Oct. 20, 1953 T. A. HAYNES 2,656,086

METHOD OF INSERTING STOPPERS INTO BOTTLES

Filed April 11, 1950

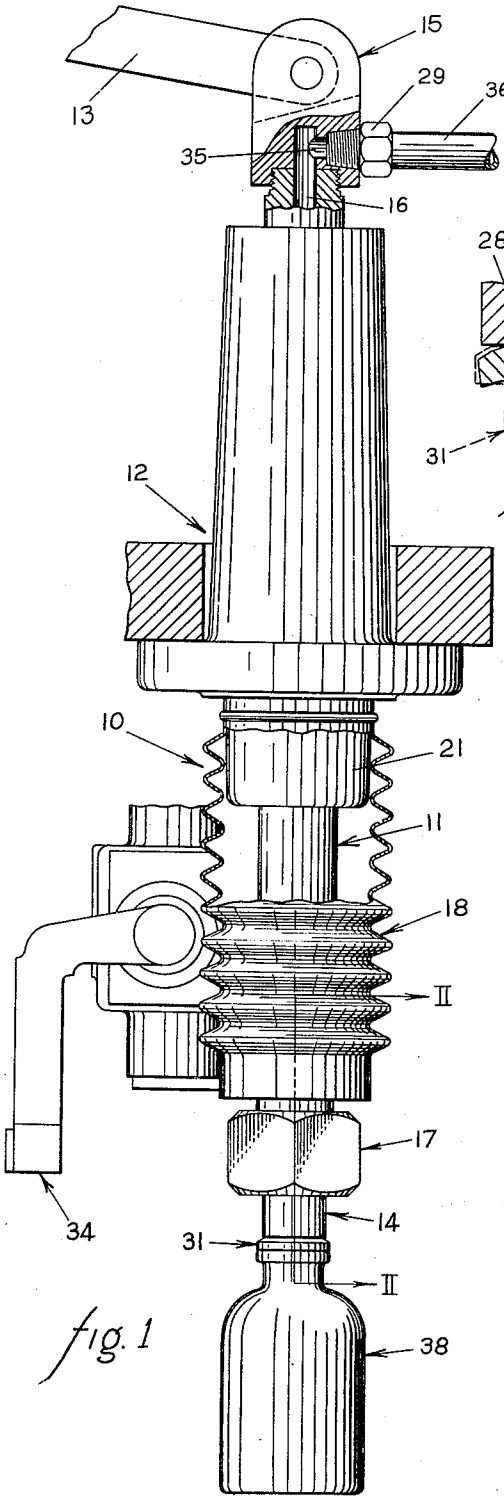


fig. 1

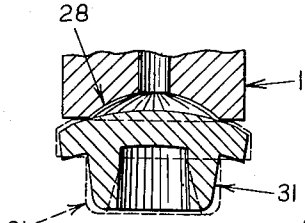


fig. 5

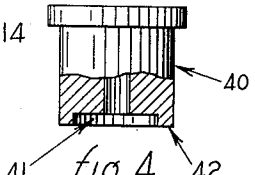


fig. 4

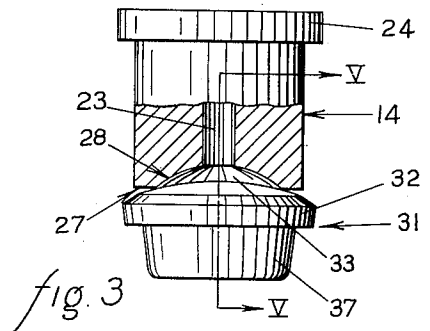


fig. 3

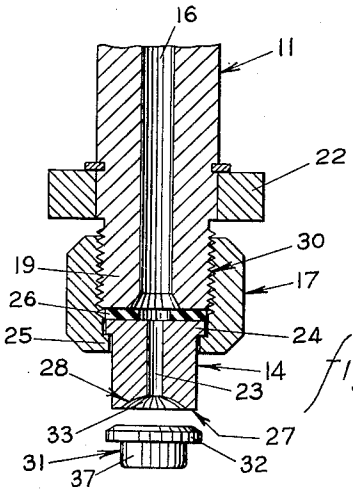


fig. 2

Inventor

THOMAS A. HAYNES

By

Attorney

Patented Oct. 20, 1953

2,656,086

UNITED STATES PATENT OFFICE

2,656,086

METHOD OF INSERTING STOPPERS INTO BOTTLES

Thomas A. Haynes, Wyandotte, Mich., assignor to The Upjohn Company, Kalamazoo, Mich., a corporation of Michigan

Application April 11, 1950, Serial No. 155,279

5 Claims. (Cl. 226—91)

1

This invention relates in general to a method for inserting a resilient stopper having a substantially flat top and a cylindrical shank into a circular opening in a container, especially where said opening is of less diameter than the normal diameter of said shank.

Known means and methods for automatically inserting a resilient stopper into an opening in a container, such as a bottle, have not proven satisfactory, particularly where the shank of the stopper is larger in diameter than the opening in the bottle, where the stopper is of the type having a flat circular top and a cylindrical shank of reduced diameter, or where said shank must be kept completely sterile prior to and during its insertion into a bottle. These requirements are all frequently encountered in the stoppering of bottles in the pharmaceutical industry, for one example.

Accordingly, a primary object of this invention is the provision of a method for distorting a resilient stopper having a flat top and a cylindrical shank, whereby said shank may be inserted into a circular opening, such as the neck of a bottle, especially where said shank is normally larger in diameter than the inside of said neck.

A further object of this invention is the provision of a method, as aforesaid, applicable when the stopper has a flat circular top of greater diameter than the stopper shank.

A further object of this invention is the provision of a method, as aforesaid, whereby the shank diameter of a stopper, particularly of the type having a hollow shank, can be reduced without physically contacting said shank.

A further object of this invention is the provision of a method, as aforesaid, whereby the shank diameter of a stopper can be substantially reduced by contacting only the top of the stopper.

Other objects and purposes of this invention will become apparent to persons familiar with this type of equipment upon referring to the accompanying drawings and upon reading the following specification.

In meeting those objects heretofore mentioned, as well as other incidental thereto and associated therewith, I have developed a method for inserting a resilient stopper having a flat top and a cylindrical shank into the neck of a bottle, wherein a partial vacuum is created in a zone immediately adjacent to the central portion of said flat top of the stopper and the periphery of said top is held in a substantially fixed

2

position with respect to said zone. Thus, said vacuum causes the center portion of said top to move out of its normal plane and into said zone. Such movement distorts said stopper and thereby effects a reduction in its shank diameter, particularly at the end of the shank remote from the top.

A preferred apparatus for practicing this method is comprised of a vertically reciprocable ram having a concave surface at the lower end thereof. A passage in said ram, which communicates with the concavity formed by said concave surface, is connected to a suction device whereby a partial vacuum may be provided in said concavity.

For illustrations of said preferred apparatus, attention is directed to the accompanying drawings in which:

Figure 1 is a broken, side elevation view of a ram and associated parts whereby my method may be practiced.

Figure 2 is a sectional view of the lower end of said ram substantially as taken along the line II—II of Figure 1.

Figure 3 is a broken, side elevation view of an adapter, removably securable to the lower end of the ram, with a stopper distorted thereby.

Figure 4 is a broken, side elevation view of a modified adapter for the lower end of the ram.

Figure 5 is a sectional view substantially as taken along the line V—V of Figure 3 and includes a broken line showing of the stopper in another position.

Construction

For the purpose of convenience in description, the terms, "upper" or "upwardly" and "lower" or "downwardly," as used in the following specification, will be understood to have reference to the upper and lower ends, respectively, of the apparatus, or parts thereof, when positioned as appearing in Figure 1. The terms "inner" or "inwardly" and "outer" or "outwardly" shall be understood to have reference to the geometric center of said apparatus, or parts thereof.

The apparatus 10 (Figure 1), whereby my method may be practiced, is comprised of a ram 11, a ram support 12, in which said ram is vertically reciprocably supported, an actuating arm 13, whereby said ram is vertically reciprocated, and an adapter 14, removably securable to the lower end of the ram 11.

As shown in Figure 1, the ram 11 is comprised of a cylindrical bar vertically reciprocably supported within the ram support 12 and having a

pivot yoke 15 secured to the upper end thereof. The ram 11 (Figures 1 and 2) is provided with a preferably co-axial, cylindrical passage 16 extending therethrough and into the yoke 15. The lower end 18 of the ram 11 is externally threaded for engagement by the adapter coupling 17.

In order to prevent contamination of the stoppers by the lubricant on the ram 11, a bellows 18 (Figure 1) encircles the lower exposed end of the ram 11. The bellows 18 is supported at its upper end upon a nipple 21, which is secured to the lower side of the ram support 12 and extends downwardly therefrom around the ram 11. The lower end of the bellows 18 is secured to a collar 22 secured upon the lower end of the ram 11 adjacent to the threaded portion 19 thereof.

An outlet opening 35 (Figure 1), communicating with the upper end of the passage 16, and radially disposed with respect thereto, is provided in the yoke 15. The walls of said opening may be threaded near the outer end thereof for appropriate reception of a nipple 29 attached to one end of a suction hose 36. The suction hose 36 is connected to a suitable suction means, such as a vacuum pump, shown schematically at 39.

The adapter 14 (Figures 2 and 3), is cylindrical in shape, has a preferably co-axial passage 23 therethrough, and is provided with an integral annular flange 24 adjacent to one end thereof, said flange preferably being slightly smaller in diameter than said ram. The lower end of the adapter 14, remote from said flange 24, is provided in this embodiment with a spherical, concave surface 28 defining the concavity 33. Said surface 28 is preferably co-axial with, and somewhat smaller in diameter than the circumference of said adapter 14, thereby providing a contact ring 27 at said lower end of said adapter 14 lying in a plane preferably perpendicular to the axis thereof.

The outside diameter of the contact ring 27, which is coincident with the circumference of the adapter 14, is preferably about equal to the diameter of the flat top 32 of the stopper 31 with which said adapter is to be used.

The adapter coupling 17 (Figures 1 and 2), which has a partially threaded opening 30 therethrough, is provided with an internally extending, annular ridge 25 adjacent to one end of said opening 30. The ridge 25 has a smaller inside diameter than the outside diameter of the flange 24 on the adapter 14, thereby permitting said ridge 25 to engage said flange 24 for holding said adapter 14 firmly against the lower end of the ram 11, when the coupling 17 is threadedly engaged with the threaded portion 19 of the ram 11. A ring gasket 26 of any convenient conventional type having an opening through the center thereof may be placed between the lower end of the ram 11 and the adjacent surface of the adapter 14.

As shown in Figure 1, a transfer mechanism 34, which mechanism is fully and completely described in my co-pending application Serial No. 149,004, filed on March 10, 1950, may be provided for receiving stoppers 31 and positioning them adjacent to the contact ring 27 (Figure 2) of the adapter 14. In such position, the shank 37 of the stopper 31 is advantageously, axially aligned with the opening in the neck of the bottle 38 into which said stopper is to be inserted.

The modified adapter 40 (Figure 4) differs from the above described adapter 14 in that the concavity 41 in the lower end thereof is cylindrical rather than a portion of a sphere. The cylindrical cavity 41 is slightly smaller in diameter than the circumference of the adapter 40 and co-axial therewith, thereby providing a contact ring 42 which may be substantially identical to the contact ring on the adapter 14. It will be recognized that other types of concavities may be provided in the adapter without departing from the scope of this invention, as long as they provide for a contact ring lying substantially within a single plane, perpendicular to the axis of said adapter. It will also be recognized that adapters having various outside diameters, particularly adjacent to the contact ring, may be employed with the ram 11 depending upon the diameter of the top of the stopper with which said adapter is to be used.

Although an adapter having an axial opening has been specifically disclosed in this application, for illustrative purposes, it will be understood that such disclosure is not intended to limit the scope of my process. In the light of this specification, it will be apparent that other specific structures for effecting evacuation of the concavity 33 will also lie within the scope of my invention.

Operation

When the apparatus 10 is assembled substantially as shown in Figures 1 and 2, a stopper 31 is positioned with its top 32 adjacent to the contact ring 27 of the adapter 14 by means, such as the transfer mechanism 34. While this positioning is being accomplished the ram 11 is preferably held in the raised position by the actuating arm 13. The air within the concavity 33 is then evacuated through the passage 23 in the adapter 14, the passage 16 in the ram 11, the outlet opening 35 in the yoke 15, and through the suction hose 36 by the vacuum pump 39. Such evacuation produces a partial vacuum in the concavity 33, thereby drawing the center portion of the upper surface of the flat top 32 of the stopper 31 (Figures 3 and 5) into said concavity 33. The contact ring 27 at the lower end of the adapter 14 prevents movement of the periphery of the flat top 32 into said concavity, thereby effecting a distortion of the stopper 31 whereby the shank 37 of said stopper is substantially reduced in diameter, particularly at the end thereof remote from from the flat top 32, as best shown in Figure 5 in solid lines. From an examination of Figure 5, it will be obvious why a stopper having a hollow shank is preferred in practicing the process to which this invention relates. However, it will be seen that my process is also applicable in varying extents to resilient stoppers of other types.

While the partial vacuum is maintained in the concavity 33, the ram 11 is moved downwardly by the actuating arm 13 until the shank 37 is appropriately inserted into the neck of the bottle 38. Said partial vacuum in the concavity 33 is then released, thereby permitting the stopper 31, and especially the shank 37 thereof, to return toward its normal shape. The ram 11 is then raised by the actuating arm 13 to a position from which another operating cycle, as above described, may be initiated.

It will be seen that adapters having contact rings corresponding to the outside diameters of stoppers 31 of various smaller sizes may be mounted upon the lower end of the ram 11 by removal of the coupling 17. For stoppers of a

larger size, it will obviously be necessary to replace the adapter 14 and coupling 17 by a unitary structure of suitable size representing a combination of said adapter 14 and coupling 17.

Although the above-mentioned drawings and description apply to one particular, preferred embodiment of an apparatus by means of which my process may be practiced, it is not my intention, implied or otherwise, to limit the practice of my process to any particular apparatus, excepting as specifically stated to the contrary in the hereinafter appended claims.

I claim:

1. In a method of distorting a resilient stopper having a flat top and a hollow cylindrical shank integral therewith for insertion into a bottle neck, the steps comprising: creating a partial vacuum in a zone immediately adjacently above and coaxial with the flat top of the stopper; preventing movement of the peripheral rim of the stopper top toward said zone while effecting movement of the center of said top partly into said zone, thereby effecting a reduction in the diameter of said shank; maintaining said partial vacuum while inserting said stopper into said bottle neck and subsequently releasing said partial vacuum.

2. In a method for inserting a resilient stopper having a flat top and a hollow cylindrical shank integral therewith into a bottle neck of less inside diameter than the normal outside diameter of said shank, the steps comprising: presenting the flat top of the stopper co-axially against an annular surface defining a zone immediately adjacently above said stopper and having an outside diameter substantially the same as the diameter of said top; creating a partial vacuum adjacent to said top within said zone such that the central portion of said top is drawn into said zone, thereby distorting said stopper and effecting a substantial reduction in the shank diameter thereof; moving said annular surface toward said bottle neck until said shank is inserted therein; releasing said partial vacuum, thereby releasing said stopper and the distortion thereof; and moving said annular surface away from said stopper.

3. In a method of distorting a resilient stopper having a flat top and a cylindrical shank integral therewith for insertion into a bottle neck, the steps comprising: creating a partial vacuum in the zone immediately adjacently above and coaxial with the flat top of the stopper; preventing movement of the peripheral rim of the stopper top toward said zone while permitting the center of said top to respond to said partial vacuum and thereby move toward said zone, thereby effecting a reduction in diameter of said shank; maintaining said partial vacuum while inserting said stopper into said bottle neck and subsequently releasing said partial vacuum.

4. In a method for inserting a resilient stopper having a flat top and a hollow cylindrical shank integral therewith into a bottle neck of less inside diameter than the normal outside diameter of said shank, the steps comprising: presenting the flat top of the stopper co-axially against an annular surface defining a zone immediately adjacently above said stopper and having an outside diameter substantially the same as the diameter of said top; creating a partial vacuum adjacent to said top within said zone such that the central portion of said top is drawn into said zone thereby distorting said stopper and effecting a substantial reduction in the shank diameter thereof; moving said annular surface toward said bottle neck until said shank is inserted therein and releasing said partial vacuum.

5. In a method of distorting a resilient stopper having a substantially flat top and a cylindrical shank integral therewith for insertion into a bottle neck, the steps comprising: creating a partial vacuum in the zone immediately adjacent the external surface of, and substantially coaxial with, the flat top of the stopper; preventing movement of the peripheral rim of the stopper top toward said zone in a direction perpendicular to the plane of said top while permitting the center of said top to respond to said partial vacuum and thereby move toward said zone, thereby effecting a reduction in the diameter of said shank; maintaining said partial vacuum while inserting said stopper into said bottle neck and subsequently releasing said partial vacuum.

THOMAS A. HAYNES.

References Cited in the file of this patent

UNITED STATES PATENTS

Number	Name	Date
1,237,761	Dwyer	Aug. 21, 1917
1,705,279	Bergmann	Mar. 12, 1929
1,750,419	Mojonnier et al.	Mar. 11, 1930
1,837,396	Barbieri	Mar. 22, 1931
2,007,369	Hawkins et al.	July 9, 1935
2,042,733	Risser	June 2, 1936
2,131,809	Killen	Oct. 4, 1938
2,157,624	Overmyer	May 9, 1939

FOREIGN PATENTS

Number	Country	Date
110,967	Austria	Oct. 25, 1928
390,471	Great Britain	Apr. 6, 1933