VALVE CONTAINER FOR PRESSURIZED MATERIALS
AND METHOD OF SEALING THE SAME

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This invention relates to manually operable, valve equipped, pressurized containers, such as are used for, example, for aerosol products, and is directed to certain salient parts of such a construction, as well as a method of applying the valve structure to the container and the sealing of such container, which is generally in the form of a metal can.

Heretofore it has been the practice in the aerosol field to permanently mount the valve assembly in an opening in the top closure of the can before said closure was attached to the can body. This closure was in some cases in the form of a stamping of substantially the same diameter as the can body. In other cases the upper portion of the can body was drawn in to a lesser diameter and was provided therein with an opening which was adapted to be sealed by a top closure in the form of a cup. The can body, fabricated by one manufacturer without a closure, was shipped to a so-called “filler.” The top closure with valve assembly mounted thereon was shipped to the filler by a valve manufacturer. The filler first filled the can body with the material which was to be packaged therein and was required thereafter to permanently attach the top closure to the can in such a manner as to provide between these parts a hermetic seal. This operation of attaching the top closure to effect sealing of the can requires rather complicated and expensive machinery and it had to be carried out with great care and skill, otherwise leakage of pressure from the pressurized container resulted thru the joint thus made. Leaky cans cannot satisfactorily function. They have to be discarded and constituted a loss to the filler for there is no satisfactory way to reclaim these cans or the material contained therein.

The object of the present invention is to eliminate the necessity for the foregoing conventional procedure and to make it possible for the filler to more efficiently carry out his operations of filling and sealing the can through the use of very simple form of structure and apparatus and with practically no failures in the production of hermetic seals between those parts which he is required to assemble to produce the complete end product.

These objects are accomplished in the following manner. The valve per se is mounted within a novel housing of molded plastic and constitutes the valve unit of this invention. It is so made as to be ready for attachment to a finished can by the filler, through the employment of extremely simple apparatus and in an efficient and leakproof manner. The can manufacturer supplies the can, to the filler ready for the attachment of such unit. If this can is provided with a top closure, this closure is sealed by the can manufacturer to the can. However, the can may be of the one-piece variety which requires no joint other than that between the unit and the can, as will be hereinafter more fully explained. In any case the can is provided with a top opening of such size and form that it is ready to receive the valve unit after the filling has taken place. The filling opening has an upwardly flared margin which while in this flared condition is of such size that it may receive the valve unit but it is later adapted to be depressed to contract the diameter of the opening for the purpose of tightly gripping the unit to permanently attach it to the can and form therewith a hermetically sealed joint. This procedure permits the filler to fill the can, then introduce the valve unit into the top filling opening, and thereafter apply sufficient pressure to the valve unit to seal the unit to the can.

By the procedure stated, the work of the filler is very greatly facilitated. He may employ any simple appropriate pressure mechanism and he is absolutely assured of the hermetic seal which is of prime importance when producing pressure packed materials.

Features of the invention, other than those adverted to, will be apparent from the hereinafter detailed description and appended claims, when read in conjunction with the accompanying drawings.

The accompanying drawings illustrate one practical embodiment of the invention, but the construction therein shown is to be understood as illustrative, only, and not as defining the limits of the invention.

Fig. 1 is a central diametric section of a valve housing embodying the present invention with a valve mounted therein and shown in elevation.

Fig. 2 shows a can with a top closure hermetically sealed to the side wall of the can and with a flared central filling opening ready to receive the valve unit shown in Fig. 1.

Fig. 3 shows the parts of Figs. 1 and 2 brought together, but prior to permanently attaching the valve unit to the can.

Fig. 4 is a view similar to Fig. 3, but showing the parts in finally assembled relation.

Fig. 5 shows a type of can wherein a cup type of closure is associated with the can body in lieu of the larger top closure shown in the preceding figures.

Fig. 6 shows a modified form of can, i.e., a one-piece can embodying the present invention.

Fig. 7 is a fragmental radial section showing a portion of the valve housing of the valve unit and illustrating how the slot shown in the preceding views may be formed by a relatively small bead extending circumferentially of the housing.

Fig. 8 is a section corresponding to Fig. 7, but showing a structure wherein the plastic housing is initially devoid of a circumferential channel but adapted to be indented by the edge of the can closure to form a retaining channel, as shown in Fig. 9.

Fig. 9 is a fragmental radial section showing the structure of Fig. 8 attached to the can.

Fig. 10 is a central section illustrating prior practice, shown for comparative purposes to illustrate the advance and improvement of the present invention thereover.

Referring first to Fig. 10, which is illustrative of prior practice, 1 designates the body of the can and 2 the can closure. It has been conventional for the manufacturer of valves to mount a complete valve assembly 3, including its valve stem 4 and dispensing button 5, within an upright standing boss 6 stamped from the central portion of the can closure 2. The valve manufacturer, having thus assembled the valve parts and top closure 2, has shipped these in bulk to the filler. On the other hand the can manufacturer, having made the can body 1, ships these can bodies in bulk to the filler. The filler after filling the can finds it necessary to employ special expensive machinery to wipe or spin the peripheral flange 7 of the can top closure 2 over and under the flange 8 of the can body to form a hermetically sealed joint. It is this operation that has heretofore caused innumerable discards through failure to obtain a satisfactory hermetic seal because if the can leaks at this point it becomes useless and unmarketable.
In carrying out the present invention, the valve manufacturer makes a valve unit 9, shown in Fig. 1. This valve unit 9 embodies a valve housing 10 in which a valve assembly is mounted in complete and finished condition for manual operation. For the purpose of illustration, the valve assembly shown is of the character disclosed in Patent No. 2,631,814, granted to Robert H. Abplanalp, on March 17, 1953. It is a highly efficient form of valve assembly, but it will be understood that any other appropriate mechanism might be used without departing from this invention, so long as its housing 10 is adapted to be gripped by the margin of the filler opening as presently described.

The housing 10 is preferably in the form of a plastic molding sufficiently hard so that it cannot be appreciably bent or deformed. In fact it should be quite stiff and hard and should possess such characteristics as are inherent in nylon or some other relatively hard plastic. In practice, the walls of the channel 11 must be so rigid that they cannot be deformed to release the housing from the can after the parts have been assembled.

In practice the housing 10 is preferably provided with a central hub-like portion 10a in the circumstance of which the channel 11 is formed and which is provided with a laterally projecting flange 10b, the under side 10c of which serves as a limiting abutment. With this construction a protecting or "stacking" cap may be fitted over either the topiphery of the channel 11 by merely sliding it over the circumference of which the flange 10b, according to the type of manually operable push button or dispenser cap to be used on the valve stem, or according to the desires of the customer. A notch 10d may be formed in the periphery of the cap to assist in holding a stacking cap against inadvertent displacement. A dip tube 10e is attached to housing in the conventional way.

The can body 12, shown in Fig. 2, may be of any shape provided that it has a top closure 13 hermetically sealed to the side wall of the can by a permanent joint 14. This top closure is provided with a central filling opening 15 and the margin 16 of which is flared upwardly as shown in Fig. 2. The diameter of the opening 15, as shown in this figure, should be at least as great as the dimension X which indicates the diameter of the mouth 11a of the channel 11 of the valve unit 9. This opening however, should be of such diameter that the flattening of the flared margin of the upper top opening will decrease the diameter of the opening 15 to approximately the diameter Y of the base of the channel 11.

After the filler has filled the can which has been supplied to him with the top closure 13 sealed to the can body 12, said filler introduces the lower portion of the valve unit 9 into the filling opening 15 of the can until the limiting abutment or shoulder 10c of the housing 10 seats on the edge of the filling opening and the mouth 11a of the channel 11 registers with the edge of said opening, as shown in Fig. 3. He thereafter applies downward pressure to the valve unit, as indicated by the arrows 17 in Figs. 2 and 4, said pressure being sufficient to bend downwardly the marginally flared portion 16. As this operation proceeds, the diameter of the edge of the filling opening is decreased and said edge is caused to enter into the channel 11 until it comes to a firm seat at the base of the channel, as shown in Fig. 4.

Experience has shown that the application of such pressure with properly proportioned parts, a hermetic seal will be produced between the edge of the filling opening of the can closure and the base of the channel 11, for when employing even hard plastics, there is always a sufficient clearance to compensate for slight irregularities in such edge and cause the edge to tightly grip the plastic and form a seal of the character stated. Although experience has shown that a gasket is unnecessary to form a seal of this kind, such a gasket may be employed if desired, without departing from this invention.

Figs. 1–4 inclusive show a can of one conventional type having the usual dome shaped closure as large as the diameter of the can body. The invention may also be employed in connection with that type of can shown in Fig. 5, wherein the can closure is in the form of a cup 13a of lesser diameter and mode of operation applies irrespective of the type of closure employed.

The present invention may also be applied to one piece cans of the drawn type. Heretofore these cans have generally been provided with a closure in the form of a cup, such as shown in Fig. 5. However, the employing of such a cup is rendered unnecessary according to the invention if the top opening is formed as shown in Fig. 6 with its margin 16 flared upwardly as shown in this figure, so that the inner margin of the flared portion has a diameter large enough to closely receive the valve housing of the valve unit. After this type of can is filled and the housing placed to project into the can as in the preceding figures, downward pressure on the housing will decrease the flare of the margin 16 from the full line position into the dotted line position wherein it will grip the valve housing with a hermetic seal and permanently mount the valve unit on the can.

In Figs. 1–4 inclusive the circumferential channel is shown as molded into the body of the can. The same result may be obtained, as shown in Fig. 7, by molding on the housing a circumferentially projecting bead 18 to form between the bead and the limiting abutment 19 a channel 20 corresponding to the channel 11. In the forms of the invention thus far described, a channel is pre-formed to receive the edge of the filling opening. However, when using moldings of fairly hard plastic, such as nylon, it is possible to carry out the invention without a pre-formed channel. In Fig. 8, no channel is shown, but there is a limiting abutment 21. The can is formed with the raised margin around the filling opening as hereinbefore described and after the valve unit has been introduced into the filler opening as stated, downward pressure upon the valve unit will cause the flare of the can to be decreased sufficiently to bite into the surface 22 of the limiting and then within a depressed sealing channel 22 as shown in Fig. 9. The seal thus produced will function satisfactorily if the internal pressures in the can are not too great but the structures with the pre-formation of an actual channel in the housing as shown in the preceding figures are preferred for they are more reliable and safe at conventional pressures.

The cans which are used for packaging are made of metal or at least have metal closures. The metal employed, while being malleable, must be sufficiently strong to hold the internal pressures to which the can is subjected and, when so constituted, will permit bending of the flared top filling opening in the can from the condition of Fig. 2 to the condition of Fig. 4 without the application of excessive pressure on the valve unit. When bent into the condition of Fig. 4, it will permanently secure the valve unit to the can so that these parts cannot thereafter be separated nor can they be sprung under ordinary usage into a condition wherein leakage will result. The cans and closures shown in the drawings simulate in general configuration, conventional shapes but this shaping may be changed without departing from this invention.

By the foregoing invention one of the most troublesome aspects of pressure packaging is eliminated. The work of the filler is materially reduced and his cost of packaging is materially lessened and his discards are practically nil. Moreover, the resulting package will withstand relatively higher continuous internal gaseous pressures such as are required for aerosol and inert gaseous pressure dispensers. This it will do without leakage and in a perfectly safe manner.

The method and structure of this invention should not be confused with those prior disclosures wherein a relatively soft and flexible element of some sort, provided with a groove or the like, must be flexed, bent or distorted in order to introduce it into a rigid opening of permanently
fixed dimensions, after which such element must spring back to its original shape to effect its attachment in said openings. Such structures cannot be safely employed in the packaging of aerosols and other pressurized materials, where the pressures may exceed 100 pounds p.s.i. The valve unit of this invention is relatively rigid. It is not flexible and when attached to the can cannot be displaced therefrom for it is positively locked thereto.

The foregoing detailed description sets forth the invention in its preferred practical forms, but the invention is to be understood as fully commensurate with the appended claims.

Having thus fully described the invention, what I claim as new and desire to secure by Letters Patent is:

1. Method of hermatically sealing an aerosol container having a permanently configurated side wall, a permanently configurated bottom wall and a top wall having therein a filling opening, all parts of which top wall are permanently configurated except the margin of the filling opening which for the time being is upwardly flared, the entire container being hermatically sealed except for the filling opening in the top wall, said method comprising the following steps, namely: inserting into the filling opening a valve unit having a housing provided with a peripheral channel and of plastic material so hard and non-flexible that it cannot be appreciably bent or deformed, positioning said valve unit so that said peripheral channel is in registration with the inner edge of the filling opening, and then applying downward pressure to the upwardly flared margin of the filling opening to bend it downwardly and diminish the diameter of said opening and force its edge into continuous contact with the interior of said channel with sufficient force to produce an autogenous hermetic seal therewith and thus complete the hermetic sealing of the container.

2. An aerosol dispenser comprising: an aerosol container having a filling opening and, in said opening an aerosol valve having a valve housing provided with a peripheral channel in which the edge of the filling opening has a compression fit extending continuously around said channel with sufficient inward radial force to produce an autogenous hermetic seal therewith, said housing being of plastic material sufficiently hard and inflexible that it cannot be appreciably bent or deformed to remove it from or replace it in said filling opening.

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