided with the inlets and slidably supporting said bell, means normally constraining said bell to an elevated position, said bell being arranged to automatically descend upon the pipe upon the application of sufficient suction to the inlets, and a current control plate in juxtaposition to said reservoir bottom and the bell and projecting beyond the outer periphery of the bell for dividing the converging incoming liquid stream to the inlets and directing substantially horizontally the upper portion of said divided stream for the purpose described.

2. A device as defined by claim 1, characterized by the addition of a dished or bowl shaped screen terminating in a peripheral guide slidable on the pipe and interposed at all times in the intake liquid flow to the inlets.

3. A device as defined by claim 1, characterized by the current control plate being fixedly mounted in predetermined relation to the bottom of the reservoir.

4. A device as defined by claim 1, characterized by the current control plate being fixedly mounted in predetermined relation to the bottom of the reservoir, and upon the inlet pipe.

5. A device as defined by claim 1, characterized by the current control plate being fixedly mounted in predetermined relation to the bottom of the reservoir and upon the inlet pipe, and by a lateral enlargement thereof.

6. A device as defined by claim 1, characterized by the inlet pipe extending downwardly and terminating in spaced relation to the bottom of the reservoir and the current control plate being associated with the end of said inlet pipe for closing the same and supported thereby and in spaced relation to the bottom of the reservoir.

7. A device as defined by claim 1, characterized by the bell including adjacent its upper inner portion a peripheral guide for slidably supporting the bell on the inlet pipe and the bell portion immediately adjacent said guide being arranged in gutter formation for trapping liquid for air sealing the slidable contact of the bell upon the pipe.

8. A device as defined by claim 1, characterized by the bell including adjacent its upper inner portion a peripheral guide for slidably supporting the bell on the inlet pipe and the bell portion immediately adjacent said guide being arranged in gutter formation for

trapping liquid for air sealing the slidable contact of the bell upon the pipe, said means for normally constraining the bell including a float construction, the latter having a downwardly and outwardly flared inner wall forming a tapering chamber surrounding the inlet pipe and closed at its upper end by said gutter protected guide.

9. A device as defined by claim 1, characterized by the bell including adjacent its upper inner portion a peripheral guide for slidably supporting the bell on the inlet pipe and the bell portion immediately adjacent said guide being arranged in gutter formation for trapping liquid for air sealing the slidable contact of the bell upon the pipe, said means for normally constraining the bell including a float construction, the latter having a downwardly and outwardly flared inner wall forming a tapering chamber surrounding the inlet pipe and closed at its upper end by said gutter protected guide, and by the addition of means integral with the current control plate and projecting upwardly therefrom for engagement by the bell construction for limiting the lowest portion of the bell to a predetermined spacing between the outer periphery of the bell and the overlapping portion of the plate.

10. A device as defined by claim 1, characterized by the bell including adjacent its upper inner portion a peripheral guide for slidably supporting the bell on the inlet pipe and the bell portion immediately adjacent said guide being arranged in gutter formation for trapping liquid for air sealing the slidable contact of the bell upon the pipe, said means for normally constraining the bell including a float construction, the latter having a downwardly and outwardly flared inner wall forming a tapering chamber surrounding the inlet pipe and closed at its upper end by said gutter protected guide, and by the addition of means integral with the current control plate and projecting upwardly therefrom for engagement by the bell construction for limiting the lowest portion of the bell to a predetermined spacing between the outer periphery of the bell and the overlapping portion of the plate, and by the further addition of a screen, the same extending inwardly toward the inlet pipe and terminating in a peripheral guide slidably mounted upon the inlet pipe, said screen being dished downwardly and arranged for ice engagement for limiting lowering movement of the bell and preventing ice locking.

11. In an automatic suction bell construction for internal combustion engines including a lubricant circulating pump and reservoir, the combination of an intake pipe, a bell slidably mounted thereon, and normally constrained toward elevated position and movable downwardly by the suction in opposition to such constraint, a control plate therebeneath and toward which the bell moves in pump operation and overlapping the outer periphery of the bell, and a pair of spaced lined guides for frictionless aligned mounting of the bell upon the pipe.

12. A device as defined by claim 11, characterized by an upwardly and inwardly inclined tubular portion carried by the bell and interposed between the outer surface of the bell and the pipe for regulating the descent of the bell when subjected to suction.

13. A device as defined by claim 1, characterized by an upwardly and inwardly inclined tubular portion carried by the bell and interposed between the outer surface of the bell and the pipe for regulating the descent of the bell when subjected to suction.

14. A device as defined by claim 1, characterized by the means for normally constraining the bell toward an elevated position, comprising a float included in said bell construction.

In witness whereof, I have hereunto affixed my signature.

RAYMOND L. WHITE.