

June 3, 1958

J. T. EFFORD ET AL
FLUID DISPENSING VALVE

2,837,375

Filed April 4, 1955

4 Sheets-Sheet 1

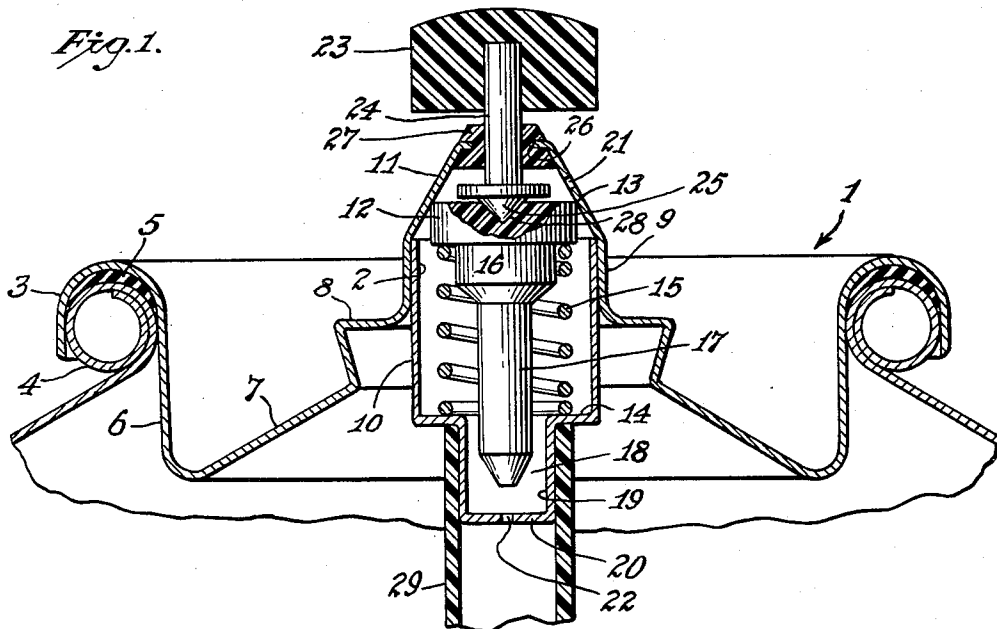
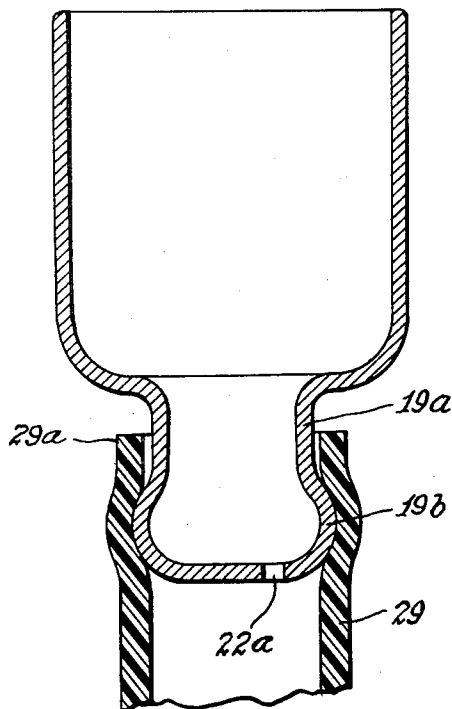


Fig. 2.



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4 Sheets-Sheet 2

Fig. 3.

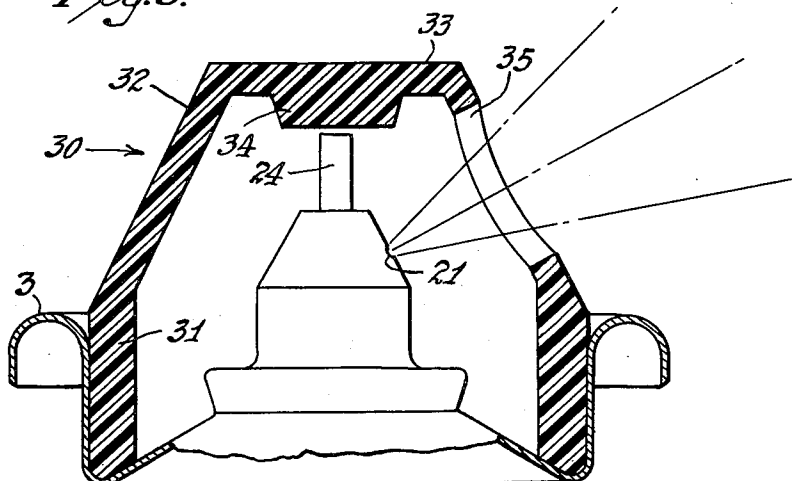
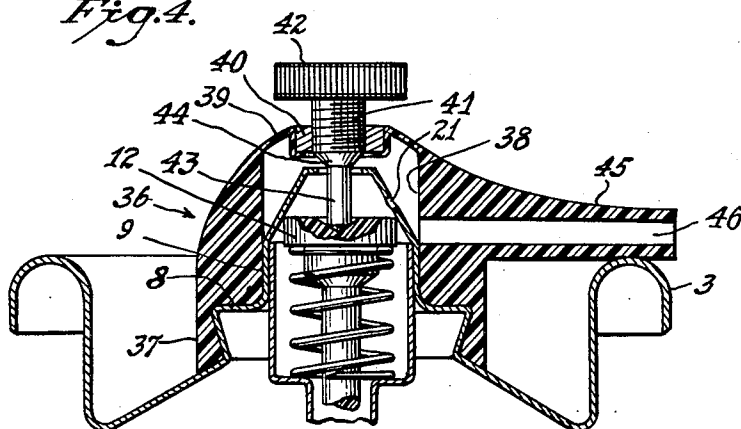


Fig. 4.



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4 Sheets-Sheet 3

Fig. 5.

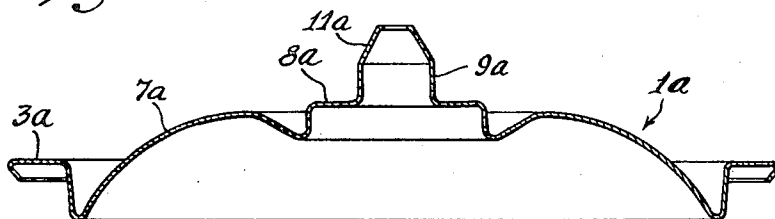
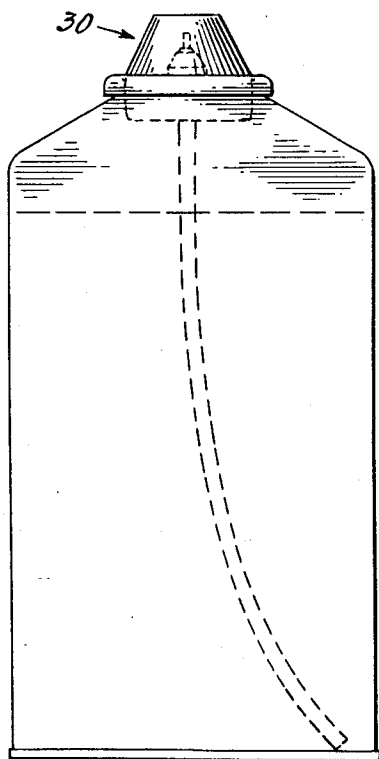


Fig. 6.



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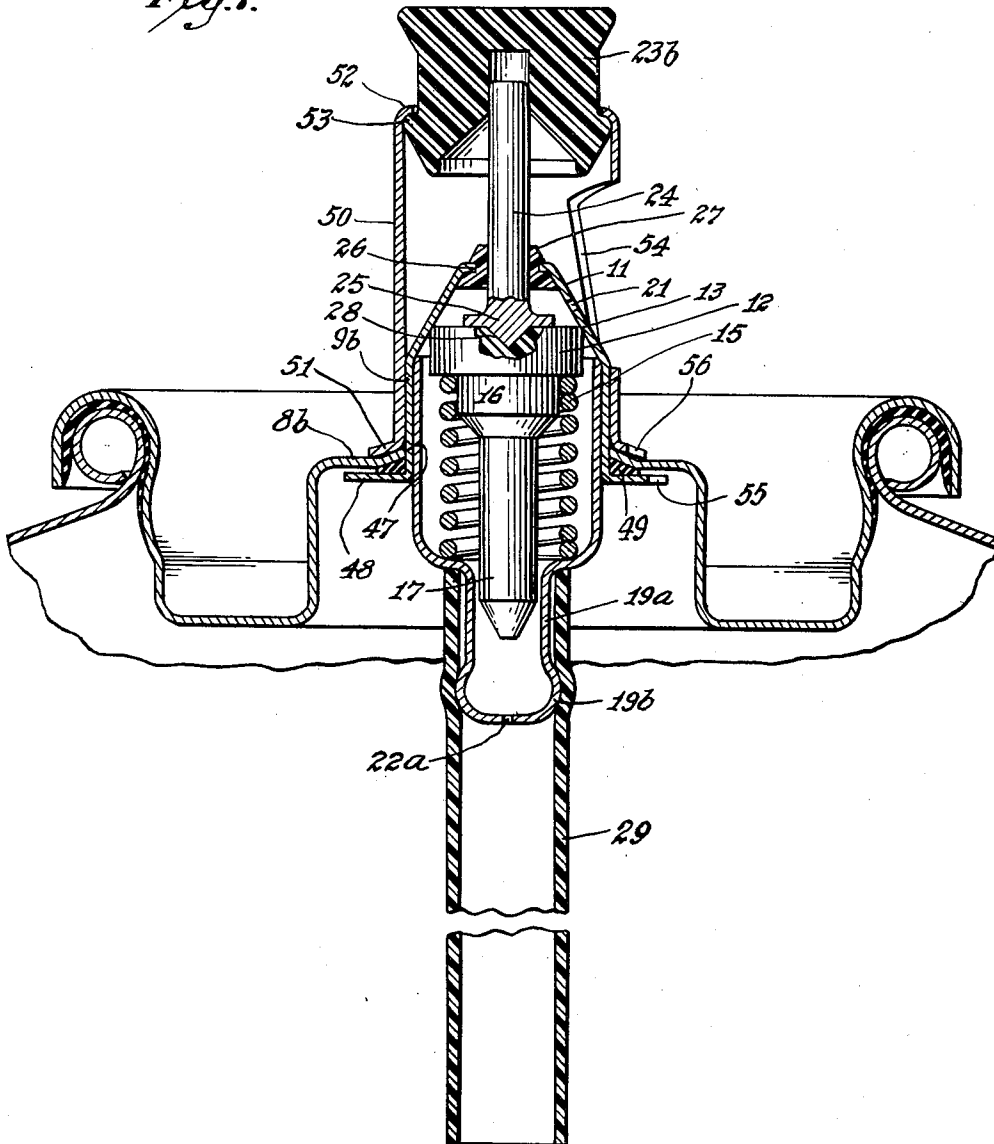
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4 Sheets-Sheet 4

Fig. 7.



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1

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FLUID DISPENSING VALVE

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Application April 4, 1955, Serial No. 498,972

5 Claims. (Cl. 299-95)

This invention relates to a fluid dispensing valve adapted to be applied to the self-powered spray or so-called aerosol type of package.

Such a package comprises a container loaded with a charge comprising a liquefied gas propellant, such as a mixture of Freon 11 and Freon 12, and the material to be dispensed in the form of a spray. Usually the container is either a seamless or soldered seam can of the pressure type and the necessary dispensing valve is mounted in the can closure or end which is applied after the can is loaded with the charge.

One of the objects of the present invention is to provide a valve for the above type of package which is of a very simple design so that its parts may be manufactured and assembled easily and inexpensively by quantity-production methods yet which is adequately reliable and positive in its action while being extremely versatile with respect to its ability to handle satisfactorily not only charges of the insecticide and deodorant types but also charges such as lacquer and paint containing either an air-hardening material or such material and relatively large amounts of solids. Another object is to provide a valve suitable for use with the described type of packages and which is made of a very few parts constructed and combined in such a manner as to provide a satisfactory valve in all respects even though the parts are made and assembled by quantity-production methods which do not permit the maintenance of rigid dimensional tolerances as to either the parts themselves or their assembled relationship.

Examples of the present invention are illustrated by the accompanying drawings for the purpose of explaining the principles, construction and operation of the invention, the various figures in these drawings being as follows:

Fig. 1 is a vertical longitudinal section of a valve mounted in a closure suitable for application to the mouth of the seamless pressure can type of container;

Fig. 2 shows a modification of the valve shown by Fig. 1;

Fig. 3 shows a second modification;

Fig. 4 shows a third modification;

Fig. 5 shows how the valve may be applied to the can end of the soldered seam pressure can type of container;

Fig. 6 shows a completed package incorporating the new valve; and

Fig. 7 is similar to Fig. 1 excepting that a fourth modification is shown.

Referring to the example shown by Fig. 1, this illustrated fluid dispensing valve includes a hollow valve body formed by the closure 1 of a seamless pressure can type of container in combination with a spring cup 2. These parts are sheet-like and may be made from stamped or drawn sheet metal pieces or molded plastic.

The closure 1 has the usual rim 3 which clamps to the neck 4 of the can, of which only the upper portion is shown, where it is made fluid tight by appropriate sealing material 5. From this peripheral portion the

2

closure descends to provide a generally cylindrical wall 6, the closure then extending radially inwardly and upwardly to form an upstanding conical or dome-like portion 7. The closure is then formed into an annular shoulder 8 and then extends upwardly to provide a cylindrical wall portion 9. The spring cup 2 has a cylindrical wall 10 which is press-fitted inside of the cylindrical wall 9, whereby to form a hollow valve body.

Above the cylindrical wall 9 the closure again extends radially inwardly and upwardly to form a conical part 11 providing a substantially conical internal surface. Now the closure itself is not very large and the valve body described is, of course, quite small, as is usual in the case of this type of dispensing valve. The closure must be produced by high-speed quantity-production methods and the described internal conical surface is, therefore, apt to be slightly rough and somewhat off from a true conic shape. Its dimensions also may vary in other ways. Such variations in shape and dimensions are unavoidable with present day manufacturing methods.

A valve head 12 is arranged inside of this hollow valve body. This valve head has an annular portion forming a relatively sharp peripheral corner 13 which seats in the conical surface of the part 11. This corner 13 may be formed with a slight radius which is, however, so small that the result is a substantially sharp corner. This portion of the valve head, at least, is made of material which is flexibly deformed by the corner 13 wedging in the conical surface of the part 11 when seating therein. Since the action is in the nature of a wedge action relatively little seating pressure is required to produce this deformation and, therefore, the valve head's periphery conforms itself to slight irregularities in the shape and dimensions of the part 11, while at the same time relatively little opening pressure is required to unseat the valve head. The valve head itself, and all the other parts of such a valve, must be made by quantity-production methods and, therefore, also involves the probability that it will not be true exactly to its design shape and dimensions. Due to the deformation of its seating corner, caused by the described wedging action, the valve still seats very positively and fluid-tightly regardless of such dimensional variations.

The bottom of the spring cup 2 is formed into a spring seat 14 and a compression coil spring 15 is arranged within the hollow valve body with one end pressing against the bottom of the valve head 12 and its other end bearing on the spring seat 14 so as to urge the valve head closed. The valve head is formed with a depending annular cylindrical stud 16 which fits within the upper end of the spring 15. A pin 17 projects downwardly from this stud 16 through the inside of the coil spring 15 and through a central hole 18 formed through the bottom of the spring cup. The spring cup's bottom has a cylindrical extension 19, so as to form this hole 18, the part 19 having a bottom 20. With the above construction the valve head 12 is free to float both laterally and angularly relative to the conical part 11 of the valve body within a range of angular limits fixed by the pin 17 engaging the wall of the extension 19. The pin 17 is smaller in diameter than the inside dimensions of the coil spring 15, the hole 18, and the depending cylindrical part 19. Of course, the valve head can also move up and down through the action of the spring 15. This floating action is effective in permitting the valve head to seat itself at a slight angularity with respect to the conical part 11 in the event this is necessary because of the previously mentioned dimensional or shape variations. This floating action further contributes to a positive and effective valve action when using parts which are not made by the precision manufacturing methods usually considered necessary to provide a valve of the poppet type of the very

small size required for use with the described type of fluid dispensing package.

As illustrated, the valve head 12 may be in the form of a cylindrical disk integrally joined with the parts 16 and 17, the whole unit being an integral molding made of suitable material.

The degree of the deformability of the valve head's peripheral corner portion is related to the angularity of the conical surface, provided by the part 11, within which this portion wedges. The general dimensions, which are all small, must also be considered. For example, in the case of the illustrated valve the angularity of the conical part 11 is 60°, this being the total angle meaning that there is an angularity of 30° with respect to the axis of the part. The valve head itself has a diameter of .220" and this is the internal diameter, subject to the variations previously mentioned, of the conical part at the seating area within the conical part. The valve head, and all of its parts, represents a molding made of polyethylene and having a hardness of from 80 to 95 on the D scale of a Shore Durometer. This particular plastic is impervious to all of the materials with which a package of the described type is now loaded. It is both elastic and plastic in character and, of course, it has the so-called elastic memory characteristic. With the conical seat angularity of 60° relatively little pressure is required to unseat the valve again. The deformability is sufficient to accommodate all reasonable variations due to the use of quantity-production manufacturing methods. Other materials having the property of adequate deformability and which are adequately impervious to the material being handled may also be used. Changes in the angularity of the conical part if possible must be kept within limits ranging from that which provides too little wedging effect to effect the described deformation of the valve head, to that which results in so much of a wedging action that unseating of the valve becomes difficult.

It should be kept in mind that valves of this type are opened by finger pressure. If the pressure required to open the valve is too great the valve is unsatisfactory for use as a fluid dispensing valve. With polyethylene of the hardness described the angularity of the conical part may range from 55° to 65° while maintaining a desirable balance between the wedging action and easy valve opening characteristics. These angularities are used in conjunction with the sharp corner provided by the short cylindrical shape of the valve head specifically described.

Because of the described characteristics it is possible to make the valve body with very thin walls which is desirable because the outlet orifice may then comprise simply a hole while still providing spray dispersion. In the case of this illustrated valve the outlet orifice is such a hole 21 formed through the conical part 11 very close to the location where the valve head's corner seats within this part 11. This location of the hole has the advantage that the spray is ejected at an upward angle and other advantages explained hereinafter. The necessary inlet hole opening for the valve body, located below the valve head, is in the form of a metering orifice 22 located in the bottom 20 of the depending part 19. All of the space between the two orifices or holes 22 and 21 is available as an expansion chamber, excepting for that portion of the space occupied by the valve head and the other valve parts. Such an expansion chamber is usually desirable in a valve of the present type and the metering orifice is required to regulate the flow of liquid driven into the expansion chamber whenever the valve is opened to atmospheric pressure.

Operation of this new valve is effected by pressing on a valve operator in the form of a button 23 located on the outside of the valve body. Motion is transmitted from this button 23 to the valve head by a stem 24 having an inner end 25 which abuts the top of the valve head which is the side towards the conical surface provided by the inside of the part 11. This part 11 has a hole 26

through its top and this hole is somewhat larger in diameter than the stem 24. The annular space which results is closed by a flexibly deformable bushing 27 which forms a substantially fluid-tight seal while permitting the stem 24 to wobble somewhat or move angularly. This bushing 27 should be suitably mounted so that it is retained in position. The bottom end 25 of the stem 24 is conically pointed and the valve head 12 has a corresponding conical depression 28. However, there is no rigid connection between the valve head and the valve stem. The above construction provides a means for transmitting motion from the external valve operator to the internal head 12 to unseat the latter's corner portion 13 while leaving the head free to float as described hereinabove. When the valve stem is depressed its conical end 25 centralizes itself within the recess 28 so that the two parts are aligned, but when the valve stem is released, as by taking a finger off the button 23, the valve head is free to float and seek its own seat within the conical surface inside of the part 11.

The bushing 27 may be made of rubber that is elastically deformable with sufficient ease or it may be made of any other material of adequate elastic deformability and which is sufficiently impervious to the charge being handled to stand up in service.

As previously explained the liquefied gas and the material to be dispensed are metered through the orifice 22 so as to expand within the valve body and finally spray through the outlet or spray orifice 21. This occurs whenever the valve head is unseated and when the valve head recloses some of the material is trapped between the top of the valve head and the top of the valve body represented by the conical part 11. Due to the expansion of the charge within the valve body the charge becomes refrigerated and hence it is a cold material which is trapped above the valve head. This material soon warms to room temperature and expands further so as to force through the nozzle orifice.

The above action is of considerable importance in connection with the handling of any material including an air-hardening substance. Lacquers and paint and adhesives are examples of such materials. These materials give prior art valves considerable trouble by clogging the discharge orifice, and this condition is aggravated when the charge includes solids as in the case of a paint pigment. In the present instance when such clogging begins to evidence itself the small portion of the charge trapped above the valve head begins to expand so as to clean out the nozzle orifice. When using the present valve with such clogging materials the nozzle orifice can be seen to close and then shortly reopen after each closing of the valve.

A dribbling effect has also plagued prior art valves. This effect is practically eliminated in the case of the present valve because the shut-off location is so very close to the outlet orifice. This is one advantage that is obtained by locating the outlet orifice in the conical part 11 close to the location where the valve head seats.

The valve stem 24 may also be made of a plastic material and it can be seen that practically the entire valve may be made from plastic. This is of considerable advantage in connection with the handling of materials which are corrosive or otherwise harmful to most metals.

In packages of the type described it is desirable to connect a standpipe to the valve which extends to the bottom of the can so that the gas pressure within the can drives the charge in its liquid phase through the metering orifice of the valve. In the described valve the small cylindrical well portion 19 provides a handy arrangement for this purpose, the standpipe 29 being shown attached to this part by being slipped thereover.

A more important function played by the part 19 is that of restricting lateral motion of the pin 17 projecting downwardly from the valve head 12. This, in turn, prevents the valve head from floating angularly so excessively

5

as to prevent it from reseating in the wedging manner previously described. That is to say, that although the valve head may float angularly throughout a range of motion it cannot float so excessively as to prevent the valve head from reseating its seat within the conical part 11 in the manner described.

As those skilled in the art know the customary standpipe, such as the one 29, usually is made from certain plastics which are known to have a tendency to split when strained permanently by being slipped over a slightly larger nipple member, such as the part 19, as is required to retain the standpipe. This splitting tendency is particularly noticeable at the top edge of the standpipe. In the modification shown by Fig. 2, the part 19a, corresponding to the part 19 in Fig. 1, is necked slightly to a somewhat smaller diameter which is still materially larger than the diameter of the pin 17 of the valve head unit. This leaves this part 19a with a bulbous end 19b over which the plastic standpipe 29 tightly fits. This bulbous part strains the plastic tube to a slightly larger diameter so that the tube, forming the standpipe is firmly anchored. However, the uppermost end of the tube 29a is either entirely unstrained or is strained but very little at the most. It is, of course, possible to make the bulbous end large enough to relieve the top end of the standpipe entirely from strain.

With the above construction of Fig. 2 the type of plastic which is known to have the described splitting tendency may be used satisfactorily. The upper end, where the splitting tendency is greatest, is free from strain. The portion spaced below this end and which is strained by the bulbous part does not split because it extends upwardly and integrally to the unstrained portion.

In Fig. 1 the metering orifice 22 is shown as being aligned with the lower end of the pin 17. When the valve operator is pressed downwardly all the way the lower end of the pin closes off the metering orifice 22. This effect may be advantageous in some instances, since it provides for a spray lasting for but a short interval, but in other instances this effect is undesirable. Therefore, in the modification of Fig. 2 the metering orifice shown there, at 22a, is offset from alignment with this lower end of the pin 17. This lower end is ordinarily chamfered to facilitate the assembly of the valve, so this end completely clears the metering orifice 22a at all times. Thus a continuous spray is possible regardless of how the valve operator is pressed downwardly.

Fig. 3 shows a modification wherein the button 23 is eliminated, leaving only the projecting stem 24. The recess provided by the disclosed closure shape serves to mount a flexible or deformable cap 30 having a relatively thick cylindrical wall 31 which fits snugly down in the space within the peripheral portion 3 of the closure. The cap then tapers upwardly, as at 32 and terminates with a flat top 33 having a downwardly projecting button 34 formed by thickening the cap material. An adequately large spray opening 35 is formed in the part 32 in alignment with the nozzle orifice 21.

This modification provides a package having a very clean looking exterior. Operation is effected by pressing downwardly on the top 33 of the deformable cap 30. Even though the present valve has relatively little tendency to dribble this cap shields the operator from any small amount of dribbling that might occur.

The invention as described so far is particularly applicable to the handling of non-foaming products. The valve operates very satisfactorily when handling any of the known insecticides, aerosol, lacquer, paint, etc. mixtures usually charged in this type of package along with the liquefied gas propellant.

In the case of foaming products, such as shaving soap, for example, the modification shown by Fig. 4 is suggested. This is the same valve as has already been described excepting that the sealing gasket or ring 27 is not used, the

6

stem 24 also being eliminated. A hood 36 covers the valve assembly, this hood having a relatively thick side wall which snugly hugs the cylindrical part 9 of the closure and a depending skirt 37 which clamps under the somewhat undercut portion of the part forming the shoulder 8. The hood is formed with a cylindrical bore 38 which extends upwardly from the cylindrical part 9, the top of this bore being closed by a flexible or deformable dome portion 39 within which is mounted a screw-threaded annulus 40. A screw 41 is screwed into this annulus 40, this screw having an external operating knob 42 and an internal depending stem 43, a shoulder 44 being formed between the screw 41 and its stem 43. The parts are proportioned so that when the knob 42 is turned to screw the screw 41 downwardly the stem 43 is long enough to unseat the valve head 12 when the knob 42 is depressed in the manner of the button 23. The flexible portion 39 flexes to permit this action. When the screw 41 is screwed upwardly the stem 43 in effect becomes too short to unseat the valve head even though the knob 42 is pressed so hard that the annulus 40 engages the top of the conical portion 11 of the previously described valve body.

When the valve is opened the foaming material discharges through the nozzle orifice 21 and fills the cylindrical bore 38 of the hood 36. This hood is provided with a horizontal extension 45 which rests on top of the annular portion 3 of the closure. This part 45 has a passage 46 through which the foaming product is discharged for use.

Fig. 5 is for the purpose of showing how the closure 1, here marked 1a, may be made when the can, used to form the package, is of the soldered side seam type. The portions 8a through 11a correspond with the correspondingly numbered parts of Fig. 1. However, 7a is in the form of an upwardly domed portion which centrally descends to form the pedestal-like part providing the shoulder 8a and permitting the attachment of caps, hoods or the like. The peripheral portion 3a has the usual shape for seaming onto the open top of the cylindrical soldered seam can body.

Practically all of the parts described herein, even including the closures possibly, may be made from suitable plastic. Alternatively, excepting for the valve head and the gasket or sealing ring 27, the parts may be stamped from thin sheet metal. The material used depends upon the relative costs of the different materials and, of even greater importance, on the chemical characteristics of the materials with which the package container is charged. For example, plastics will resist the action of certain charges which are desirable but which attack metal parts.

In Fig. 6 the complete package is illustrated. To provide an example, the container is a 12 ounce seamless drawn can having the crown top type of closure shown by Fig. 1. All of the valve elements shown by Fig. 1 are included, the modification shown by Fig. 3 being illustrated to show the attractive effect obtained. The can is charged with a liquefied propellant such as Freon 11 and Freon 12 in proportions providing for a low pressure type of package along with, for example, an air-drying material as exemplified by a lacquer, paint or the like. In the case of paint a considerable portion of solids, in the form of pigment, may be included. This type of charge is mentioned because it has been very troublesome to handle in the case of prior art valves. Using the valve of the present invention, little or no dribbling results and the discharge orifice remains clean and open. An encrustation may form around the nozzle orifice and immediately after the valve is closed the nozzle orifice may seal with the air-drying material. However, very shortly the nozzle orifice is blown open and clean because of the effect previously described.

In the constructions of the preceding figures the closure 1 was formed throughout from a single sheet integrally

providing all of the parts 3 and 6 through 9 and 11. It has been found to be advantageous, in some instances, to separate the parts 9 and 11 from the part 8, so that the can closure or end or top terminates at the inner periphery of the annular shoulder 8, leaving a hole for the installation of the balance of the parts forming the valve. Such an assembly is permitted by the construction shown by Fig. 7 and, in fact, this construction permits the valve to be applied to any wall having a hole of suitable size.

In this Fig. 7 the parts corresponding generally to those of the preceding forms are given corresponding numbers followed by the identifying letter *b*.

With the above in mind, Fig. 7 shows the shoulder 8*b* surrounding the hole 47 located where the base of the cylindrical wall 9 is located in Fig. 1. This wall 9 is formed as a separate wall 9*b* having an external flange 48 which, through an interposed sealing ring 49 made of rubber for example, engages the bottom of the shoulder 8*b*. The spring cup of Fig. 2 is press-fitted inside of the wall 9*b* and the balance of the internal valve parts are assembled as previously described, these being the same and, therefore, bearing the same numerals. This forms a self-contained valve unit which can be mounted in any hole.

Mounting of the valve is effected by press-fitting a tubular housing 50 downwardly over the part 9*b*, this housing having an external flange 51 which engages the top of the latter is clamped tightly between the two flanges 48 and 51, the sealing ring 49 being compressed to form a fluid-tight joint. The shoulder 8*b* may be formed conically upwardly to aid in the action of the seal 49 by forcing the latter radially inwardly.

This housing 50 extends upwardly and has its upper edge turned inwardly to form a flange 52 so as to retain the operating button 23*b* which has a shoulder 53 retained by this flange 52. The button projects through the upper end of the housing so that it may be used to depress the valve stem 24 with which it connects. An opening 54 is formed in the wall of the housing so as to pass the spray when it discharges from the nozzle orifice 21.

As an aid when assembling the valve, the flange 48 and the housing's flange 51 have indexing notches 55 and 56, respectively, formed therein. This permits the nozzle orifice 21 to be registered with the housing's opening 54 accurately and easily during the assembly of the valve parts. This housing and the modified part 9*b* may be made on an eyelet machine from sheet metal, or may be molded plastic members. All of the parts may be assembled by press-fitting them together.

We claim:

1. A fluid dispensing valve including a hollow valve body having a substantially conical internal surface, and a valve head having an annular portion forming a relatively sharp peripheral corner seating in said conical surface, said corner being made of non-metallic material which is flexibly deformed both radially and axially by said corner wedging in said surface, said body having fluid openings on the opposite sides of said head, and means for mounting said head so that it floats angularly and laterally while being reciprocative with respect to said conical surface, said means comprising a coil compression spring having one end mounting said head, said body having an internal spring seat spaced oppositely to said conical surface and said spring having a second end engaging said seat, said spring otherwise being free from said body and urging said head towards said surface, said seat having a central hole formed therethrough, and a pin projecting from said head axially through said spring and through said hole, said pin being smaller in diameter than said hole to a degree permitting said head to float as described herein while restricting said head from floating angularly so excessively that said corner cannot wedge in said surface.

2. A fluid dispensing valve including a hollow valve body having a substantially conical internal surface, and a valve head having an annular portion forming a rela-

tively sharp peripheral corner seating in said conical surface, said corner being made of non-metallic material which is flexibly deformed both radially and axially by said corner wedging in said surface, said body having fluid openings on the opposite sides of said head, and means for mounting said head so that it floats angularly and laterally while being reciprocative with respect to said conical surface, a valve operator located on the outside of said body, and means for transmitting motion from said operator to said head to unseat said corner while leaving said head free to float as described herein, said motion-transmitting means comprising a stem having an inner end abutting the side of said head towards said conical surface and said stem extending therefrom through said body and having an outer end connected to said operator on the outside of said body, the latter having a hole formed therethrough and through which said stem passes, said hole being larger than said stem and defining an annular space therearound, and a flexibly deformable bushing closing said annular space and mounting said stem slidably so that the latter floats angularly while being reciprocative with respect to said body.

3. A fluid dispensing valve including a hollow valve body having a substantially conical internal surface, and a valve head having an annular portion forming a relatively sharp peripheral corner seating in said conical surface, said corner being made of non-metallic material which is flexibly deformed both radially and axially by said corner wedging in said surface, said body having fluid openings on the opposite sides of said head, and means for mounting said head so that it floats angularly and laterally while being reciprocative with respect to said conical surface, said means comprising a coil compression spring having one end mounting said head, said body having an internal spring seat spaced oppositely to said conical surface and said spring having a second end engaging said seat, said spring otherwise being free from said body and urging said head towards said surface, said motion-transmitting means comprising a stem having an inner end abutting the side of said head towards said conical surface and said stem extending therefrom through said body and having an outer end connected to said operator on the outside of said body, the latter having a hole formed therethrough and through which said stem passes, said hole being larger than said stem and defining an annular space therearound, and a flexibly deformable bushing closing said annular space and mounting said stem slidably so that the latter floats angularly while being reciprocative with respect to said body, said inner end of said stem abutting said side of said head centrally and said inner end being conical and said side of said head having a central conical recess formed therein for receiving said conical end.

4. A fluid dispensing valve including a hollow valve body having a substantially conical internal surface, and a valve head having an annular portion forming a relatively sharp peripheral corner seating in said conical surface, said corner being made of non-metallic material which is flexibly deformed both radially and axially by said corner wedging in said surface, said body having fluid openings on the opposite sides of said head, and means for mounting said head so that it floats angularly and laterally while being reciprocative with respect to said conical surface, said means comprising a coil compression spring having one end mounting said head, said body having an internal spring seat spaced oppositely to said conical surface and said spring having a second end engaging said seat, said spring otherwise being free from said body and urging said head towards said surface, said seat having a central hole formed therethrough, and a pin projecting from said head axially through said spring and through said hole, said pin being smaller in diameter than said hole to a degree permitting said head to float as described herein while restricting said

head from floating angularly so excessively that said corner cannot wedge in said surface, the one of said openings on the side of said head towards said conical surface being in the form of an outlet spray orifice extending through said conical surface and said body at a location adjacent to said corner when the latter is wedged in said conical surface, said body otherwise forming a closed space on said side of said head, said other opening being in the form of a metering orifice of the size required when said valve dispenses material from a package charged with liquefied gas propellant, a valve operator located on the outside of said body, and means for transmitting motion from said operator to said head to unseat said corner while leaving said head free to float as described herein, said motion-transmitting means comprising a stem having an inner end abutting the side of said head towards said conical surface and said stem extending therefrom through said body and having an outer end connected to said operator on the outside of said body, the latter having a hole formed therethrough and through which said stem passes, said hole being larger than said stem and defining an annular space therearound, and a flexibly deformable bushing closing said annular space and slidably mounting said stem so that the latter floats angularly while being reciprocative with respect to said body, said inner end of said stem abutting said side of said head centrally and said inner end being conical and said side of said head having a central conical recess formed therein for receiving said conical end.

5. A dispensing valve for an aerosol type package enclosing a liquefied gas propellant and a charge containing air-hardening material or relatively large amounts of solids, said valve comprising an outer part projecting from the interior of said package and providing a substantially conical internal surface, a valve head having a peripheral corner portion located to seat on said surface and made of an elastically deformable plastic, a cup projecting towards the interior of said package and having an inner end in which is formed an inlet opening con-

necting with the interior of said package and said cup having a rim portion connecting with the base portion of said conical part, spring means for biasing said valve head's corner portion to seat on said surface while leaving said corner portion free to float laterally and angularly within limits, the space within said cup between said inlet opening and said valve head's corner portion forming a gas expansion chamber sealed from the outer atmosphere when said valve head's corner portion is seated on said conical surface, a hole being formed through said outer part at the apex of said conical surface, a stem extending through said hole and having an outer end and an inner end which, when said outer end is pushed inwardly, engages said valve head and pushes it inwardly against the bias of said spring means so as to unseat said head's corner portion, and a substantially fluid-tight bushing for said hole and through which said stem slides, a discharge nozzle orifice being formed through said outer part at a location between said valve head's corner portion and said hole formed through said outer part, the space within said conical surface between said valve head's corner portion and said orifice forming a second gas expansion chamber but which is continuously open to the outer atmosphere, the action of said valve head when pushed inwardly by said stem being to enlarge said second gas expansion chamber while unseating said valve head's corner portions away from said second chamber, said valve head's corner portions being deformable enough to close around any roughness or irregularity on said conical internal seating surface.

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