April 26, 1966 M. VOLPE 3,248,121

JAW ASSEMBLY

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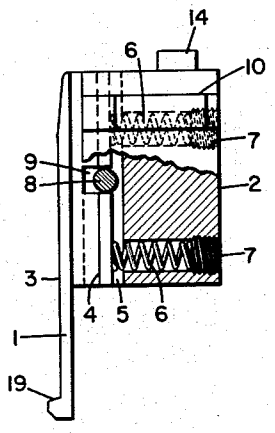


FIG. 1

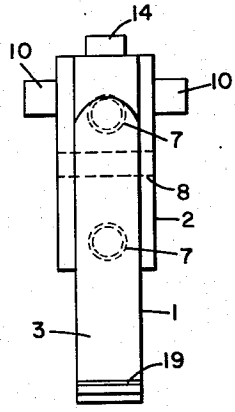


FIG. 2

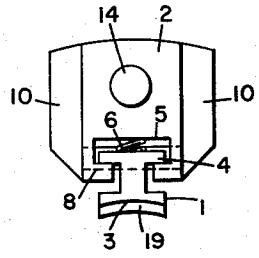


FIG. 3

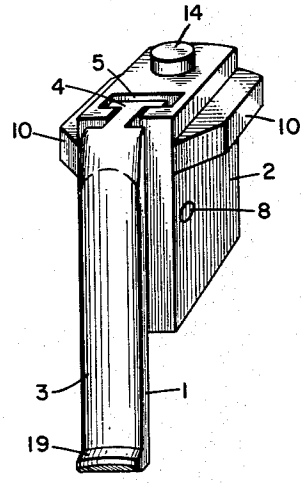


FIG. 4

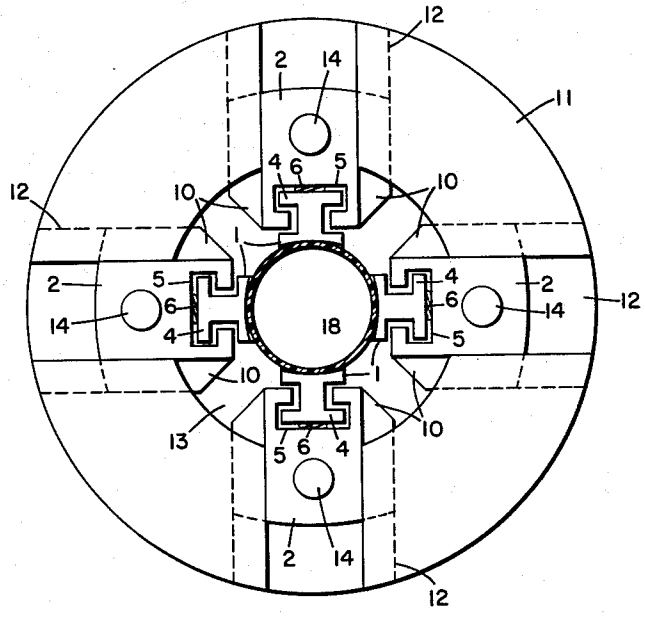


FIG. 5

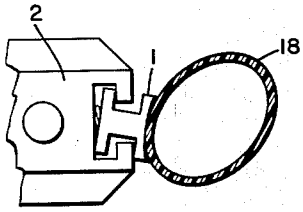


FIG. 6

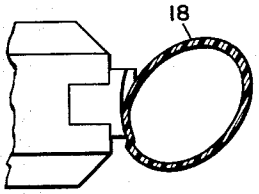


FIG. 7

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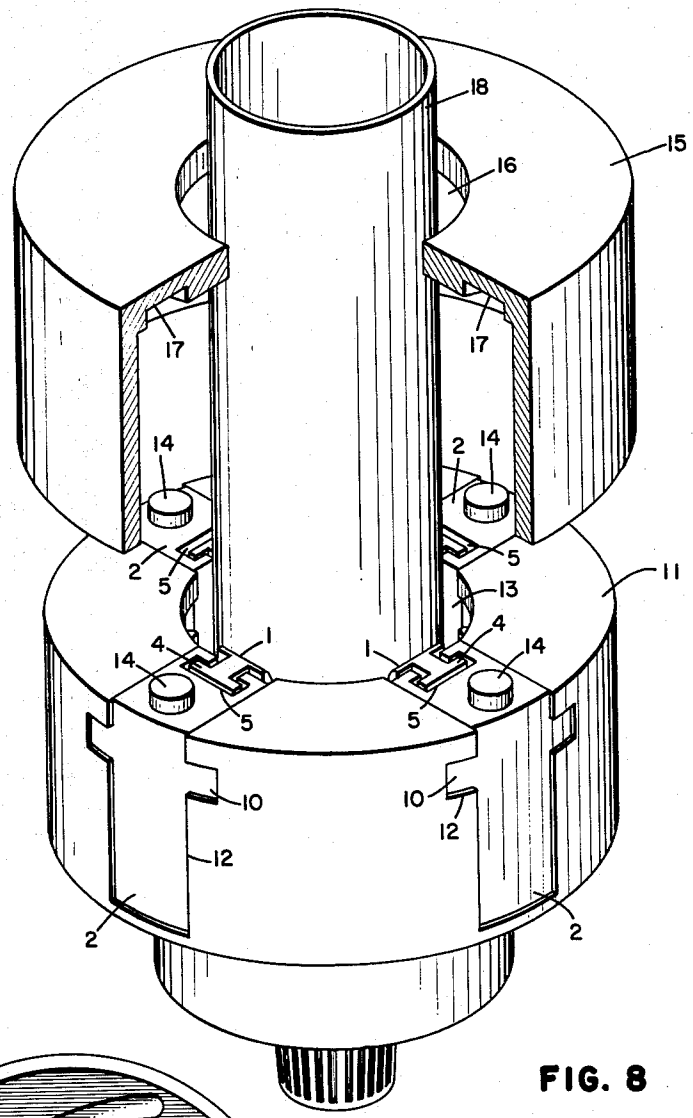


FIG. 8

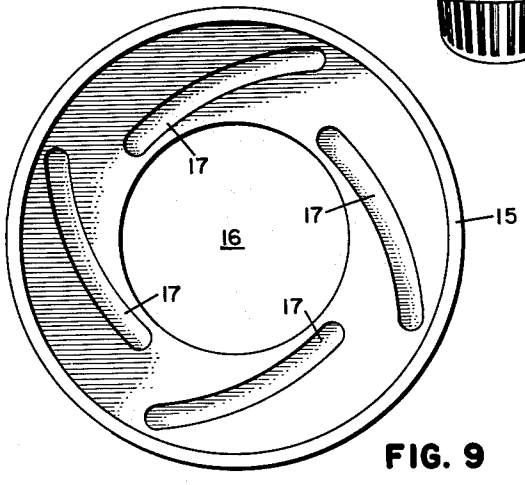


FIG. 9

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3,248,121

JAW ASSEMBLY

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4 Claims. (Cl. 279—71)

This invention relates to a means for holding and supporting collapsible tubes. More specifically, this invention teaches a jaw assembly which is capable of responding to changes in the configuration of collapsible tubes, so as to prevent denting or otherwise marring the tubes during the filling or sealing operation, or when the tube is removed from the holder.

Collapsible tubes are widely used for dispersing pasty, viscous, and liquid materials. The tube is initially supported in a vertical position while in a cylindrical shape, open on the top end. The selected material, in required quantities, is injected into the open tube from above. Thereafter, the upper portion of the tube is sealed. Upon sealing the configuration of the tube is altered: both the horizontal and vertical cross sections are effected. The horizontal cross section is changed from circular to elliptical and the vertical cross section, rather than being defined by two parallel sides, appears as two converging lines which join at the pinched topmost end of the tube.

From the above discussion, it can be readily seen that securely supporting the tubes during the various operations, without marring its surface is a problem.

It is an object of this invention to provide a jaw assembly having sufficient flexibility to delicately, but securely, support a collapsible tube.

This invention is particularly adaptable for the jaw assemblies for a tube holder as described in copending application Serial No. 318,216, filed October 23, 1963. This patent application illustrates a tube holder which can be adjusted to accommodate collapsible tubes having different diameters. It is composed of at least two, generally four, jaw assemblies, each provided with a face for engaging the sides of the collapsible tubes.

In accordance with this invention, a jaw assembly has been discovered which is composed of a jaw and a body portion. The jaw has a face or surface adapted to engage the vertical sides of the tube. The body portion is in "interlocking relationship" with the jaw. This "interlocking relationship" is the essence of the invention. As will hereinafter be described, the jaw is capable of limited horizontal reciprocal movements, horizontal pivoting movement and vertical pivoting movement in respect to the body portion. Most importantly, the vertical pivoting movement is provided, thereby presenting a degree of flexibility not properly afforded by the jaw assemblies of the prior art. Additionally, the interlocking relationship prevents vertical reciprocal movement of the jaw, and resilient means are provided to urge the jaw away from the body portion of the jaw assembly and into firm contact with the side wall of the collapsible tube.

In a more specific embodiment of the instant invention, the jaw is provided with a vertical disposed T which is adapted to interlock with a vertically aligned T groove in the body portion of the jaw assembly. A plurality of springs urges the jaw away from the tube body.

Most importantly, in this embodiment, is that the T groove be of larger dimensions than the T affixed to the jaw. This dimensional relationship permits limited horizontal and vertical pivoting of the jaw with respect to the body portion and horizontal reciprocal movements. Any means may be employed to prevent vertical reciprocal movement of the jaw with respect to the body portion.

To describe more fully the instant invention, attention is directed to the following figures.

FIGURE 1 is a side view in partial cross section of the jaw assembly of the instant invention.

FIGURE 2 and 3 are a front view and top view, respectively.

FIGURE 4 is an isometric drawing of the jaw assembly.

FIGURE 5 is a top view of the tube holder with the control cap removed showing the jaws engaging a collapsible tube prior to the closing operation.

FIGURE 6 shows the relationship of the jaw to the body portion and the collapsible tube after the tube is closed.

FIGURE 7 shows the jaw assembly of the prior art after the collapsible tube is closed.

FIGURE 8 is an isometric view, partially exploded and partially broken away, showing the tube holder.

FIGURE 9 is a bottom view of the control cap.

Turning to figures, FIGURE 1 through 4 illustrate the jaw and body portion of the jaw assembly. The jaw is provided with a face or surface **3** adapted to engage a vertically aligned collapsible tube. On the opposite end of the jaw is a vertically displaced T **4** composed of a cross bar, substantially parallel to the face **3**, and a vertical stem which serves to connect the cross bar to the rear portion of face **3**. The body portion **2** has a T shaped groove **5** adapted to receive the T **4**. As illustrated, the cross bar of the T groove is wider and somewhat longer than the cross bar of the T **4**. Additionally, the width of the stem of the T groove is wider than that of the T, but, of course, not so wide as to permit the cross bar of the T to pass therethrough.

This dimensional relationship between the T and the T groove forms an interlocking relationship which permits limited horizontal reciprocating motion of the jaw in respect to the body portion. The amount of this motion is determined by the width of the cross bar of the T in respect to the T groove and the length of the stem of the T. Maximum horizontal reciprocal displacements of the jaw is illustrated in FIGURES 1 through 4. A resilient member, in the illustration springs **6**, urges the jaw away from the body portion. These springs are held in position by set screws **7**, located in the rear of the body portion **2**, and urge the jaws into the position illustrated.

Vertical reciprocal movement of the jaw with respect to the body portion is prevented by pin **8** and the groove **9** in the rear surface of the T **4**. Viewing FIGURES 1 and 4, it can be readily seen that the jaw **1** may be capable of vertical pivotal movement. For example, pressure exerted at the uppermost portion of the jaw face **3** would compress the upper spring **6**, and conversely, pressure exerted at the lower portion of the jaw face would compress the lower spring. In either case, the jaw face, as illustrated best in FIGURE 1, would move slightly out of its vertical alignment.

Similarly, the jaw is capable of twisting about a vertical axis, i.e., pivoting vertically. This movement is best illustrated by reference to FIGURE 6.

From the above discussion, it can be readily seen that the jaw of the instant invention is capable of limited movement in response to changes in the configuration of a collapsible tube.

The intergrated application of the jaw assembly in conjunction with the adjustable tube holder aforementioned in the U.S. patent application is illustrated by reference to FIGURES 5, 8, and 9. As will be noted, a plurality of jaw assemblies are supported in a body **11** which may be described as a thick walled holed cylinder. Four radial T slots **12** are provided equidistantly spaced within the body wall.

The longitudinal axis of these slots are radially positioned with respect to the center line of the body. The

body **11** defines a hollow area **13**, which is slightly larger in diameter than the largest collapsible tube to be supported by the holder.

The jaw assembly has a horizontal guide **10** which is adapted to engage the horizontal portion of the T slot **12**.

The body portion **2** of the jaw assembly has a width adapted to fit within the vertical portion of the T slot **12**. Hence, the jaw assembly may be inserted into the T slots and reciprocated radially therein.

At the top of the body portion is located a control pin **14**. Control cap or shell **15** is adapted to slide over the body **11**. The hollow portion **16** is aligned with the hollow portion **13**. In the top inner surface of the control shell **17** are located four arcuate control channels. These channels originate towards the outer diameter of the control shell and curve gradually inward towards the hollow opening **16**. Each control channel **17** is adapted to receive a control pin **14**.

In actual operation each of the jaw assemblies is placed into the T slots so that the jaw **1** extends into the hollow area **13**. The collapsible tube **18** rests against the jaws **1** and the shoulders **19**. Each of the slide bodies is positioned so that the jaws **1** are equidistant from the center line of the body **11**. Hence, the center line of the collapsible tube is substantially coincident to the center line of the body **11** of the tube holder. The jaw assemblies are held in position by the control pins **14** interlocked with the control channels **17**. By rotating the control shell **15** with respect to the body **11**, the jaw assemblies may be positioned a predetermined distance from the center line of the body. Clockwise rotation brings the jaws closer together. Once the desired position is located, the position of the control shell **15** is fixed in relationship to the body **11**. This may be accomplished by any locking means known to those skilled in the art, such as by threading a set or shouldered screw (not shown) through the side of the control shell **11**. By tightening the screw against the body **11**, movement is prevented. If desired, proper graduation may be placed on the body or the control shell, so as to permit the rapid positioning of the jaws **1**. However, such markings are not essential: the jaws may be closed gradually about a collapsible tube until the proper adjustment is achieved.

FIGURE 5 illustrates the position of the jaw with respect to the body portion when the collapsible tube is initially inserted and during the filling operation. FIGURE 6 illustrates the preferred embodiment of the invention, after the collapsible tube has been sealed or pinched at the upper end. The horizontal cross section of the tube assumed an elliptical cross section and the jaw face pivots accordingly so as to remain tangent to and engage the collapsible tube. In order to properly follow the surface of the tube, it will be noted that the jaw has pivoted vertically in respect to the body portion.

FIGURE 7 illustrates the tube holder of the jaw assembly of the prior art, such as shown in the copending U.S. patent application, after the sealing of the collapsible tube. Because of the inability of the jaw face to pivot vertically, only one corner of the jaw rests against the surface of the collapsible tube. This will cause a dent in the tube wall which will be aggravated upon the removal of the tube from the tube holder. While the denting is exaggerated for purposes of the instant illustration, it has been observed that noticeable denting will occur and that the surface of the tube is impaired.

While not illustrated, the above jaw assembly has sufficient flexibility to provide for changes in the vertical cross section of the collapsible tube upon closing. This enables the entire tube face to rest tangentially and uniformly against the tube surface while the collapsible tube is in the tube holder. Hence, because of the rigid support afforded, the position of the collapsible tube will be exactly determinable at each and every station of the operation.

The spring or resilient member determines the amount of pressure applied to the tube wall. Additionally, it

enables some latitude in the initial positioning of the jaw, because of the limited horizontal reciprocal movement.

Initially, of course, before the insertion of the tube, the jaws must define a circumference somewhat smaller than the true diameter of the collapsible tube. Upon inserting the tube, the springs are compressed to the appropriate degree, to maintain a secure hold.

The vertical rotational or pivoting movement of the jaw should be at least 10° to either side, preferably at least 8°. Of course an excessive degree of freedom is not detrimental, but complicates the construction of the jaw assembly.

The horizontal rotational or pivoting movement should be at least 10°. It is best that this rotation be limited so that when the tube is inserted into the tube holder, it is not possible for the shoulders to spread so far apart that the tube may slip through the holder.

The adjustable tube holder must be designed to facilitate its insertion and removal from the tube filling machine. The lower portion of the body **11**, which is a reduced diameter, may be inserted into a proper female opening in the tube fitting machine. See U.S. Patent 2,574,157 where the relationship of a tube holder to a filling machine is shown.

Though the tube holder is adjustable, it is generally desirable to use a few different size adjustable holders. For example, one set of adjustable tube holders may be suitable for supporting tubes from ½" to 1" in diameter, another from 1 1/16" to 1½" and a third for tubes from 1 9/16" to 2½".

The control means illustrated for positioning the jaws is not a necessary feature of the instant invention. For example, each of the jaws may be positioned individually and provided with individual locking means. While this technique may be cumbersome, such procedure may be used. While four jaws are shown in the illustration, three or even two jaws may be adequate in the case of small tubes. Preferably, no less than three jaws should be employed. Conversely, in the case of large size collapsible tubes, the adjustable holder may be provided with six or even eight jaws.

The shoulder illustrated at the lower portion of each jaw is merely optional. Any means may be employed to limit the vertical movement of the collapsible tube. For example, a horizontal plate or ring may be affixed across the bottom of the hollow area **13**. Such plate or ring could conveniently limit the vertical displacement of the tube by engaging the bottom, or alternatively, the cap, of the tube. Means within the female opening of the tube fitting machine could also be adapted as would be obvious to those skilled in the art.

While the jaw is illustrated as extending down well past the bottom edge of the body portion, this is not essential. The jaw may be only half this length, terminating above the bottom edge. When such a short jaw is used, the shoulder may be supported in substantially the same position as shown by a rigid projection from the bottom edge of the body portion. Since, in this modification the shoulder is immovable, the danger of the tube sliding through the holder is completely eliminated. Additionally, the projection for supporting the shoulder may be formed so as to engage the very lowest surface of the tube wall. In this way further support can be provided. Though the projection lacks the flexibility of the jaw, there is no danger of marring the tube, since the cross section of this lowest surface has a constant cross section throughout the operation.

While the instant invention is primarily intended for supporting collapsible tubes, it is apparent that it is readily adaptable for other types of containers, such as jars. Nor is it mandatory that the container be of a circular cross section: regulator polygonal cross sections, e.g., square or octagonal, would not destroy the applicability of the tube holder.

The material of construction of the jaw assembly and

tube holder is of little importance. Preferably, however, a metal such as aluminum or stainless steel is employed. Other materials, such as rigid plastics, may be also advantageously adapted.

In view of the foregoing disclosures, variations and modifications thereof will be apparent to one skilled in the art, and it is intended to include within the invention all such variations and modifications except as to not come within the scope of the appended claims.

What is claimed is:

1. An adjustable tube holder for supporting collapsible tubes in substantially vertical alignment which comprises: a body; a plurality of jaw assemblies each having a substantially vertically disposed jaw having a face adapted to engage said tube, a vertically disposed body portion side by side and in loose interlocking relationship with said jaws; resilient means between said jaw and said body portion adapted to urge them apart, said loose interlocking relationship limiting the horizontal reciprocal movement and permitting limited horizontal and vertical pivoting of said jaw in respect to said body portion, means to prevent vertical reciprocal movement of said jaw with respect to said body portion; said jaw assemblies being adapted to reciprocate radially in said body, thereby permitting said tube holder to support collapsible tubes of differing diameters.

2. The adjustable tube holder of claim 1 wherein the T on said jaw and a T slot on said body portion form said loose interlocking relationship.

3. The adjustable tube holder of claim 1 wherein said face has an inwardly projecting shoulder perpendicular thereto adapted to limit the vertical displacement of said collapsible tube.

4. The adjustable tube holder of claim 1 wherein said resilient means is at least one spring.

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