Nov. 9, 1965 C. W. DEARING 3,216,632

CONTAINER WALL CLOSURE COMBINATIONS AND ASSEMBLIES

Filed Aug. 16, 1962 3 Sheets-Sheet 2

Fig. 7.

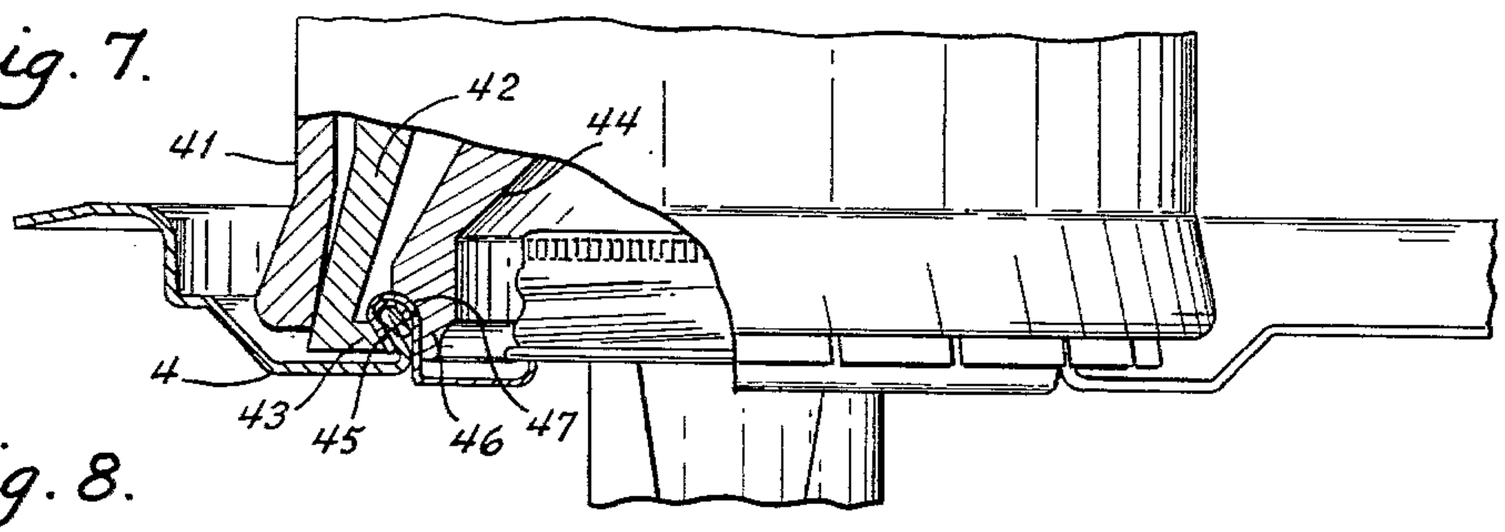


Fig. 8.

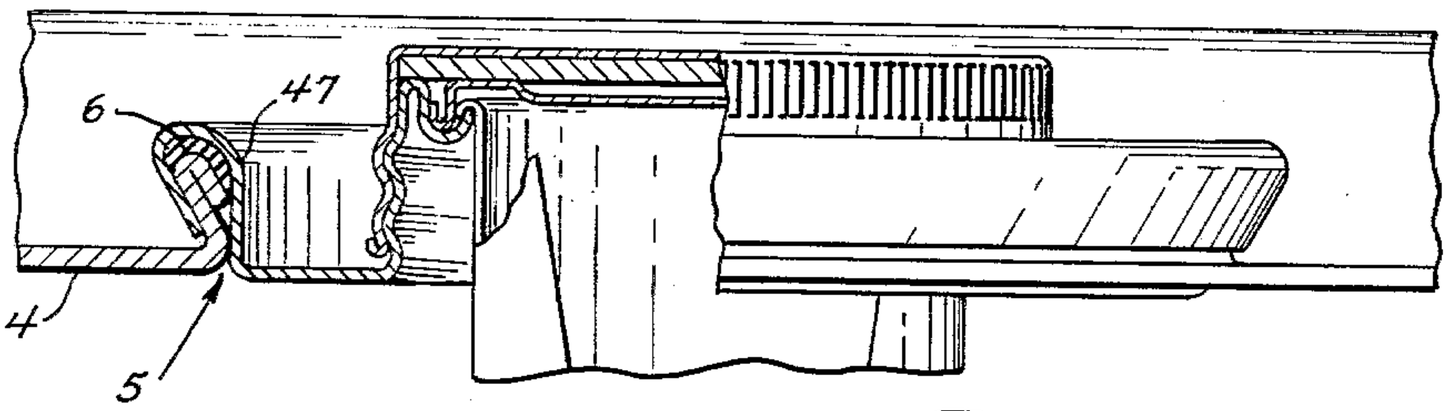


Fig. 9.

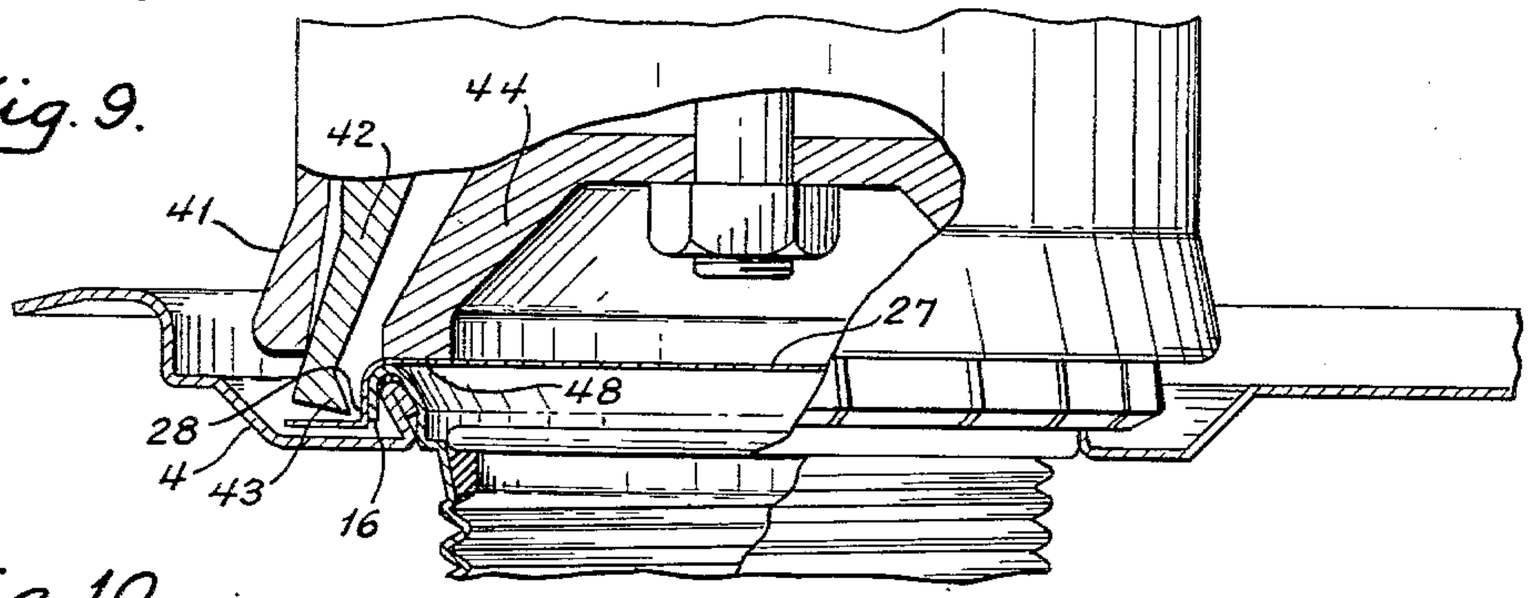
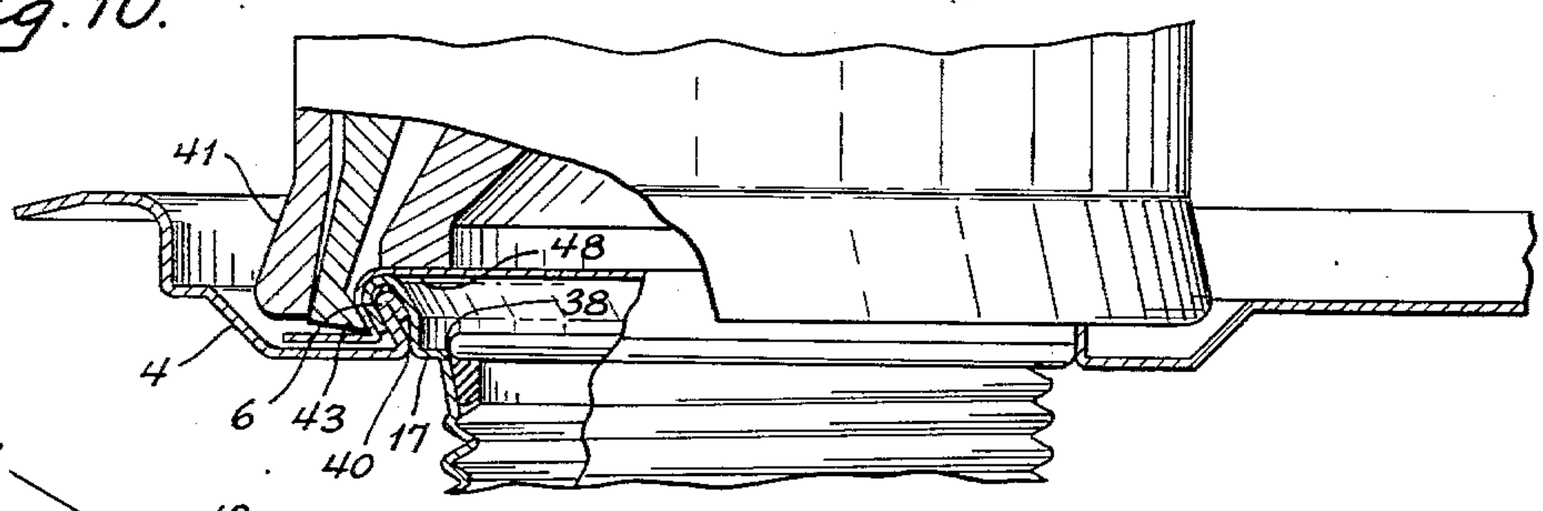


Fig. 10.



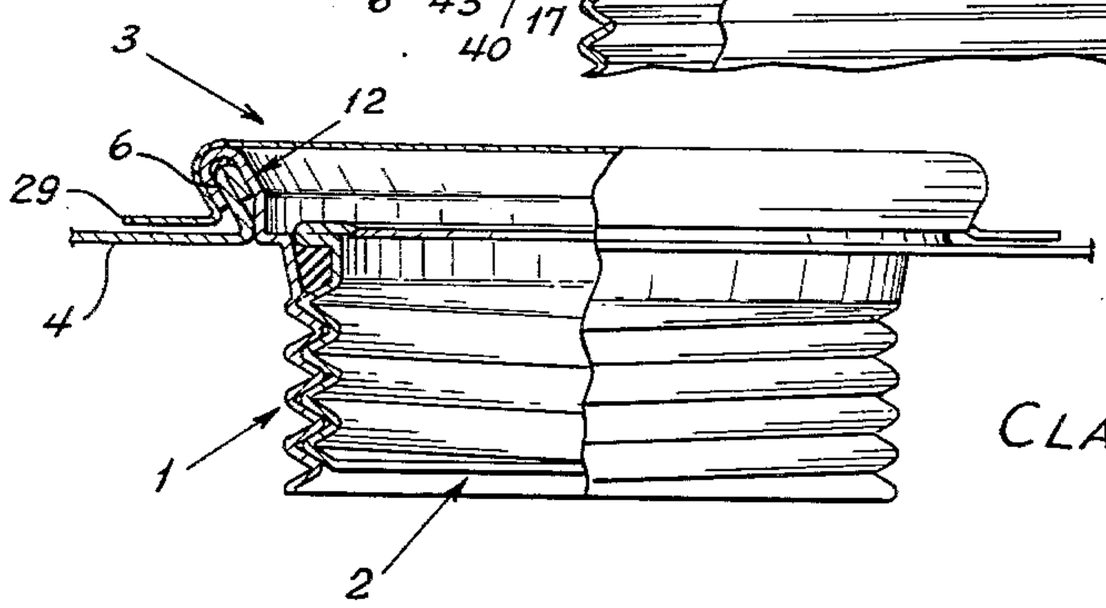


Fig. 11.

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CONTAINER WALL CLOSURE COMBINATIONS AND ASSEMBLIES

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Fig. 13.

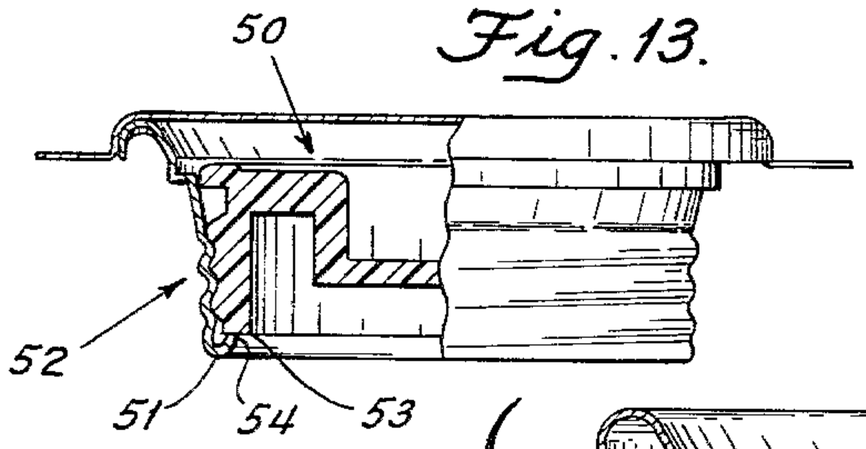


Fig. 14.

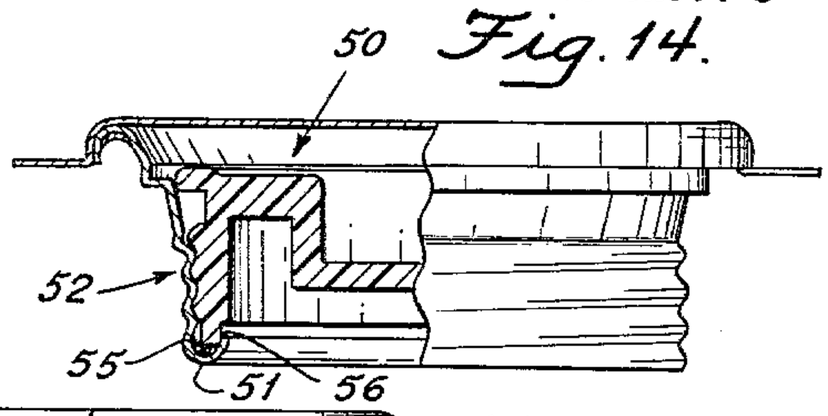


Fig. 15.

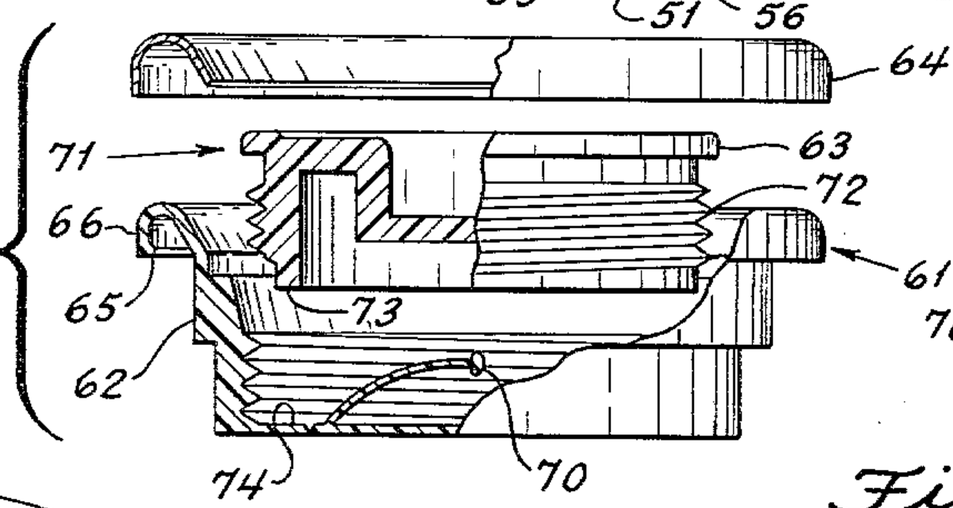


Fig. 18.

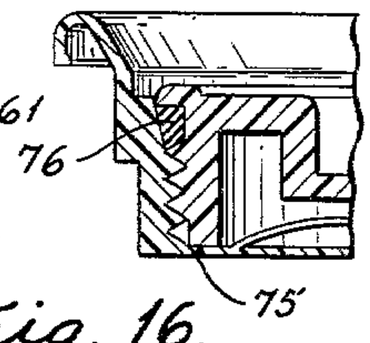
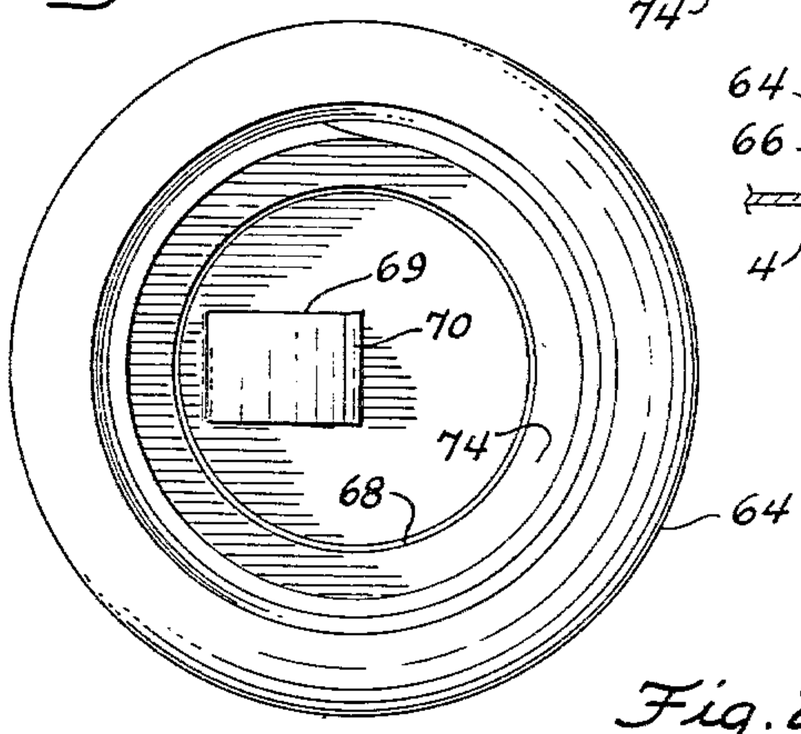


Fig. 16.

Fig. 17.



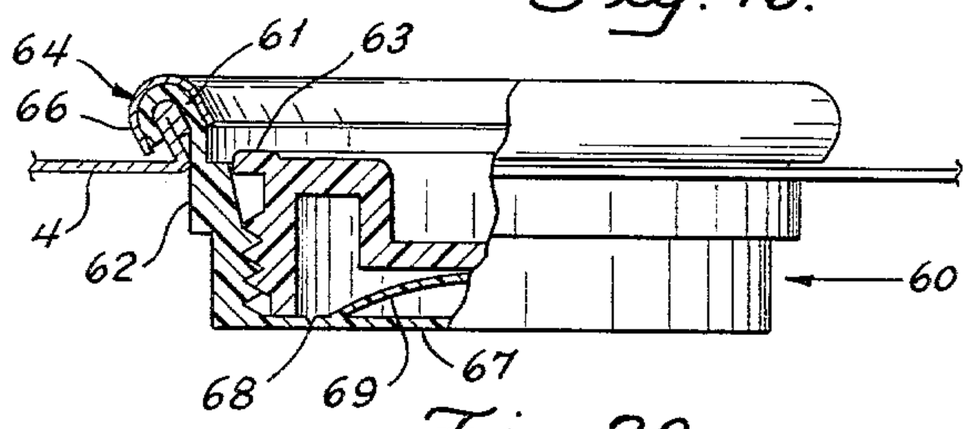


Fig. 20.

Fig. 21.

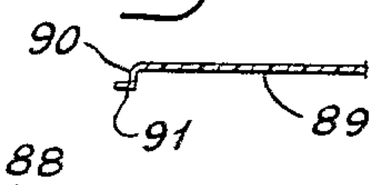
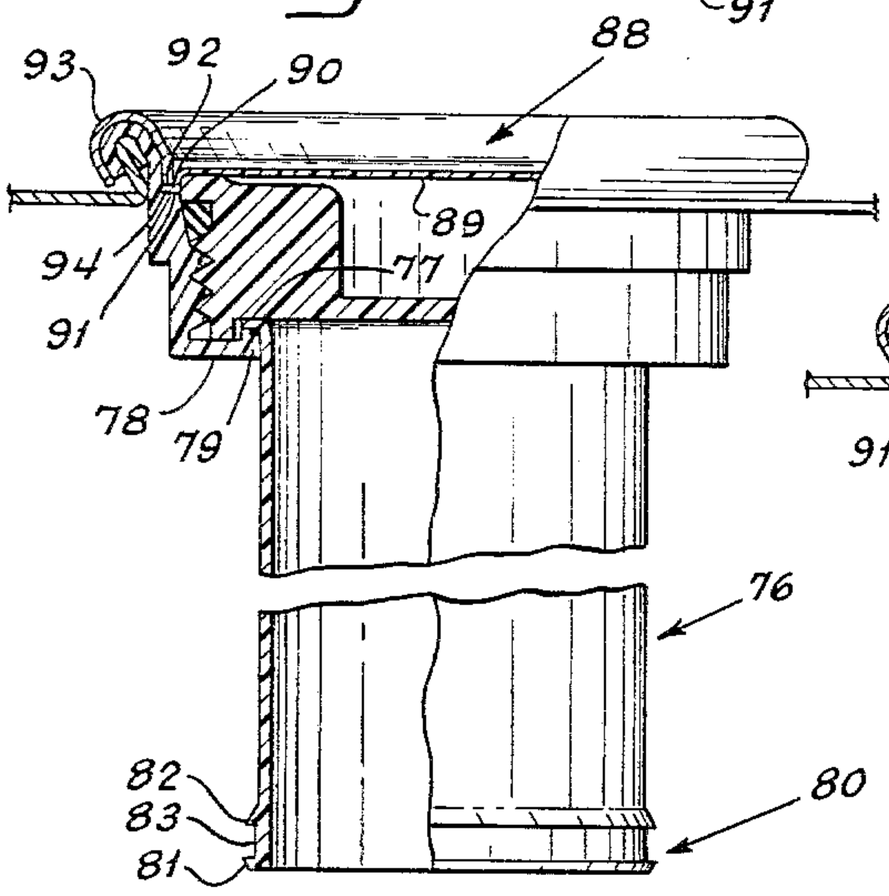
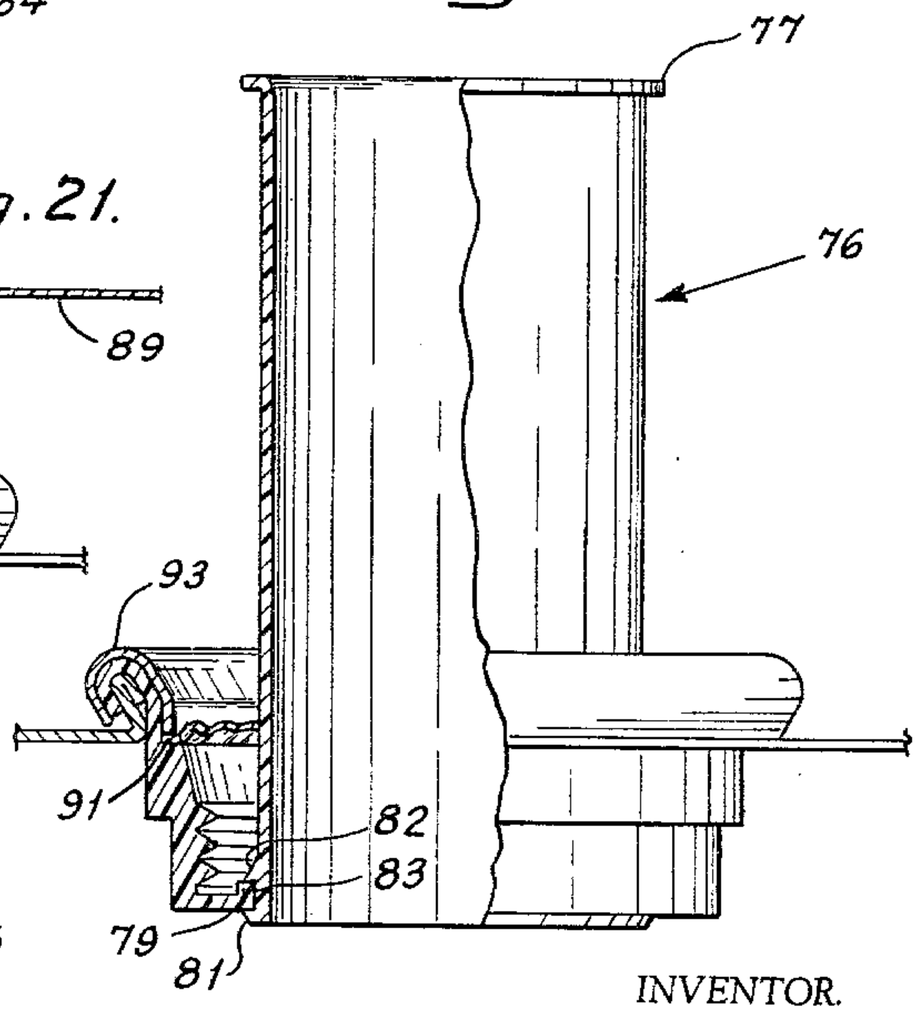


Fig. 19.





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CONTAINER WALL CLOSURE COMBINATIONS AND ASSEMBLIES

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Filed Aug. 16, 1962, Ser. No. 217,483
12 Claims. (Cl. 222—541)

This invention relates to closures for containers and is particularly concerned with the provision of closures for large containers, which closures can be applied after the containers have otherwise been completed and filled.

This application is a continuation-in-part of my presently allowed co-pending application Serial No. 702,698 now abandoned which discloses a particular opening neck formation in a container wall having a closure assembly secured thereto. This invention differs from that disclosed in the parent application in that, besides disclosing various other closure assemblies secured to said neck formation, the securing formation of the closure assembly has been modified so that the entire assembly can be more effectively secured to the opening neck after the container has been filled. This arrangement has the advantage of allowing the manufacturer of large containers such as pails, buckets, drums and the like, to snap a light, inexpensive, dust cap over the container opening for shipment thereof to the filler who can then remove the dust cap, fill the container utilizing the largest opening size possible, and, as the last operation, secure a suitable closure assembly to the opening neck.

As disclosed in my parent application Serial No. 702,-698, it was thought necessary under certain conditions to provide an annular recess in the upper surface of the closure assembly furnishing space for the reception of a back-up anvil on the tool which clinches the assembly onto the neck formation and against which the securing formation and the neck formation are squeezed in the clinching operation. In many instances an annular recess in the top surface of a closure assembly is a highly undesirable feature. Such a configuration serves to accumulate water or other foreign matter which may eventually rust or otherwise harm the closure or gain access to the contents of the container upon the opening thereof.

One possible solution to the problem is to clinch on a closure flange and plug assembly having an annular recess for a back-up anvil and then clinch a separate cap seal over the subassembly. However, this arrangement besides requiring two separate operations, also requires the use of two different tools and hence becomes impractical for economic reasons. Another possible solution to the problem of how to effectively clinch a closure assembly onto on opening neck formation, is to deform the neck formation and outer wall of the assembly securing formation inwardly together. This arrangement also has its disadvantages, the most obvious one being that once a closure assembly has been secured in place, the neck has been permanently deformed so as to preclude reuse thereof.

With the present trend toward the use of lighter gauge metal for large containers, the need is becoming increasing acute to provide inexpensive lightweight closures which are compatible costwise with such containers. The design and application of the instant closure are such that if, after the contents of the container have been dispensed and the container has been reconditioned, the application of a new closure assembly is desired or necessary for reuse of the container, the initial closure flange can readily be pried off of the neck formation with a special tool. This can be done without any deleterious deformation of the neck, whereupon the container can

be refilled and another closure assembly applied thereto. Another disadvantage of constructions where deformation of the opening neck is effected in the clinching operation is that such arrangements normally necessitate beginning with an opening neck having a vertical outer wall. Such a configuration is not at all suited for the effective securing of a dust cap thereon which is an important factor particularly when the container may be stored for a substantial period of time between the manufacture and the filling thereof.

The closure assembly of the instant invention solves the above mentioned and other problems by cooperating with the opening neck formation disclosed in Serial No. 702,698 in such manners as to effectively clinch a closure, presenting a flat upper surface, onto a container without any deformation of the opening neck. This operation involves but a single step employing one sealing tool and results in a lightweight closure having structural qualities heretofore thought possible only in much heavier type closures. Further the instant closure assembly is so designed as to provide a high degree of radial rigidity to withstand the severe stresses frequently applied thereto in the clinching operation or upon subsequent impact in the field.

It is accordingly a primary object of this invention to simplify the fabrication of containers so as to eliminate a substantial part of the work heretofore imposed on the container manufacturer in the provision of closures therefor.

Another object is to provide a container closure whereby such container can be filled through its maximum opening diameter and the closure subsequently applied by the filler.

Another object is to provide a completely assembled tamper-proof container closure which may be quickly and effectively applied to a container wall opening formation by the filler of the container.

A further object is to provide an assembled container closure combination presenting a flat upper surface which may be clinched onto a container wall opening neck without the use of a back-up anvil.

A still further object is to provide for the clinching of an assembled container closure onto a container opening neck without deforming such neck.

A still further object is to provide a structurally rigid closure assembly which can take a number of different forms depending on the container contents and the manner of dispensing preferred.

A more detailed object is to provide a structually rigid container closure presenting increased resistance to radial deformation across the container wall opening.

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

In that drawing:

FIG. 1 is a part elevation, part sectional exploded view of a container wall closure assembly in accordance with the invention.

FIG. 2 is an enlarged fragmentary section of a portion of the container wall closure assembly in unclinched position.

FIG. 3 is a top plan view partially cut away of the closure assembly.

FIG. 4 is a top plan view of the closure plug employed in FIGS. 1 and 2.

FIG. 5 is a part elevation, part sectional view of a modified form of closure plug.

FIG. 6 is a part elevation, part sectional view of the container opening neck formation of FIG. 1 with a temporary dust cap thereon.

FIG. 7 is an elevation having a portion cut away show-

in fluid form which upon curing becomes a resilient gasket and takes the form indicated by numeral 39 in FIG. 2. This gasket conforms to and cooperates with the upper rounded end portion 9 of the opening formation 6 to provide an effective seal against leakage between the flange and the container wall.

In FIG. 12 the closure assembly is shown crimped onto the opening neck formation by an operation subsequently to be described, however, the specific cooperation between the closure assembly and the opening neck formation is to be noted here. The particular design of the securing formation 12 of the closure flange 1 is such that the first vertically upwardly extending portion 13 contacts the inwardly radiused surface of the curved single thickness portion 7 of the opening neck formation as indicated by numeral 40. Then the upwardly and outwardly inclined second portion 14 of the securing formation is parallel to and in overlying engagement with the inwardly facing surface of the frusto conical neck portion 10. It can be clearly seen in FIG. 12 that when the closure assembly is clinched onto the neck, the securing formation of the flange tightly engages the neck formation around its entire periphery resulting in structural characteristics heretofore found present only in closures formed of much heavier material. Not only does the presently disclosed configuration of the flange securing formation provide an improved seal against leakage but in addition the opening neck is reinforced around its entire periphery by another layer of material providing an extremely rigid protective wall around the closure.

A feature of major importance in this invention and as seen in FIGS. 2 and 12 is that the container wall 4, the annular flange web 17, and the lower portion of the head 22 of the closure plug, all lie in a common horizontal plane. The purpose of this specific arrangement is to provide a rigid continuous wall across the entire container wall closure assembly combination. It should be kept in mind that the closure of the present invention is designed for use on large steel drums of the 55 gallon type although not limited thereto. Closures employed in such containers must be strong enough to withstand the impact imparted thereto when such containers are dropped from a height of several feet. This type of "drop test" must be met before a closure can be recognized as commercially acceptable. Having in mind the severe stresses which a closure of this type must withstand, it can be readily appreciated that the concept of having a continuous co-planar surface across the entire closure assembly is of substantial merit. With the above described relationships, a degree of strength and rigidity is achieved such as to result in a highly improved closure.

Another major feature of the present invention resides in the manner in which the closure assembly is applied to the container wall opening. FIGS. 7–10 illustrate this operation which is essentially the same as that disclosed in application Serial No. 702,698 in fact FIGS. 7 and 8 are taken from that application so as to clearly show the improvement of the additional material disclosed herein thereover. FIG. 7 illustrates a tool for applying closure assemblies of the type generally herein described which may be manually or power operated and in either case has as its main parts a closing sleeve 41, a plurality of closing jaws 42 each of which has an engaging ledge 43 and a pressure pad 44. The pressure pad 44, as here shown, has an engaging surface 45 formed with a back-up anvil 46 which extends inwardly behind the securing formation 47 so as to oppose the engaging ledges 43. In the operation of the tool the sleeve 41 is urged downwardly so as to bear against the jaws 42 urging the latter inwardly toward the back-up anvil 46 of the pressure pad hence clinching the securing formation 47 inwardly around the neck 6.

As distinguished from the arrangement just described and employed in application Serial No. 702,698, FIG. 9 shows the closure assembly of the instant invention being

applied to a container wall opening by means of a tool generally of the type shown in FIG. 7. In this instance however, the tool has a flat bottom engaging surface 48 on the pressure pad 44 which surface bears on the flat upper surface of the capseal of the closure assembly. In many instances it is highly undesirable to have an annular recess behind the securing formation to facilitate use of a back-up anvil. Such a configuration serves to accumulate water or other foreign matter which may rust or otherwise harm the closure. Also any accumulation of dirt in the closure assembly may gain access to the container when it is opened which is obviously a highly undesirable situation.

The problems that arise in providing a closure assembly which can be applied without the use of a back-up anvil are substantial. A closure assembly of the type disclosed in application Serial No. 702,698 is not suited for application to an opening formation by a tool having a flat pressure pad because, in that instance, as readily seen from FIGS. 7 and 8, there is not enough radial support in the dispensing opening against radial inward collapse. Consequently the result is a deformation of the threaded neck so that the screw cap cannot be properly secured thereto. The arrangement of the instant invention wherein the container wall 4, the flange web 17 and the portion of the plug head 22 form a rigid co-planar wall, completely eliminates any distortion of the assembly when applied with a tool having a flat pressure pad. Furthermore the manner in which the securing portions 13 and 14 cooperate with the neck formation 6 enables the closure assembly to be positioned tightly in engagement with the opening neck by means of a purely vertical force applied through the engaging surface 48 and adds sufficient rigidity to the neck formation so that the capseal wall 28 and outer securing formation wall 16 can be crimped inwardly simultaneously around the neck formation 6 as shown in FIG. 13 without any deformation of that neck formation.

It has been found that with the securing formation described herein, as distinguished from that shown in application Serial No. 702,698, a closure assembly can be effectively clinched onto an opening neck without the use of a back-up anvil and without any damaging distortion of the assembly or neck. Another advantage of the instant invention resides in the fact that although the above described closure is primarily intended to satisfy a need in the field of lightweight single trip drums, it is also contemplated that this closure will find acceptance in drums intended for reuse. For the latter purpose, if desired, the instant closure flange can be easily pried off of the neck formation with a hand tool without causing any damaging distortion of the neck formation whereupon a new closure assembly can be reapplied. This is possible because no deformation of the opening neck has taken place when the closure assembly is secured thereto; a feature thought necessary in some of the prior art arrangements. Reuse would be precluded if the neck were also deformed in the applying operation. Another advantage of this particular opening neck formation as distinguished from one that is initially straight and subsequently deformed inwardly in the closure application is that a dust cap such as shown in FIG. 6 may be easily and securely snapped thereover for the purpose set forth earlier.

A modified form of the invention is embodied in the showings of FIGS. 13 and 14. These are particularly adapted for use in containers which are interiorly coated or lacquered to prevent the contents thereof from coming in direct contact with the container walls. In such containers it can be readily appreciated that the closure assembly used therewith would also require a similar coating to completely avoid contamination. In the embodiments of FIGS. 13 and 14 the closure plug 50 has a gasketing means located on the bottom surface thereof which cooperates with a gasketing portion 51 located at the lower end of the flange neck 52. The gasketing portion

51 comprises an inwardly and upwardly turned portion forming an integral annular groove at the base of the flange neck. In the FIG. 13 embodiment the lower wall portion 53 of the plastic plug engages the upwardly disposed inner edge 54 of the portion 51 and deforms thereover to form a tight seal therewith. This arrangement eliminates the necessity of coating the interior portion of the flange. Also the flange neck has a coarser and less abrupt thread form thereon resulting in better coverage thereof in the coating process. The remainder of the flange cooperates with the opening neck formation as described above. The FIG. 14 embodiment shows a gasket 55 flowed into the annular groove 51 which gasket is engaged by a reduced lower wall portion 56 on the closure plug forming an effective leakproof seal therebetween.

FIGS. 15 and 16 show a further modification wherein the closure flange 60 is formed of a synthetic plastic material of which polyethylene is a non-limiting example. The form of the securing portion 61 is the same as the metal embodiments except that the web 62 is thicker. However, from the FIG. 16 showing, it will be apparent that the concept of having the container wall 4, the web 62, and the head 63 of the plug all lying in a common plane is carried through all of the various embodiments. The securing portion 61 is secured onto the neck formation 6 by means of an overlying metal sealing ring 64 which is shown expanded in FIG. 15 and crimped inwardly in FIG. 16. It can be seen in FIG. 15 that the securing formation 64 has an inwardly projecting lip 65 at the lower edge of its outer peripheral wall 66. This lip insures a tight seal against the back of the neck formation 6 when urged inwardly by the sealing ring 64.

This embodiment, instead of having an overlying capseal, is provided with a rupturable diaphragm 67 (see FIG. 16) across the bottom of the flange which can be simply punctured and torn out to gain access to the contents of the container. The diaphragm 67 is formed integrally with the flange 60 and has an annular weakened portion 68 to facilitate tearing. Also, a thin resilient finger grip 69 is molded integrally with the diaphragm and has an enlarged portion 70 to enhance the user's grip thereon. In FIG. 16 it can be seen that the grip 69 is resiliently urged downwardly by the bottom surface of the plug when the latter is threadedly engaged within the flange.

The closure plug 71 has a threaded side wall 72 which terminates in a bottom surface 73. This surface 73 may form a seal with the annular portion 74 outside of the weakened section 68 which remains in the flange after the diaphragm is removed hence eliminating the need for a plug gasket.

In the embodiment of FIG. 18, the weakened section 75 is located at the outer periphery of the diaphragm hence requiring a plug gasket 76 to seal off the opening once the diaphragm has been destroyed. This arrangement however has the advantage of providing a larger opening through which the contents of the container can be dispensed.

A further modification is disclosed in FIGS. 19 and 20 wherein the closure assembly is similar to that of FIG. 15 in that the flange is formed of a plastic material, but instead of a rupturable diaphragm across the dispensing opening the latter is provided with a retractable pull-up spout 76. In FIG. 19 the spout is shown in lowered position where it is held from dropping into the container by means of an outwardly projecting lip 77 at the upper end of the spout cooperating with an annular web 78 having an upwardly turned portion 79 formed integrally with the lower end of the flange neck. The spout 76 is shown in its raised or pouring position in FIG. 20 where it is rigidly held by the cooperation of an annular formation 80 at the lower end thereof with the upwardly turned flange neck portion 79. The formation 80 comprises a

pair of ribs 81 and 82 which, with the slightly radially enlarged cylindrical base surface 83, define a groove which may be snapped over the upwardly turned portion 79 at the inner periphery of the flange base to form a tight joint therewith. Here again, as in the FIG. 15 modification, the closure plug 84 has a threaded side wall 85 terminating at its lower end in a reduced portion 86 which engages the upper surface of the annular web 78 so as to form a seal therewith. With this sealing arrangement a plug gasket 87 is optional.

In this form of the invention the closure assembly is rendered tamper-proof by the provision of a lightweight capseal 88 (see FIG. 21) preferably formed of a plastic material and having a flat top 89, a laterally extending side wall 90, and a radially outwardly projecting annular portion 91 extending from the edge of the side wall 90. This capseal is formed so as to overlie the closure plug with the portion 91 being tightly held between the downwardly facing end edge 92 of the sealing ring 93 and the annular flange surface 94. FIG. 20 shows the capseal partially torn away permitting access to the closure plug which can then be removed and the spout raised to its pouring position.

Since numerous variations and modifications of the container wall closure assembly combination herein shown and described will readily suggest themselves to those skilled in the art, it is to be understood that changes may be made in the construction described and shown and various embodiments of the invention can be made without departing from the scope thereof. It is accordingly intended that all matter contained in the above description or shown in the accompanying drawing shall be interpreted as illustrative and not in a limiting sense.

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

1. A container wall closure assembly combination which comprises a container wall formed with a large standard opening therein and a closure assembly secured thereto, said standard opening having a bordering formation in the form of a neck formed integrally from the stock of said container wall surrounding said opening, said opening neck including a first portion of a single thickness of container wall extending upwardly from said container wall and a second portion formed as an extension of said first portion and having a double thickness of said container wall material, said second portion having an upwardly extending first part, a rounded upper end and an inwardly extending second part extending downwardly and inwardly from said rounded end, said first portion of said opening neck being curved outwardly and said second portion extending outwardly from said curved portion in frusto conical form at an angle of substantial extent with respect to the axis of said opening, said closure assembly having a securing formation secured to said opening neck and being capable of providing various sizes and types of pouring openings and closures therefor within the confines of said standard opening and said assembly being formed for application in secured sealed relationship to said opening neck from the outside of a completed container after the same is filled, said closure assembly including a closure flange and a closure removably secured thereto, said flange being formed as an annular member and said securing formation forming the peripheral portion of said flange, said securing formation having an upwardly extending inner portion overlying the rounded upper end of said opening neck, an outer portion extending downwardly from said upper portion in tight engagement with the outer portion of said opening neck to form a tight joint between said neck and said securing formation on the outer side of the wall of said container, annular gasket means compressively engaged between confronting annular zones of the securing formation and the opening neck of the container, an annular web extending integrally radially inwardly from said securing formation, the inner portion of the securing for-

mation has a first part which rises from the outer edge of the web substantially normal thereto and a second part of generally frusto conical shape which is parallel to and closely overlies the frusto conical inner surface of the inner surface of the opening neck of the container, a neck formed with a dispensing opening therethrough, said neck extending from the radially innermost portion of said web and in spaced relation to said securing formation, a gasketing portion integral with said neck, a gasket engaging said gasketing portion, said closure including means for engaging said gasket for effecting a leakproof joint between the closure and the neck of the flange of the closure assembly.

2. A container wall closure assembly combination as in claim 1, wherein the outer edge of the web of the closure flange is in substantial engagement with the container wall at the junction therewith of the first portion of the opening neck of the bordering formation, and the web lies substantially coplanar with the part of the container wall immediately surrounding said opening neck.

3. A container wall closure assembly combination as in claim 1, wherein the said closure is a plug having a threaded sidewall and the gasketing portion of the neck of the flange is located adjacent the inner edge of the web.

4. A container wall closure assembly combination as in claim 3, wherein the gasketing portion of the neck of the flange and the means on the closure plug for engaging the gasket present therebetween a gasket-receiving seat which decreases in cross sectional area as the closure plug is tightened toward fully engaged tightened position, whereby the gasket is then strongly compressed into said seat and exerts a strong radially outwardly directed force upon the web.

5. A container wall closure assembly combination as in claim 3, wherein the closure plug has a radially enlarged head in substantial engagement with the inner surface of the junction between the inner edge of the web and the gasketing portion of the neck of the flange when the closure plug is in fully engaged tightened position.

6. A container wall closure assembly combination as in claim 1, wherein said closure is a plug having a threaded sidewall and the gasketing portion of the neck of the flange is located closely adjacent the inner edge of the web, said gasketing portion is in the form of a downwardly and inwardly tapering frustum of a cone, and wherein when the closure plug is in fully engaged tightened condition the gasket is strongly compressed against the gasketing portion of the neck of the flange and exerts a strong radially outwardly directed force upon the web, the assembly being so constructed and arranged that with the closure plug in such fully engaged tightened position the outer edge of the head substantially fits within and engages the upper, larger diametered end of the frusto conical gasketing portion of the neck of the flange.

7. A container closure assembly adapted to be secured to a large standard size container wall opening having an upstanding neck formation therearound, comprising a closure flange and a closure plug secured therein, said flange formed as an annular member and having a securing formation forming the peripheral portion of said flange, said securing formation having a first vertically upwardly extending portion, a second portion extending upwardly and outwardly from the upper end of said first portion, a rounded upper portion and an outer portion extending downwardly from said upper portion adapted to be formed inwardly around the opening neck formation, an annular surface extending integrally radially inwardly from the lower end of said first portion of said securing formation, a screw threaded neck formed with a dispensing opening therethrough extending from the radially innermost portion of said annular surface and a gasketing portion integral with said neck below said annular surface for the leakproof engagement of said closure plug therewith, said closure plug including means for engaging said gasketing portion for effecting a leakproof joint and said closure

plug being formed with a side wall threadedly engaged with the threads of said screw threaded neck, the radial extent of said annular surface determining the size of said dispensing opening through said screw threaded neck whereby containers equipped with standard openings available for fast filling of the containers and after filling will have the desired size and type of assembly applied to close said opening within the confines of said larger standard opening.

8. A container wall closure assembly as in claim 7, wherein said gasketing portion integral with said neck includes an inwardly and upwardly turned portion forming an annular groove at the base of said neck and the base of said plug side wall forming said engaging means.

9. A container wall closure assembly combination which comprises a container wall formed with a large standard opening therein and a closure assembly secured thereto, said standard opening having a bordering formation in the form of a neck formed integrally from the stock of said container surrounding said opening, said opening neck including a first portion of a single thickness of container wall extending upwardly from said container wall and an inwardly doubled over second portion formed as an extension of said first portion and extending outwardly and upwardly from said first portion in frusto conical form at an angle of substantial extent with respect to the axis of said opening, said closure assembly including a closure flange and a closure plug secured therein, said flange formed as an annular member and having a securing formation forming the peripheral portion of said flange, said securing formation having an upwardly and outwardly extending inner portion overlying the frusto conical inner surface of said opening neck, an upper portion overlying the upper end of said opening neck and an outer portion extending downwardly from said upper portion in tight engagement with the outer portion of said opening neck to form a tight joint between said neck and said securing formation on the outer side of the wall of said container, an annular web extending integrally radially inwardly from said securing formation, a screw threaded neck formed with a dispensing opening therethrough extending downwardly from the radially innermost portion of said web and in spaced relation to said securing formation and a gasketing portion integral with said neck adjacent the inner edge of said web for the leakproof engagement of said closure plug therewith, said closure plug including means for engaging said gasketing portion for effecting a leakproof joint, said closure plug being formed with a side wall threadedly engaged with the threads of said screw threaded neck and a radially outwardly projecting head forming the upper extent of said plug side wall, said plug head acting to urge said engaging means into tight sealing engagement with said gasketing portion when said closure plug is in fully tightened position.

10. A container wall closure assembly as in claim 9, wherein said flange is formed of a synthetic plastic material and includes a metal sealing ring overlying said securing portion.

11. A container wall closure assembly as in claim 9 and including a readily destructible tamperproof seal overlying said closure plug and forming part of said assembly so as to be secured to said opening neck formation simultaneously therewith.

12. A container closure assembly adapted to be secured to a large standard size container wall opening having an upstanding neck formation therearound, comprising a closure flange and a closure plug secured therein, said flange formed as an annular member and having a securing formation forming the peripheral portion of said flange, said securing formation having an upwardly and outwardly extending inner portion, a rounded upper portion and an outer portion extending downwardly from said upper portion adapted to be formed inwardly around the opening neck formation, an annular web extending integrally radially from the lower end of said first portion of said securing formation, a screw threaded neck formed with

a dispensing opening therethrough extending downwardly from the radially innermost portion of said web and a gasketing portion integral with said neck for the leakproof engagement of said closure plug therewith, said closure plug including means for engaging said gasketing portion for effecting a leakproof joint, said closure plug being formed with a side wall threadedly engaged with the threads of said screw threaded neck and a radially outwardly projecting head forming the upper extent of said plug side wall, said plug head and said annular web lying in a common plane so when said closure assembly is secured to an opening neck formation, a continuous rigid horizontal wall is formed between the closure plug and the container wall, the radial extent of said annular web determining the size of said dispensing opening through said screw threaded neck whereby containers equipped with standard openings will have the full areas of said standard openings available for fast filling of the containers

and after filling will have the desired size and type of assembly applied to close said opening within the confines of said larger standard openings.

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SWEATER RE-FORMING APPARATUS

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3 Sheets-Sheet 1

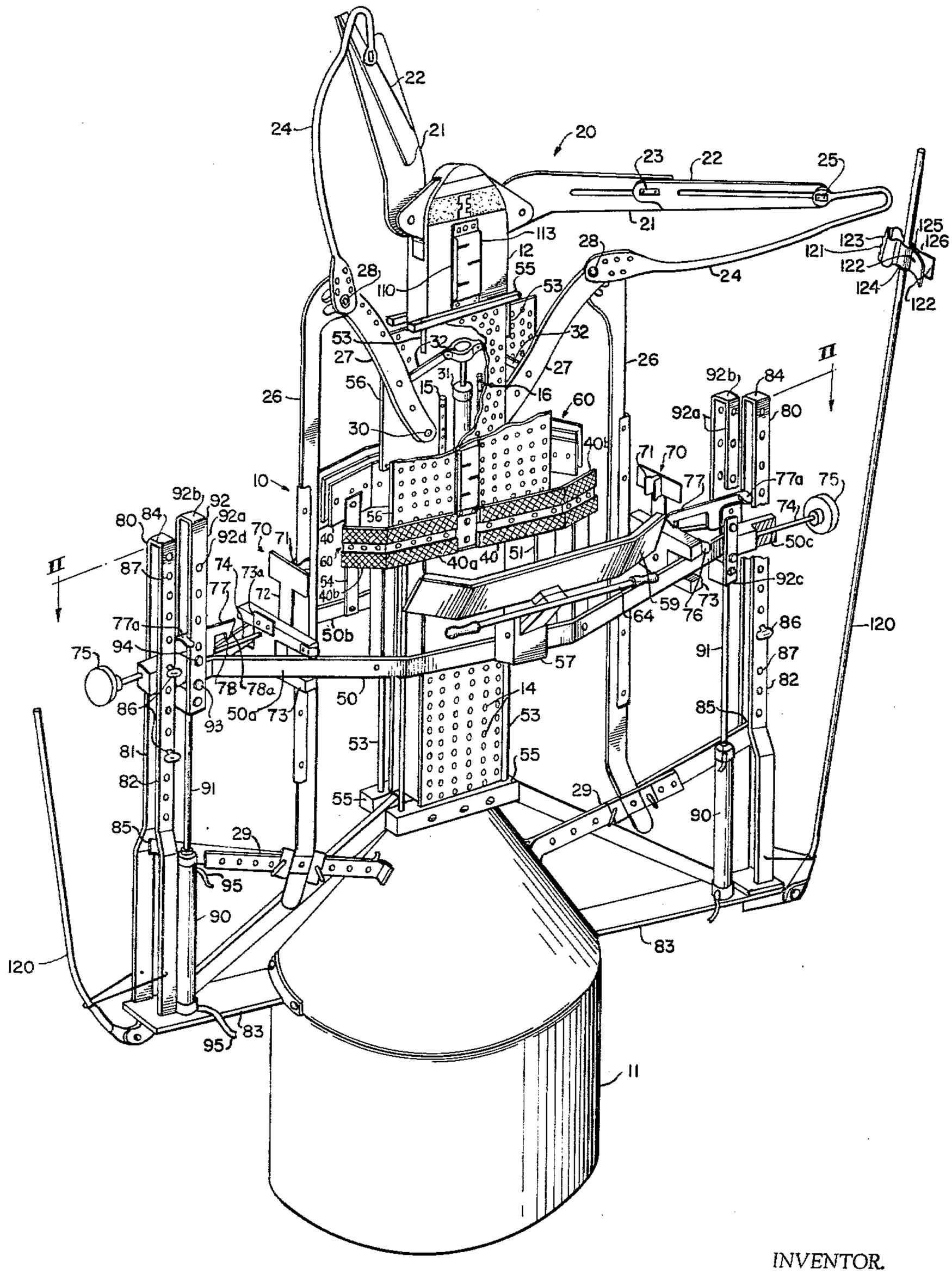


Fig. 1.

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