Aug. 27, 1963 C. R. BEE 3,101,878

CLOSURE ASSEMBLY FOR CONTAINERS AND PARTS THEREOF

Filed Feb. 28, 1961

Fig. 1

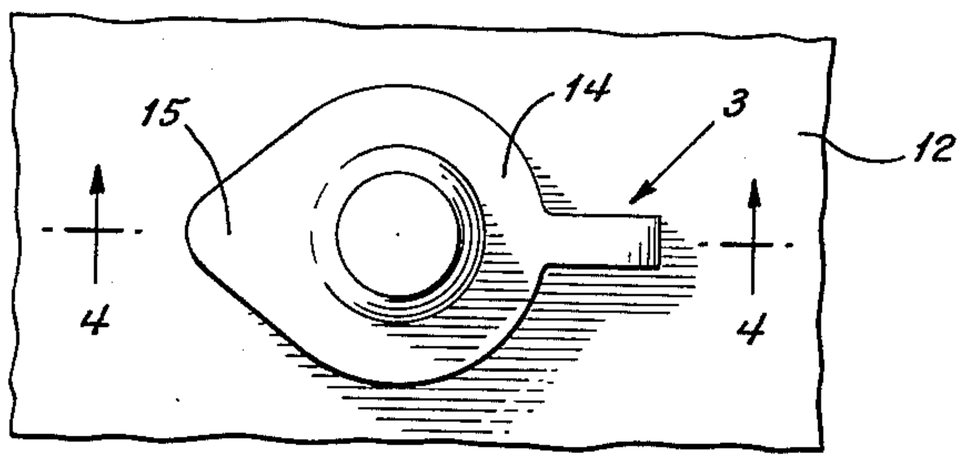

Fig. 2.

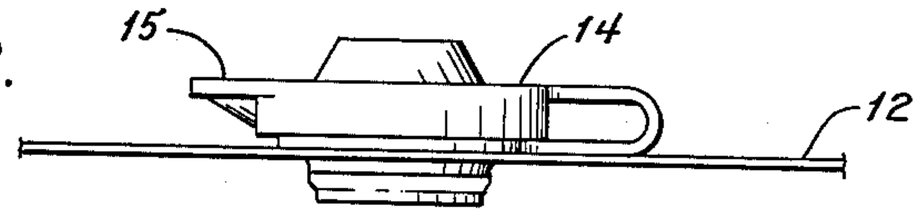

Fig. 3.

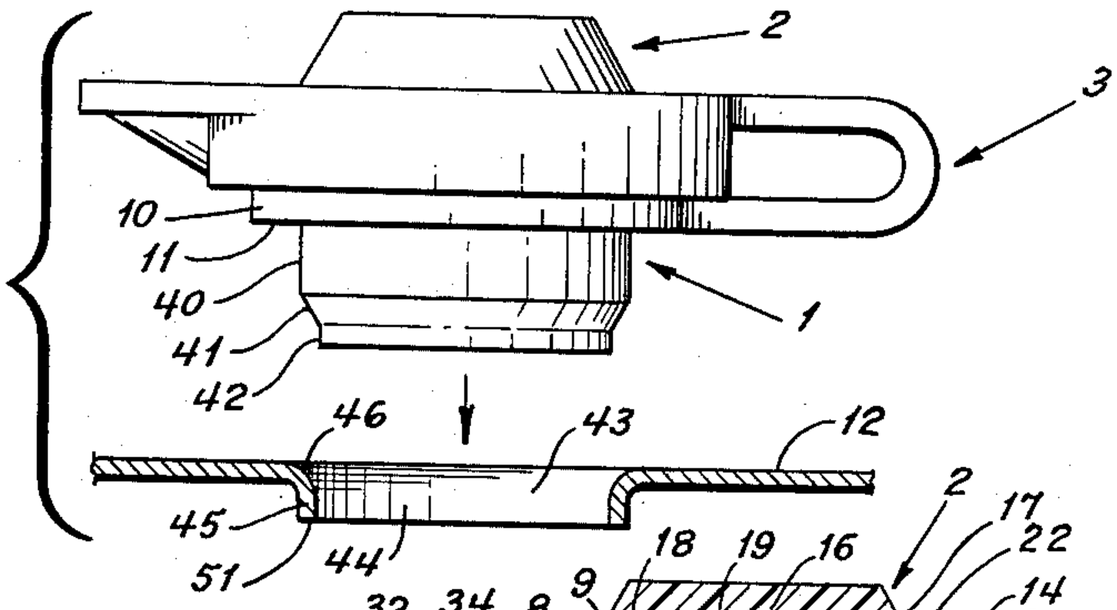

Fig. 4.

Fig. 5.

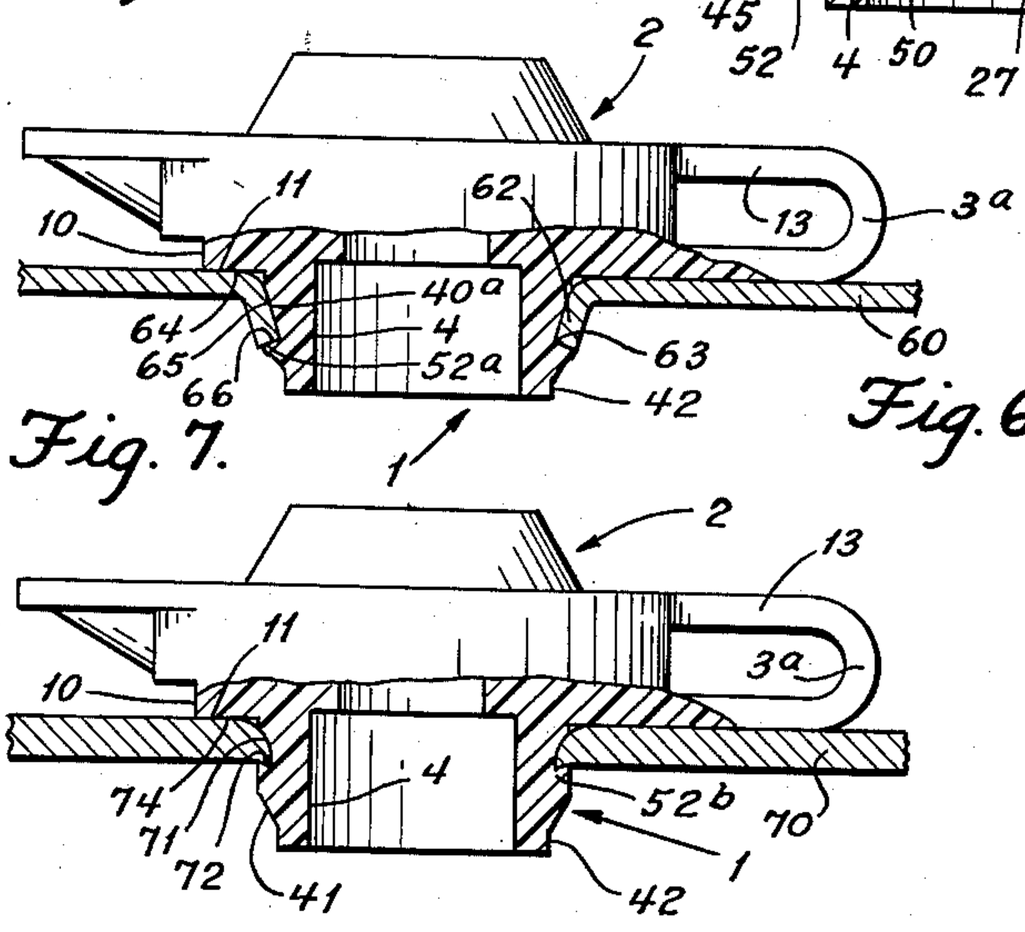

Fig. 6.

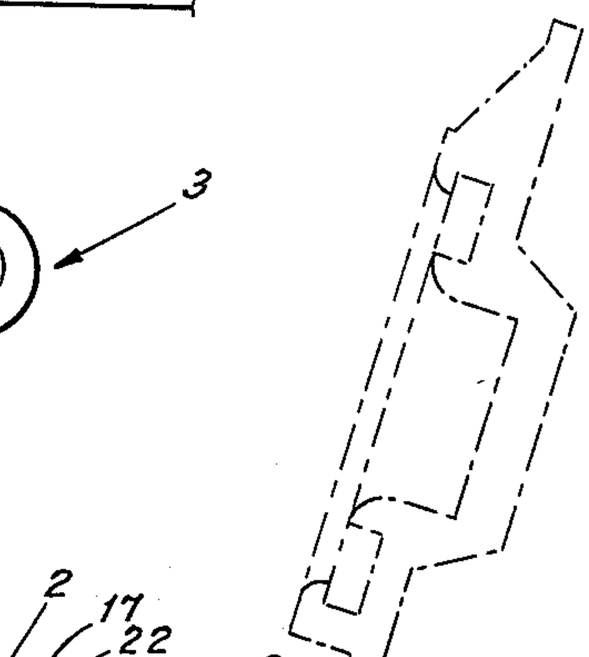

Fig. 7.

INVENTOR.
CARL R. BEE
BY
Albert M. Parker
ATTORNEY.

United States Patent Office

3,101,878
Patented Aug. 27, 1963

3,101,878
CLOSURE ASSEMBLY FOR CONTAINERS AND PARTS THEREOF

Carl R. Bee, Warren, Ohio, assignor to American Flange & Manufacturing Co. Inc., New York, N.Y., a corporation of Delaware

Filed Feb. 28, 1961, Ser. No. 92,266
2 Claims. (Cl. 222—542)

This invention relates to closures and dispensing devices for containers. It is particularly concerned with integrated closures which provide their own seating as well as closing and which may be applied to openings in container walls from the outside of an otherwise finished container. Such application is easily effected, yet the closure remains securely in place.

The closure of the invention, merely by the making of minor variations therein, is adaptable for use on small cans, such as those whose sides are squeezed to project a small stream of fluid therefrom, to larger cans where the dispensing of the contents is effected by pouring and to containers in the steel barrel and drum category where the closure may serve merely as venting means to emit air so that dispensing can be effected through a larger opening. The closure of the invention is also adaptable for closing off with a membrane which needs to be fractured in order to open a passage to the contents of the container.

Heretofore, in the making of integrated closures of resilient material, the use of which has largely been limited to smaller size cans, effort has been directed to producing a single purpose closure capable of being applied to and properly fitting a specially formed receiving opening therefor in the can head. This limited the applicability of such closures and the market for them, since each one had to be pre-formed to fit a certain pre-formed container condition.

The closure of the invention, contrary to prior practices generally, is formed of such material and is so dimensioned that regardless of the weight of metal of the can, pail, or drum to which it is applied, it will seat itself securely thereto and make a tight leakproof joint with the wall thereof. The formation around the opening in the container wall would have certain variations, depending upon the thickness of the wall material but, so long as such are the only variations, the same closure will make a tight joint with an opening of the same size, regardless of the thickness of the container wall material.

It is accordingly a principal object of the invention to provide integrated container closures capable of forming tight joints with opening formations in container walls of various thicknesses.

Another object is to provide such closures which, though all of the same construction, will seat themselves effectively in the opening formations of container walls of different thicknesses.

Still another object is to provide such closure formations which can easily be applied from the outside of the container after it is otherwise completed.

Still another object is to provide such closure formations with varying formations of openings therethrough, depending on the service to which they are put.

A more detailed object is to provide such closure means which have integrated seating and closing means forming a unitary element.

A more detailed object is to provide such closure means which may be economically manufactured, are easy to apply and will give effective service for a long period of time.

Further and more detailed objects will be partly obvious and partly pointed out as the description of the invention, taken in conjunction with the accompanying drawing proceeds.

In that drawing:

FIG. 1 is a plan view of a section of thin wall container with the closure of the invention applied thereto.

FIG. 2 is a front elevation thereof.

FIG. 3 is an enlarged exploded view showing the closure of the invention and the section of the container wall stock, as in FIGS. 1 and 2, in position to be assembled together.

FIG. 4 is an enlarged sectional view taken on lines 4—4 of FIG. 1 and looking in the direction of the arrows, showthe cap member in closed position in section and in open position in dot dash lines.

FIG. 5 is a view similar to FIG. 4, with a part of the closure shown in elevation, of a closure-container wall assembly in accordance with the invention, where the container wall stock is heavier than that of the previous figures.

FIG. 6 is an enlarged fragmentary exploded view of a fragment of the container wall stock around the opening and a fragment of the seating portion of the closure means of FIG. 5 in position for assembly.

FIG. 7 is a view similar to FIG. 5, showing a closure-container wall assembly where the container wall is of still greater thickness.

The closure means of the invention, heretofore referred to as an integrated closure, consists generally of a seating part indicated at 1, a cap-like closure member generally indicated at 2 and a flexible strap-like hinge indicated at 3 by which the cap member 2 is held captive with respect to the seating part 1. These elements of the closure are preferably formed integrally, such as by moulding out of a plastic material of which the tougher grades of polyethylene or, other plastic materials having the characteristics of resiliency, flowability, comparable to that of polyethylene, inertness to a wide range of products and long life, without change of characteristics, may be employed. In certain instances also tougher material such as nylon, Teflon and Mylar, to name a few, may be employed. The particular characteristics which they would need will be further apparent as the description of the performance of the material in the case of the invention is set forth.

Considering first the seating part 1, of the closure of the invention, and the assembly of the same with the container wall, as in FIGS. 1 to 4, it will be seen that this is generally a cylindrical member having a lower part 4 for securement within the container wall opening, an upper dispensing part 5 extending above the container wall and here shown as having an internal diameter smaller than that of the part 4. Between the parts 4 and 5 the seating part 1 extends outwardly in the form of an annular collar 6. The collar 6, as here shown, has its periphery recessed in an annular channel 7, which enlarges again in a head portion 8, which head portion is separated from the portion 5 by a cylindrical channel 9.

The portion of the annular collar 6, below the channel 7, forms an annular shoulder 10 whose undersurface 11

is formed to lie against the flat outer surface on the container wall **12**. It is to be noticed that the shoulder **10** extends radially outwardly from and with respect to the thicker central portion of the collar **6**. Thus the shoulder **10** has strong support in the material of the seating part **1**, for reasons which will appear hereinafter.

At one position on its periphery the material of the shoulder **10** extends integrally outwardly in the strap-like hinge **3** which has a return bend **3***a* from which it extends radially inwardly at **13**. The portion **13** joins with the periphery of the skirt **14** of the closure cap **2**. This skirt is generally circular save for an outwardly extending lip **15** opposite the hinge **3**.

The top **16** of the cap **2** is domed upwardly from the skirt **14**, has an inwardly inclined side wall **17** and is formed interiorly with a cylindrical recess having a side wall **18** and a closing end wall **19**. As here seen the relationship of the portions **18** and **19** to the dispensing neck **5** is such that the side wall **18** snugly engages the outer surface **20** of the neck **5**, while the closing wall **19** lies just above the plane end **21** of the neck **5**. The engagement of the surfaces **18** and **20** provides a tight closing against leakage of the contents of the container. Further security against leakage and tight securing of the cap in place on the seating member is achieved in the following manner.

First the portion **22** which connects the dome top **16** with the rim **14** is provided with a downwardly projecting collar **24** whose outer cylindrical periphery **25** tightly engages the inner periphery **26** of the head portion **8**, when the cap is in place over the opening. The bottom end of the collar **24** extends away from the cylindrical periphery **25** in an inwardly and upwardly convexly rounded curved surface **27** which, as can be seen from the showing in FIG. 4, facilitates the proper positioning of the cap **2** over the neck **5** as the cap is brought into closed position.

Where the skirt **14** extends outwardly from the portion **22**, it has an undersurface **28** which tightly engages the upper surface **29** of the head portion **8**. Surrounding that surface the skirt **14** extends downwardly in a collar **30**, which terminates in a radially inwardly extending annular projection **31** whose upper surface **32** engages tightly against the upper side of the channel **7**. The end surface **33** of the annular projection **31** is rounded upwardly and inwardly to facilitate the snapping of the projection **31** down past the peripheral surface **34** of the head portion **8**. When that snapping is effected, it will be seen that the projection **31** is positioned well within the channel **7** so that the skirt **14** is held down tight with its various internal surfaces in tight engagement with the opposed surfaces of the head **8**. Hence these engagements provide additional assurance against leakage beyond the normally fully effective one provided by the engagement of the surfaces **18** and **20**.

The securing of the cap **2**, in closed leakproof position with respect to the seating member as just described and as seen in FIG. 4, is achieved merely by pressing down with sufficient force on the dome top **16**, whereupon the other portions will snap into their closed positions. When it is desired to lift the cap for opening the closure, however, it is merely necessary to introduce one's finger beneath the lip **15**, forcing it upwardly, whereupon the projection **31** comes out of the channel **7** at the position nearest the lip **15**. Continued upward pressure on the lip **15** will enable the cap to be opened all the way into the dot-dash position of FIG. 4.

The important universal aspect of the invention resides in the particular securing part **4** of the part **1** and the relationship of the same to the undersurface **11** of the shoulder **10**. As seen in FIGS. 3 and 6 the exterior surface of the part **4**, where it departs from the surface **11**, is, prior to the application of the closure member to the container wall, merely a straight cylinder **40**. This cylinder extends downwardly for a substantial portion of

the overall extent of the part **4**, then the part **4** turns downwardly and inwardly in a short frusto-conical portion **41**. The portion **41** ends in a short cylindrical pilot portion **42** of smaller diameter than that of the cylindrical surface **40**.

Considering now the opening **43** in the thin container wall stock **12**, it will be seen to have an I. D. substantially the same as the O. D. of the pilot portion **42**. This opening I. D. continues down the cylindrical surface **44** of the neck **45** bordering the opening **43**. Further than that it will be seen that this I. D. is enlarged at the short radius **46** where the neck **45** departs from the wall **12**. Thus the pilot portion **42** can be started into the neck **45** without the exertion of any particular force. As the downward movement of the closure member proceeds, however, it is first necessary to force the frusto-conical portion **41** through the opening **43** and then follow that with a portion of the larger diameter cylindrical part **40**.

Again referring to the relationships as seen in FIG. 3, it will be seen that this cylindrical part **40** has a substantially larger O. D. than the I. D. **44** of the neck. The difference in these diameters is, however, selected so that the required portion of the cylinder **40** can be forced through the opening **43** by normal manual pressure until the surface **11** is brought tightly down on to the upper surface of the container wall **12**. At the upper portion of the neck **4** the cylindrical surface **40** will have been reduced in diameter as seen at **50**, where it embraces the neck **45**. The portion of the member **4**, below the end **51** of the neck, will be seen to have flowed outwardly into an annular projection **52** which lies out even beyond the outer diameter of the neck **45**. Thus instead of a preformed recess having been provided for the reception of the neck **45**, the recess is formed by the flowing of the plastic material as the neck **4** is forced through the neck **45** thus resulting in the formation as shown in FIG. 4. This assembly makes for a much tighter and more rigid joint than if the plastic were pre-formed to receive the metal neck **45**. In the case of pre-formed parts, little or no allowance is made for variations, cracks and other faults in the metal parts so that a certain proportion of the joints will be below standard, if not complete failures, permitting leakage.

In the assembly of the invention, however, the flow of the plastic material to form its own engagement with the metal neck and to embrace that neck, serves to fill any crevices and make up for any distortions or cracks in the neck. It not only does so at the outset, when the assembly is effected, but it continues to do so throughout the life of the container, since the plastic material, with its constant tendency to return to its initial state, grips on to the metal. Besides gripping the metal within it, between the projection **52** and the collar **10** it also seeks to spring outwardly in the section **50** where the metal protrudes into the plastic.

The exact same integrated closure can be effectively applied to openings in container walls of heavier metal. The way that this is done and the resilient assembly of container wall and closure member are illustrated in FIGS. 5 and 6. Starting with a fragmentary showing in FIG. 6, the closure member is exactly the same as that shown in FIG. 3 so the reference characters remain the same. The difference in the assembly resides in the fact that the thicker container wall stock **60**, when formed with an opening for the reception of the closure member, has the stock, bordering that opening formed at little differently from the cylindrical neck in the lighter gauge stock **12** of FIGS. 1 through 4. Though the stock **60**, when punched and drawn downwardly around the opening, takes a bend **61** in departing from the flat into the neck **62**, the bend **61** is not such an abrupt angle as where the stock is of lighter gauge. Thus the neck **62**, instead of being a section of a cylinder, is a section of a downwardly inclining cone.

The inner circular edge **63** of the neck **62** has substan-

tially the same diameter as the pilot portion **42** of the part **4**. Thus the closure member may readily have its neck started into the opening bordered by the edge **63**. Then on pushing the closure downward manually, the plastic will flow sufficiently to enable the conical portion **41** to travel past the edge **63**. Just after it passes this, however, the point is reached where the upper surface **64** of the wall **60** comes into engagement with the shoulder **11** on the part **10** of the closure, thereby precluding further downward movement of the closure. At this point, however, the portion **40**, of the neck, as well as part of the conical portion **41**, will have been recessed inwardly into a new conical surface **40***a* which mates with and lies tightly against the conical surface **65** on the outer surface of the portion **62**. Furthermore the circular edge **63** will have seated itself deeply into the plastic material of the neck which, in turn, has been caused to flow out into the shouldered projection **52***a* which lies out across the end **66** of the neck **62**. Thus, again, the neck **62** is held tightly between the projection **52***a* and the surface **11** while radially speaking the neck has seated itself into the plastic neck. The plastic being resilient, however, it is constantly pushing outward to effect and maintain a tight joint between the surfaces **65** and **40***a*. The resilient flow characteristics of the plastic would make a tight leakproof joint and make it extremely difficult to dislodge the closure member from the container wall. At the same time imperfections in the neck will be compensated for by the flow of the plastic.

The assembly shown in FIG. 7 is one involving identical integral closure members of the preceding figures applied to an opening in a container wall **70**, which wall is, again, materially thicker than the wall **60** of FIGS. 5 and 6. This wall is so thick that, in the punching of an opening therethrough, the drawing of any real neck is hardly feasible. However, it is not necessary for the mere rounding of the stock downwardly and inwardly, as shown at **71**, to terminate in a small inwardly and downwardly projecting lip **72**, is all that is necessary for tightly and effectively holding the closure member and container wall in assembled relationship. Again the lip **72** has substantially the same diameter as the pilot portion **42**, so centering for the seating of the closure member in place can be readily effected. Here, however, the position where the edge **72** engages the stock of the neck is further up the neck as in the previous forms, so more body **52***b*, of plastic material, flows out into the projection lying beneath and radially outwardly of the lip **72**. This adequately compensates for the shortness of the longitudinal engagement of the metal wtih respect to the plastic. Thus the surfaces **74** and **11** will be held tightly in engagement while the plastic of the neck **4**, pushing outwardly against the surface **71** and under the edge **72**, will also make tight joints here.

Though, in the foregoing, a particular closure formation, effective for making a tight joint with the various formations imparted around the openings to container walls of varying thicknesses, has been described, with reference to the showing in the accompanying drawing, it is to be understood, of course, that the invention is not to be considered as being limited by the particulars of such showing. Container wall stock of thicknesses varying from those shown in the accompanying drawing would vary in the formations around the openings therein. Such variances, however, so long as the inner dimension of the opening was the same in each case, would still lend themselves to effective assemblies of the closure member of the invention with the container walls. Also, of course, the variations in the construction of the closure member, both with regard to the seating part and the closing part, might well suggest themselves to those skilled in the art, without departing from the spirit and scope of the invention. It is accordingly to be understood that the structures and relationships shown in the accompanying

drawing and described in the foregoing description are to be considered as illustrative of the invention and are not set forth in a limiting sense.

Having described my invention, what I claim is new and desire to secure by Letters Patent is:

1. An integral one-piece closure and dispensing member formed out of yieldable resilient synthetic plastic material for forming a permanent leakproof joint about various bordering formations surrounding openings of the same minimum internal diameter in metallic container walls of a variety of thickness, such variations in the bordering formations depending upon the wall thicknesses, which comprises, an annular body part having a substantially flat undersurface formed for seating on the outer surface of a container wall and a downwardly extending tubular seating part extending integrally from said undersurface of said body part and formed for seating within the container wall opening, said body part and said seating part being formed with a pouring passage extending substantially therethrough, said seating part commencing at said undersurface of said body part as a cylindrical neck of substantial extent extending at right angles to said undersurface, said cylindrical neck having a straight uninterrupted exterior surface, the external diameter of said cylindrical neck being constant throughout its extent and substantially greater than the minimum internal diameter of the bordering formation surrounding the container wall opening, said seating part at the immediate lower end of said cylindrical neck having a exterior surface in the form of a downwardly and inwardly inclined frusto-conical portion extending directly from said cylindrical neck, and a relatively short cylindrical pilot portion extending from the lower, smaller end of said frusto-conical portion and terminating in a free end, said pilot portion having a straight uninterrupted exterior surface of constant diameter throughout its extent and said diameter being substantially equal to the minimum internal diameter of the bordering formation surrounding the container wall opening, whereby on introduction of said pilot portion into the container wall opening said closure member may be forced downwardly and by virtue of the yieldable resilient nature of the plastic material, said cylindrical neck can be forced through the opening causing the bordering formation about said opening to resiliently seat itself into the material of said cylindrical neck.

2. In container construction in combination, a container wall formed with an opening therethrough and an integral one-piece closure and dispensing member formed out of yieldable resilient synthetic platic material axially received within said opening, said container wall being formed out of metal and having the metal immediately surrounding said opening formed into a downwardly extending bordering formation, said closing and dispensing member having an annular body part formed with a substantially flat undersurface engaging the outer surface of said container wall and a downwardly extending tubular seating part extending integrally from said undersurface of said body part and through said container wall opening, said body part and said seating part being formed with a pouring passage extending substantially therethrough, said seating part commencing at said undersurface of said body part as a cylindrical neck of substantial extent extending at right angles to said undersurface, said neck prior to insertion within said opening having a straight uninterrupted exterior surface and the external diameter of said cylindrical neck being constant throughout its extent and being substantially greater than the minimum internal diameter of said bordering formation, said seating part at the immediate lower end of said cylindrical neck having an exterior surface in the form of a downwardly and inwardly inclined frusto-conical portion extending directly from said cylindrical neck, a relatively short cylindrical pilot portion extending from the lower smaller end of said frusto-conical portion and terminat-

ing in a free end, said pilot portion having a straight uninterrupted exterior surface of constant diameter throughout its extent and said diameter being substantially equal to the minimum internal diameter of said bordering formation, said bordering formation on insertion of said cylindrical neck within said opening being resiliently seated in said cylindrical neck with the material of said neck at the lower end of said bordering formation expanding radially outwardly and acting with said undersurface of said body to axially grip said bordering formation thereby permanently securing said closure and dispensing member within said container wall opening in leakproof engagement therewith.

References Cited in the file of this patent

UNITED STATES PATENTS

2,687,831	Miller	Aug. 31, 1954
2,792,976	Stewart	May 21, 1957
2,907,489	Taylor	Oct. 6, 1959
2,911,128	Krautkramer	Nov. 3, 1959
2,981,444	Root	Apr. 25, 1961