United States Patent

[11] **3,549,037**

[72] Inventor **John J. Moloney**
Chicago, Ill.

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Division of Ser. No. 315,333, Oct. 10, 1963, Pat. No. 3,380,419.
[45] Patented **Dec. 22, 1970**

[73] Assignee **Continental Can Company, Inc.,**
New York, N.Y.,
a corporation of New York

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[54] **CLOSURE CAP**
3 Claims, 4 Drawing Figs.

[52] **U.S. Cl.** **215/40;** 117/68, 117/94, 117/132
[51] **Int. Cl.** **B65d 41/00**
[50] **Field of Search** 117/94, 132C, 135, 168, 68; 113/121; 215/38, 39, 40

[56] **References Cited**

UNITED STATES PATENTS

3,303,954	2/1967	Beaudet	215/39
3,110,409	11/1963	Chaplin	215/40
2,961,110	11/1960	Cooke et al.	117/CC
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Primary Examiner—Alfred L. Leavitt
Assistant Examiner—William E. Ball
Attorney—Greist, Lockwood, Greenawalt and Dewey

ABSTRACT: Closure caps formed of tinplate for sealing filled glass containers, in which the caps have cured plastisol gaskets and have outer surfaces coated with a thin residual film composed primarily of nonemulsifiable low molecular weight polyethylene resin (e.g. a molecular weight of 1,500) that originally formed a tinplate coating solution with paraffin wax at elevated temperature and after being deposited on the tinplate withstood temperatures in the range of about 400° F. to 475° F. for at least about one minute.

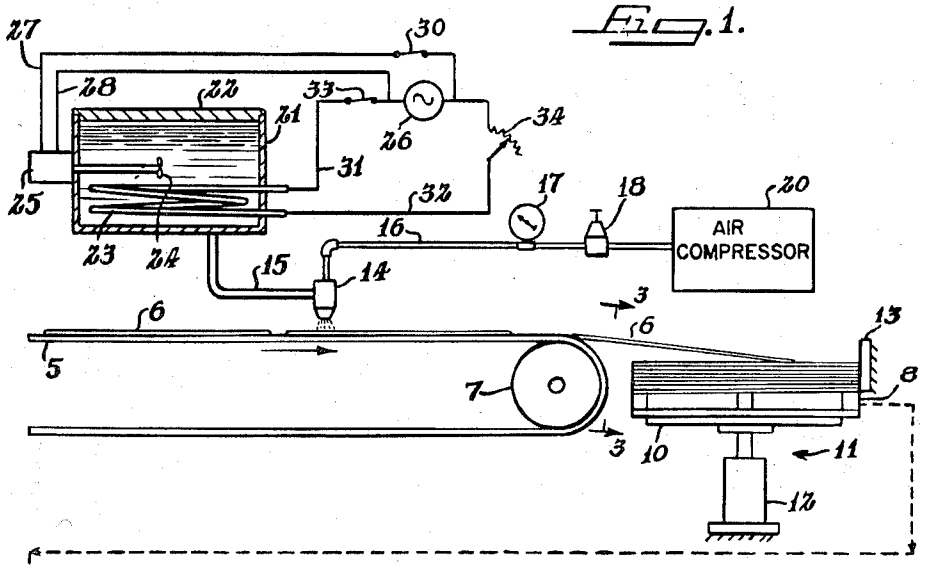


Fig. 1.

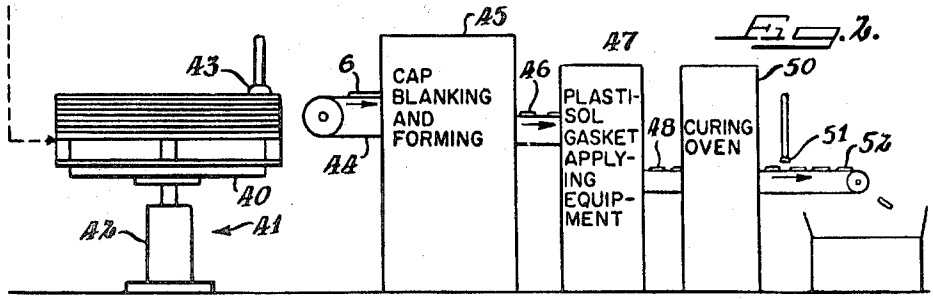


Fig. 2.

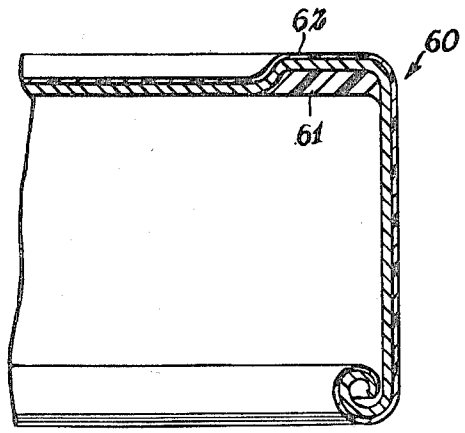


Fig. 4.

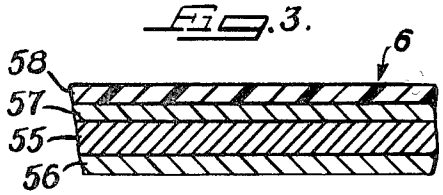


Fig. 3.

INVENTORS
JOHN JAMES MOLONEY

CLOSURE CAP

This application is a division of Ser. No. 315,333 filed Oct. 10, 1963, now U.S. Pat. No. 3,380,419.

This invention relates, generally, to innovations and improvements in closure caps for glass containers such as glass bottles and jars, such closure caps having two features in common. First, the shells or bodies thereof are blanked or stamped from tinplate or the like. Second, the caps have interior gaskets or liners formed of cured plastisols. The invention relates to improvements and innovations in the conventional method of making such closure caps, the caps themselves, as well as in the prepared sheet stock from which the same are made.

Closure caps of the type referred to are broadly old in the art and often are more specifically identified to type as crown caps, lug caps, screw caps, press-on caps, etc. Crown caps are the type that are used on bottles containing liquids under pressure such for example as soda pop bottles, beer bottles, etc. Crown caps or closures having plastisol liners are disclosed for example in Maier et al. U.S. Pats. Nos. 2,835,926, 2,654,913, 2,654,914, 2,663,908 and Schneider U.S. Pat. Nos. 2,719,564 and 2,752,059.

Screw caps, press-on caps and lug caps are typified by the ones that are commonly used on wide mouth glass jars in the food industries such as those containing peanut butter, pickles, jellies and jams, etc., as well as the smaller diameter caps that are used on catsup and chili sauce bottles. Patents showing lug caps having cured plastisol gaskets include Unger et al. U.S. Pat. No. 2,874,863 and Foye U.S. Pat. No. 2,489,407.

In the manufacture of closure caps of the class described, sheets of tinplate are first properly prepared with respect to the surfaces thereof before the closure cap shells are stamped, blanked or died out from the sheets. For example, the surface of such a sheet that is going to form the exterior surfaces of the caps will generally be coated with one or more applications of enamel or lacquer and then decoration and printing will often be applied by lithography or other appropriate technique. On the underside there will usually be applied one or two coats of special lacquer or enamel which is capable of resisting corrosion or which provides good adherence properties for the gasket or liner. These tinplate sheets with their surfaces thus prepared will typically measure 29 inches by 34 inches.

Prior to the advent of cured plastisol gaskets or liners it was a fairly common practice by cap manufacturers to apply a coating of paraffin wax to the prepared surfaces of the plates that were to become the exterior surfaces of the caps. The application of such paraffin coating performed several important functions. First, it served as a die lubricant during the stamping or blanking out of the cap shells and during any subsequent forming operation such as forming the inner curl on the bottom of the skirts of the caps, the formation of the lugs or threads, etc. Later on, after cut ring gaskets, or composition gaskets or liners had been put into place within the cap shells, the wax coatings served to protect the caps from abrasion and from sticking to one another during packaging, shipment and hoppering. Commencing around 1954 the use of cured plastisols as the gasket or liner forming materials in closure caps of the class described was introduced, replacing cut ring gaskets formed of special rubber formulations, cork liners in crown caps, and flowed-in rubber base gasket compositions.

In the formation of closure caps of the class described with plastisol gaskets or liners, the cap shells are formed from tinplate having the surfaces properly prepared just as they were before. However, instead of inserting a disc or liner of cork in a crown shell, or crimping in a cut ring rubber gasket in a press-on cap, the plastisol compositions are deposited or flowed into place and then the cap shells containing the flowed in plastisol gaskets or liners are subjected to fluxing or curing temperatures, e.g. 400—475° F. for approximately 1 minute. Subjecting the cap shells with the plastisols to such temperatures resulted in substantially complete volatilization of the exterior protective wax coatings which had been depended upon for die and metal working lubrication during the formation of the shells and thereafter to prevent dust, abrasion, sticking, and to facilitate hoppering of the caps.

Since paraffin wax alone was no longer adequate for the purpose of coating the surfaces of the tinplate sheets from which cap shells were to be formed and provided with plastisol gaskets or liners, several other materials were tried, including mixtures, but insofar as I am aware always with one or more shortcomings or disadvantages.

It has been discovered in accordance with the present invention that the paraffin wax previously used as the sole coating material for the tinplate sheets may be successfully replaced by a solution of paraffin wax containing from about 1 to 30 **percent by weight of polyolefin resin which does not volatilize materially during the curing of the plastisol gaskets or liners. After such solutions have been applied to the prepared exterior surface of the tinplate which later become the exterior surfaces of the closure caps, the paraffin as well as the polyolefin resin serve very well as high pressure lubricants during the blanking or stamping out of the cap shells from the plates, while the polyolefin resin will remain as a residual coating after the curing step so as to provide the necessary protective coating to prevent abrasion, dusting, sticking, and to facilitate hoppering of the caps.**

Accordingly, an important object of the present invention is the improvement in the method of making closure caps of the class described having plastisol liners or gaskets which comprises applying to the proper surfaces of the sheets of tinplate from which the cap shells or bodies are to be formed a coating in the form of a solution of polyolefin resin in molten paraffin wax.

A further object of the invention is the provision of sheets of tinplate from which the shells or bodies of closure caps of the class described may be stamped or blanked, which sheets have been provided with a coating formed from a solution of polyolefin resin in paraffin wax, the polyolefin resin being capable of withstanding temperatures in the range of about 400—475°appreciably.

Another important object of the invention is the provision of closure caps of the class described wherein the exterior of the cap shells or bodies carry a residual coating deposit of polyolefin resin that will form a solution with molten paraffin and which has withstood elevated temperatures in the range of 400—475°F. for a least about I minute without volatilizing.

Certain other objects of the invention will, in part, be obvious and will in part appear hereinafter.

For a more complete understanding of the nature and scope of the invention reference may now be had to the following detailed description thereof taken in connection with the accompanying drawings wherein:

FIG. l is a schematic view of a product line and apparatus for continuously coating sheets of tinplate, having the surfaces thereof prepared for the formation of cap shells therefrom, with a heated solution of a polyolefin resin in paraffin wax;

FIG. 2 is a diagrammatic view of a production line and apparatus showing the manner in which the fully prepared and coated tinplate sheets from the apparatus and line of FIG. 1 are formed into completed closure caps;

FIG. 3 is a detailed sectional view on enlarged scale taken through a fully prepared and coated sheet from the operation and apparatus illustrated in FIG. 1, the section being taken on line 3—3 in FIG. 1; and

FIG. 4 is a fragmentary cross-sectional view through a completed lug cap formed in accordance with the principles of the present invention.

Referring to FIG. 1, the upper run 5 of a conveyor for delivering sheets 6 of tinplate is shown, with the discharge end of the conveyor running over a driven end return roll 7. As each of the sheets 6 passes over the roll 7 it is delivered onto a stack of sheets which is being built up on a pallet 8 which is placed on the platform 10 of a height control device for maintaining the level of the uppermost sheet 6 of the stack. The device 11 has a hydraulic cylinder 12 which allows the top of

each pallet 8 to be started out at the desired level and then permits the pallets with their stack of sheets to lower as additional sheets are added. The sheets 6 are evenly positioned in place by means of an aligning fence or guide member 13.

As the sheets 6 come in on the upper run 5 of the conveyor these sheets have already had both their upper and lower surfaces suitably prepared for the formation of closure cap shells or bodies therefrom. For example, the bottom surfaces of these sheets of tinplate will be suitable lacquered or enameled with one or more coatings of an appropriate lacquer or enamel formulation for service on the interiors of the cap shells or bodies. On the other hand, the exterior or upper surfaces of the sheets 6 will also have been suitably enameled or lacquered, and may also very well be decorated with advertising material, names and indicia of the type customarily found on the exterior of closure caps of this type.

As the sheets 6 pass along on the conveyor 5 they pass under a plurality of spray gun heads, one of which is shown or indicated at 14. Each of these heads receives a solution of a polyolefin resin in molten paraffin wax through a conduit or line 15 and also receives air under pressure for atomization through a line 16. The line 16 is provided with a pressure gauge 17, and desirably with an automatic pressure regulating valve 18 of known type. The line 16 is shown being connected to a source of air pressure such as an air compressor indicated diagrammatically at 20.

The solution delivered through line 15 is prepared and maintained in a tank 21 which is preferably provided with a cover 22 and is also equipped with a heating coil 23 and a stirrer or agitator 24 driven by a mixer or agitator motor 25. The motor 25 is energized from a source of alternating current indicated diagrammatically at 26 by way of conductors 27 and 28 with conductor 27 including an operating switch indicated diagrammatically at 30. The electric heating coil 23 is also energized from the current source 26 by way of conductors 31 and 32 with conductor 31 including a control switch 33 and with conductor 32 including in series a variable potentiometer of known type indicated diagrammatically at 34.

The solution of polyolefin resin in molten paraffin wax contained within the tank 21 may be prepared in one of several ways. According to one method the paraffin wax is first melted and held at a temperature of about 195° F. within the tank 21, care being taken that it has not become heated over 200° F. since it tends to oxidize rapidly and become rancid at such elevated temperatures. Pellets of the polyolefin resin in the desired amount may then be added, with agitation provided by the stirrer 24 to the molten wax being continued until these pellets are all dissolved completely and uniformly within the tank 21.

A somewhat faster method of preparing the molten solution within the tank 21 is to prepare separate melts of the paraffin wax and the polyolefin resin. In this technique the paraffin wax is melted in a separate container to a temperature of about 180° F. while the polyolefin resin is separately melted at a temperature in the order of 225° F. The melted resin is added to the molten wax slowly and with agitation with a complete solution being obtained and properly carried out without entrapping air in the melt. Since the amount of polyolefin resin added to the paraffin is relatively small (e.g. about 1 to 30 percent by weight) the fact that the resin is at a temperature above 200° F. causes no harm upon being blended with the paraffin wax at a temperature somewhat below 200° F., e.g. 180° F., since the resultant temperature will be under 200° F.

Preferably fully refined paraffin wax is utilized in making up the solution in tank 21. The polyolefin resin may be one of several that are commercially available including polyethylene and polypropylene. A preferred polyolefin resin is a nonemulsifiable, low molecular weight polyethylene resin commercially available from Eastman Chemical Products, Inc., Kingsport, Tennessee, under the trade name "Epolene N-11." This particular commercially available resin is characterized by a Ring and Ball Softing Point of 107.5° C.; a Penetration Hardness at 100g./5sec./77° F., of 0.2 mm., a density at 77° F. of 0.925; a Brookfield Viscosity at 257° F. of 390 Centipoises, and a molecular weight of approximately 1500; and a color of 1 on the Gardner scale.

It will of course be understood that other similar polyolefin resins, including both polyethylene and polypropylene resins, may be used to replace all or part of the foregoing preferred resin.

The solution within tank 21 must contain sufficient of the polyolefin resin so that after the paraffin wax has been largely volatilized during the fluxing or curing of the plastisol gasket or liner, there will be a sufficient residual of the resin to provide the necessary protective film or coating on the outer surfaces of the cap shells as described above. On the other hand, if there is too great a quantity of the polyolefin resin, the melting point thereof being somewhat in excess of 200° F., it is liable to result in a composite melting point which is excessive. As a practical matter the useful range of concentration of the polyolefin resin is from about 1 to 30 percent by weight of the total solution mixture, the balance being substantially and entirely the paraffin wax.

Once the solution has been properly formed and a complete uniform blend has been obtained the mixer or agitator 24 may be stopped since the solution will remain stable without further agitation as long as it is retained in the molten condition at a temperature between about 180—200° F.

It will be understood that additional solution can be made up from time to time so that the operation of the equipment may be continuous. The additional solution can be made up within the tank 21 or it can be made up in a separate tank and added thereto or it can be made up in a separate tank which may be switched to line 15 when the tank 21 is empty or near empty.

The amount of the solution applied to the upper surfaces of the sheets 6 can vary between approximately .0000024 to .0000097 ounces per square inch surface area. Since the film or coating applied by the spray heads 14 is relatively thin, the same readily solidifies on the plates 6, although a blast of cooling air could be used if required.

The fully prepared and sprayed or coated sheet 6 continue to build up on the pallet that is in place on the stack-height control until 11 until the proper number of sheets has been received onto the stack. The pallet with the stack in place is then removed while a new pallet is inserted in place so as to allow another stack to be built up. The removed stack is then taken and mounted on the table 40 of another stack-height control device indicated generally at 41 and including a hydraulic cylinder 42. In this unit as the sheets are removed from the top of the stack by means of vacuum pickup devices 43 of known type the hydraulic cylinder 42 raises the height of the stack to the level which is approximately even or level with the upper run 44 of a conveyor of known type. The vacuum pickup devices transfer the sheets 6 to the upper run where they are fed into cap blanking and forming machinery of known type indicated diagrammatically at 45. The machines used for stamping out or blanking out the cap shells from the sheets 6 is well known in the art and does not require specific illustration or description. The cap blanks or empty shells that are formed in the equipment 45 are shown as discharging on the upper run of the conveyor, the same being indicated at 46. These empty shells go into plastisol gasket applying equipment in the upside down position, this equipment being indicated diagrammatically at 47 inasmuch as it is also well known and commercially available. The cap shells in the upside down condition with their deposits of plastisol liners or gaskets discharge from the equipment 47 as indicated at 48 and are conveyed through a plastisol curing oven of known type wherein the temperature may range between about 400—475° F. and the time of travel through the oven may be approximately one minute. This equipment is indicated diagrammatically at 50. The plastisol liners or gaskets flux within the equipment 50 and when they discharge therefrom they pass underneath a blast of cooling air provided by one or more noz-

zles 51. The caps themselves are indicated at 52. The finished caps 52 are discharged from the conveyor into a shipping carton.

The wax content plus the polyolefin resin in the spray coated solution within the tank 21 is sufficient to provide adequate protection to the metal when it is stamped or blanked out into the cap shells or blanks in passing through the equipment 45. While most of the paraffin is volatilized on passage of the caps through the equipment 50, the polyolefin resin remains in place with little or no loss through volatilization.

It will be understood that several changes may be readily made in the equipment described in connection with FIGS. 1 and 2. For example, the spray heads or spray guns 14 may be replaced with other types of coating equipment such as roller coaters, brush coaters, etc. However the spray heads 14 of the well known "Grammer Waxer" serve adequately for this coating purpose. Obviously, the completely prepared and coated sheets 6 could be gathered in other manners than as illustrated. There could be discontinuity in the production line shown in FIG. 2 as between the operations performed in the equipment indicated generally at 45, 47 and 50. Instead of relying on cooling air to cool the caps after they emerge from the oven, simply a longer time on the conveyor could suffice.

In FIG. 3 one of the sheets 6 is shown in magnified cross section (not to scale). The tinplate itself is indicated at 55, the prepared inner cap surface that receives the plastisol gaskets or liners is indicated at 56, the enameled or lacquered exterior surface is indicated at 57, and the layer of solidified polyolefin-paraffin solution is indicated at 58.

In FIG. 4 a portion of a rotatable lug cap 60 is shown being provided with an annular plastisol gasket 61 on the interior and with a residual film of polyolefin being indicated at 62. As pointed out above the residual film 62 remains after the cap 60 has undergone curing and the paraffin wax content of the coating or layer 58 in FIG. 3 has been volatilized.

I claim:

1. A closure cap having a cured plastisol gasket wherein the outer surface of the cap shell is coated with a thin residual film composed primarily of polyolefin resin that formed a solution with paraffin wax at elevated temperature and withstood temperatures in the range of about 400° F. to 475° F. for a least about 1 minute.

2. A closure cap having a cured plastisol gasket wherein the outer surface of the cap shell is coated with a thin residual film composed primarily of nonemulsifiable low molecular weight polyethylene resin that formed a solution with paraffin wax at elevated temperature and withstood temperatures in the range of about 400° F. to 475° F. for at least about 1 minute.

3. The closure cap of claim 1 wherein said polyethylene has a molecular weight of approximately 1500.

UNITED STATES PATENT OFFICE
CERTIFICATE OF CORRECTION

Patent No. 3,549,037 Dated December 22, 1970

Inventor(s) John J. Moloney

It is certified that error appears in the above-identified patent and that said Letters Patent are hereby corrected as shown below:

Column 2, line 39, after "400-475°", insert --for at lea: about one minute without volatizing--.

Column 3, line 9, change "suitable" to --suitably--.

Column 6, line 16, change "a" to --at--.

Signed and sealed this 31st day of August 1971.

(SEAL)
Attest:

EDWARD M.FLETCHER,JR.
Attesting Officer

WILLIAM E. SCHUYLER, JR.
Commissioner of Patents