UNITED STATES PATENT OFFICE

TUBULAR PACKAGE FORMING AND FILLING METHOD AND APPARATUS

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This invention relates to methods and apparatus for forming and filling tubular packages. In the packaging of small candies and small candy-like particles commonly used in the decoration of pastry, it has been found commercially advantageous to package these goods in transparent packages of rather small size. Various kinds of materials suitable for this purpose have been used such as transparent papers and sheet material such as "Cellophane". Herefore, such packages have generally been made by hand. In accordance with this invention, means and methods are provided for forming such packages by machinery, and at the same time filling the packages as rapidly as they are formed. This is contrary to prior methods in which packages of this character were formed entirely by manual operation and then stacked in boxes or crates for subsequent filling.

One of the objects of this invention therefore is to provide means and methods for forming tubular packages from sheet material, usually of a flexible transparent nature.

Another object of the invention is to provide means and methods for forming such packages and for filling them immediately after forming before removal from the forming machine.

Another object of the invention is to provide a single machine adapted for the forming of cylindrical packages and the filling of the same.

Another object of the invention is to provide means for forming and filling a cylindrical package which means can be operated by one operator at a single position.

Another object of the invention is to provide means for forming a flexible sheet into a cylindrical package, employing suction for gripping and retaining the sheet material upon a rotating mandrel to facilitate wrapping the sheet about the mandrel.

Various other objects and advantages of the invention will be alluded to hereinafter and will become apparent from a perusal of the specification and drawings in which there is shown and described, to illustrate the nature of the invention, a preferred embodiment thereof.

On the drawings:

Figure 1 is a central vertical section of the essential parts of the apparatus;

Figure 2 shows the position of the sheet of material preliminary to wrapping it;

Figure 3 is a partial sectional view showing the sheet material wrapped upon the cylindrical mandrel, with the bottom end of the formed tube twisted together;

Figure 4 shows the next step in the forming of the package, namely, the insertion of the twisted lower end of the cylindrical package upwardly into the rotating tube; and

Figure 5 shows the final step in the operation of withdrawing the cylindrical package from the mandrel after it has been filled.

Referring further to the drawings, a filling spout 1 will be positioned on a charge measuring machine in such a manner as to receive measured charges to be delivered into the packages. The details of construction of the mechanism for measuring the charges and for assuring the delivery of measured charges at each filling operation do not constitute a part of this invention, as such constructions are well known and any satisfactory one may be employed. However, to illustrate the mode of operation, I have shown a filling spout 1 having a valve 2 in the form of a truncated cone, the interior of which is provided with a hollowed out chamber 3 within which is mounted a rotatable cam 4 on a shaft 5. The shaft 5 passes through the wall of the filling spout 1 and through a slot 6 in the side of the valve 2 and has connected at its outer end a bell crank 7 to which is connected an operating link 8. It is apparent that by rotating the cam 4 in a clockwise direction from the position as shown in Figure 1, the high point on the cam will cause the valve to rise, permitting the measured charge already contained in the cone or spout 1 to fall down below the valve.

It should be understood that this valve mechanism is merely illustrative of a means for controlling the release of a previously measured charge, and is not shown to indicate a preferred construction.

The link 8 is connected to the arm 9 of a bell crank pivoted at 10. The arm 11 of the bell crank is pivotally connected to a link 12 which in turn is pivotally connected to an arm 13 which is intended to be rotated integrally with a foot pedal 14, by means of which the operator may open the valve 2. It is indicated that the pedal 14 is pivotally mounted on a bracket 15. A spring 16 under the foot pedal tends normally to restore the valve to closed position.

Also connected with the arm 11 of the bell crank is another link 17 whose lower end is pivotally connected with the arm 18 pivotally mounted at 19, the arm carrying on its end a valve 20 whose function will later be described.

A rotatable mandrel consisting of two concentric sleeves 21 and 22 is positioned below the stationary filling spout 1 and rotatably supported
in any appropriate manner, no means therefore being shown herein. A pulley 23 fixed on the outer sleeve 21 at its drift end by a bolt 24 from any suitable source of power will rotate the mandrel.

The inner sleeve 22 constitutes a filling tube for delivering the filling material to the packages, its upper end being secured in airtight relation, as by welding or otherwise to the upper end of the outer tube 21 and the lower end likewise being sealed against the lower end of the outer tube. As shown on the drawings, an annular space is thereby provided between the two sleeves, and this space is normally maintained under suction during the forming operation by supplying vacuum through the pipe 25 into an annular chamber 26 formed in the bearing 27 within which the outer sleeve rotates. A plurality of ports 28 spaced at intervals in the outer sleeve 21 establish communication between the suction space between the two sleeves and the vacuum supply line 27. A plurality of ports such as 29, 30 and 31 are provided in the outer sleeve for the purpose of gripping by suction the sheet material which is to be wound about the mandrel. As indicated in the drawings, these three suction ports may be arranged in a single vertical line, although I may employ other arrangements of the suction ports.

The apparatus shown in Figure 1 is operated as follows. The rotatable mandrel is preferably continuously rotated by the pulley 23 and suction is normally maintained through the pipe 29 on the space between the eccentric sleeves 21 and 22, the valve 20 normally being held closed by the spring 32. Any suitable mechanism, not shown, delivers measured charges of material such as small candy particles or decorative material into the hopper 1 for subsequent release by the valve 2. Some means (not shown) under control of the operator delivers the measured charges into the hopper, and such means may be connected with the foot operated pedal 14 if desired. Operation of the pedal through the action of the cam 4 raises the valve 2 which is guided on a post 33 extending into the bore 34. It may be assumed that the valve 4 is too small for the escape of filling material, or that it may be shielded to prevent escape of such particles.

To assist in the accurate feeding of sheet to the rotating mandrel, I may mount adjoining but slightly spaced apart therefrom a flat plate 35 having extending outwardly from its front face guide pins 36 and 37 against which the top edge of a sheet of the material may be abutted. The mounting of this guide plate 35 in a vertical position may be accomplished in any desired manner.

In order to form a cylindrical package, the operator will place a pre-cut sheet of predetermined dimensions against the plate 35 and slide it over until the leading vertical edge of a sheet such as 33 overlaps the rotating mandrel, as shown in Figure 2, with the upper edge of the sheet abutting a collar 39 which is suitably secured upon the mandrel by one or more set screws 40. The operator will then press the sheet against the mandrel with one hand, or some other means may be provided for accomplishing this effect, in order that as the mandrel rotates and the suction holes 29, 30 and 31 come in line with the sheet, they may grip the sheet by suction and wind it about the mandrel. Ordinarily it will be sufficient if the operator places the palm of his hand against the sheet to enable the suction ports to grip the sheet, after which the sheet will be wrapped around the mandrel as the operator's hand holds it in proper alignment, permitting it however to slide under the palm of the hand.

It has been found from experience that the horizontal dimension of the sheet, as it is viewed in Figure 2, should be sufficient so that the sheet will be wrapped twice or slightly more around the mandrel, although the exact dimension and hence the amount of overlapping is not critical. As the mandrel is employed will usually be of the nature of "Cellophone" or other transparent flexible material, a cylindrical package of such double-walled construction provides substantial strength and adequately precludes spilling of the contents or leakage of the filling through the trailing edge of the sheet where it terminates on the outside of the package.

The amount of pressure or drag exerted by the hand or otherwise upon the sheet while it is being wrapped, and before its lower end is closed as described below determines the snugness with which the sheet is wound on the mandrel and closeness of the inner and outer layers of the sheet. Hence the pressure or drag should be regulated to produce tightly wound layers, but not wound so snugly as to prevent ready removal from the mandrel.

It will be noted that in placing the sheet preparatory to winding, as shown in Figure 2, the lower edge of the sheet extends below the bottom edge of the rotating mandrel, for a distance which may be roughly in the neighborhood of an inch or more depending upon the diameter of the package to be formed. Immediately after the sheet of material is completely wound and still held upon the mandrel, the operator will grasp the cylindrical portion of the package extending below the mandrel, pinch it together with his fingers, and hold it slightly against the rotative force of the mandrel, which will cause the sheet to wrinkle and twist upon itself in an interlocking manner. Thereafter, the operator will push this twisted portion or tail which is indicated as 41 in Figure 3, upwardly inside the rotating mandrel until it occupies the position shown in Figure 4. It has been found that by thus intussuscepting the twisted tail the bottom of a package of this character may be formed and locked adequately for its intended usage. The wide open lower end of the mandrel is smoothly shaped and finished so that the sheet may be neatly wrapped around the tail, with ample area on the mandrel being unfolded over the lower end of the mandrel. This provides a bottom edge on the finished package in a plane exactly perpendicular to the axis of the package; hence, packages so formed will stand firmly and directly on their bottoms.

Immediately after inserting the twisted end of the package up inside of the hollow mandrel, the operator may release the suction being exerted through the suction ports upon the package, by stepping on the pedal 14, while grasping the package with the hand and causing it to slide downwardly along the rotating mandrel. The mandrel is slightly tapered as shown in the drawing toward a smaller diameter at its lower end to facilitate removal of the package. The operation of the foot pedal also opens the valve 2 and permits the filling into just one package without the outer sleeve into the package as the package is being lowered on the mandrel. By the time the package reaches the position shown in Figure 5, where it is about to be removed from the mandrel, the charge of filling material will all be in the package, leaving an ample empty space above the top of the filling material within the package so that
the top end of the package may later be turned over and closed or sealed in any suitable manner.
I have found that it is practical to fold the top of the package inwardly and seal it with a label, although obviously other methods may be employed to effect closure of the top end of the package.

The packages thus filled, even though not sealed, have sufficient rigidity, due to their construction and due to the material contained within them, that they may be stood upright in a crate until opportunity is found to close or seal their tops.

While a stationary conical hopper containing a valve is shown a hopper rotating with the mandrel could be substituted therefor and the controlled delivery of measured charges thereinto could be provided for.

From the foregoing explanation, it will be apparent that cylindrical packages may be formed in accordance with this invention and filled almost simultaneously in a simple and brief operation. The motion of the package by the mandrel during the filling operation assists in distributing and compacting the material as it fills into the package.

It should be understood that the invention is not limited to the illustrated embodiment but is susceptible of suitable variations and modifications without departure from the spirit and scope of the invention defined in the appended claims.

I claim as my invention:

1. A method of forming and filling a tubular package comprising engaging a sheet of flexible material with a rotating mandrel having suction ports therein, causing the mandrel to grip the sheet by suction exerted through said ports and wrapping the sheet about the mandrel to form a tubular structure, allowing a portion of the sheet during wrapping to protrude beyond the lower end of the mandrel, twisting together the protruding portion of the package to form a tail and inserting the tail upwardly into the mandrel, releasing the suction applied to said package through said ports and sliding the package off the mandrel, and introducing filling material into the package as it is being slid off the mandrel.

2. A package forming and filling apparatus comprising a rotatable hollow mandrel having double concentric walls providing an air chamber therebetween, suction ports provided in the outer wall of the mandrel, means for exerting suction upon the air space between the walls, means for controlling the application of suction to sheet material contacting said mandrel during package forming and for release of the suction thereafter, and means for supplying filling material through the inner concentric wall of the mandrel into the formed package.

3. A package forming and filling apparatus comprising a rotatable hollow mandrel having closely spaced concentric walls providing an annular air space therebetween, regulatable means for applying suction to said air space while the mandrel is rotating, suction ports in the outer wall of said mandrel for gripping a sheet of material to retain the same during wrapping of the sheet about said mandrel during the forming of a tubular package, and regulatable means for supplying filling material for delivery through said inner wall into the package after the package has been formed on said mandrel and is closed at its lower end and is still engaged in part with said mandrel.

4. A tubular package forming and filling apparatus comprising a stationary filling spout having a port at its lower end, a rotating mandrel provided with concentric spaced apart walls and constructed to form a narrow annular air space between them, said inner wall being vertically in registration with the port of said spout, suction ports in said outer mandrel wall, controlable means for applying suction to said air space and through said suction ports for gripping a sheet of material and retaining it during the wrapping of the same around said mandrel for forming a tubular package, the lower open end of the mandrel being shaped to permit the tubular package after wrapping to be twisted at its lower end and the twisted portion inserted upwardly into said mandrel, and means for delivering measured charges of filling material through said spout into the package through the inner concentric wall of the mandrel.

5. A package forming and filling apparatus comprising a rotatable mandrel having concentric spaced apart walls sealed together at their upper and lower ends, a filling spout mounted above said mandrel, means for delivering measured charges of filling material from said spout through the inner of said concentric walls, suction ports in the outer of said walls, means for applying suction through said ports to grip a sheet of flexible material for retaining the same during wrapping of the sheet about said mandrel to form a tubular package, and means for releasing said suction to facilitate withdrawal of said tubular package from said mandrel.

6. A package forming and filling apparatus comprising a rotatable hollow mandrel having double concentric walls providing an air chamber therebetween, suction ports provided in the outer wall of the mandrel positioned for gripping a sheet of package material during the wrapping of the same about the mandrel, a suction box in which a cylindrical portion of the mandrel rotates, means for exerting suction upon the air space between the walls including duct means in said box and mandrel mutually registrable, means for controlling the application of suction to sheet material contacting said mandrel during package forming and for release of the suction thereafter, and means for supplying filling material through the inner concentric wall of the mandrel into the formed package.

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REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

<table>
<thead>
<tr>
<th>Number</th>
<th>Name</th>
<th>Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>883,169</td>
<td>Cheesey</td>
<td>Mar. 31, 1908</td>
</tr>
<tr>
<td>1,312,570</td>
<td>Pulmer</td>
<td>Aug. 12, 1919</td>
</tr>
<tr>
<td>1,702,503</td>
<td>Wakefield</td>
<td>Feb. 10, 1929</td>
</tr>
<tr>
<td>2,135,132</td>
<td>Boehmer</td>
<td>Nov. 1, 1938</td>
</tr>
</tbody>
</table>