Nov. 18, 1969 P. G. KEMP 3,478,913

ALL-PLASTIC BOTTLES

Filed Jan. 5, 1967

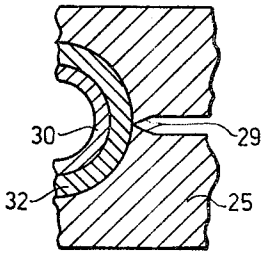


Fig.-4

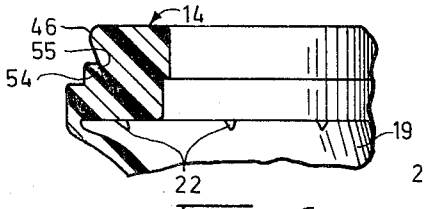


Fig.-6

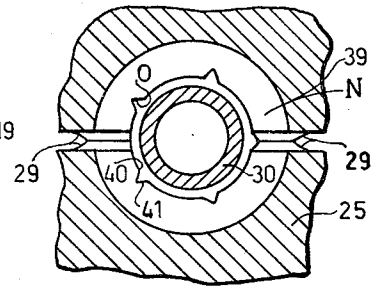


Fig.-5

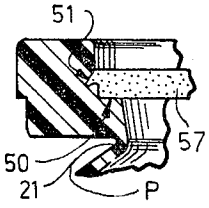


Fig.-8

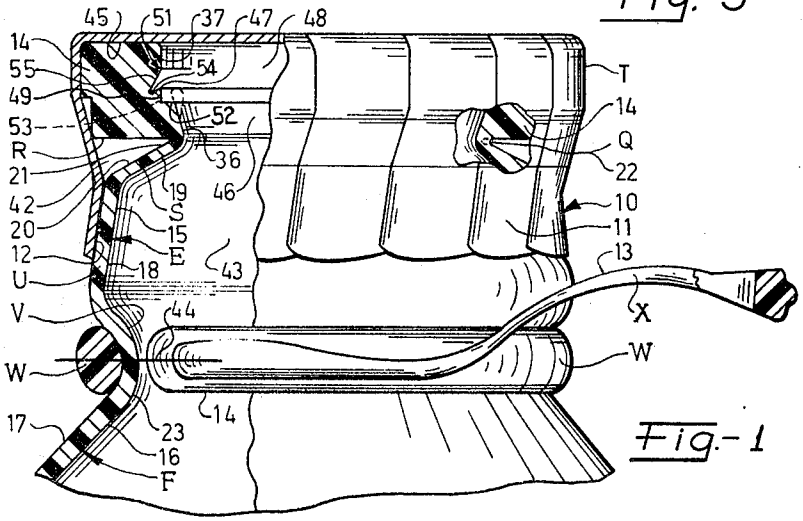


Fig.-1

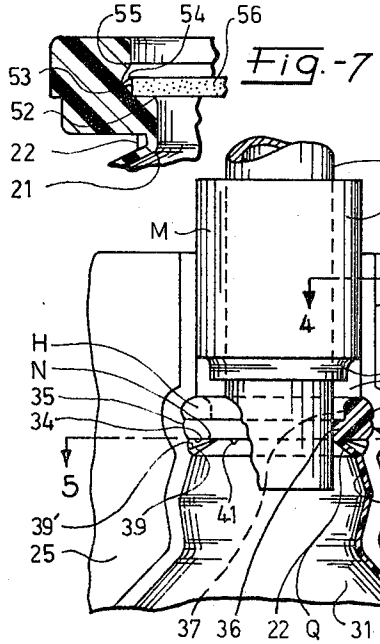
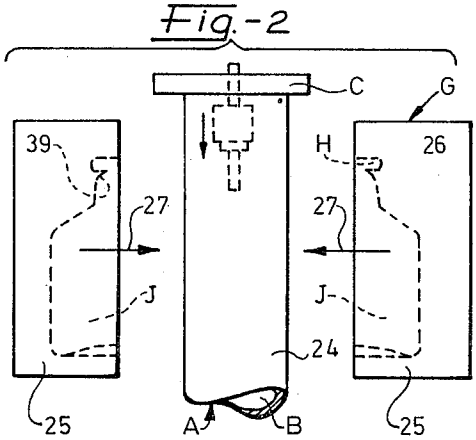


Fig.-7

Fig.-2



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ALL-PLASTIC BOTTLES

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U.S. Cl. 215—100 22 Claims

ABSTRACT OF THE DISCLOSURE

A plastic bottle having a finish, characterized by a neck structure including the finish, which includes the combination of an annular, relatively wide, hood-attaching band, the neck embodying an annular, inwardly projecting apical flange surmounting and co-terminus with the band, the external undersurface of the finish overlying the flange to provide therebetween a relatively deep annular cleft, and a relatively thin narrow connecting ring in the trough of the cleft between the upper edge of the flange and the lower inner edge of the finish for uniting the finish to the flange, and in which the neck structure includes an annular, inwardly restricted throat below said band, the lower edge of the throat being coterminus with an outwardly and downwardly inclining surrounding shoulder of the bottle.

The present invention relates to all-plastic milk bottles, particularly, but not necessarily, of three quart capacity, a principal feature of the present invention being the production of an all-plastic milk bottle in which an impact-moulded finish, and a blow-moulded neck structure and body formed substantially simultaneously, is inventively modified and adapted so as to provide, in the same forming operation, a wide, slightly tapered hood-attaching band surmounted by an inwardly and upwardly inclined, or shallow frusto-conical flange together with a connection between the upper edge of said flange and the lower part of said finish which is buttressed, and sufficiently strong to resist rupture therebetween, and all for the purpose of providing, in a plastic milk-bottle neck structure, an ample sufficiency of strength against undesirable permanent compression or distortion such as would make bottle washing procedures insufficient according to governmental regulations, since, in this connection it should be explained that in the hooding (i.e. the attaching of a standard hood type outer cap having a surrounding skirt), and in the capping operation, a considerable, uniform, downward effort is applied upon the finish by the hooding equipment.

Another important feature of the present invention in combination with the foregoing, resides in the provision of an all-plastic bottle neck structure which, without wasteage of material, includes an annular band of sufficient vertical width, and sufficient diameter relative to the diameter of the finish, to receive the annular skirt of the conventional hood in adhesive contact, while at the same time providing a commodius plenum to accommodate hydraulic surge due to impact on the yieldable walls of the plastic bottle, and shrinkage, to which plastic is also liable, it being understood that this bottle will normally only be filled up to the level of the base of the neck structure. The described neck structure may also

yield or bulge toward spheroidal shape under hydraulic pressure when very tightly sealed as with the novel double cap-seating arrangements to be described, particularly when formed of the thin plastic such as employed for single-use bottles. At this point it should also expressly be noted that by the words "annular," "ring," and "diameter" it is not to be assumed in this disclosure or any claims of this specification that these words are intended to be restricted to "circularity," or "roundness" since obviously the disclosed neck structure might be of various polygonal configurations.

A further object is to provide, in combination with an all-plastic bottle having the novel characteristics already stated, a throat below the hood adhering band which throat is of annular, recessed configuration capable of receiving and retaining the band or ring of a plastic carrying handle.

A still further novel feature, and one of great importance, resides in the disclosed double cap seating arrangements whereby any bottle, but particularly a filled plastic milk bottle, may be very securely sealed both against pop-out under internal hydraulic pressure, and against "push-in" from without—and particularly against being accidentally pushed into the bottle by the user, all this due to the ability to provide, in the finish forming part of the herein novel neck structure, a wider-than-usual primary land, step or seat, and therefore a secondary "lock-step" into which wet-swollen, and diametrically wet-expanded conventional plug caps will spread and "lock down" around their thickened edges, as will be more fully explained hereinafter.

A further object is to provide an all-plastic milk bottle which meets all presently known governmental standards as to satisfactory, repeated washings both internally and externally with standard forms of dairy soaker equipment, and, in addition, accommodates itself to the perfect satisfaction of the trade, and the equipment used thereby, in respect to filling procedures.

With the foregoing in view, and such other objects, purposes or advantages as may become apparent from consideration of this disclosure and specification, the present invention consists of the inventive concept embodied in the method, process, construction, arrangement of parts, or new use of the same, as herein particularly exemplified in one or more specific embodiments of such concept, reference being had to the accompanying figures in which—

FIGURE 1 is an enlarged fragmented representation of the invented all-plastic bottle, as to the finish, neck and upper portion of the surrounding shoulder thereof, in elevation and partly in diametrical cross-section, such figure also depicting the plastic carrying handle associated therewith.

FIGURE 2 is a schematic representation of the two halves of the mould in which the invented bottle is formed, this figure also showing the tubular, open ended plastic parison before enclosure by the two mould-halves, and, in phantom lines, the blowpin and impact head slideable thereon.

FIGURE 3 is a cross-sectional representation showing fragments of the two mould-halves closed around the parison, this figure depicting the finish, on one side as if fully formed, but with the impact head raised, the better to illustrate the manner in which said head (subsequently) compresses the finish to complete the illustrated formation thereof.

FIGURE 4 is a section on the line 4—4 of FIGURE 3.

FIGURE 5 is a section on the line 5—5 of FIGURE 3.

FIGURE 6 is a distorted parallel perspective fragmentary detail of the novel finish and flange, the better to illustrate several strengthening buttresses therebetween.

FIGURE 7 is an elevational detail particularly depicting the novel double cap-seated finish with a dry plug cap therein.

FIGURE 8 is a detail similar to FIGURE 7, but particularly depicting the manner in which a wet-swollen and wet-expanded cap is caused to lock down into the secondary seat.

In the drawings like characters of reference designate similar parts in the several figures.

Proceeding first to provide a summary of the present invention in order that the basic inventive concept may be understood to a preliminary extent, and to aid in the interpretation of the claim or any of the same forming part of this specification, but expressly without restriction of any expression in said claim or claims to such as may be employed in said summary, the invention comprises the means and method of forming an all plastic milk bottle from a single parison A (FIG. 2) open at the lower end B thereof and extruded from conventional structure C thereabove, which is characterized by substantially simultaneously impact-moulding an annular finish D, and blow-moulding a neck E and body F (FIG. 1), said means comprising a mould G capable of enclosing a finish-forming cavity H, and a neck and body forming cavity J for use in combination with a blow-moulding machine, said mould embodying at least (i) a neck, finish-underside, and finish-outerside forming unit K, (ii) an inner, finish-surface forming section L, and (iii) an impact head M, the inner finish-surface forming section L also constituting the blowpin of said machine, said impact head sliding vertically on the blowpin as shown in FIGURE 3, said unit K including an annular, inwardly projecting cleft-forming ring N at the finish-end or flange end of the neck forming part of the unit, said ring having a plurality of spaced sub-recesses O (FIG. 5) formed upon the inner extremity thereof, the said inner extremity of said ring being in close proximity to blowpin L. The method of employing the foregoing means consists of surrounding parison A with the said unit, blow-moulding the neck and body E and F, and impact-forming the finish D by moving impact head M downwardly toward the cleft-forming ring N thereby permitting the forced flow of plastic between the blowpin L and the inner extremity of ring N to form between the said finish-forming cavity and the said neck-forming cavity a thin and narrow plastic connecting ring P (FIG. 8) uniting the finish and flange of the neck which ring is strengthened by spaced, plastic reinforcing buttress-portions Q between the underside R of finish D, and the said flange.

It is not claimed that novelty resides in simultaneously forming an impact-moulded finish and blow-moulded neck or body by forcing plastic between a very narrow annular gap as aforesaid. However, the provision of means, and the step of effecting the reinforcement of ring P by the buttresses Q is novel, as is also the downwardly and outwardly inclining, or shallow frusto-conical and inwardly projecting flange S of the disclosed neck structure, either alone or in combination with the aforesaid buttresses whereby considerable resistance against downward compression is achieved against the effort exerted by the equipment employed to attach hood T (FIG. 1) or the filler-nozzle seatings. In addition, novelty resides in the provision of the slowly outwardly and downwardly tapered, annular and relatively wide, hood-attaching band U. Further it is considered novel to combine with the aforesaid means and method, the annular throat V for attachment thereto of the plastic ring W of the plastic carrying handle collectively designated X.

Having thus summarized the present invention, a detailed description thereof follows, in which numerals may generally be substituted for the preceding letters.

In the adaptation of plastic, in substitution of glass, in the manufacture of plastic milk bottles capable of accepting the conventional crimped hoods **10**, it was found preferable to provide a wider flat circular surface whereby the skirt **11** might be adhesively secured as depicted at **12** against the bottle neck. It also was desirable at the same time to provide a neck structure capable of yielding downwardly, expand-slightly spheroidally, and one which had ample volume for accommodating hydraulic surge of fluid into the neck structure consequent upon external impact or plastic shrinkage. It was desirable, in further addition, to provide a neck structure which would accept and retain a bottle carrying plastic handle **13** (including ring W) which would permit the use of rapid modern filling nozzles, and could be cleaned in conformity with governmental standards of cleanliness with existing soaker equipment, and, most importantly, could retain a conventional plug cap with greater security, but easy removability, and proper replacement, as a consequence of which, among other advantages the present bottle may be stacked and conveyed lying on its side, which is not practical with glass bottles.

The invented bottle accordingly comprises the impact formed finish **14**, and a blow-moulded neck **15** and **16**, (of which it is only necessary to show a portion of the shoulder **17**), of which parts **15** and **16** may collectively be considered the "neck structure."

The neck **15** (FIG. 1) comprises the intermediate slightly downwardly and outwardly tapered or frusto-conical, annular and relatively wide hood attaching band **18**, and an inwardly projecting flange **19** surrounding the hood, of a downwardly and outwardly inclining, and preferably frusto-conical cross-sectional configuration (or at least as to the external surface **20** thereof).

Finally the neck (or neck structure) includes the connecting ring **21** (FIG. 8) reinforced at intervals upon its circumference by the buttress-portions **22** (FIGS. 6 and 7), and, at the lower end of the neck, the annular restricted throat **23** (FIG. 1) designed to secure in place the band W already referred to.

The means and method of forming the product of such means and method, that is to say, the bottle which has just been described consists of the following component parts and method steps:

The soft plastic parison **24** is engaged by the two-halves **25** of mould **26** as they move together in the direction of the arrows **27** of FIG. 2. When the parison is fully embraced it will be obvious that the upper portion is squeezed within the annular area **28**. The parting edges **29** converge according to standard practise as illustrated in FIGS. 3 through 5 to cut away the flash. Simultaneously with the introduction of an air blast through blowpin **30** into the plenum **31** for the purpose of blow-moulding the neck **18** and body **17**, impact head **32** descends and squeezes the plastic in the area **28** against the unit **33** constituting the finish underside **34** and finish outerside **35**. It also compresses plastic against the cylindrical surface of blowpin **30** which constitutes the lower portion **36** of the inner finish-surface. The upper inner surface portion **37** of the finish is formed by the annular portion **38** projecting from the lower end of impact head **32**.

The inwardly projecting, cleft-forming ring **39** is of the acute angular configuration best depicted in the left hand portion of FIG. 3, wherein it is to be understood that line **39'** simply represents the parting edge of each mould-half **25**. As the impact head **32** is forced downwardly, a small quantity of plastic is forced through the narrow annular gap existing between the inner edge **40** (FIG. 5) of ring **39** to form the connecting ring **21**. At the same time, and importantly in connection with the present invention, small quantities of plastic are also squeezed through the

notches **41** (FIGS. 3 and 5) formed in edge **40** to provide the small spaced buttresses **22** (FIG. 1).

In the accompanying FIGURE 5 only five such notches are shown, and proportionately somewhat deeper than in actual fact. In actual fact they are very shallow notches, being little more than what might be called "nicks," such as might be made with a sharp triangular file, and somewhat in the order of quarter of an inch apart. If they are oversized, a small globule of plastic will be projected through these notches to form undesirable small promontaries projecting upon the inside of the neck at their locations, which might interfere with efficient bottle cleaning, filling and the like. When sufficiently small however, these buttresses do not form such globules but aid very materially in strengthening the connection at the trough of the annular cleft **42** (FIG. 3) between the finish **14** and neck **15** since it will be recognized that such buttresses are impact formed as well of course as the thin ring **21**. The novel buttresses just described however are of great importance in preventing accidental rupturing or breaking away of the finish **14** from the neck of the bottle due to accidental angular blows and the like received during the course of repeated usage. In the accompanying drawings, a ring **21** (FIG. 1) of about .025" in vertical height is shown. For greater strength however, as intended to be disclosed by FIGS. 7 and 8, a deeper ring of some .060" is provided, and consequently somewhat more massive buttresses of which one is illustrated in said FIG. 7. The remainder of the bottle forming method is conventional.

From the foregoing it will be apparent that there has been provided a more commodius plenum **43**, than in copending United States application Ser. No. 499,376 filed on Oct. 21, 1965, now abandoned. Specifically, the plenum of this application has more closely the relationship that a cylinder has to a sphere, than has a cone of the substantial slope disclosed in the aforesaid co-pending application. For it should again be explained that, generally speaking, the bottle with which the presently invented neck structure is associated will only be filled to the midline or trough **44** of the throat **23**. In taking impact from above, this neck structure can yield downwardly via the flange **19**, which flange can, if necessary, transmit radial stresses to the upper surrounding edge of band **18**. Further yielding is possible of course at the stratum of the throat **23** since it should be explained that some milk bottle processing operations exert a downward impact of 200 lbs. upon the upper finish surface **45**.

Describing next the important novel double cap seating arrangements associated with the inner annular overall surface generally designated **46** of finish **14**, it should be explained that, as will be apparent from FIGURE 3, the arrangements there illustrated, and which have been described, form an inner surface **46** which would follow the full lines depicted in FIGURE 1, but only to the extent they are modified by the phantom lines **47**. In other words a single step on the line **48** would be provided. In fact however some shrinkage occurs after cooling which accounts for the curvature of portion **36** which continues up to step **48** as indicated by the dotted line **49**.

While the shrinkage aforesaid could be avoided by suitable allowance in mould design, to date it has been found preferable to post-ream the inner finish surface **46** to the configuration illustrated in the accompanying FIGURES 1, 6, 7, and 8. Such post-reaming therefore comprises providing a primary and lower cap seat collectively designated **50** and a secondary upper cap seat collectively designated **51** (FIG. 8). The foregoing cap seats each comprise a step and a riser, of which the step and riser of the primary cap seat are designated **52** and **53** (FIG. 7) respectively. The step and riser of the secondary cap seat **51** are designated **54** and **55** respectively.

It will be observed that the primary step and riser **52** and **53** are in right angular relationship, and that the secondary step and riser are in acute angular relationship so that the secondary riser **55** overlies the step **54**. Secondary cap seat **51** therefore constitutes an annular locking ring or notch as will presently be explained.

Conventional cap seats **56** are formed of material which swells both in thickness and diameter when wet. When a bottle is capped of course the plug cap **56** is dry, and it is snugly machine fitted as illustrated in the accompanying FIGURE 7 so as to engage the primary cap seat **50**. As soon as it has become wetted however, which, in the operation of bottle filling is virtually immediately, the cap swells as depicted in FIGURE 8, wherefore it is designated as a wet-swollen and wet-expanded cap seat **57**.

As swollen in thickness and expanded in diameter, the perimeter of the cap **57** enters secondary cap seat **51** and is guided by the inclination of the riser **55** thereof downwardly and outwardly so that fills the annular notch which constitutes secondary cap seat **51**, and is forced thereinto by said inclination.

It will thus be apparent that a very tight seat is thereby effected. When a uniform expulsive pressure is applied to the underside, very great pressure would be required to blow it off. On the other hand, the user can quite conveniently pry it off from one edge. Thereafter, obviously reseating is much easier and may be less seal-tight. However it is still sufficiently tight and since the bottle is in use it will not be inclined on its side. Furthermore, the wide primary step **52** is such that the housewife for example is not liable to push the cap down through into the bottle.

It will be observed that the diameter of the finish at the upper edge of the inclined step **55** is equal in diameter to riser **53** for preference. Hence, notwithstanding the particularly tight sealing possible with the arrangements just described, the dry plug cap **56** is quite easily insertable down to the primary step **52** by ordinary procedures.

Various modifications can be made within the scope of the inventive concept disclosed. Accordingly, it is intended that what is described herein should be regarded as illustrative of such concept and not for the purpose of limiting protection to any particular embodiment thereof, but that only such limitations should be placed upon the scope of protection to which the inventor hereof is entitled, as justice dictates.

What is claimed is:

1. A blow-moulded, all-plastic bottle having an impact-moulded finish, characterized by a neck structure including said finish, which consists in combination of an annular, vertically relatively wide, hood-attaching band, said neck embodying an annular, inwardly projecting apical flange surmounting and co-terminus with said band, the undersurface of said finish overlying said flange to provide therebetween a relatively deep annular cleft, and a relatively thin narrow connecting ring in the trough of said cleft between the upper edge of said flange and the lower inner edge of said finish for uniting said finish to said flange, and including a set of spaced, relatively small buttresses occupying the trough of said cleft, and being integral and co-terminus with said ring.

2. The bottle according to claim **1** in which said neck structure includes an annular, inwardly resctricted throat below said band, the lower edge of said throat being co-terminus with an outwardly and downwardly inclining surrounding shoulder of said bottle.

3. In combination with the bottle structure according to claim **2**, a plastic handle including a band encircling said throat, said band being secured in place thereby, said band including a flexible handle portion integral with said band.

4. The bottle according to claim **1** in which said flange is, horizontally considered, of relatively shallow, frusto-conical configuration.

5. The bottle according to claim **1** in which said flange is, horizontally considered, of relatively shallow, frusto-conical configuration, and in which said finish has an underside which is flat, and lies in a plane normal to the longitudinal bottle axis.

6. A blow-moulded, all-plastic bottle having an impact-moulded finish, a characterized by a neck structure including said finish, which consists in combination of an annular, vertically relatively wide, hood-attaching band, said neck embodying an annular, inwardly projecting apical flange surmounting and co-terminus with said band, the external undersurface of said finish overlying said flange to provide therebetween a relatively deep annular cleft, and a relatively thin narrow connecting ring in the trough of said cleft between the upper edge of said flange and the lower inner edge of said finish for uniting said finish to said flange, in which the underside of said finish is flat and lies in a plane normal to the longitudinal bottle axis, said flange also projecting upwardly, and a set of spaced, relatively small buttresses occupying the trough of said cleft and being integral and co-terminus with said ring.

7. A blow-moulded, all-plastic bottle having an impact-moulded finish, characterized by a neck structure including said finish, which consists in combination of an annular, vertically relatively wide, hood-attaching band, said neck embodying an annular, inwardly projecting apical flange surmounting and co-terminus with said band, the external undersurface of said finish overlying said flange to provide therebetween a relatively deep annular cleft, and a relatively thin narrow connecting ring in the trough of said cleft between the upper edge of said flange and the lower inner edge of said finish for uniting said finish to said flange, and in which said neck structure includes an annular, inwardly restricted throat below said band, the lower edge of said throat being co-terminus with an outwardly and downwardly inclining surrounding shoulder of said bottle.

8. In combination with the bottle structure according to claim 7, a plastic handle including a band encircling said throat, said band being secured in place thereby, said band including a flexible handle portion integral with said band.

9. A blow-moulded, all-plastic bottle having an impact-moulded finish, characterized by a neck structure including said finish, which consists in combination of an annular, vertically relatively wide, hood-attaching band, said neck embodying an annular, inwardly projecting apical flange surmounting and co-terminus with said band, the external undersurface of said finish overlying said flange to provide therebetween a relatively deep annular cleft, and a relatively thin narrow connecting ring in the trough of said cleft between the upper edge of said flange and the lower inner edge of said finish for uniting said finish to said flange, and in which said neck structure includes an annular restricted throat, said throat, as viewed in vertical diametrical cross section being seen to curve smoothly inwardly toward the longitudinal bottle axis co-terminusly with and below said band, the lower part of said throat curving smoothly outwardly to join a surrounding shoulder of said bottle.

10. In combination with the bottle structure according to claim 9 a plastic handle including a band encircling said throat, said band being secured in place thereby, said band including a flexible handle portion integral with said band.

11. In a bottle, a double-seating finish for expandable plug caps, characterized in that the inner surface of said finish has a primary, annular, inwardly projecting lower cap-seat, and slightly spaced therefrom, a secondary cap-seat in outstepped annular relationship to said primary seat, to accommodate a plug cap or the like when expanded, said primary and secondary cap-seats each consisting of annular step and riser, the step and riser of said primary seat being in substantially right angular relationship, the riser of said secondary seat inclining annularly inward and upward over the step thereof, the vertical distance between the step of said primary and secondary seats is such that the upper stratum of the perimeter of conventional wet-swelling and diametrically expansible plug-caps, when wet, will enter said secondary seat and bear against said inclining riser to be forced downwardly into a double-sealing contact with said seats, and the step of said secondary seat being inclined outward and downward to provide an annular seat of acute interior angular cross section.

12. The bottle according to claim 11 in which the upper edge of the riser of said secondary seat is substantially equal in diameter to that of the riser of said primary seat.

13. A plastic bottle comprising, a hollow body closed at the bottom and an annular finish integral with said body defining a pouring opening at the top of said bottle, and a neck structure integrally connecting said finish to the body of said bottle, said neck structure including a relatively vertically narrow annular ring portion of reduced periphery disposed immediately below said finish, said ring portion merging at is upper end into the undersurface of said finish and at its lower end into the upper end of a downwardly and outwardly inclined annular flange, the lower end of said flange merging into the upper end of a relatively vertically wide inclined annular band extending downwardly and outwardly in a direction away from said flange adapted to receive in supporting relation thereon a hood-type bottle cap, the lower end of said band merging into an annular inwardly smoothly curved restricted throat portion which is co-terminus with a surrounding shoulder of the body of said bottle and adapted to receive therein the band of a carrying handle for lifting said bottle.

14. A plastic bottle in accordance with claim 13, wherein the width of said band is greater than the width of said flange.

15. A plastic bottle in accordance with claim 13, wherein the inclination of said band is greater than the inclination of said flange.

16. A plastic bottle in accordance with claim 13, wherein the minimum periphery of said finish is greater than the periphery of said ring portion.

17. A plastic bottle in accordance with claim 13, wherein the external surfaces of said flange and band are each of a frusto-conical configuration with the maximum periphery of said band adjacent its blower end being greater than the maximum periphery of said flange adjacent its lower end.

18. A plastic bottle in accordance with claim 13, wherein the maximum periphery of said finish is greater than the maximum periphery of said flange adjacent its lower end and greater than the minimum periphery of said band adjacent its upper end.

19. A plastic bottle in accordance with claim 13, wherein the maximum periphery of said flange adjacent its lower end is greater than the minimum periphery of said restricted throat portion.

20. A plastic bottle in accordance with claim 13, wherein the periphery of said ring portion is less than the minimum periphery of said reduced throat portion.

21. A plastic bottle in accordance with claim 13, wherein said ring portion and said flange together define a relatively deep annular cleft beneath said finish, and a plurality of peripherally spaced buttresses disposed in said cleft and being integral and co-terminus with said ring portion.

22. A plastic bottle comprising, a hollow body and an annular finish defining a pouring opening at the top of the bottle body, said finish including a primary, annular radially inwardly extending lower cap-seat, and a secondary, annular radially outwardly extending upper cap-seat disposed in axial offset and generally concentric relationship with respect to said lower cap-seat, each of said cap-seats having step and riser portions with the step and riser portions of said lower cap-seat being disposed in generally right angular relationship with respect to one another and with the step and riser portions of said upper cap-seat being disposed in acute angular relationship with respect to one another, and wherein the upper peripheral edge of the riser of said lower cap-seat merges at an acute angle with the outer peripheral edge of the step of said upper cap-seat, and wherein the step

of said upper cap-seat inclines outward and downward to provide an annular seat of acute interior cross section.

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U.S. Cl. X.R.

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