

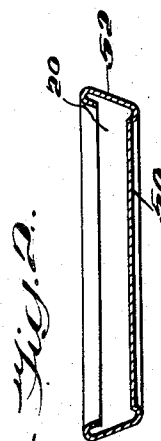
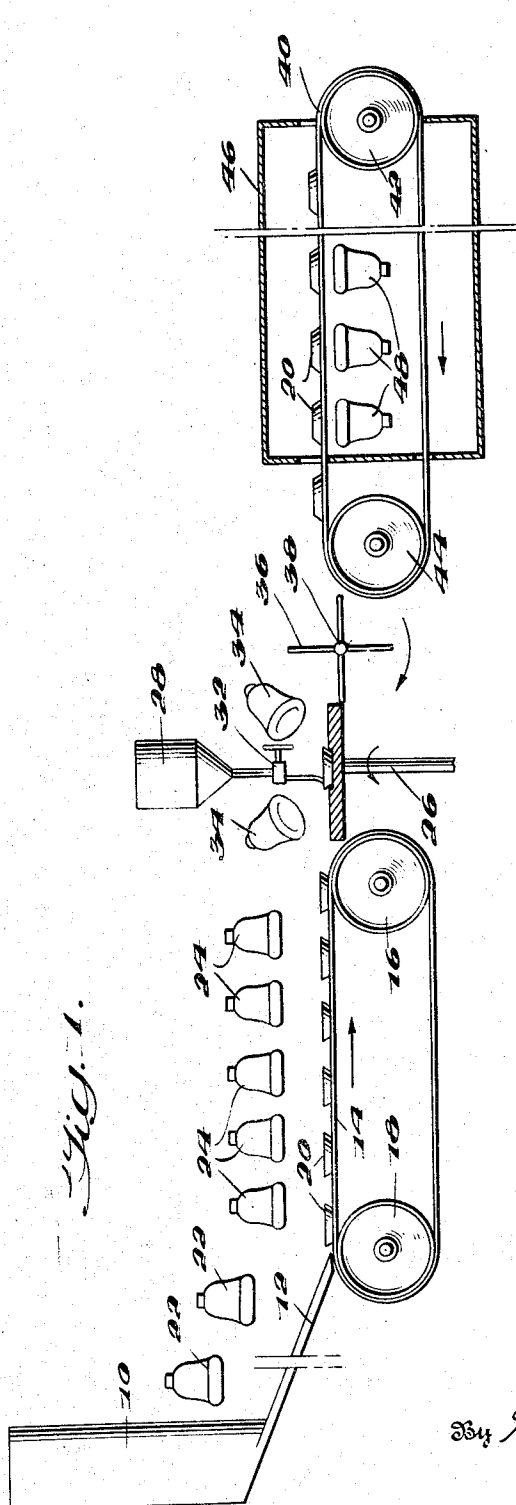
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F. W. JOSWIG

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PLACING AND FIXING OF SEALING COMPOUNDS IN CLOSURE CAPS

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Inventor

FRED W. JOSWIG,

By *Henningst and Pillars*

Attorney

UNITED STATES PATENT OFFICE

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PLACING AND FIXING OF SEALING
COMPOUNDS IN CLOSURE CAPS

Fred W. Joswig, Elyria, Ohio, assignor to Super
Seal Container Corporation, Washington, D. C.,
a corporation of Delaware

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This invention relates to closure caps for bottles and jars, and more particularly, the invention concerns itself with a continuous method for applying a more or less liquid sealing compound to the peripheral zone of such closure caps and to the fixing of such sealing compound.

There have been prior methods for lining closure caps with plastic sealing compound which involve the spreading of such compound on more or less horizontally disposed retaining surfaces of an inverted cap while the cap is rotated approximately 150 R. P. M. The practice of the prior methods was seriously limited in utility by reason of the fact that it has been possible to fix such compounds in only relatively thin layers ranging from .015 to .020 of an inch in thickness.

The practical requirement of the packing industry which uses glass jars and wide mouthed glass bottles is a closure having a sealing compound layer of a thickness considerably in excess of that possible under the old compound spreading and setting method. This requirement grows out of the fact that a great lack of uniformity exists in the finished dimensions of the various receptacles. Glass does not adapt itself to precise molding, since different batches of glass will contract to a greater or less degree during the cooling of the molded receptacle. Therefore, a closure is required that will adapt itself to the variations in the size of the finished receptacles, and this adaptation must be provided for in the greater thickness of the sealing gasket that is employed. The dimensional irregularities of a glass receptacle increase in magnitude as the size of the bottle or jar mouth increases. Thus the problem becomes more marked and the demand for thicker sealing gaskets is more acute as the size of the closure increases.

The closure cap now in most general use includes a peripheral skirt which flares outwardly from the web which normally overlies the mouth of the receptacle. The peripheral skirt is adapted to surround the external surface of a receptacle below the mouth of the receptacle and accordingly these skirt portions frequently are provided with sealing gaskets composed of deformable materials. Heretofore the methods for applying a plastic sealing compound to the skirted portions of closure caps have been best adapted to deposit such compounds on generally horizontal surfaces but they have been poorly adapted to deposit such material on inclined or vertical surfaces. In these latter cases, the gravitational flow of the plastic sealing com-

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pound toward the base of the skirt portion of an inverted cap has been a serious difficulty.

The industry has been conscious of the shortcomings of flow-in gasket applying methods but the efforts heretofore directed to the improvement of these methods and particularly at increasing the thickness of the flow-in gaskets have been not uniformly successful.

It might be supposed that a thicker gasket may be obtained by the mere enlargement of the compound spreading nozzle which deposits the material on the supporting surface of the cap. It has been found, however, that the enlargement of the compound stream results in a substantial flow of sealing compound toward the bottom of the inverted cap and an otherwise uneven distribution of the material within the closure. It has been sought to overcome this difficulty by increasing the rotational speed of the closure during the application of the plastic compound, but this expedient has simply resulted in the displacement of the compound over the edge of the closure skirt under the influence of centrifugal force.

This invention, therefore, provides a method by the practice of which sealing compounds may be deposited onto the inclined or vertical receiving surfaces of closure caps in fluid form and by which a fixed gasket of a desired thickness may be obtained.

In accordance with the present method, the closure cap is preheated to a temperature of 180-190° F. before the sealing compound is applied. In one specific practice of the method, the closures are preheated while they travel in inverted position from a feed hopper through a runway to the compound-applying station. In practice, this runway has been substantially four feet in length, and the progress of the closure caps has been at the rate of approximately thirty feet per minute. The preheated caps are each rotated about their axis at a compound-applying station, the rotation thereof being at a speed of 400-900 R. P. M. Despite the increased rotational speed of the closures at the compound-applying station, the size of the compound-applying nozzle has been maintained relatively small. In essence the present method contemplates the application of a plurality of layers of compound to the receiving surface of the cap. In an exemplary practice of the method, four such layers have been applied while subjecting the closure cap and the applied compound to an elevated temperature in the compound-applying zone. Ordinarily the stream of

compound is controlled to deposit a layer of plastic material that will produce a gasket not substantially thicker than .010-.015 of an inch. The volume of the compound stream at the applying station will be regulated in accordance with the diameter of the cap and the speed of its rotation. This procedure is in sharp distinction to the conventional method wherein a single layer of sealing compound has been applied to the slowly rotating compound-receiving surface of the cap.

In a specific practice of the present method, a gasket having a thickness of between .050 to .060 of an inch has been applied to a 66-millimeter cap spinning through four revolutions at the rate of 600 R. P. M. The rate at which the caps are rotated while the sealing compound is being applied is, of course, a variable factor which is dependent on the diameter of the cap and the amount of compound that is applied, the peripheral speed and the mass of the material within the cap being factors directly influencing the centrifugal force to which the sealing compound is subjected. The optimum rate of rotation for a cap of any given size is the highest rate at which the cap may be rotated without throwing the sealing compound over the edges of the retaining surface. In any event, for all practical purposes, a rotational rate of more than 150 R. P. M. is required, and it will be found that closures of all presently known sizes can be processed at a rate of 400-900 R. P. M. when the stream of sealing compound is kept relatively small.

The thickness of the final gasket will be determined by the number of revolutions through which the cap is rotated. In this regard it is believed that each thin layer that is deposited becomes immediately somewhat self-sustaining under the influence of heat imparted to the cap in the preheating zone and that to which it is subject at the compound-applying station. In any event, the volume of compound will not flow as a unit mass when it is deposited in thin discrete layers. It is to be observed, however, that while the compound is deposited in thin discrete layers, the body of the final gasket is homogeneous in structure.

The preheating of the cap has certain important results, two of which are of prime importance. In the first place, the metal cap which is presented for the application of the gasket-forming compound is usually coated with a thin skin of grease which is a residue of the sheet fabricating process. The heating in the preheating zone is effective to melt, and in many cases volatilize, the residual grease on the compound-receiving surface of the cap, thereby presenting a clean surface to which the plastic compound will adhere much more readily. The second advantage is realized in the faster setting of the applied sealing compound, due to both accelerated coagulation under the influence of the heat and, in possibly a minor degree, to the evaporation of liquid components in which the compound is constituted.

The compounds which are useful in the practice of the method are the viscous liquid thermo-setting materials which contain natural rubber or synthetic rubber components and which assume a rubber-like nature when set. A number of sealing gasket compounds are available which react as desired in the practice of the method.

Of prime importance is the fact that the method may be performed continuously. Here-

tofore similar methods have involved separate steps with an intervening lag between two or more of the steps in the process. In the present method the gasket-forming compound is placed into the cap as above described while subjecting the cap to the influence of heat in the compound-applying zone. Immediately after the necessary quantity of gasket-forming compound has been deposited on the receiving surface of the cap, the cap is turned over and passed continuously through a heating zone wherein the compound is further fixed. The temperature in the heating zone is controlled and maintained in the neighborhood of 210° F. In an exemplary machine, the closures are turned over on an endless form-ining conveyor, approximately ten feet in length, that travels at a rate of approximately three feet per minute. The re-inversion of the cap eliminates any tendency for the sealing compound to gravitate toward the bottom of the cap, and in fact it increases the tendency for the compound to gravitate toward and accumulate in the central area of the skirt where the bulk of the sealing compound is most urgently needed.

After the closures have been treated as described above, they may be removed from the compound-setting apparatus and placed in a suitable curing oven without any danger of disturbing the position of the compound which, under these circumstances, has now been fairly set.

The source of heat is not of critical importance so long as the proper temperatures are maintained. However, in the preferred practice of the method, advantage is taken of the peculiar penetrating properties of the relatively long heat waves, and particularly those of a wave length corresponding to the infra red zone of the spectrum. Heating by infra red radiation in the cap preheating zone imparts to the metal of the closure a high degree of latent heat which is peculiarly useful when the sealing compound is first applied to its receiving surface.

The application of heat rays of this character is particularly useful in the compound-applying zone for the reason that they immediately penetrate the mass of the material and do not concentrate their effect merely on the surface thereof. The penetrating nature of the infra red radiation avoids the formation of a superficial skin over the compound layer which is later subject to pitting upon volatilization of the liquid constituents of the compound emulsion under continued heating.

The method may be performed in any desired manner, but in its preferred practice it will be performed in a continuously operating machine such as that diagrammatically illustrated in Figure 1 of the drawing.

Figure 2 of the drawing is a cross sectional view of a closure cap to which gasket-forming compound is to be applied; and,

Figure 3 is a cross sectional view of a closure cap to which compound has been applied.

The closure caps to which a gasket-forming sealing compound is to be applied are held in a storage hopper 10 from which they are discharged through an inclined runway 12 and from which they are deposited on an endless conveyor 14 which is trained about pulleys 16 and 18, one of which may be power driven in clockwise direction so that the upper flight of the conveyor 14 will move toward the compound-applying station.

The closure caps 20 are deposited on the upper flight of the conveyor 14 in inverted position, i. e.,

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the crown of the cap resting on the conveyor thereby presenting an upturned inner surface.

As the closure caps 20 travel downwardly in the inclined runway 12, they are subjected to a source of heat, preferably that radiating from a series of infra red lamps 22. Furthermore, as the caps are carried forwardly on the upper flight of the endless conveyor 14, they are subjected to further heating, as that radiation from a second series of infra red lamps 24 which are disposed above the conveyor 14 in such position as to project the radiation therefrom against the caps being carried toward the compound-applying station.

A compound-applying station is located at the distal end of the conveyor 14 and consists of a cap holding and rotating chuck 26 which is arranged to hold a single cap and rotate the same while the plastic sealing compound is applied to the inner surface of the upturned skirt of the cap. The sealing compound is preferably fed from a storage container 28 wherein it may be held under air pressure to facilitate its discharge through the applying nozzle 30. Within the conduit extending between the storage receptacle 28 and the compound-applying nozzle is a valve 32 by manipulation of which the stream of the compound issuing from the nozzle 30 may be controlled.

While the successive layers of gasket-forming compound are deposited against the inner surface of the closure skirt, the compound is subjected to continued heat from infra red heat sources 34 which are positioned over the cap holding and spinning chuck 26 and which direct their rays against the cap under treatment.

After the successive layers of gasket-forming compound have been deposited within the closure cap, the cap is removed from the rotating chuck 26 and is deposited on a cap inverting device 36 which rotates in a clockwise direction about the axis 38. As the cap inverting device rotates, the cap which is received in one of the compartments thereof in an inverted position is deposited therefrom onto the upper flight of a second conveyor 40. The conveyor 40 is of the endless belt variety, consisting of an endless foraminous belt trained about pulleys 42 and 44, one or both of which may be power driven as desired.

As the caps are deposited on the conveyor 40 in upright position, they are carried through a curing chamber 46 in which are located a series of infra red lamps 48. In the arrangement shown, the lamps are positioned under the upper flight of the conveyor 40 and are so located as to direct their rays against the interior of the closures as they pass through the chamber.

It is contemplated that the chamber 46 may embody an air circulating fan together with other heat control devices in order to maintain the temperature therein at a desired level.

In Figure 2 of the drawing the cap 20 is shown as consisting of a web portion 50 which normally overlies the mouth of the receptacle and a flared skirt portion 52 which overlies the neck of the receptacle when the cap is applied thereto.

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In Figure 3 is shown the gasket 54 which has been deposited against the skirt 52.

It will be appreciated that the method taught herein may be practiced by the use of any suitable mechanical instrumentalities adapted thereto and that the invention resides in the method no matter how the same is carried into effect.

Now, having described my invention, what I claim and desire to protect by Letters Patent is the following:

1. The method of applying and fixing a plastic gasket-forming compound that is subject to gravitational flow to the inclined skirt surface of a closure cap to provide a side sealing surface which consists in applying the compound in its plastic state directly to the inclined surface in a stream of such volume as to deposit a gasket layer on the receiving surface of the cap not substantially in excess of .010 to 0.15 inches in thickness, rotating the cap through a plurality of revolutions while continuously applying the compound, and applying heat to said cap and said compound while the compound is being applied to the cap at the compound-applying station.

2. The method of applying and fixing a plastic gasket-forming compound that is subject to gravitational flow to the inclined skirt surface of a closure cap to provide a side sealing surface which consists in applying the compound in its plastic state directly to the inclined surface in a plurality of thin layers while rotating the cap in a horizontal plane through a plurality of revolutions at a rate in excess of 400 revolutions per minute, and applying heat to said cap and said compound while the compound is being applied to the cap at the compound-applying station.

3. The method of applying and fixing a plastic gasket-forming compound that is subject to gravitational flow to the inclined skirt surface of a closure cap to provide a side sealing surface which consists in applying the compound in its plastic state directly to the inclined surface in a plurality of thin layers while rotating the cap in a horizontal plane through a plurality of revolutions at a rate in excess of 400 revolutions per minute, and applying radiant heat to said cap and said compound while the compound is being applied to the cap at the compound-applying station.

FRED W. JOSWIG.

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