April 23, 1963 C. A. FRANK 3,086,335

PACKAGING MACHINES

Filed April 1, 1960 3 Sheets-Sheet 1

FIG. 1.

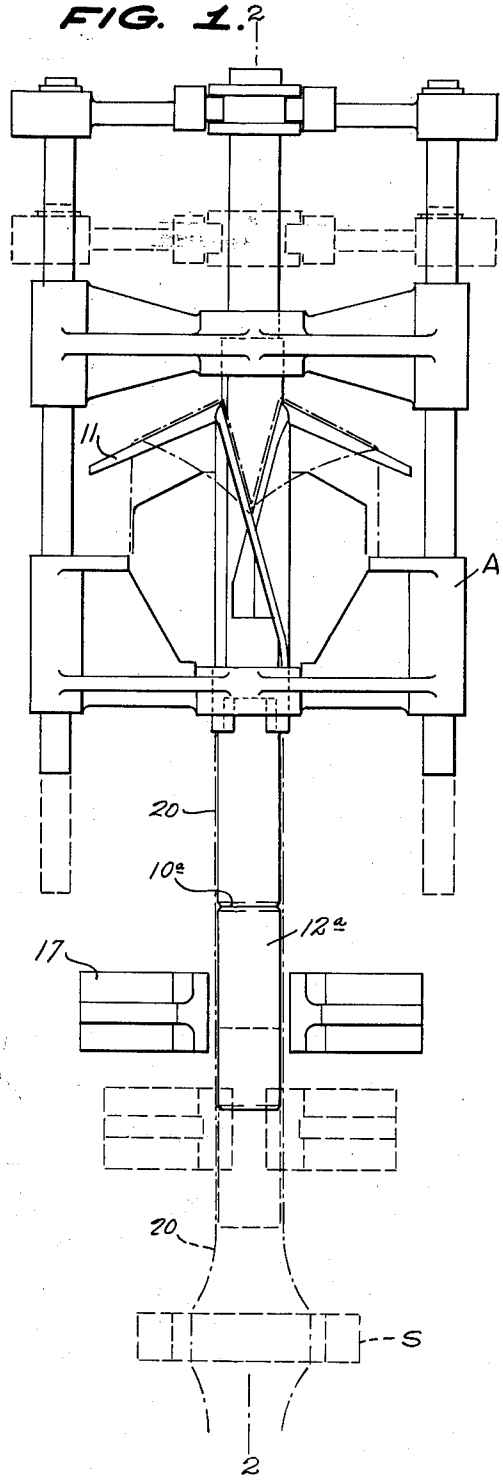


FIG. 2.

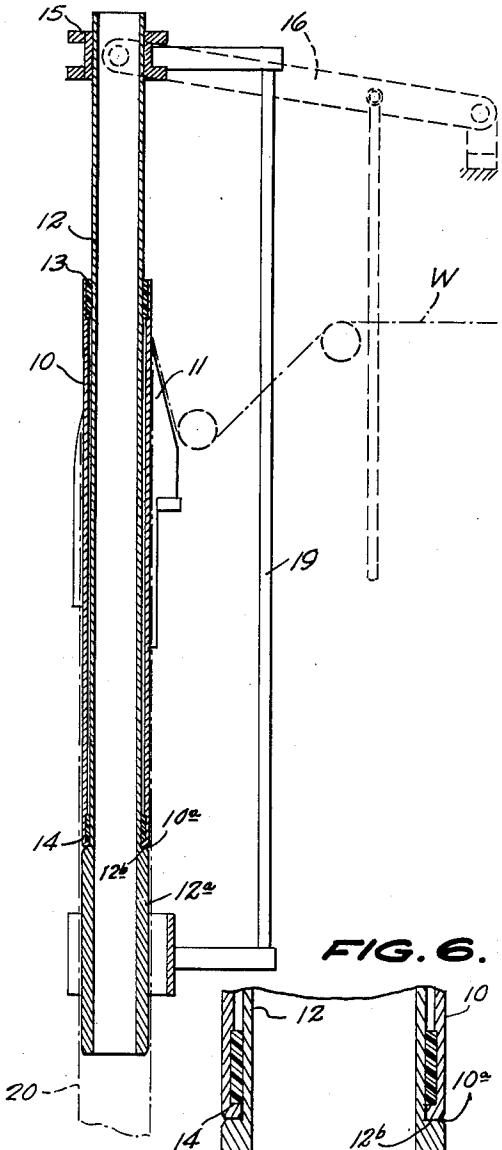


FIG. 6.

INVENTOR.
CARL A. FRANK,
BY
Mary Hall
ATTORNEY.

April 23, 1963 C. A. FRANK 3,086,335

PACKAGING MACHINES

Filed April 1, 1960 3 Sheets-Sheet 2

FIG. 3.

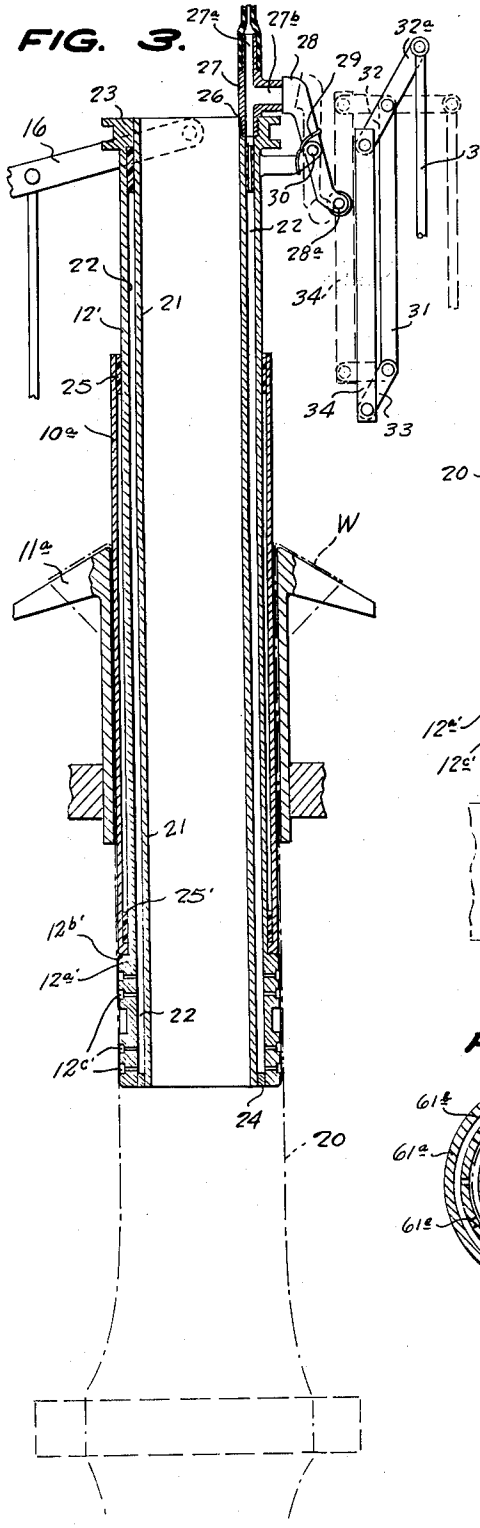


FIG. 4.

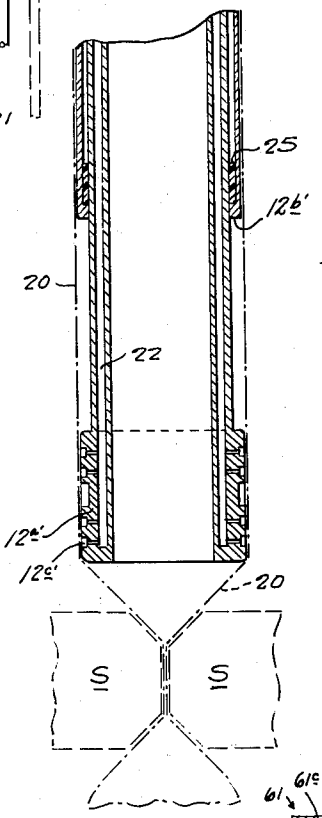


FIG. 5.

PRIOR ART

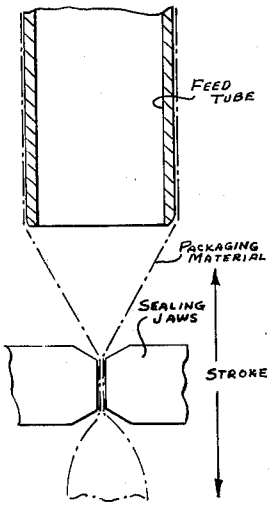


FIG. 9.

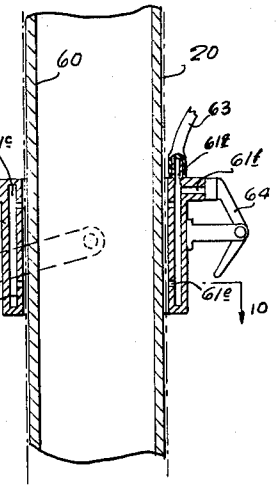
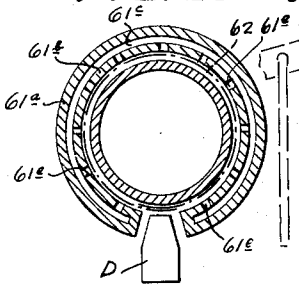


FIG. 10.



INVENTOR.
CARL A. FRANK,
BY
Max Hall
ATTORNEY

April 23, 1963 C. A. FRANK 3,086,335

PACKAGING MACHINES

Filed April 1, 1960 3 Sheets-Sheet 3

FIG. 7.

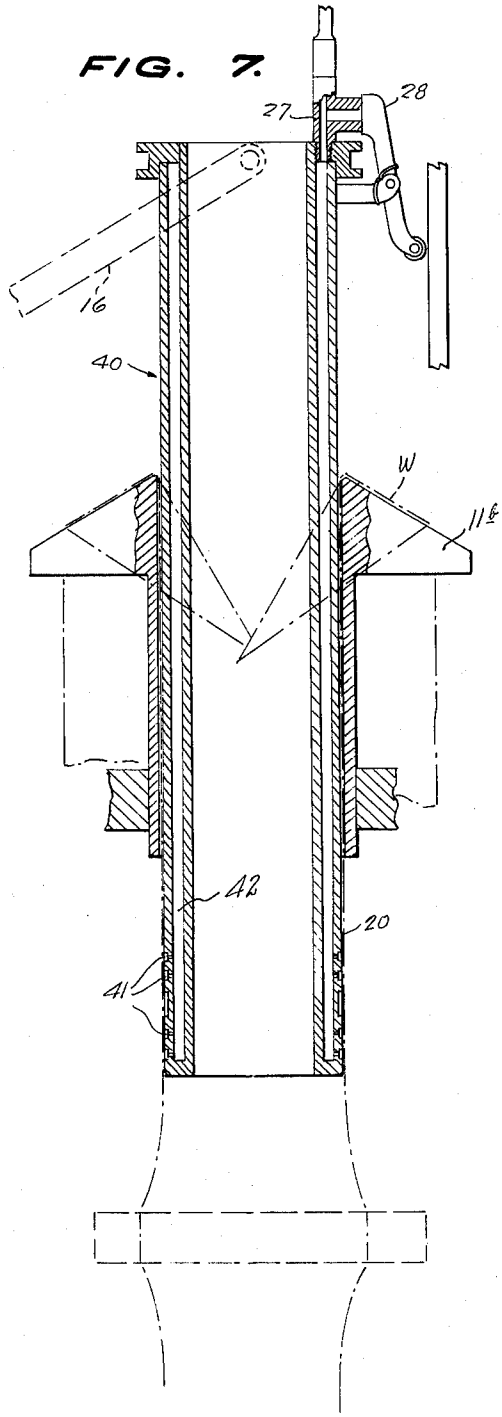
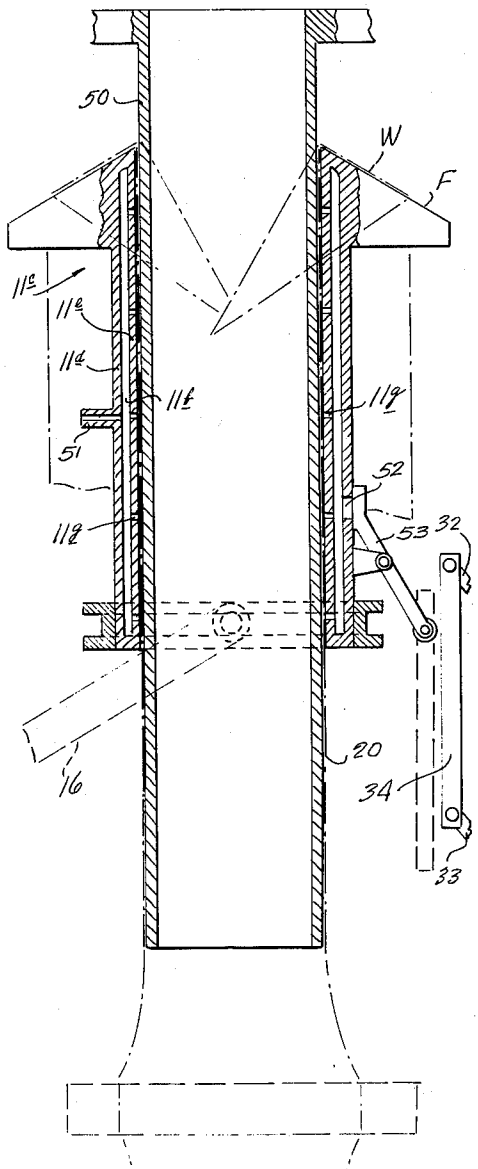


FIG. 8.



INVENTOR.
CARL A. FRANK,
BY
Max Wall
ATTORNEY.

United States Patent Office 3,086,335 Patented Apr. 23, 1963

3,086,335

PACKAGING MACHINES

Carl A. Frank, Rockford, Ill.
(624 Stanley Place, Rivervale, N.J.)

Filed Apr. 1, 1960, Ser. No. 19,260
22 Claims. (Cl. 53—180)

This invention relates to improvements in packaging machines. More specifically, it relates to improvements in automatic packaging machines of the type wherein a web of packaging material is fed into the machine where it is formed into a continuous tube, the tube is sealed at one end, at which time a product is dropped into it, the tube is then sealed above the product, and the completed package is then severed from the tube. In machines of this type, such as Zwoyer Patent No. 1,986,422, January 1, 1935, for example, a pair of reciprocating clamping bars is used to form a transverse seal on the container tube, and to draw it downwardly whereupon it is filled with a product. The bars then release the tube and move upwardly of the tube to grip it at another point. This is a continuous operation wherein successive packages are continuously formed. In machines of this type, the grip of the clamping bars compresses the wall of the container tube material so that it is flattened out and the contacting portions thereof sealed together. This tends to pull together the portions of the tube immediately above the clamping bars and forms said tube substantially into a V shape above the bars, also stretching the tube somewhat in the longitudinal direction and thereby restricting the internal capacity of the bag that is formed.

One of the objects of this invention is to prevent the pulling and stretching of the bag or container tube at this point so as to maintain as fully as possible the greatest volume capacity of the bag as it is filled with the product.

Likewise, in machines of this type, the clamping bars and their operating mechanism are cumbersome, heavy, very noisy and add considerably to the cost of the machine. A further object of this invention, therefore, is to eliminate, in certain modifications, the need for the use of clamping bars to draw the packaging material through the machine, substituting other means simpler, less expensive and noiseless in operation, to accomplish the same result. This is accomplished generally by substituting the force of suction for the mechanical motion of the clamping bars.

Another object of the invention, therefore, is to provide a feed tube which is movable, rather than stationary as heretofore, and to provide means for clamping the container tube to the feed tube by various means to accomplish the continuous feed of the container tube through the machine.

Alternatively, another object of the invention is to provide a tube former which is movable rather than stationary as heretofore, and to provide means for clamping the container tube to the tube former by various means to accomplish the continuous feed of the container tube through the machine.

Another object is to provide the feed tube or tube former with a suction box whereby suction may be applied to the container tube, either internally or externally thereof, so as to clamp the container tube to the feed tube or to the tube former during the feeding movements of either of the latter tubes, depending on which one is used for feeding movement.

A further object is to synchronize the movement of the feed tube or the tube former with the operating mechanism of the machine so that suction is applied to the container tube on the feeding stroke thereof and released on the return stroke, means being provided to prevent return movement of the container tube.

The foregoing and other objects will more fully appear from a consideration of the accompanying drawings and specification, illustrating and describing several practical embodiments of the invention.

In the drawings:

FIGURE 1 is a front elevational view of the improvement in a feed tube mechanism and tube former according to this invention;

FIGURE 2 is a central vertical sectional view along the line **2—2** of FIGURE 1, with parts shown in elevation;

FIGURE 3 is a modification of the form of the invention shown in FIGURE 1;

FIGURE 4 is a sectional detail showing the parts of FIGURE 3 in an extended operative relationship.

FIGURE 5 is a sectional detail of a prior art arrangement;

FIGURE 6 is an enlarged sectional detail of a portion of FIGURE 2;

FIGURE 7 is a sectional view of another modified form of the invention;

FIGURE 8 is a sectional view of still another modified form of the invention;

FIGURE 9 is a central vertical sectional view of a further modification, with parts in elevation; and

FIGURE 10 is a sectional view of FIGURE 9 along the line **10—10**.

According to the form shown in FIGURE 1, the invention is built about the fed tube **10** of a packaging machine of a type which is well known in the packaging machine art, through which the product is dropped into the container formed by the machine, such machine being shown, for example, in the patent to Zwoyer No. 1,986,422, January 1, 1935. This tube **10** is supported on the machine in a known manner and carries a tube folder or former **11** which is mounted over the tube **10** near its upper end and is fixedly supported thereon in any known manner, as by a bracket A extending from the frame of the machine. The tube folder **11** is also well known in the art and requires no further description. According to this invention, within the feed tube **10**, an inner tube **12** is mounted for reciprocating movement, the inner tube having a sliding fit within the outer tube **10** on bushings **13**, **14**, preferably of nylon, positioned within the tube **10** at the upper and lower ends thereof. The lower end of the outer tube terminates at point **10*a*** (FIGURE 6) and the inner tube has an integral enlarged extension **12*a*** on its lower end with a shoulder **12*b*** for which the end **10*a*** of the outer tube **10** forms a stop. The extension **12*a*** forms an internal support for the container tube, and its diameter is coextensive with the diameter of the feed tube **10**. At its upper end, the inner tube **12** is provided with an annular collar **15** fixed thereto, the collar having a peripheral annular groove **15*a***.

The inner tube is reciprocated by means of a forked arm **16**, as shown in my Patent No. 2,923,115, February 2, 1960, or by any other suitable means. It will be understood that in use, a film or web W of packaging material, such as paper, cellophane, polyethylene or the like, is drawn over the folder **11** and formed into a container tube around the outer tube **10**, the outer tube serving as a mandrel, the container tube being sealed along its longitudinal seam by a seam sealer (not shown), also well known in the art. In machines of this type, clamps are provided to grip the container tube so formed, seal it transversely and pull it downwardly while a product is dropped into it through the feed tube from above. The clamps then move upwardly to grip said container tube at another point along its length to seal the package above the product and means are usually provided for cutting the finished package from the tube.

In the present invention, separate gripping and pulling clamps **17** and separate sealing clamps S are provided.

Whereas, heretofore in the art, the pulling clamps clamped the walls of the container tube directly against one another during the pulling movement, in the present invention, the pulling clamps at the upper limit of their stroke grip the container tube against the support 12*a* and pull the container tube downwardly together with the inner feed tube extension support 12*a*. The manner in which the pulling clamps 17 are reciprocated to open and close around the container tube is well known in the art and need not be described here. Likewise, the manner in which the sealing clamps S open and close periodically to seal the container tube is well known.

The sealing clamps S are arranged to grip the container tube 20 at the bottom of the stroke of the pulling clamps and just before the pulling clamps are opened and moved upwards. The action of the pulling clamps 17 is so synchronized with the movement of the inner feed tube 12 that the clamps open as the tube reaches the bottom of its stroke and closes as the tube reaches the upper limit of its stroke, the clamps being connected to the tube by means of yoke 19 and moving up and down with the tube. In the operation of this mechanism, the container tube 20 is maintained as a cylinder in cross section while the product is dropped into it, as shown in FIGURE 4, rather than an oval or flat package in cross section as is conventional in the art and shown in FIGURE 5. By this means, when the product is dropped into the container tube 20 after the sealing jaws S have closed, with the extension 12*c* still at its lower limit, a greater amount of the product can be accommodated within the same amount of space within the container before the extension moves up and the container tube is sealed at its upper end and made into a package. The inner tube extension 12*a* thus holds the container tube open in the form of a cylinder closer to the sealing clamps.

In the form shown in FIGURE 3, the outer tube 10*a* also carries the tube folder 11*a*, and the inner reciprocating tube 12′ has the lower enlarged extension 12*a*′ with the shoulder 12*b*′. This inner tube, however, is a double walled construction having a second tube 21 of smaller diameter spaced from the inner tube 12′ to define an annular space 22. This space is closed at the top by an annular cap member 23 and at the bottom by an annular ring 24 which is suitably secured to the tubes 12′ and 21 by welding, for example.

In this form of the invention, the extension 12*a*′ is provided around its periphery with a series of ports or passages 12*c*′ which connect the outer face of said extension with the annular space 22. The inner tube unit 12′, 21, may be reciprocated with respect to the outer tube 10*a* as described with respect to FIGURE 1, the inner tube unit sliding on friction bearings 25, 25′ at the upper and lower ends thereof. The annular cap 23 has a port 26 formed in it to communicate with the space 22, the port being fitted with a coupling 27 adapted for connection with a source of vacuum.

In use, the web W to form the packaging container 20 is drawn over the tube former 11*a* and a container tube is formed in the manner well known in the art. However, in this form of the invention, the clamps for pulling the container tube are omitted. Instead, suction from the vacuum source is applied to the interior wall of the container tube 20 through the space 22 and ports 12*c*′, as many of the latter being provided as is necessary to tightly clamp the container tube around the outer wall of the extension 12*a*′. The outer wall 10*a* and the extension 12*a*′ serve as a mandrel for the container tube 20. With the container tube 20 so clamped to the inner tube unit, the unit may be moved downwardly by any suitable mechanism, the means disclosed with respect to FIGURE 1 being an illustration of one form which may be employed. The vacuum source may be operated continuously while the machine is in operation so that the space 22 becomes, in effect, a vacuum chamber or suction box with suction operating continuously on the container tube 20 as described. Means therefore must be provided to vent said chamber 22 periodically when the inner tube unit reaches the lower limit of its stroke during a cycle of operation, so as to release the container tube in order that it may be filled with a product, and the inner tube unit moved upwardly to begin another cycle. The container tube 20 is held stationary during the upward movement of the reciprocating tube by the grip of the sealing clamps S while the transverse seal is being formed, the construction and operation of the sealing clamps being well known in the art and therefore requiring no further description here. The venting means comprises a flap valve 28 secured to the upper portion of the inner tube unit, the coupling 27 having a passage 27*a* connecting the vacuum chamber 22 with the source of vacuum. A port 27*b* connects the passage 27*a* with the atmosphere, this port being closed by the flap closure member 28 which is pivoted at 30 intermediate its ends. The closure member 28 is controlled by a spring 29 which constantly urges the flap into closing position over the port 27*b*. The other end 28*a* of the closure member extends outwardly of its pivot into the path of a parallel bar arrangement characterized by a bar 31 fixed to the frame of the machine, the bar pivotally supporting a pair of spaced parallel links 32, 33 to which a fourth bar 34, parallel to the fixed bar, is pivotally mounted. One of the links has an extension 32*a* carrying a link 35 which is periodically operated from a cam shaft (not shown) or other operating mechanism of the machine. This parallel bar arrangement is so synchronized with the movement of the inner tube unit that it actuates the flap valve 28 to vent the vacuum chamber 22 to the atmosphere after the inner tube unit has reached the lower limit of its stroke, and holds the flap valve in the open position on the upstroke of the inner tube unit. As the unit reaches the upper limit of its stroke, the bar 34 is withdrawn from the end 28*a* of the valve and the closed suction circuit is reestablished. By this means, it will be clear that the container tube 20 is periodically moved downwardly as the inner tube unit moves downwardly, the container tube being held secured to the inner tube by suction, the suction being released when the container and tube unit reach the lower limit of the stroke of the tube unit. The product to be packaged is dropped through the central tube 21, which forms the feed tube for the machine. In this form of the invention, therefore, separate container gripping and pulling clamps as heretofore used in the art, with their attendant disadvantages, are completely eliminated. In FIGURE 3, the inner tube unit is shown at the upper limit of its stroke, with the flap valve 28 closed so that suction is operating in the chamber 22 to grip the container tube 20 tightly against the outer wall of the extension member 12*a*′, preparatory to a downward stroke. The sealing clamps S are open. In FIGURE 4, the sliding tube unit is shown in its lowermost position with the sealing clamps closed on the tube 20 to seal it and form a bag, which is now in condition to receive the charge of the product. It will be observed that in this condition, the tube 20 is held wide open by the inner tube closely adjacent the sealing clamps S so that as the product is dropped into it, and the inner tube moves upwardly, a greater amount of the product can be accommodated within the container.

A modification of the construction and arrangement of FIGURE 3 is shown in FIGURE 7. In this form, the stationary feed tube 10*a* of FIGURE 3 is eliminated and the double walled inner tube 40, as previously described with respect to FIGURE 3, is reciprocably mounted directly within the tube former 11*b* which is fixed to some stationary part of the machine as heretofore practiced in the art. Sealing clamps S, as known in the art, are pro-

vided to form the transverse seal for the packages formed. The lower end of the sliding tube **40** has ports **41** in the outer wall, the ports communicating with the vacuum space **42** between the double walls, suction being supplied and controlled as indicated with respect to FIGURE 3.

In the form of the invention shown in FIGURE 8, the feed tube **50** is held stationary as is conventional in the art, but the tube former **11***c* is made to reciprocate with respect to the feed tube by means of the arm **16**. This tube former has a double walled tubular construction **11***d* and **11***e*, providing a space **11***f* between them. The inner wall **11***e* is provided with a plurality of ports **11***g* which connect said space with the internal bore of the tube former. The space **11***f* is connected by means of a flexible connection **51** to a suitable source of vacuum, and the space is vented to atmosphere by means of a port **52** in the outside wall **11***d*, the port being controlled by a flap valve **53** as explained in connection with FIGURE 3. It is possible, in this form of the invention, to eliminate the feed tube **50** entirely, the tube former **11***c* providing adequate support and guiding means for the container tube **20**.

In the use of this form of the invention, the web of packaging material W is drawn over the shoulder F of the former and through the folding mechanism thereof where it is formed into a container tube **20** around the feed tube **50**. It is then pulled down to the point where it may be engaged by the sealing clamps S. With the flap valve **53** closed and the tube former **11***c* at the upper limit of its stroke, suction is applied in the chamber **11***f* and through the ports **11***g* to the container tube **20** to secure said tube **50** to the inner wall **11***e* of the tube former. The tube former is then moved downwardly by any suitable mechanism, as by the arm **16**, carrying the container tube with it until it reaches the lower limit of its stroke. At that point in the cycle of operation, the sealing clamps S close on the container tube closely adjacent the lower end of the feed tube **50** and the product is dropped into the tube **50** from above. The vacuum chamber **11***f* is vented to atmosphere by opening flap valve **53** as the tube former reaches its lower limit, freeing the container tube **20** from its adhesion to the wall **11***e* so that the tube former may return to its starting position to begin another cycle of operation.

In the form of the invention shown in FIGURE 9, the feed tube **60** is stationary and carries a conventional tube former (not shown) as in FIGURE 1, which is also stationary. The conventional gripping and pulling clamps, however, are omitted in this form of the invention and a reciprocating sleeve is substituted to pull the container tube **20** in its successive movements along the feed tube. This sleeve is positioned over the tube **60** and comprises a member **61** having the double walls **61***a*, **61***b* with the space **61***c* between them. The interior wall **61***b* is provided with a plurality of ports **61***e* which communicate with the internal bore **62** of the sleeve. The sleeve is split as shown to accommodate the fixed longitudinal seam sealer D. The sleeve is reciprocated on the tube **60** by means of the driven arm **16**, as explained with respect to the previous figures, or it may be driven in any other suitable manner. The sleeve has a port **61***f* which establishes communication between the chamber **61***c* and the atmosphere, and a port **61***g* is provided for connection by means of a flexible tube **63** with a source of vacuum. A valve **64**, similar in construction and operation to the valve shown and described with respect to FIGURE 8, normally closes the port **61***f*.

In operation, with the container tube **20** initially pulled down between the tube **60** and the sleeve **61**, with the sleeve at the upper limit of its stroke, suction applied in the space **61***c* will grip the container tube through the openings **61***e* and clamp it to the wall **61***b* of the sleeve, and downward movement thereof will carry the container tube with it. As the sleeve reaches the lower limit of its stroke, the sealing jaws (not shown) will clamp the container tube closely adjacent the lower end of the feed tube **60** and form a transverse seal. At this time the product is dropped into the container tube **20** through feed tube **60**, and the valve **64** is opened to vent the chamber **61***c* to the atmosphere, thereby releasing the grip on the tube **20**, whereupon the sleeve is returned on its upward stroke to start another cycle of operation.

In each of the foregoing illustrations, the length of the stroke of the reciprocating member is adjusted to suit the length of the package desired.

While various forms of the invention have been shown and described, it is to be understood that these are merely for illustrative purposes and that changes in the construction and design may be made without departing from the spirit of the invention as defined by the appended claims.

What is claimed and desired to be secured by United States Letters Patent is as follows:

1. In a packaging machine, the combination with a tube former member adapted to form a continuous container tube from a web of material, of a feed tube member, said feed tube forming a passage for feeding and discharging a product into said container tube, one of said members forming a support for said container tube, said support member being reciprocable with respect to the other member, said support member including a suction box for applying suction to said container tube when said support member is moved, means for applying said suction when the support member moves in one direction and for releasing it when the support member moves in the opposite direction.

2. In a packaging machine, the combination comprising a package tube former over which a web of packaging material is drawn to form a container tube, a stationary feed tube member within said tube former, said tube former being reciprocable with respect to the feed tube, and means for pulling said packaging material between said members to form the container tube therebetween, said pulling means comprising a suction box on said tube former applying suction to said container tube.

3. A device according to claim 2, in which said tube former comprises a double-walled construction forming a suction chamber, one of said walls having parts therein for the application of suction to said container tube.

4. In a packaging machine, the combination comprising a feed tube member forming a mandrel over which a container tube is drawn, and a sleeve member about said feed tube member, said container tube adapted to be drawn between said sleeve and said feed tube, said sleeve member having a suction box thereon in communication with said container tube, means to reciprocate said sleeve along said feed tube, means for applying suction to said container tube to secure same against said sleeve for motion of said sleeve and container tube in one direction and to release said suction for motion of said sleeve in the opposite direction.

5. A container tube feeding mechanism for a packaging machine comprising a stationary product feed tube member over which a container tube is drawn while a product is fed through said feed tube, a double-walled sleeve member forming a suction box about said feed tube, said sleeve member being spaced from said feed tube a distance sufficient to allow free passage of said container tube in the space therebetween, said sleeve member having ports in the wall in communication with said space, means for reciprocating said sleeve member, means for applying suction to said container tube through said suction box and ports to clamp said container tube to said sleeve for motion in one direction, and means for venting said suction box to release said container tube from said sleeve for motion of said sleeve in the opposite direction.

6. A device according to claim 5 in which the suction box is valved, means for closing the valve when the sleeve is moved in one direction to feed said container tube, and means for opening the valve when the sleeve is moved in the opposite direction.

7. Means for pulling flexible tube material comprising a rigid hollow mandrel member, a sleeve member enclosing said mandrel and spaced therefrom a distance sufficient to allow free passage of said flexible tube material between them, one of said members being reciprocable with respect to the other, one of said members comprising a suction box for applying suction to said flexible tube material to clamp same to the reciprocable member for its movement in one direction.

8. Means according to claim 7 in which the mandrel member provides a passage for receiving and discharging a product into said flexible tube material.

9. In a packaging machine, the combination comprising a stationary product feed tube member over which a container tube is drawn, and a sleeve about said feed tube member, the sleeve comprising a suction box in communication with said container tube, and means for venting said box, said container tube being clamped to said sleeve by the application of suction thereto, and being released from said sleeve when said box is vented, said container tube adapted to be drawn between said sleeve and said feed tube member, means for reciprocating said sleeve along said feed tube, and means for clamping said container tube to said sleeve for motion thereof in one direction and for releasing said container tube from said sleeve for motion in the opposite direction.

10. In a packaging machine, the combination with a package tube former member over which a web of packaging material is drawn to form a container tube, of a product receiving feed tube member within said tube former, said feed tube forming a passage for receiving and discharging a product into said container tube, one of said members being movable with respect to the other, each of said members being in contact with said container tube for a portion of its length, and means for clamping said container tube to said movable member for feeding movement, said clamping means comprising a suction box on the movable member, said box having ports leading to said container tube, and means to apply and release suction from said box to said container tube to clamp said container tube to said movable member.

11. A device according to claim 10 in which the feed tube member is the movable member, and the suction is applied to the interior wall of the container tube.

12. A device according to claim 10 in which the tube former is the movable member and the suction is applied to the exterior wall of the container tube.

13. In a packaging machine, the combination with a tube former of inner and outer feed tubes, the inner tube being reciprocable with respect to said outer tube and being of greater length than said outer tube, said inner tube forming a passage for receiving and discharging a product into said container tube, a portion of said length being enlarged to be coextensive in diameter with that of said outer tube, said inner and outer tubes forming a mandrel to support a flexible container tube as it is formed over said tube former, said inner tube comprising a suction box with passages leading therefrom to said container tube, and means for applying suction to the wall of said container tube during its movement in one direction.

14. A device according to claim 1 in which said last named means comprises a valve controlling said suction box, and means on the machine operating to close said valve when said support member moves in said one direction and to vent said valve when the support member moves in said opposite direction.

15. A device for pulling tubes comprising a stationary inner tube member over which a flexible container tube is adapted to be drawn, said inner tube providing an unobstructed passage for receiving and discharging a product into said container tube, an outer member enclosing said stationary member and spaced therefrom a distance sufficient to allow free passage of said flexible tube member between them, said inner member being reciprocable with respect to said outer member, and means carried by said reciprocable member for clamping said container tube to said reciprocable member.

16. In a packaging machine, the combination comprising a package tube former over which a web of packaging material is drawn to form a container tube, a stationary feed tube member within said tube former, said tube former being reciprocable with respect to the said feed tube, said packaging material passing between said tube former and feed tube, and means for clamping said packaging material to said tube former to pull said container tube over said feed tube.

17. A packaging machine comprising a package tube former over which a web of packaging material is drawn to form a container tube, means for reciprocating said tube former, and means for clamping said packaging material to said tube former to pull said packaging material with said tube former.

18. A device according to claim 17, including means to release said clamping means to free the packaging material from the tube former at the end of a stroke of said tube former.

19. A packaging machine comprising a package tube former over which a web of packaging material is drawn to form a container tube, means for reciprocating said tube former, means on said tube former for applying suction to said packaging material to clamp same to said tube former, and means for releasing said suction to free said packaging material from said tube former at the end of a stroke of said tube former.

20. In a packaging machine, the combination with a package tube former member over which a web of packaging material is drawn to form a container tube, of a produce receiving feed tube member within said tube former member, said feed tube member forming an unobstructed package for receiving and discharging a product into said container tube, the feed tube member being reciprocable with respect to the other member and comprising a suction box in communication with said container tube, and means to apply suction to the container tube to clamp said container tube to the feed tube to advance said container tube.

21. In a packaging machine, the combination with a package tube former member over which a web of packaging material is drawn to form a container tube, of a product receiving feed tube member within said tube former member, said feed tube member forming an unobstructed passage for receiving and discharging a product into said container tube, the tube former member being reciprocable with respect to the other member and comprising a suction box in communication with said container tube, and means to apply suction to said container tube to clamp same to the tube former member.

22. A device for pulling tubes comprising a stationary inner tube member over which a flexible container tube is adapted to be drawn, said inner tube providing an unobstructed passage for receiving and discharging a product said container tube, an outer member enclosing said stationary member and spaced therefrom a distance sufficient to allow free passage of said flexible tube member between them, said outer member being reciprocable with respect to said inner member, said outer member comprising a suction box in communication with said container tube, and means for controlling the application of suction to said container tube.

References Cited in the file of this patent

UNITED STATES PATENTS

1,944,147	Aldrich	Jan. 23, 1934
2,521,007	Heinmets	Sept. 5, 1950