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3,400,853

CAN FOR FILLING WITH HOT GOODS

Filed Jan. 18, 1965

2 Sheets-Sheet 1

FIG. 2

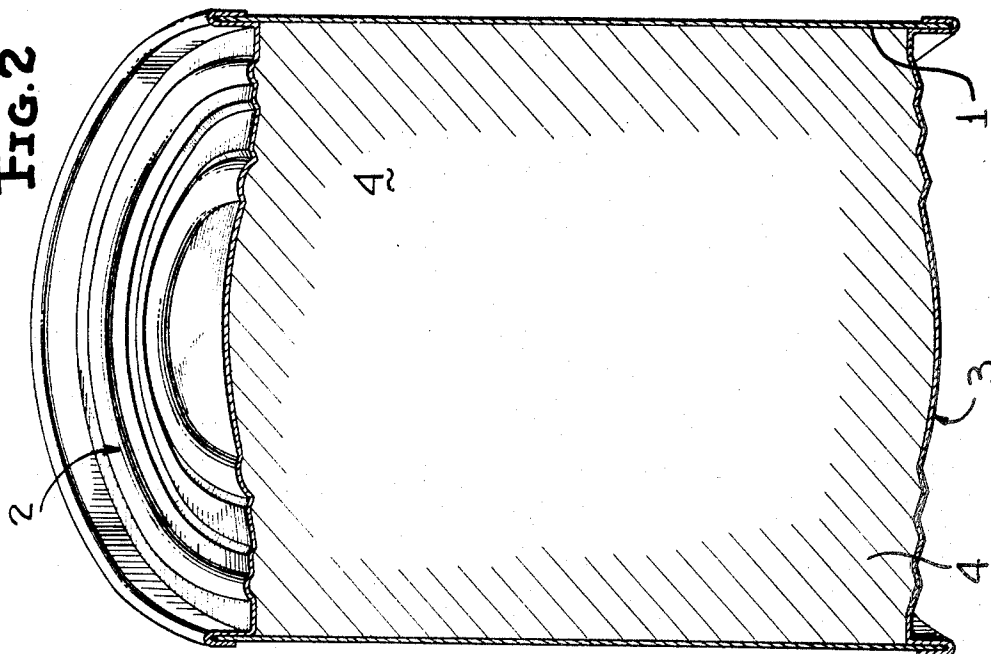
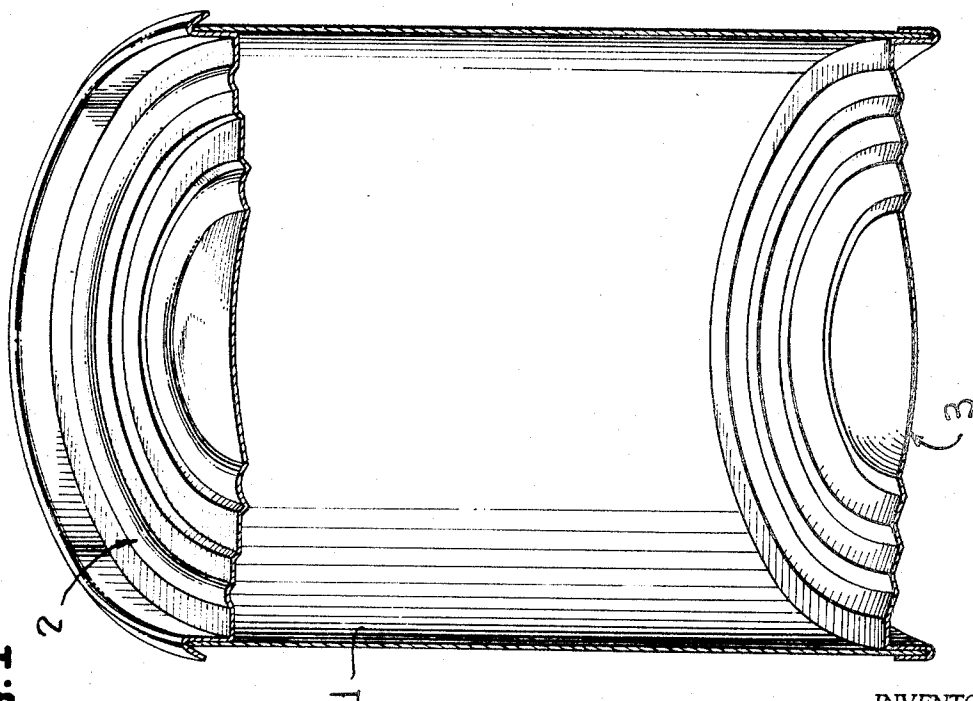


FIG. 1



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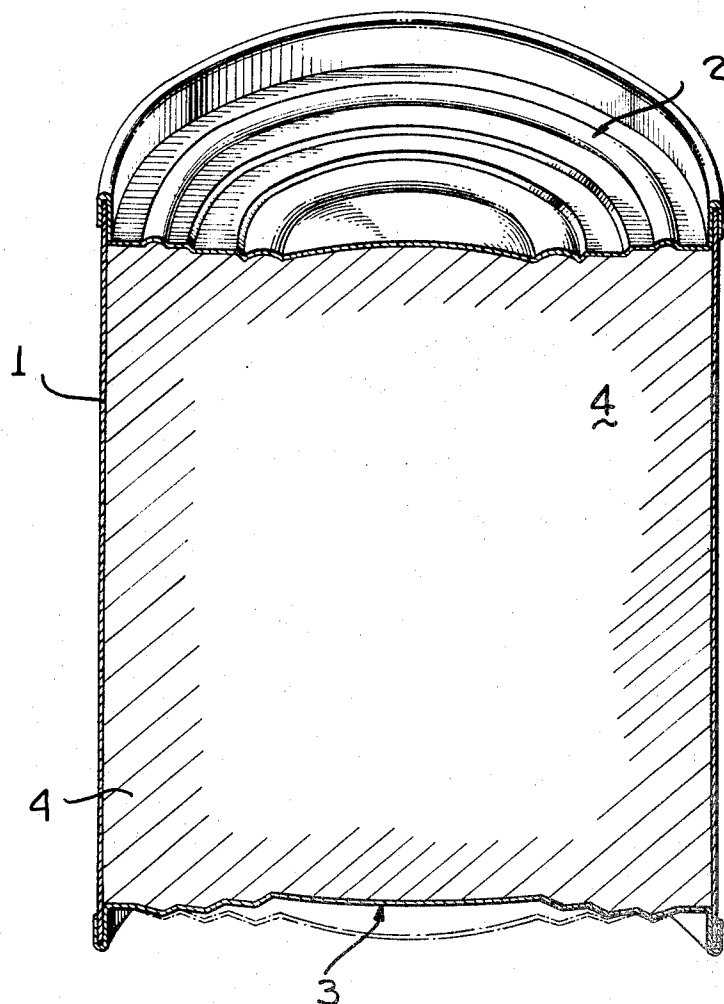
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FIG. 3



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CAN FOR FILLING WITH HOT GOODS
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ABSTRACT OF THE DISCLOSURE

The present invention relates generally to can structures to be employed in packaging, and more particularly to cans intended for use in the packaging of hot goods. The can complement comprising a body, a top end closure closing one end of the body and a bottom end closure closing the other end of the body. Each said end closure of the can body having the quality of assuming a convex or concave position depending upon differential pressure application thereon internally and externally of the can.

It has been common practice to fill cans with cold goods. Such cans are closed by seaming on or otherwise securing closures at each end, which closures have the quality or adaptability of assuming two different positions, namely a convex position and a concave position. In this common practice, when the bottom closure of the can has a concave position, as externally viewed, and when the cover is secured in place, this also has a concave position. After the can has been thus closed, it is commonly subjected to sterilization, this being achieved through heating. During the sterilization, the pressure inside the can rises to such a degree that the two end closures are caused to assume their other positions, i.e. both end closures will become convex, as externally viewed. When the sterilization has been completed, the can is allowed to cool to ambient temperature, and the two end closures resume such positions that they are both concave, as externally viewed.

For some time now, there has been a desire for a practice of filling cans with hot goods, with subsequent sterilization of the filled cans. The same procedure as the one described above has then been applied as regards the end closures, as a precaution against an increase in pressure inside the can at the sterilization. However, difficulties have arisen when using cans with end closures arranged as previously described, as it has proved that at the cooling after the sterilization a vacuum of such nature has been developed in the can that indentations in the can body have resulted, owing to the fact that the air pressure externally has been so great in relation to the pressure inside the can. In order to overcome this disadvantage, attempts have been made to provide the can body with welts or beads encircling it, thus to make the body of the can stronger. The use of heavier plate has also been tried. However, these measures have not proved to be entirely satisfactory and it has not always been possible to avoid indentations in the body of the can.

The purpose of the present invention is to provide a can with end closures constructed and arranged in such a way that, when the can is used for filling with hot goods which, after the can has been closed, are sterilized, the can, after or during the cooling, is not subjected to body indentation caused by the difference in pressure inside and outside the can.

The problem is solved according to the present invention by using a can which has end closures, each of which can assume a convex or a concave position, externally viewed. According to the present invention, the can end closures are so constructed and arranged that when the can is filled with hot goods, its bottom remains in a normal convex position, and the cover, after the filling, remains in a normal concave position. At the sterilization, the concave top or cover end closure will assume a convex

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position while the bottom retains its convex position. At the subsequent cooling, the two convex end closures will assume concave positions, the change in position of one of the end closures then compensating for the decrease in pressure arising owing to hot goods having been used for the filling.

With the above and other objects in view that will hereinafter appear, the nature of the invention will be more clearly understood by following the detailed description, the appended claims and the several views illustrated in the accompanying drawings.

In the drawings:

FIGURE 1 is a sectional perspective view illustrating a can and end closures therefor according to the invention, the bottom and cover closures being shown in their normal convex and concave position, respectively, the positions they normally hold in an unfilled but covered can or in a closed can filled with hot goods or fill therein prior to sterilization.

FIGURE 2 is a sectional view showing the closed can in the end closure convex condition it assumes during sterilization, and

FIGURE 3 is a view similar to FIGURE 2 showing the end closures in the concave positions they assume upon cooling of the sterilized fill and development of a vacuum in the can as a result of said cooling.

In the figures, 1 is a can body provided with two end closures 2 and 3, which have been folded on, that is, secured in place by the usual seaming operation, or otherwise. The can is filled with goods 4, which can consist of e.g. foodstuffs. The end closures 2 and 3 are so designed that they can be caused to assume outwardly projected or convex positions, or inwardly projected or concave positions by flexure of the centrally located dished end panels thereof and as a consequence of the pressure conditions prevailing on either side of the end closures internally and externally of the can. The end closures are appropriately made of the usual metallurgical material. Furthermore, the end closures should have a thickness of between 0.2 and 0.4 mm.

According to the invention, when a can is empty and is to be filled, the bottom end closure 3 will be in its normal convex position. After the can has been filled with hot goods, the end closure 2 is applied and secured in position, which end closure then has its normal concave position, as shown in FIGURE 1. Thereafter the can is subjected to sterilization, which takes place through heating, and owing to the internal pressure which then arises, the end closure 2 is displaced to a convex position. FIGURE 2 shows the end closure 2 of the can 1 in this position. When the sterilization has been completed, the can with its contents is allowed to cool to ambient temperature, and the closure 2 will then assume its concave position, owing to the cessation of the increase in pressure caused by the heat and expansion during sterilization. Furthermore, the end closure 3 will also assume a concave position owing to the vacuum developed incidental to the temperature drop and contraction resulting from the cooling down of the hot goods or fill to ambient temperature.

Practical tests which have been carried out have shown that a can with a diameter of 129 mm., from the closing at the filling, has its volume increased by 57 ml. at the sterilization. When it has cooled, the volume of the can has decreased by 78 ml. For a can with a diameter of 154 mm. the corresponding increase and decrease are 85 and 405 ml., respectively, and for a can with a diameter of 218 mm., 360 and 1,000 ml., respectively.

It is to be understood that the end closure 3 is designed to normally assume a convex condition as shown in FIGURE 1 and not to partake of any substantial deflection or increase in convexity during the sterilizing action, as depicted in FIGURE 2. This closure 3 is de-

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signed, however, to be forced upward or into a concave position by atmospheric pressure when the can fill cools down to the ambient temperature following the sterilization process.

It is also to be understood that the cover or top end closure 2 is designed to be less resistant to pressure differential flexing than is the end closure 3, thereby to substantially retain its normal concave position during hot goods filling and yet be subject to flexing outward to the convex position shown in FIGURE 2 during the sterilizing action and then to spring back to its initial concave position under atmospheric pressure action following cooling of the sterilized fill and upon development of a vacuum within the can as a result of said cooling.

From the foregoing, it will be apparent that by forming and arranging the two end closures in the manner herein described, the influence of the vacuum which develops owing to the can having been filled with hot goods instead of cold goods can be eliminated.

While a preferred package, packaging can structure and method of forming said package are disclosed herein, it is to be understood that variations in the can structure and package and the method steps may be made without departing from the spirit and scope of the invention as defined in the appended claims.

I claim:

1. A packaging can structure, intended for filling with hot goods, and after filling and total closure, to be subjected to sterilization through heating, and which in a closed condition consists of a tubular body, an end closure for each end of the body, each said end closure having a dish, centrally located end panel means for providing the end closures with the quality of assuming a convex or a concave position as viewed externally, said end closed structure being characterized in that immediately after having been closed after the filling with hot goods, it has one of said end panel means outwardly dished to provide a convex closure and the other end panel means inwardly dished to provide a concave closure, the said last mentioned one concave closure then changing from a concave position to a convex position at the sterilization and at a cooling following said sterilization to a not-hot condition assuming a concave position.

2. A packaging can complement intended for the packaging of hot fill and which is to be subject to a sterilization processing following such filling and end closure sealing thereof, said can complement comprising, a body, a top end closure closing one end of the body and a bottom end closure, closing the other end of the body, each said end closure having a dish, centrally located end panel means for providing the end closure with the quality of assuming a convex or concave position depending upon differential pressure applications thereon internally and externally of the can, the end panel means of one of said end closures being normally outwardly dished, normally assuming a convex position when the can is empty and when the can is filled with a hot fill, the end panel means of said other end closure being normally inwardly dished, said other end closure normally assuming a concave position when the can is empty and remaining in that position when the can is filled with said hot fill but being subject to flexing to a convex position during a fill sterilization heat application while said one can end closure retains its convex position, and both said end closures being subject to flexing to concave positions upon cooling of the can subsequent to completion of the sterilization heat application and as a result of the creation of a vacuum within the can and application of atmospheric pressure externally on said end closures.

3. A packaging can complement as defined in claim 2 wherein the top end closure is the normally concave end closure.

4. A packaging can complement intended for the packaging of hot fill and which is to be subject to a sterilization processing following such filling and end closure sealing thereof, said can complement comprising, a body, a

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top end closure closing one end of the body and a bottom end closure closing the other end of the body, each said end closure having the quality of assuming a convex or concave position depending upon differential pressure applications thereon internally and externally of the can, one said end closure having a lesser resistance to pressure differential flexing than the other end closure whereby it normally assumes a convex position when the can is empty and when the can is filled with a hot fill, while the other of said end closures normally assumes a concave position when the can is filled with said hot fill but is subject to flexing to a convex position during a fill sterilization heat application while said one can end closure retains its convex position, and both said end closures are subject to flexing to concave positions upon cooling of the can subsequent to completion of the sterilization heat application and as a result of the creation of a vacuum within the can and application of atmospheric pressure externally on said end closures.

5. A packaging can complement as defined in claim 4 wherein the end closure having the lesser resistance to pressure differential flexing is the top end closure.

6. The herein disclosed method of providing a sterilized hot goods filled package, said method comprising, providing a can complement including one attached end closure closing one end of the can and one cover end closure closing the other end of the can, each said end closure having the quality of assuming a convex or concave position depending upon differential pressure applications thereon internally and externally of the can, one said end closure normally assuming a convex position when the can is empty and when the can is filled with a hot fill, the other of said end closures normally assuming a concave position when the can is empty and remaining in that position when the can is filled with said hot fill but being subject to flexing to a convex position during a fill sterilization heat application while said one can end closure retains its convex position, and both said end closures being subject to flexing to concave positions upon cooling of the can subsequent to completion of the sterilization heat application and as a result of the creation of a vacuum within the can and application of atmospheric pressure externally on said end closures, filling said can with the hot goods, securing the cover end closure on the filled can, subjecting the filled and sealed can to a sterilizing action by application of heat and thereby bringing about flexing of the cover end closure to its convex position, then upon completion of the sterilization action bringing about a cooling of the can to reduce the same and its fill to ambient temperature and create a vacuum interiorly of the can resulting in the flexing of both end closures to their concave positions.

7. A packaging can complement intended for the packaging of hot fill and which is to be subject to a sterilization process following the filling and end closure sealing thereof; the can complement comprising a body, a flexible first end closure of normally concave configuration closing one end of the body, a flexible second end closure of normally convex configuration closing the other end of the body, said first end closure being more flexible than said second end closure, being responsive to a relatively high internal can complement pressure to flex outwardly into a convex configuration during said sterilization process and being responsive to a reduction in internal can complement pressure to flex inwardly into a concave configuration upon cooling of said can complement following sterilization thereof, and said second end closure being responsive to relative low internal can complement pressure to flex inwardly into a concave configuration upon cooling of the fill below the hot filling temperature thereof.

8. A packaging can complement comprising a tubular body, normally concave first closure means for closing one end of said tubular body and responsive to a first pressure condition within said can complement for flexing outwardly into a convex configuration and normally con-

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vex second closure means closing the other end of said tubular body and responsive to a second pressure condition within said can complement for flexing inwardly into a concave configuration.

9. A packaging can complement according to claim 8 wherein said first and second closure means comprise flexible first and second closure members respectively, said first closure member being more flexible than said second closure member.

10. A packaging can complement comprising a body, a normally concave first closure means, closing one end of the body responsive to a first pressure condition within said can complement for flexing outwardly into a convex configuration and responsive to a second pressure condition within said can complement for flexing inwardly from said convex configuration to a concave configuration thereof, and normally convex second closure means closing the other end of said body, responsive to a third pressure condition within said can complement for flexing inwardly into a concave configuration.

11. A packaging can complement according to claim 10 wherein said first and second closure means comprise flexible first and second closure members respectively, said first closure member being more flexible than said second closure member.

12. A packaging can complement intended for the packaging of hot fill and which is to be subject to a relatively high temperature sterilization process following the filling and end closure sealing thereof; the can complement comprising a body, a flexible normally concave first closure means closing one end of the body, for maintaining its concave configuration upon the enclosure of hot fill within said can complement, for flexing outwardly into a convex configuration upon the sterilization of said can complement, and for flexing inwardly from said convex configuration to a concave configuration upon the cooling of said can complement following sterilization, a flexible

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normally convex second closure means, closing the other end of the body, for maintaining its convex configuration upon the enclosure of hot fill and the sterilization of said can complement, and for flexing inwardly into a concave configuration during cooling of said can complement following sterilization thereof.

13. The method of providing a sterilized hot goods filled package, said method comprising, providing a can complement including an attached flexible end closure for one end of the can and a flexible cover end closure for the other end of the can, filling the can with hot goods, securing the cover end closure on the filled can to form a filled and sealed can having one end closure of normally concave configuration and the other end closure of normally convex configuration, sterilizing the filled and sealed can so formed and the contents thereof by the application of a relatively high degree of heat thereto to cause the concave end closure to flex outwardly to a convex configuration, and then cooling the can and its contents to cause the outwardly flexed normally concave end closure and the normally convex end closure to flex inwardly to a concave configuration.

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