

March 8, 1966

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3,239,192

LIVESTOCK OILER VALVE AND METHOD OF INSTALLING SAME

Filed Feb. 18, 1963

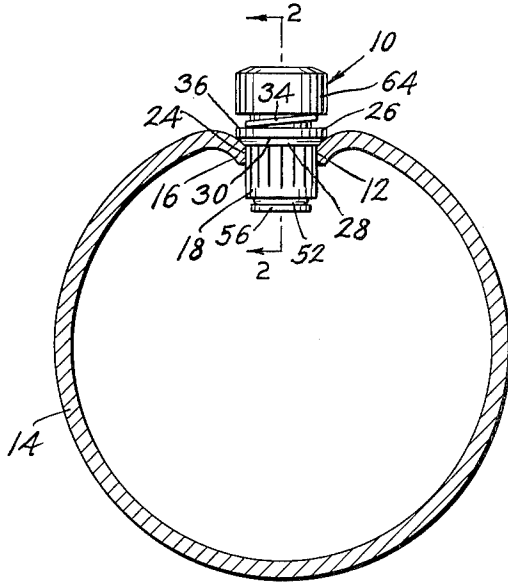


FIG. 1.

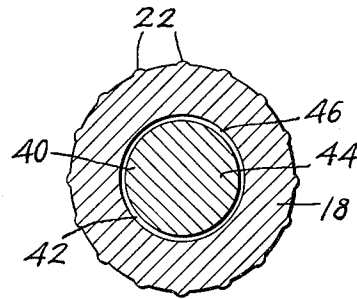


FIG. 3.

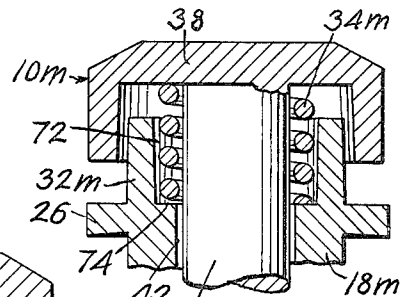


FIG. 4.

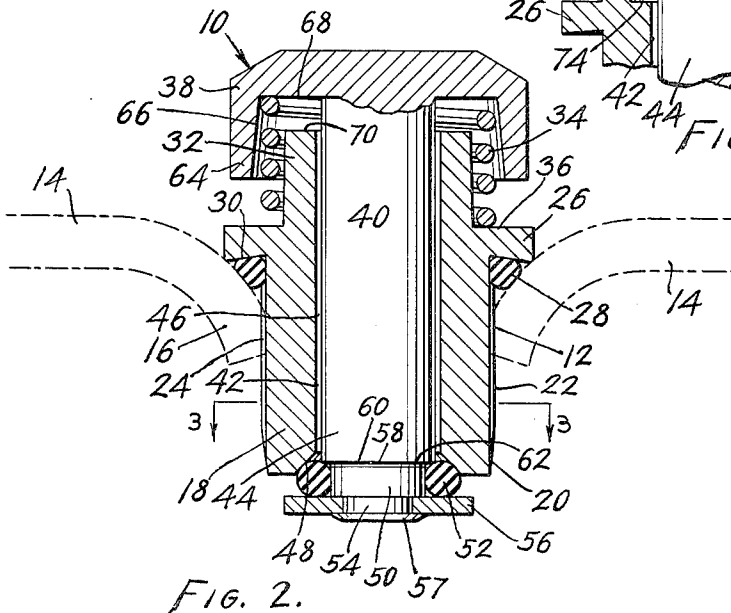


FIG. 2.

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LIVESTOCK OILER VALVE AND METHOD OF INSTALLING SAME

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Filed Feb. 18, 1963, Ser. No. 259,204
11 Claims. (Cl. 251-322)

The invention relates to devices commonly known as "livestock oilers" and, more particularly, to novel valve mechanisms for use therein together with the method employed in installing same.

Various devices have been used over the years as a means for transferring fluids such as, for example, oils and insecticides, to the hides of cattle and other animals on the hoof. These units are operated by the animals themselves who, while exercising their natural propensity to scratch themselves, rub up against some type of rubbing element which transfers the desired fluid from a reservoir thereof to their hide.

Most of the earlier devices for this purpose, many of which are still used, employed a wick-type rubbing element that became saturated with the liquid which, in turn, was transferred to the animal as they rubbed thereagainst. These units, however, suffered many deficiencies which limited their usefulness. Among these deficiencies are the fact that volatile components evaporated quickly from the wick-type rubbing element and little was actually transferred to the animals. Also, nearly all of the different types of liquid compositions used in these "oilers" are adversely affected by exposure to air, sunlight or both which materially reduces their potency and effectiveness. All in all, much greater quantities of the treating liquid are used in this type of unit than theoretically necessary due to evaporation losses or reduced potency making them expensive to maintain even though their initial cost might be low.

More recently, a few devices have been marketed which overcome some of the problems outlined above that occur with wick-type oilers. The main difference between the early units and the more recent ones is the elimination of the wick-type rubbing element in favor of a tubular metal rubbing element that is fitted with a number of pressure-actuated valves which function to dispense small quantities of liquid on to the animals' hide when they rub or lean against one or more of these valves. This type of unit has several advantages, the more significant of which are reduction of evaporation occurring with volatile liquids, more economical operation, and less likelihood that the rubbing element will become clogged with dust, dirt, hair and other foreign substances which is another serious drawback to the wick-type "oiler." While the valved oiler is certainly an improvement over the wick-type, it also is deficient in some of these same areas and, in addition, has a number of other shortcomings associated with the valves.

Valve leakage is a major problem. This usually occurs in one of two ways, namely, the valve element fails to seat properly or its mode of attachment within the tube is such that fluid leaks around the entire valve assembly. The first of these leakage problems is usually brought about by foreign particles entering the valve and preventing same from closing. The nature of use is such that these valves are continually subjected to hair and dirt rubbing off the animal's coat, blowing dust which combines with atmosphere's moisture or the treating liquid itself to produce a hard mud-cake inside the valve, and ice and snow which freeze the operating elements. Somewhat less often leakage occurs by reason of bent valve stems, worn seals, canted valve elements and broken parts.

Leakage around the valve, on the other hand, usually

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occurs when the valve assembly becomes tilted in its mounting hole. These valves are subjected to extremely rough treatment as fully-grown animals rub back-and-forth across them. Most of the valves are mounted with a press-fit into drilled holes provided in relatively thin-walled pipe or tubing; therefore, the annular contact area is so small as to enable the valve to become loosened rather easily. Threaded connections, while possible, are not much better due to the relatively few threads that are possible in the thin tube wall. Also, if a threaded connection is stripped, the entire rubbing unit may have to be discarded due to the difficulty of plugging the opening or replacing the valve with another one. Furthermore, continued use tends to enlarge the openings in the tube and valve replacement becomes difficult if not impossible under some circumstances.

Other problems arise in connection with the design of the valves. For instance, the clogging and seating problems already mentioned are, in large measure, attributable to poor valve design. Secondly, the prior art valves are so constructed that they stay open and continue to dispense fluid as long as pressure is applied thereto. Cattle, in particular, are likely to lean against the rubbing element for long periods of time allowing substantial quantities of the treating liquid to leak out of the reservoir.

Lastly, the prior art valved units by no means completely solve the problem of deterioration occurring in the treating liquid due to exposure to the air and sunlight. Most, if not all, of the treating compositions oxidize rapidly in air and become less effective when subjected to the ultra-violet rays of the sun. This means, of course, that even though the liquid is dispensed onto the animal's hide in the desired quantities and at the required intervals, it may well have become so impotent as to be utterly useless for its intended purpose. Insecticides, in particular, are prone to deteriorate under these conditions and must, therefore, be replaced at frequent intervals if they are to remain effective.

While numerous other deficiencies exist in the prior art valved "livestock oilers" they are, for the most part, of less significance and those mentioned above should suffice to indicate the nature and extent of the problems associated with the design of such a unit. It has now been found in accordance with the teaching of the instant invention that these and other shortcomings can, in large measure, be overcome or even completely eliminated through the use of much improved valve design and method of mounting same in the tube.

First of all, the outside of the valve case or barrel is so constructed that it will cooperate with the curled edges surrounding a punched opening when inserted therein to produce a substantially liquid and air-tight seal while, at the same time, increasing the total metal-to-metal contact area to a point where it cannot become canted or otherwise tilted even when subjected to rough usage. This occurs whether or not the peripheral edge of the punched opening seals tightly against the valve barrel. Means are also provided on the surface of the valve barrel to accommodate slightly enlarged openings.

Secondly, several features of the valve function alone or in combination with one another to produce a self-cleaning action which is quite effective to eliminate any difficulties that might arise in connection with the presence of foreign material. Some of these same features along with others so protect the working parts that the introduction of hair, dirt, dust, snow, ice, water and mud become extremely rare. Provision is even made to prevent hair from being pinched off when the valve is actuated by the animal's body.

Of considerable advantage to the user is the fact that installation or replacement of the valves may be accomplished in the field with simple hand tools in a matter

of a few minutes at the most by relatively unskilled persons. Perhaps the most significant advantage to the customer is, however, the economies that are realized through the use of the valve. These arise because the treating liquid is not wasted, is protected against deterioration, and is, therefore, transferred to the animal at full potency.

Accordingly, it is the principal object of the present invention to provide a novel and improved valve mechanism for livestock oilers together with a superior method of installing same.

A second object is the provision of a unit of the class described that is self-cleaning in that a closing spring functions on each actuation to break away encrustations near the outlet and the fluid being dispensed washes away foreign matter on the seat and within the flow orifices.

Another object is to provide a valve for livestock treating units which effectively seals the working parts against entry of contaminants.

Still another object is the provision of a valve which, in effect, has two closed positions, one completely actuated and another unactuated thus preventing waste of the treating liquid should an animal lean against the valve for an extended period of time.

An additional object of the invention herein set forth is to provide a valve which is extremely simple to install, remove and replace with common hand tools.

Further objects are the provision of a livestock oiler valve assembly that is simple, extremely rugged, versatile, small, compact, inexpensive and even somewhat decorative.

Other objects will be in part apparent and in part pointed out specifically hereinafter in connection with the description of the drawings that follows, and in which:

FIGURE 1 is a transverse section through a tube of a livestock oiler showing the valve of the present invention in place within a punched opening therein;

FIGURE 2 is an enlarged diametrical section through the valve itself taken along line 2—2 of FIGURE 1, portions of the tube wall having been indicated in dot-dashed lines;

FIGURE 3 is a transverse section taken along line 3—3 of FIGURE 2 showing the annular fluid discharge passage between the barrel and plunger of the valve element; and,

FIGURE 4 is a fragmentary diametrical section similar to FIGURE 2 showing an alternative construction in which the valve spring is mounted inside of the barrel rather than outside thereof.

Referring now to the drawing for a detailed description of the present invention and, initially, to FIGURES 1 and 2 for this purpose, the valve has been designated broadly by reference numeral 10 and has been illustrated in installed position within a punched opening 12 provided for the purpose in the wall of tube 14. Tube 14 comprises but a portion of a so-called "livestock oiler" (not illustrated) which usually includes a ground-anchored base from which this tube projects upwardly and a fluid-reservoir atop the tube. The top of the tube communicates with the interior of the reservoir and is, therefore, kept full while the fluid supply lasts. Actually, several valves are provided in each tube located at varying distances above the base and at such peripheral points as the cattle or other animals are likely to come into contact with when they rub thereagainst.

From comparison between the wall-thickness of the tube and the length of the valve, it will be apparent that this and similar valves could easily become canted in drilled openings because of the small annular area of metal-to-metal contact especially when the fact is considered that nearly all the forces applied thereto by the animal are in the nature of a rubbing action tending to rock it back and forth. Experience with the prior art valve structures has shown that they become loose to the point of leaking and even falling out of the tube altogether when mounted within a drilled opening for the

above reasons. As aforementioned, threaded connections also cause problems and are often no better than the drilled holes if as good. Of course, heavier-walled tubing could be used or reinforcing plates welded to the tube where the valves are located but these are expensive and time-consuming solutions.

It has been found in accordance with the instant invention that this problem can be solved quite simply by punching out the openings 12 in the tubing thereby creating an inwardly-curved peripheral edge 16 bordering said opening. Then, when the barrel 18 of the valve is driven into such an opening which is preferably slightly undersized, the slightly tapered leading end 20 along with longitudinal lands 22 on the exterior surface cooperate to perform a reaming action on the edge 24 of the hole that results in a substantial annular area of metal-to-metal contact. Also, note that the exteriorly-positioned portion of the valve becomes recessed slightly within the socket produced by the incurled edge 16 that further protects the valve and opening against the detrimental effects of the rocking action aforementioned.

This punched opening 12 is, in and of itself, sufficient to prevent the valve from becoming loosened and leaking due to the greater contact area and recessed valve position; however, additional protective measures are provided on the valve assembly that insure no relative movement between the valve and tube. One of these measures takes the form of an annular flange or rib 26 encircling the barrel intermediate the ends thereof. This flange engages the inturned edge 16 of the hole 12 and makes annular line contact therewith in a plane spaced apart from the annular area of metal-to-metal contact between the reamed portion 24 bordering said hole and the ribbed section of the barrel. It thus becomes extremely difficult to tilt the valve in the opening due to these separated regions of continuous annular engagement.

Furthermore, an O-ring seal or gasket 28 encircles the barrel 18 in annular contact with the inwardly-facing shoulder 30 of the annular flange. With the valve in installed position as shown in FIGURES 1 and 2, this O-ring seal, likewise, engages the incurled edge 16 of the tube bordering the punched opening 12 therein producing still a third continuous annular contact area located between those provided by the peripheral flange and the ribbed section of the barrel that have already been described. Thus, O-ring 28 not only seals the connection between the valve body and tube against the entry of air, moisture, sunlight and dirt, it also resists the tilting forces ordinarily applied to the valve by the animals. This O-ring also makes continuous annular contact with both the annular flange and cylindrical surface of the valve barrel to produce the fluid and air-tight seal which is its primary function. Note that shoulder 30 formed on the inner face of flange 26 is undercut slightly because this is significant for two reasons. The first is that it deepens the corner into which the O-ring is compressed by the curled edge 16 of the tube and makes it possible for the flange to completely enclose said O-ring thereby protecting same from damage occasioned by the animal rubbing thereagainst and the abrasive action of sand-laden winds. The other function relates to removal of the valve and will be described in detail presently.

The outer or exposed end of the barrel 18 comprises an annular smooth-surfaced section 32 of lesser diameter than the ribbed section thereof. As shown, this annular section is tapered slightly in the direction of the outside end to provide a surface that is less likely to bend against valve spring 34 which encircles same. While this taper is not absolutely necessary, it tends to allow foreign particles that may enter this area to work themselves back out rather than become trapped between the spring coils, where they can jam the valve mechanism. The valve spring is of the loose-wound helical compression type that seats at its inner extremity on the outwardly-facing shoulder 36 of flange 26. The outer end of spring 34,

seats inside the generally cup-shaped head 38 of plunger-type valve element 40.

Next, with particular reference to FIGURES 2 and 3, it will be seen that barrel 18 has an axial bore 43 through which loosely receives the cylindrical plunger or stem 44 of the valve element 40 for reciprocal movement defining therewith an annular fluid-flow passage 46 by which the treating fluid moves through the valve. The inner extremity of the barrel contains a frusto-conical seat 48 bordering the axial bore.

Valve element 40 carries cup-shaped cap 38 on the outer extremity of the plunger and an annular cylindrical section of reduced diameter 50 adjacent the inner-end thereof which receives O-ring 52. This section of reduced diameter 50 also has an annular groove 54 encircling same that receives and retains washer 56 which holds the O-ring 52 in place. Actually, groove 54 is formed by up-setting the end 57 of the plunger once the washer and O-ring are in place on the inner extremity thereof. Valve spring 34 fits up inside the cup-shaped cap 38 of the plunger biasing the latter outwardly and drawing the O-ring 52 up snug against the frusto-conical seat 48 on the end of the barrel to produce an air and liquid-tight seal. While not critical, it has been found that a better seal results if O-ring 52 makes essentially line-contact rather than area contact with the frusto-conical seat 48 and also with the outside corner 58 produced by the shoulder 60 separating the main cylindrical section of the plunger from the reduced section 50 thereof. Thus, even though the inside corner 62 of this shoulder is formed with a small radius, the O-ring has a substantially greater radius resulting in one line contact seal at outside corner 60 and a second at the line of tangency between said O-ring and reduced section 50 which lies intermediate the washer and inside radiused corner 62.

The annular fluid-flow passage 46 between the plunger and barrel makes it possible for the valve element 40 to become slightly canted out of its proper coaxial position in the bore thus preventing the valve from seating properly. By locating the valve spring 34 at the opposite extremity of the valve element from O-ring 52, this problem is, however, eliminated and the assembly becomes self-aligning.

The cup-shaped cap or head 38 of the valve element 40 is also an important feature of the valve assembly. The external diameter of the annular skirt-forming portion 64 is, in the particular form shown, approximately equal to the diameter of flange 26 making the cap relatively large. This area of the valve is what contacts the animal's hide which is quite abrasive due to dirt and sand trapped in the hair; therefore, a broad surface is advantageous to prevent undue wear. The internal annular surface 66 of the skirt 64 of the cap is flared in the direction of the open end thereof so as to allow foreign matter to escape more easily. Note that the annular space between opposed surfaces 66 and 32 is considerably wider than necessary to accommodate the coils of spring 34 thus preventing these elements from binding-up when the stem is cocked in the barrel due to sidewise pressure on the head exerted by the animal rubbing thereagainst. This also permits the treating liquid to flow freely from the valve.

Now, with the plunger of the valve element so positioned within the barrel that its axis is either coincident with the bore axis or parallel thereto, note that the inside planar surface 68 underneath the cap is also parallel to the outer end of the barrel that has been represented by reference numeral 70. Thus, when the plunger is depressed fully with the axis of the plunger and bore occupying either a coaxial or parallel relationship, the cap will rest on top of the barrel and shut off the flow of fluid. This is an important advantage of the instant valve structure as it prevents large quantities of the treating solution from leaking out should an animal decide to lean up against the unit for an extended period of time as they are wont to do on occasion. From the foregoing it should be

apparent that the liquid is dispensed at each actuation of the valve insuring its distribution on many animals and over wide areas of their bodies.

The design of the cap is such the the fluid must follow a circuitous path before emerging from the valve and this arrangement also results in conservation of the treating solutions. The fluid must pass first between the O-ring 52 and the frusto-conical seat 48 therefor, thence through annular passage 46, reverse direction around the outer end of the barrel, flow over the convolutions of the spring, and once again change direction to pass from underneath the cap. While the fluid is following this rather tortuous path to escape from the valve, it is also washing the surfaces over which it flows clean of contaminants and carrying them away. More important, however, is the fact that foreign material must progress through this same labyrinth, but in the opposite direction, in order to be deposited between the O-ring 52 and its seat which is about the only place it can do much damage.

The spring, likewise, performs a significant self-cleaning action. Over extended periods of non-use, it is possible for fine dust to enter the cavity underneath the cap, become wetted and solidify into a hard clay-like substance that will completely plug up the prior art valve structures for this purpose. Here, however, the initial actuation of the valve after such a period will immediately cause the spring to break-up such an encrustation as the coils flex toward and away from one another. As these crusts are broken, they fall or are washed out from under the cap by the action of the fluid issuing from the valve.

Before proceeding with a brief description of the modified form of the valve shown in FIGURE 4 and the manner in which the valve is installed, removed and replaced, one other feature is worthy of particular mention. When the valve is in the closed position of FIGURE 2, the gap separating the outer end of the barrel from the inside surface 68 of the cap is less than the space left between the free edge of the skirt 64 and outwardly-facing shoulder 36 of flange 26. Thus, when the stem is fully depressed, the skirt will not engage flange 26 and pinch off hairs from the animal's hide which could otherwise enter the valve assembly, become tangled, and cause problems. This is another of the difficulties associated with the prior art valve structures that has been largely eliminated with the instant design.

FIGURE 4 is modified over the structure shown in FIGURE 2 in that spring 34m has a smaller coil diameter and fits inside rather than outside of the barrel 18m. The barrel is thus changed to enlarge annular tapered section 32m to approximately the same outside diameter as the ribbed portion thereof. An annular enlargement 72 is provided at the outer extremity of the bore 42 that terminates at one end in a shoulder 74 upon which the spring rests. Annular enlarged section 72 flares slightly in the direction of the outer end of the barrel to prevent binding of the plunger 44 and the space between the latter portion of the valve element and enlargement 72 is sufficient to receive the spring quite loosely for the same reason.

The modified form of the valve shown in FIGURE 4 has a few shortcomings when compared with the FIGURE 2 design, the latter being preferred. First of all, the self-cleaning action of spring 34m is no longer effective to remove encrustations from underneath the cap where they are most likely to occur. Also, while spring 34m will break up scale forming around the plunger, such foreign material will have already progressed too far into the working parts of the valve for best results. Also, once broken loose, these contaminants may tend to migrate toward the seat rather than the cap where they will be discharged. Even so, at each actuation of the valve, the seat and O-ring 52 are flushed with the treating solution which should carry away any particles before they can damage the seal.

Furthermore, there is less likelihood of the valve element 40 becoming canted in the barrel of the FIGURE 2

construction wherein the bore extends nearly the full length of the plunger 44. Apart from the differences mentioned above, all the remaining structural elements of the valve 10 and the modified form thereof 10*m*, are exactly the same.

The last features that should be given detailed consideration are the procedures in installing, removing and replacing the valves and the structural features that make these operations possible. The first of these is installation which is accomplished by merely tapping the valve on the head lightly until the ribbed section of the barrel is fully inserted into punched opening 12. In so doing, it is best to hold the plunger in depressed position so that it will not damage the surface 70 on the outer end of the barrel. Also, care must be exercised to drive the valve far enough into the opening to seat flange 26 against the incurled edge 24 thereby compressing O-ring 28 and insuring an air and liquid-tight seal.

Removal of the valve is accomplished by inserting screw-drivers between the cap and flange at diametrically-opposed points and prying the plunger outwardly until the up-set portion 57 holding the washer on gives way. Once the up-set end is broken free, both the washer and O-ring drop off into the bottom of the tube 14 where they do no harm. The plunger and spring can now be withdrawn and discarded.

The final operation is to drive the barrel into the tube through opening 12. It is in this connection that the undercut shoulder 30 of flange 26 assumes its greatest importance. The undercut produces a frangible connection between the flange and barrel that will fracture immediately upon the application of a sharp blow to the end of the barrel with a hammer or blunt ended punch. The outside edge of the flange, of course, is in contact with the incurled edge 24 of the tube which causes it to break-off flush with the ribbed surface of the barrel. After the fragments of the flange fall away, no obstruction remains which will prevent the barrel being driven on through the hole. Furthermore, this is accomplished without appreciably enlarging the hole, if at all. Should the hole have become slightly enlarged, the ribs on the barrel of the replacement valve are usually adequate to compensate therefor and still provide a secure connection. Note that the barrel need not seal against the margin of the hole to prevent leakage because the O-ring 28 produces the seal a bit farther out.

Replacement of the discarded valve follows the installation procedure already described and need not be repeated. It will be apparent, therefore, that the several worthwhile objectives for which the instant valve was developed have been achieved. Even though the description given above has been confined to but two specific embodiments of the valve of the present invention, I realize that certain additional modifications may well occur to those skilled in the art within the broad teaching thereof; hence, it is my intention that the scope of protection afforded hereby shall be limited only insofar as said limitations are expressly set forth in the appended claims.

What is claimed is:

1. A valve mechanism of a type especially suited for use in livestock oilers and the like as a means for dispensing fluids onto the hides of animals that press thereagainst which comprises, a generally cylindrical barrel having an axial bore therethrough terminating at its inner end in a flared frusto-conical seat, an annular flange formed integrally with the barrel on the outside thereof intermediate its ends, gasket means encircling the barrel in continuous annular contact therewith and with the inner face of the flange adapted to engage the portion of a fluid-reservoir surrounding the opening therein sized to accept the barrel and form of fluid-tight joint therebetween, a valve element having a cylindrical plunger mounted within the barrel for reciprocal movement in continuous annular spaced relation to the bore defining a fluid passage therebetween, said valve element including

a cup-shaped cap on the outer end thereof covering the outer end of the barrel and defining a continuous annular cavity therebetween through which fluid may pass from the valve, compressible elastic sealing means mounted on the inner end of the plunger positioned and adapted to engage the frusto-conical seat and form a continuous annular closure for the fluid passage when the valve element is in extended position, and spring means operatively interconnecting the barrel and valve element biasing the latter into extended position the spring means comprises a helical compression spring located in the annular cavities between the cup-shaped cap and the outer end of the barrel, the inner end of said spring seating against the outer face of the annular flange while the outer end thereof engages the top of the cap on the inside thereof.

2. The valve as set forth in claim 1 in which, the cup-shaped cap includes an annular skirt-forming portion whose inside surface is flared in the direction of the free edge thereof, and in which that externally-located portion of the barrel extending outwardly from the annular flange is tapered.

3. The valve as set forth in claim 1 in which, the outer end of the barrel and the inside surface of the cap positioned in opposed relation thereto lie in parallel planes normal to the bore axis when the plunger axis is parallel to said bore axis, and in which said opposed planar surfaces of the barrel and cap engage one another and form a substantially liquid-tight seal therebetween when the valve element is depressed into fully open position.

4. The valve as set forth in claim 1 in which the cup-shaped cap includes an annular skirt-forming portion whose free edge lies in continuous annular spaced relation to the annular flange on the barrel when the valve element is fully depressed to the point where said cap engages the outer end of the barrel.

5. The valve as set forth in claim 1 in which the annular flange is thinner adjacent the barrel than elsewhere to provide a fracturable connection therebetween by means of which said flange can be removed by driving said barrel on through the opening in which the valve is mounted.

6. The valve as set forth in claim 1 in which means forming a removable annular flange is provided on the inner extremity of the plunger, said flange-forming means retaining the sealing means in place while providing a rigid support therefor opposing the frusto-conical valve seat, and said flange-forming means being separable from the plunger upon the application of forces substantially greater than those exerted by the spring means in a direction to draw the valve element from the barrel.

7. The valve as set forth in claim 1 in which, the inner end of the plunger is provided with a section of reduced diameter defining an annular shoulder, and in which the sealing means comprises an O-ring located on said section of reduced diameter in continuous annular line contact therewith and with said shoulder.

8. The valve as set forth in claim 1 in which the outer face of the annular flange is essentially planar and normal to the bore axis while the inner face thereof is undercut to produce a frusto-conical surface.

9. The valve as set forth in claim 1 in which the annular flange, gasket means and portion of the barrel extending inwardly from said flange are so arranged and proportioned that they each will engage the inverted edge bordering a punched opening in a metal wall so as to provide longitudinally-spaced areas of annular contact that will resist forces applied to the exposed elements of the valve element in a direction to tilt same.

10. The valve as set forth in claim 1 in which the annular cavity between the cap and barrel end is sufficiently wide to permit the plunger to become cocked within the bore without the spring binding.

11. A valve mechanism of a type especially suited for use in livestock oilers and the like as a means for dispensing fluids onto the hides of animals that press there-

against which comprises, a generally cylindrical barrel having an axial bore therethrough terminating at its inner end in a flared frusto-conical seat, an annular flange formed integrally with the barrel on the outside thereof intermediate its ends, gasket means encircling the barrel in continuous annular contact therewith and with the inner face of the flange adapted to engage the portion of a fluid-reservoir surrounding the opening therein sized to accept the barrel and form of fluid-tight joint therebetween, a valve element having a cylindrical plunger mounted within the barrel for reciprocal movement in continuous annular spaced relation to the bore defining a fluid passage therebetween, said valve element including a cup-shaped cap on the outer end thereof covering the outer end of the barrel and defining a continuous annular cavity therebetween through which fluid may pass from the valve, compressible elastic sealing means mounted on the inner end of the plunger positioned and adapted to engage the frusto-conical seat and form a continuous annular closure for the fluid passage when the valve element is in extended position, and spring means operatively interconnecting the barrel and valve element biasing the latter into extended position the outer end of the axial bore is enlarged to define an annular shoulder intermediate the ends thereof, and in which the spring

means comprises a helical compression spring positioned in the enlarged section of the bore surrounding the plunger with its inner end seated on the shoulder and the outer end thereof in engagement with the inside of the cap.

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