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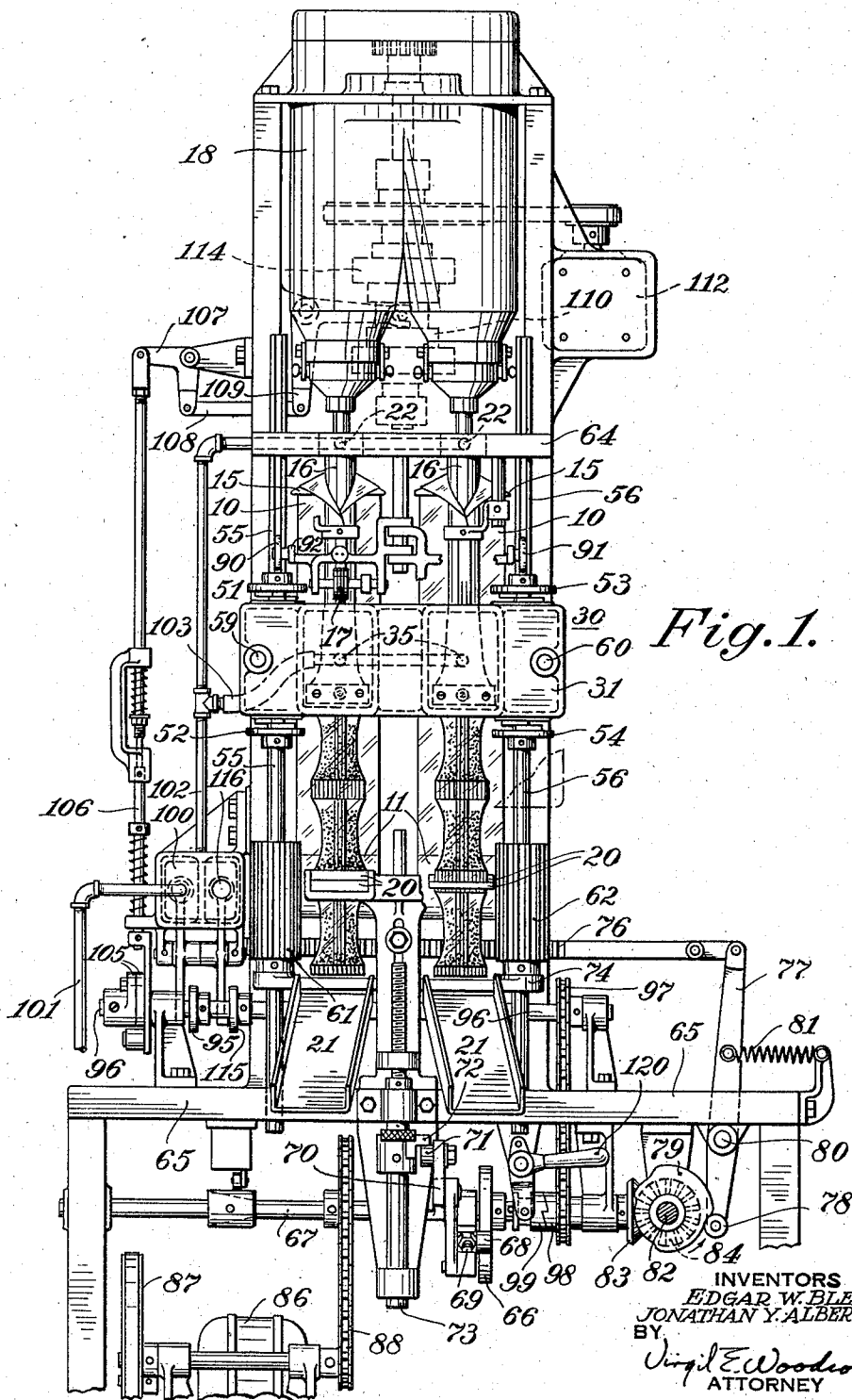
E. W. BLEAM ET AL

2,432,373

SYSTEM FOR FILLING CONTAINERS

Filed Aug. 8, 1945

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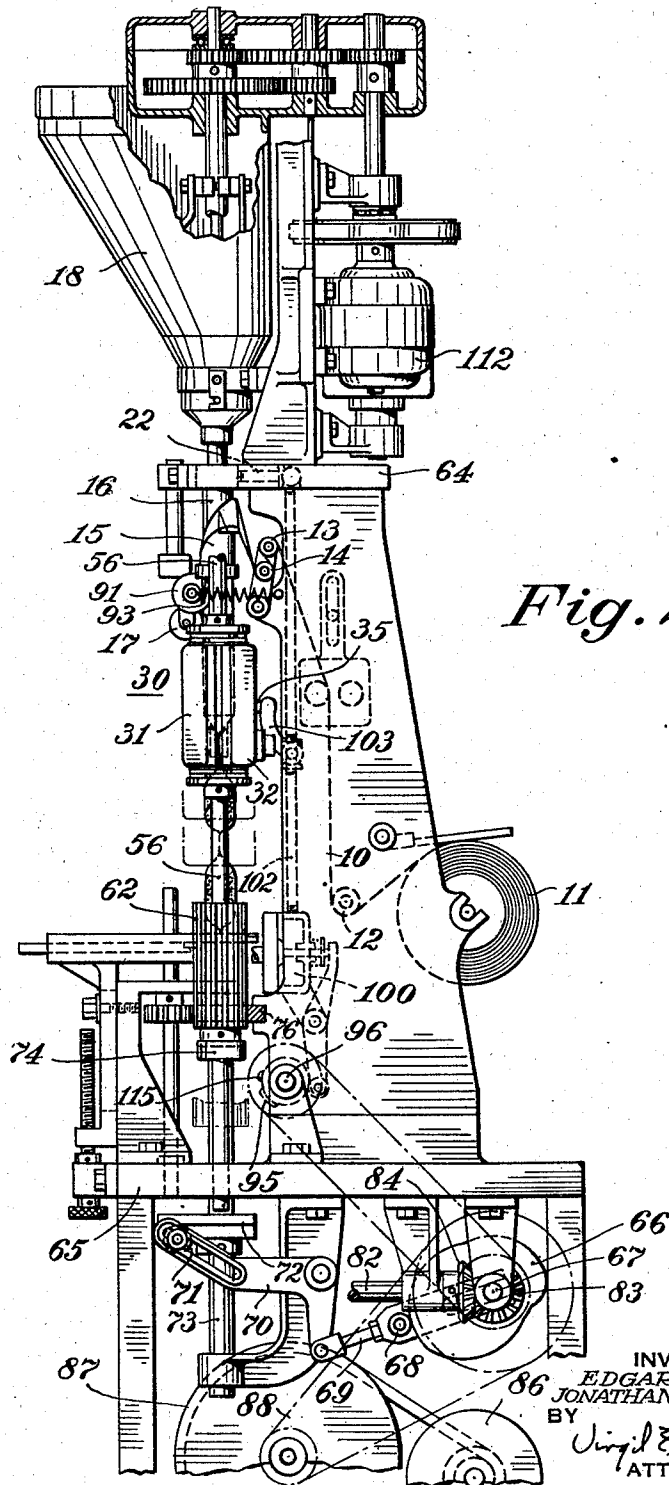


Fig. 2.

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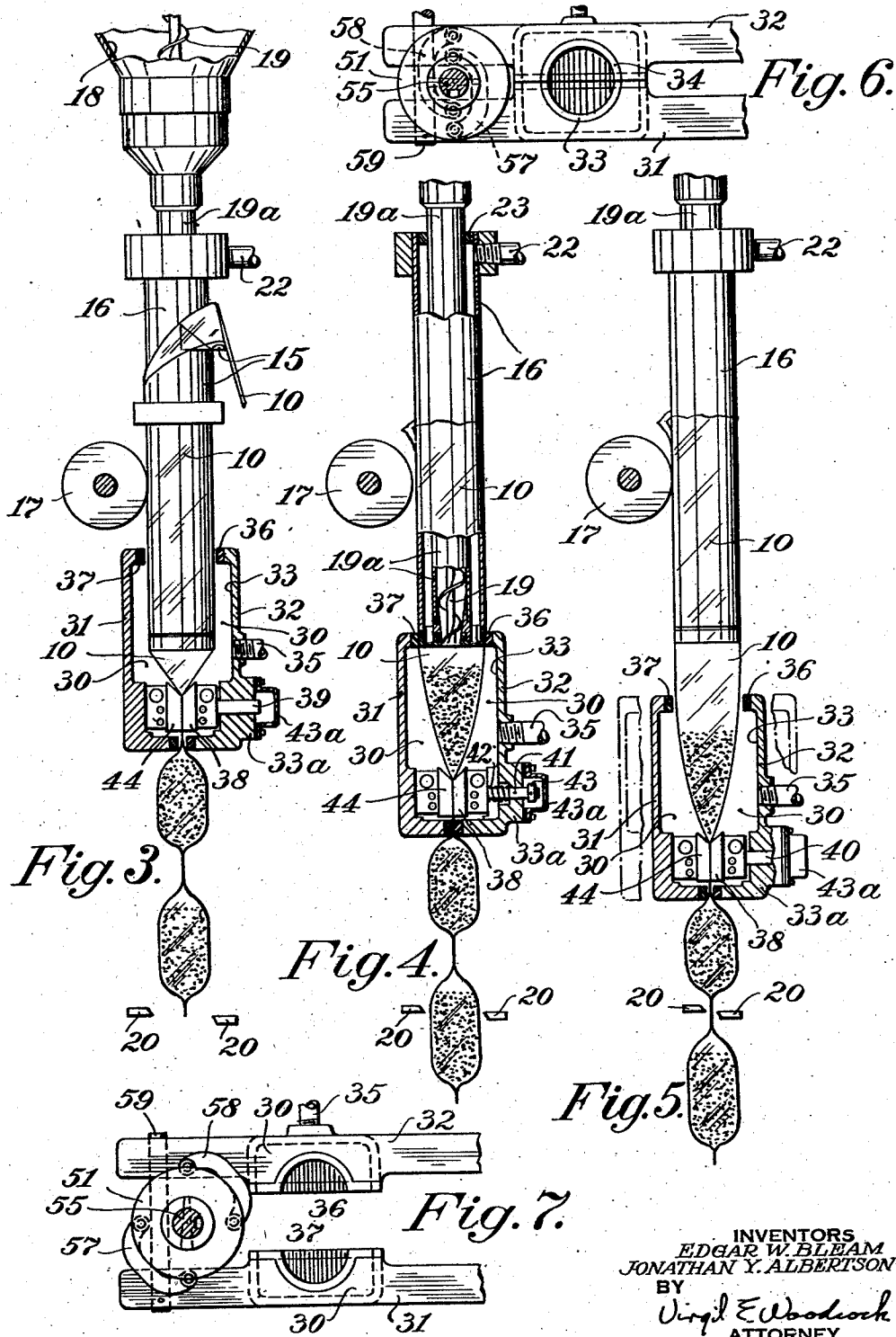
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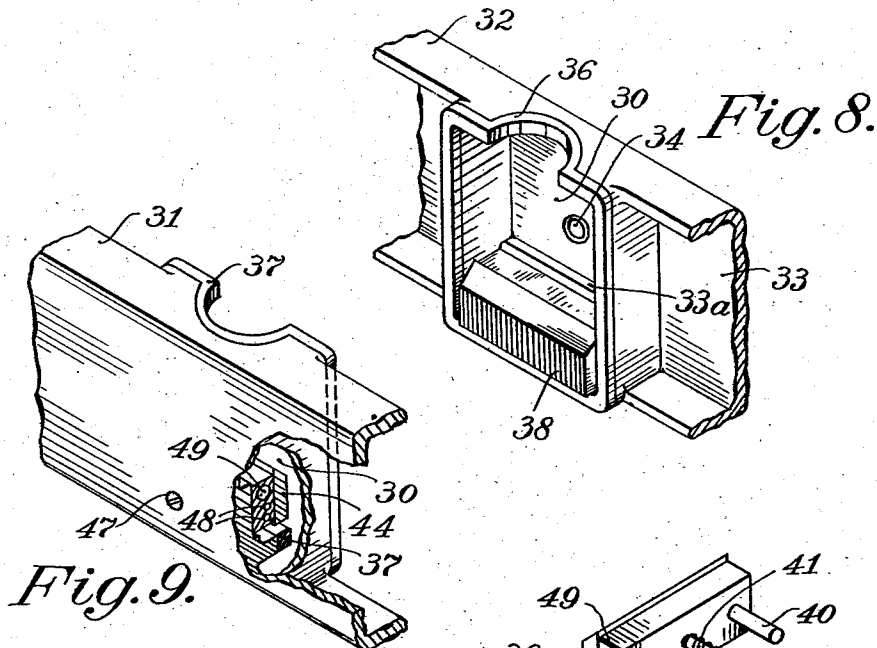


Fig. 9.

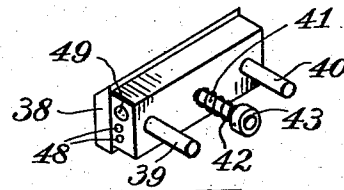


Fig. 11.

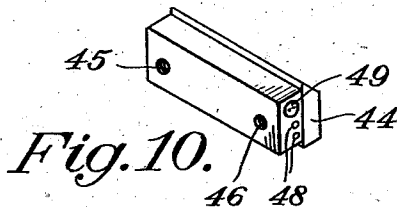


Fig. 10.

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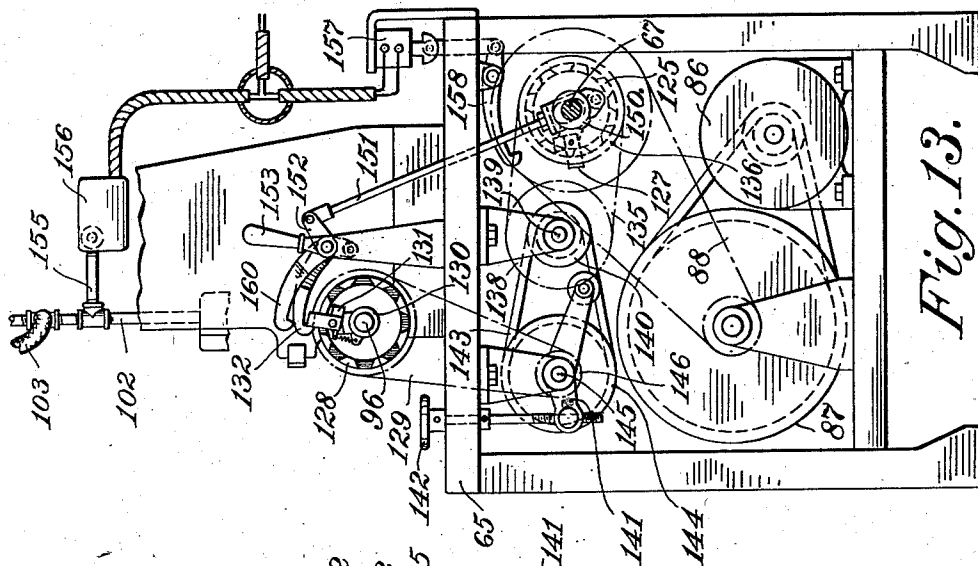


Fig. 13.

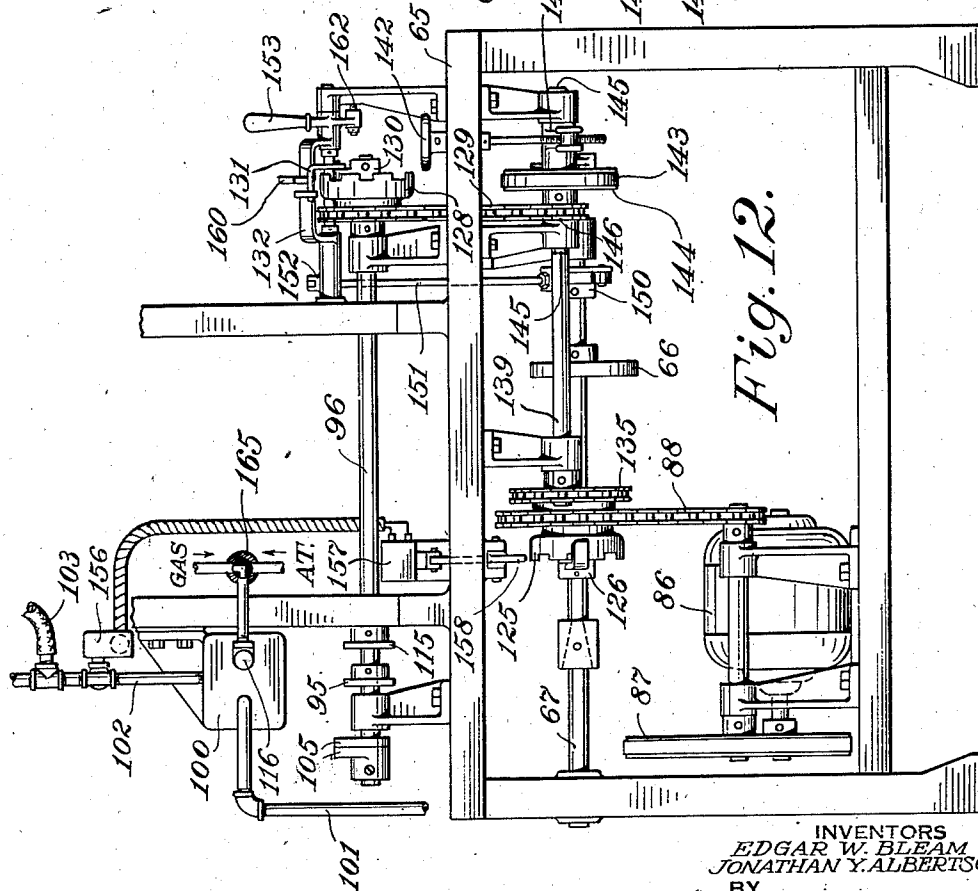


Fig. 12.

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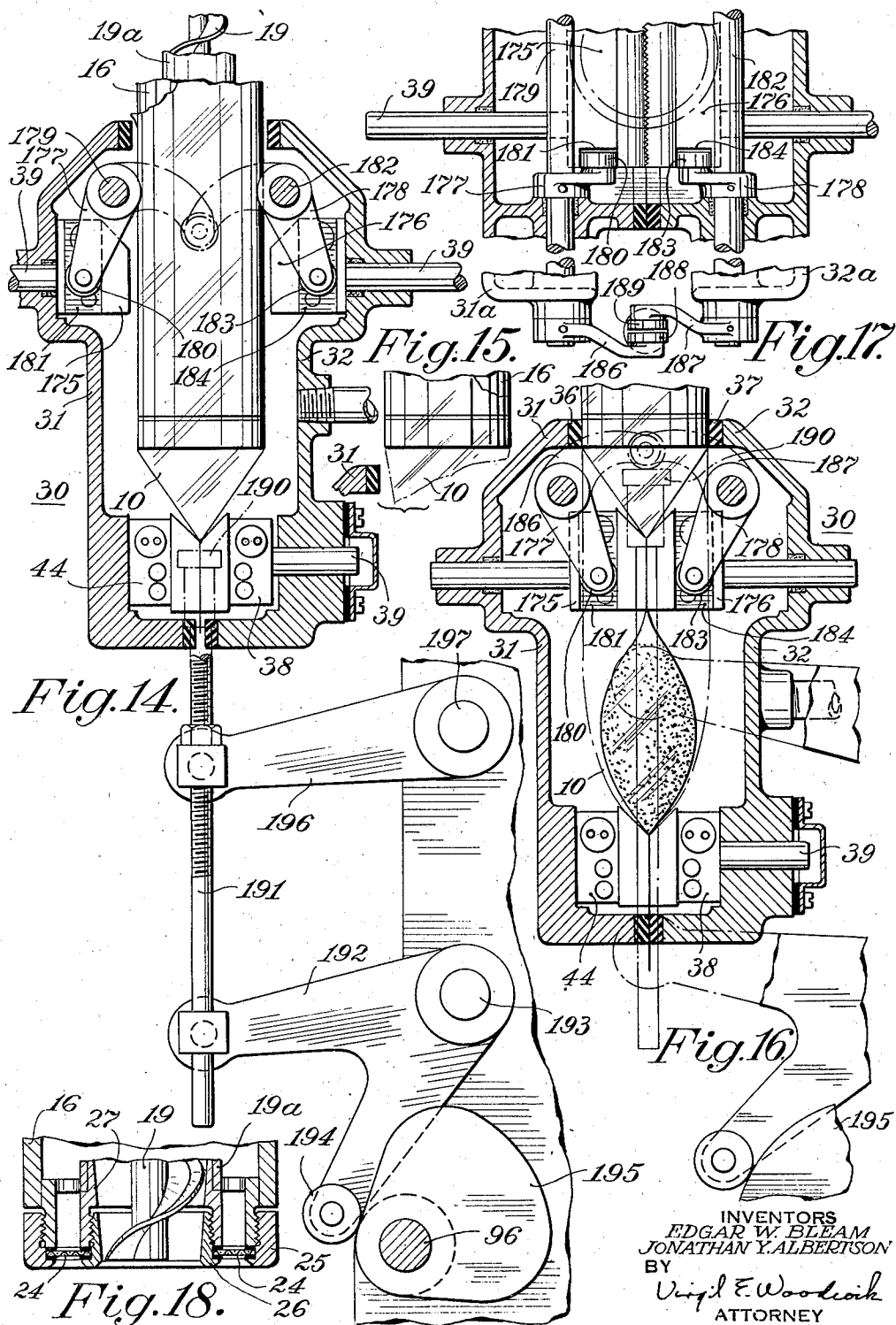
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UNITED STATES PATENT OFFICE

2,432,373

SYSTEM FOR FILLING CONTAINERS

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Application August 8, 1945, Serial No. 609,624

33 Claims. (Cl. 93—3)

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This invention relates to systems for making, filling and sealing containers of sheet material, particularly thermoplastic web material, and has for an object the provision of methods and means for applying vacuum to the containers to assist in the filling thereof.

Over a period of years, systems for making, filling and sealing containers of sheet material have been growing in popularity. The sheet material is fed from a roll around forming tools and after one end and the sides thereof have been sealed, a predetermined quantity of material is fed into the partially formed container. Thereafter, the upper end of the container is sealed, simultaneously forming a seal for the lower end of the next succeeding container. Though systems of this type have proved highly satisfactory and are in wide use, they leave something to be desired where the container is to be filled with a material which does not readily flow under the influence of gravity. Even where an auger feed is utilized, powdered material such as cocoa, talcum, flour, and powdered materials including milk, soap, and the like, occupy far more space in the container than is desired due to the air which is occluded within the material.

In accordance with the invention, and in order to insure compactness and dense packing of such powdered material in the container, a vacuum is applied thereto prior to discharge of the material into the container. In this manner, not only is the filling of the container facilitated, but the filling or charge is dense and compact. More material may be introduced into a container of given size, or a container of less size may be utilized by filling under a partial vacuum than by filling without the vacuum. The resultant packages or containers, compactly filled, over a period of time maintain a better appearance and never have a slack-filled appearance which would otherwise result.

Further in accordance with the invention, a substantial saving results in the amount of thermoplastic web material required for a given number of bags or containers. Moreover, the bags or containers are filled at high rates of speed, with the time required for producing a partial vacuum minimized.

For a more complete understanding of the invention and for further objects and advantages,

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thereof, reference should be had to the following description taken in conjunction with the accompanying drawings, in which:

Fig. 1 is a front elevational view, with parts broken away, of a machine for making, filling under vacuum, and sealing containers;

Fig. 2 is a side elevation, with parts broken away, of the machine of Fig. 1;

Fig. 3 is a fragmentary view, partly in section, showing the gripping and suction-applying mechanism in its uppermost position;

Fig. 4 is a fragmentary view, partly in section, showing the suction mechanism in an intermediate position;

Fig. 5 is a fragmentary view, partly in section, showing the suction and gripping mechanism in its lowermost position;

Fig. 6 is a fractional plan view with certain parts omitted, to illustrate the operating mechanism for the gripping and suction-applying mechanism, with the parts in the engaging positions;

Fig. 7 is a fractional plan view similar to Fig. 6 but with the parts in the disengaged or retracted position;

Fig. 8 is a perspective view, partly in section, of one element of the suction and gripping mechanism;

Fig. 9 is a perspective view, partly in section, of the other element of the suction and gripping mechanism;

Fig. 10 is a perspective view of the sealing element partly shown in Fig. 9;

Fig. 11 is a perspective view of the sealing element partly shown in Fig. 8;

Fig. 12 is a front elevational view of a modified form of the driving mechanism illustrated in Fig. 1 with certain of the parts omitted;

Fig. 13 is a side elevational view of the modified mechanism of Fig. 12;

Fig. 14 is a sectional elevation of a modified form of the gripping, sealing, and suction-applying means;

Fig. 15 is a fragmentary view illustrating a second position of the mechanism of Fig. 14;

Fig. 16 is a fractional sectional elevation showing the parts of Fig. 14 in a third position;

Fig. 17 is a fractional plan view, partly in section, of the mechanism of Fig. 16; and

Fig. 18 is an enlarged fractional sectional view

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of the lower end of the auger feed, shown in Fig. 4, and utilized in all illustrated forms of the invention.

Referring to Figs. 1-7 illustrative of the method of and a machine for making, filling and sealing containers in accordance with the invention, there is shown a machine generally of the type described in Sonneborn U. S. Patent No. 2,200,971. Briefly, Fig. 2, web material 10 is fed from a roll 11 over idler rollers 12-14 and is shaped into tubular form by a tube-forming element 15. As shown in Fig. 1, the machine is of the duplex type; i. e., two webs are simultaneously fed around tube-forming elements 15. Obviously, the machine may be constructed for use with a single web of material or any selected number of units may be assembled together in the manner illustrated by the duplex unit of Fig. 1. To simplify the presentation of the invention, the description will be largely in terms of one of the duplex assemblies. Since both function in identical manner, the same reference characters will be applied to large degree to like parts of the two units.

The web 10 after passing around the forming element 15 is so shaped that it descends as a tube encircling a hollow tubular guide 16. The web overlaps slightly and is sealed longitudinally of the tube by a sealing device or roll 17 shown in Figs. 1-5. The webs 10 are formed into containers or packages filled with any desired material. The material itself may be stored in a hopper 18 provided with auger feeding devices, one of which, the auger 19, is shown in detail in Figs. 4 and 18. After a bag has been filled and sealed it is separated from the preceding bag by a suitable severing mechanism 20. The filled bags or containers then drop onto chutes 21 for discharge from the machine.

Heretofore it has not been deemed possible to apply suction to produce a partial vacuum to assist in the filling of bags formed in the foregoing manner. However, it has been proposed to exhaust the air from the packages after they have been filled. This has been done by puncturing a wall, applying suction through the puncture, and thereafter sealing the puncture.

The difficulties in filling under a partial vacuum bags or containers made from a continuous web of material are as follows: The application of vacuum or suction to the interior of the bag will tend to collapse it. In order for a suction means to be effective, an air-tight seal must be provided for the walls forming the upper end of the bag. The vacuum must be maintained during the filling of the bag. In accordance with the invention, the tubular guide 16 forms the inner element of a sealing means for each bag. Disposed within the guide 16 is the auger feed which comprises an auger 19 and an enclosing tube 19a. The space between the tubular guide 16 and the inner tube 19a forms a passage extending to a pipe 22 through which suction may be applied. The pipe 22 is located above the forming element 15. The upper end of the tubular guide 16 is provided with a closure member 23, Fig. 4, which forms an air-tight connection with the tube 19a. As best shown in Fig. 18, the lower end of the guide 16 carries a suction head comprising an annular opening in which there is disposed an annular screen 24. This screen or filter 24 is to prevent withdrawal of powdered material from the container during application of suction thereto. The screen

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24 may be readily replaced by unscrewing an outer cap 25 and an inner cap 26, respectively provided with lips which engage sealing gaskets. Like gaskets are provided on the opposite side of the screen to form air-tight seals against the cooperating threaded sections.

It will be observed that the suction head includes a separate member 27 to provide a slight taper for the wall, which taper is continued by the member 26 to the open end of the suction head and around the lower end of the auger. By gradually decreasing the cross-sectional area of the opening at the exit end thereof, the material fed by the auger is not only compacted to a greater degree than it otherwise would be but it is also better retained in position during the time the auger 19 is at standstill. By increasing the compactness of the material around the lower end of the auger there is in effect formed an air-tight seal by the compacted material. Hence, the application of suction through the screen or filter 24 is effective in producing a partial vacuum within each bag. The material so compacted will not flow into the bag due to the suction alone because the friction attained within the auger is greater than the force applied by the differential of air pressure.

Further in accordance with the invention, suction is also applied to the exterior of each bag to prevent collapse of the bag during application of suction to the interior thereof. This is accomplished by providing a traveling enclosure or suction box 30 for each bag. Each enclosure is formed by walls carried by or integral with horizontally and vertically movable members 31 and 32. One-half of one enclosure or suction box is illustrated in the perspective view of Fig. 8. It consists of a rear wall 33 formed by the web of channel member 32 and having an opening 34 connected by a pipe 35, Figs. 3-5, to suction-producing apparatus, later to be described. The upper side wall, Fig. 8, has a semi-circular opening lined with a soft rubber gasket 36 which, it will be observed, extends along the inner edges of the side and bottom walls of one section of the enclosure or box 30. The semi-circular opening in the upper wall has the same radius as, or slightly less than that of, the tubular guide 16. The other half of the suction box, Fig. 9, is of like construction but without the exhaust opening, and is provided with a similar rubber gasket 37. One section of the box 30 carries a sealing element 38 mounted for slidable movement by means of two guide rods 39 and 40, Fig. 11, which are slidably mounted in openings extending through the rear wall 33. It will be seen in Figs. 3-5, and 8, that the lower portion 33a of the wall 33 is of greater thickness to provide the requisite bearing surface for the rods 39 and 40. In Fig. 3 the rod 39 has been shown while in Fig. 5 the rod 40 has been shown. There is also provided a rod 41, Fig. 11, for supporting a spring 42. As best shown in Fig. 4, one end of the spring 42 bears against the sealing element 38 while the opposite end bears against the rear wall 33a. A collar 43 is secured to the end of the rod 41 which extends outwardly of the wall 33a in such a position that the spring 42 is under compression. The outer ends of the rods 39 and 40, and the collar 43, are enclosed in an air-tight cap 43a secured by suitable means, such as bolts and a gasket, to the member 32. A cooperating sealing element 44 is rigidly secured to the rear wall of the section of the box 30, shown in Fig. 9, as

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by screws extending into the threaded openings 45 and 46, one of which, the screw 47, may be seen in Fig. 9. The sealing elements are heated by heater elements carried in openings 48. A thermostat (not shown) is mounted in each of the additional openings 49. The suction box 30 is carried by the channel-shaped members 31 and 32 which are supported, Fig. 1, by means of four collars 51-54. The collars 51 and 52 are secured as by pins to a vertical shaft 55 while the collars 53 and 54 are secured to a vertical shaft 56. Each collar is provided with operating links to move the members 31 and 32 toward and away from each other. Since the construction is identical, only the links 57 and 58 associated with the collar 51 will be described in detail.

As best shown in Figs. 6 and 7, the link 57 is pivoted at one end to the member 31 and at its other end to the collar 51. The link 58 is pivoted at one end to the member 32 and at its other end to the collar 51. If a clockwise movement of the shaft 55 is assumed, as viewed in Fig. 7, it will be observed the links 57 and 58 will be moved in a direction to pull members 31 and 32 toward each other. The fully closed position is shown in Fig. 6. By rotating the shaft 55 in a counterclockwise direction, as viewed in Fig. 6, the members 31 and 32 will be moved away from each other. To assist in guiding the members 31 and 32 and to insure parallel movement thereof, guiding means such as rods 59 and 60, Figs. 1 and 7, may be provided near the outer ends of members 31 and 32. The vertical shafts 55 and 56 have elongated gears 61 and 62 secured thereto near the lower ends thereof. These shafts 55 and 56 are guided in frame members 64 and 65. They are vertically reciprocated by a cam 66 carried on a drive shaft 67 through a driving connection which includes a cam roller 68 carried by a link 69 which actuates a crank arm 70. To the end of the crank arm 70 is secured a cam roller 71 which bears against a cam plate 72 secured to a vertical shaft 73 which shaft, at its upper end, carries a bracket 74 on which rest the elongated gears 61 and 62. As shown in Figs. 1 and 2, the bracket 74 is in its uppermost position. Accordingly, the channel members 31 and 32 and the traveling enclosures or suction boxes formed therein are in their uppermost positions.

As has already been explained, the members 31 and 32 are moved toward and away from each other upon rotation of the shafts 55 and 56. These shafts are rotated by means of a rack gear 76 driven by a lever 77, the lower end of which carries a cam roller 78 engaging an actuating cam 79. This lever is pivoted at 80 and is provided with a spring 81 which biases the roller 78 against the cam 79. The cam 79 is carried by a shaft 82 driven through the gears 83 and 84 from shaft 67. The shaft 67 is driven by a motor 86 by means of a belt-driven pulley 87 and a chain 88.

In describing the operation of the system as a whole, it will be assumed that the hopper 18 has been filled with a powdered material and that the parts are in the positions illustrated in Figs. 1-3 at the moment the motor 86 is energized. It will be observed that the sealing element 38 is biased by the spring 42 into clamping engagement with the web material 10 disposed between it and the cooperating sealing element 44. The spring has sufficient force to insure that the elements 38 and 44 will hold the web material securely enough for the pulling of the web material downwardly to form a new bag or container.

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As the motor 86 rotates, it moves the cam 66 in a counterclockwise direction, as viewed in Fig. 2, whereupon the cam follower or roller 68 is free to move to the right for a distance determined by the curvature of the cam. The crank arm 70 thereby rotates in a counterclockwise direction to move downwardly the cam plate 72, the vertical shaft 73, and the bracket 74. This movement is insured by the weight of the descending parts. In this manner, the gears 61 and 62 which rest on the bracket 74 and the suction box 30 and elements 38 and 44 move vertically downward. The result is that enough of the web material 10 is pulled from the supply roll 11 to form the major part of a container. During this downward movement the sealing roller 17, which is electrically heated, applies heat and pressure to seal the edges of the web material. The material itself may be either thermoplastic in character or it may be coated with a thermoplastic or thermoplastic material which will form the seals upon application of heat and pressure.

When the parts reach the position illustrated in Fig. 4, the cam 66 provides for a dwell, during which time other operations occur. As the roller or cam follower 68 approaches the position of dwell on cam 66, the cam 79 has been rotated in a counterclockwise direction as viewed in Fig. 1 until the roller or cam follower 78 is released for movement of the lever 77 in a clockwise direction about its pivot pin 80. The rotation of lever 77, under the influence of a spring 81, moves the rack gear 76 to the right to rotate the elongated gears 61 and 62 and the vertically-extending shafts 55 and 56.

It will be observed, Fig. 1, that the upper ends of the shafts are provided with elongated slots into which rest a pair of wheels 90 and 91 carried by a bracket 92 which also supports the sealing rollers 17, only one of which is shown. Thus, as the shafts 55 and 56 are rotated, the wheels 90 and 91 are lifted against the opposition of spring 93, Fig. 2, out of the slots to move the sealing roller 17 away from contact with the longitudinal seam of the web material 10.

The rotation of the shafts 55 and 56 also rotates the collars 51-54 to move the members 31 and 32 from the positions shown in Fig. 7 toward the positions shown in Fig. 6. As the respective halves of the suction boxes approach each other the sealing material or gaskets 36 and 37 engage each other and the web material around the cylindrical guide 16 to form an air-tight seal around the entire gasket surface. The movement of the members 31 and 32 to their sealing positions increases the pressure applied to that portion of the web disposed between the sealing elements 38 and 44. Thus, the spring 42 is not only compressed but eventually the sealing element 38 is moved against the inner wall of the thickened section 33a for application of the maximum pressure developed by the spring 81. This pressure is adequate to insure the production of a perfect seal of the web material disposed between the sealing elements. It will be recalled that these elements are provided with heating elements and thermostats. It may here be observed that since the sealing elements 38 and 44 remain in contact with the web for an interval of time, the temperature thereof is so controlled as to produce an optimum sealing temperature at the time maximum pressure is applied thereto.

As the web is sealed and as the suction box 30 is made air-tight, a cam 95, carried on a shaft 96 driven through a chain 97 and clutch members

98 and 99 carried by the shaft 67, has been rotated to a position to operate a suction-applying valve 100. Suction is thereby applied through a pipe 101 which is connected to a suitable vacuum pump, not shown, for exhaustion of air from the suction box 30. The opening of the valve 100 applies suction by way of a pipe 102 and the pipe 22 to the annular space leading to the interior of the container. Suction is also applied by way of the pipe 102 and a flexible hose 103 to the pipe 35 which leads to the suction box 30 for removal of air from around the outside of each bag or container. Since suction is applied to the inside and the outside of each bag, there is no tendency for it to collapse. After suction has been applied for a time interval adequate for production of a partial vacuum or suitably thereafter, the cam 95 closes the vacuum-applying valve 100.

During this time, an adjustable cam 105, carried by a shaft 96 through linkage 106, actuates a crank arm 107 and a link 108 connected to another crank arm 109 to engage clutch members 110 to start the operation of the auger 19. As shown, a separate motor 112 is utilized to rotate the driving element of the clutch 110. This mechanism need not be described in detail since any suitable mechanism may be utilized therefor, such for example, as the mechanism shown and described in Bleam Patent No. 2,330,862. The auger 19 thereupon feeds or discharges material into the interior of the bag or container. When a suitable or predetermined quantity of material has been discharged by the auger 19, Fig. 4, the cam 105 is rotated to the position shown in Fig. 1 for actuation of a braking device 114, quickly to bring the auger 19 to standstill. Since there is a partial vacuum within the container, the material, regardless of its original fluffiness, is deposited therein with substantially the same compactness it had after compression by the auger 19. It is characterized by the absence of occluded air and fluffiness.

As the auger 19 is braked to a standstill, the cam 115 operates a valve 116 to connect the pipe 102 to atmosphere. In consequence, air rushes through the pipe and into the interior and exterior of the bag. The rapid flow of air through the screen 24 cleans or removes any material which may have lodged against or in it.

As the valve 116 opens, the cam 79 will have progressed in its counterclockwise movement to a position where the cam roller 78 is moved to the right, as viewed in Fig. 1. This movement rotates the shafts 55 and 56 for operation of the members 31 and 32 to the same positions with respect to each other as shown in Fig. 3; i. e., to break the air-tight seal formed between the gaskets or sealing elements 36 and 37. At the same time, the sealing roller 17 is again moved into contact with the longitudinal seam of the web material 10.

As soon as the air-tight seal of the suction box has been broken, the cam 66 operates to release the cam follower 68 for its final movement to the right, as viewed in Fig. 2. Accordingly, the shafts 55 and 56 are moved to their lowermost positions. During this movement the sealing elements 38 and 44, which have remained in contact with the web material 10, draw an additional length of material downwardly over the tubular guide 16 substantially to complete the formation of the container, as shown in Fig. 5. In accordance with the invention, it will be observed that the last length of material drawn from the tubular guide 16 is free of material or filling delivered by

the auger 19. This feature is highly desirable where the filling is of a character to interfere with the sealing of the upper end of the bag. It insures that no material of any kind will be disposed between the surfaces joined or sealed together by the elements 38 and 44.

The cam 79, Fig. 1, will now move its outermost crest against the cam follower 78 to move the members 31 and 32 outwardly or away from each other until the sealing members 38 and 44 are spaced apart a greater distance than the diameter of the tubular guide 16. With all parts associated with the suction box 30 clear of the bag, the cam 66 then engages the cam follower 68 to elevate the shafts 55 and 56 and the suction box 30 to its uppermost position shown in Figs. 1-3. Thereafter, the cam 79 moves to the position shown in Fig. 1 for actuation of the lever 77 to rotate the rods 55 and 56, partially to close the suction box 30, as shown in Figs. 1-3.

A complete cycle of operations has now been described. The cycle will be repeated continuously and rapidly to form and fill bags or containers under a partial vacuum. The bags may be delivered to the chutes 21 without severing the seal therebetween. However, it is preferred that the severing mechanism 20 be actuated to deliver the bags in succession thereto. Accordingly, the severing mechanism is operated, as indicated in Fig. 5, to sever the lowermost bag when the suction box 30 is in its lowermost position.

For convenience, in starting up the machine, a starting lever 120, Fig. 1, is provided for manual control of the clutch member 99. If the lever 120 is moved in a clockwise direction as viewed in Fig. 1, it moves the driving clutch member 99 out of engagement with the driven clutch member 98. Accordingly, the chain 97 and the shaft 96 remain at standstill. However, when the lever 120 is moved to its illustrated position the shaft 96 is driven to initiate operation of the valves 109 and 116 and the auger feeding mechanism.

In filling bags or containers with certain types of material, and particularly when filling bags of substantial size, the time required for operation of the auger 19 to deliver the requisite amount of material will be increased beyond that permitted by the normal cycle of operations of the mechanism above described. In this connection, it will be understood that bags of larger diameter may be made by increasing the diameter of the tubular guide 16 or bags of greater length and volume may be formed by increasing the travel of the web-feeding mechanism. For bags of large capacity, the system of Figs. 12 and 13 is particularly applicable. Where the parts perform functions like those of Figs. 1-11, the same reference characters have been utilized. In fact, the apparatus of Figs. 1-11 will be the same except for the changes illustrated in Figs. 12 and 13.

In accordance with the modified form of the invention, a bag of any desired size is formed in the manner already described. However, the operation of the filling apparatus is differently controlled so that the auger feeding means may operate for a period adequate to fill the bags of larger size. During such operation of the auger feeding mechanism, the other parts remain at standstill. Synchronized operation is resumed at the conclusion of the filling operation. This is accomplished by several relatively simple, though important, changes in the mechanism of Fig. 1. For example, the driving connection between the shafts 67 and 96, in accordance with the modifi-

cation of Figs. 12 and 13, comprises a wheel clutch having a driving member 125 driven by a chain 88 and a driven member 126 secured to the shaft 67. A dog 127, carried by the member 126, is normally biased to a position to complete the driving connection between the driving and driven members 125 and 126.

The shaft 96 is driven through a clutch having a driving member 128, Fig. 13, driven by a chain 129, Fig. 12, and a driven member 130 secured to the shaft 96. This clutch is of like construction with the clutch 125-127. It too has a dog 131, carried by driving member 128, and normally biased to the engaged position. As shown, it is held in the disengaged position by a latching member 132. It will be recalled that the shaft 96 also carries the cams 95, 105 and 115 which control the operation of the auger feeding mechanism and the application of suction to the interior and exterior of the bags. In order that the auger feeding mechanism may be operated for any desired time interval, a variable speed drive is interposed between the driving member 128 and the driving chain 88 from which power is derived therefor. A chain 135 is carried by a sprocket 136 which is carried by the same hub member as the large sprocket for the chain 88. These two sprockets are formed integrally with the driving clutch member 125 and the hub or casting of which they are a part rotates freely on the shaft 67. As will be readily apparent from Fig. 13, the chain 135 is also carried by a sprocket 138, supported on a shaft 139 which, as seen in Fig. 12, is in front of the shaft 67. The shaft 139 carries a pulley 140 which is automatically adjustable as to radius under the control of a crank arm 141 actuated by a handwheel 142. The pulley 140 supports a belt 143 which is threaded over a cooperating pulley 144 which drives a shaft 145. A sprocket 146 and a chain 129 complete the driving connection to the driving member 128 carried by the shaft 96. By rotating the handwheel 142 in one direction or the other, the ratio between the pulleys 144 and 140 may be changed at will to vary the speed at which the shaft 96 is driven.

Variable speed drives of this type are well known to those skilled in the art and the description here need not be further elaborated. It is sufficient to say that the handwheel 142 is adjusted so that the auger feeding mechanism will be operated for the period required to fill the bags then being made by the machine.

In operation, the apparatus as a whole functions as described in connection with Figs. 1-11 until a bag has been moved to the filling position as shown in Fig. 4. Prior to arrival at the filling position, a cam 150, Fig. 12, carried by the shaft 67 operates a rod 151 to actuate a crank arm 152 to release the latch 132 which has restrained the dog 131 in its disengaged position. With a control handle 153 in the position illustrated, the dog 131 will be moved by its biasing spring to complete a driving connection between the driving and driven members 128 and 130 of the clutch. The shaft 96 is thereupon rotated at a speed dependent upon the setting of the wheel 142. The cam 95, Figs. 1 and 12, thereupon actuates the valve 100 to apply suction to the interior and exterior of the bag. The application of suction to the pipe 102 is effective through the pipe connection 155 to actuate a switch 156 to complete an energizing circuit for an electromagnet 157 which thereupon rotates a latching member 158 into the path of movement of the dog 127. As the dog

engages the end of the latching member 158, it breaks the driving connection between the driving and driven members 125 and 126. Thus, the shaft 67 remains at standstill until the dog 127 again completes the driving connection. This will occur upon de-energization of the electromagnet 157 due to the weight of the plunger and/or the bias of a spring may aid the force of gravity in releasing the member 158.

After application of suction by the valve 100, the cam 105 initiates operation of the auger feeding mechanism, as described in connection with Figs. 1-11. The auger will continue to feed material into the bag or bags during a time interval which will depend upon the setting of the handwheel 142. The slower the shaft 96 is rotated, the longer will be that time interval. After the auger feed has been operated to fill the bag with the desired quantity of material, the cam 95 is rotated to a position to close the valve 100 and the cam 115 causes opening of the valve 116 to connect the pipe 102 to atmosphere. The pressure-responsive switch 156 thereupon opens the energizing circuit to the electromagnet 157 and its operates to withdraw the latching member 158. Thereupon the dog 127 is moved to the driving position, illustrated in Figs. 12 and 13, for resumption of rotation of the shaft 67. The operations heretofore described in connection with Figs. 1-11 are then carried out in succession until such time as a new bag arrives at its filling position, Fig. 4, at which time the mechanism of Figs. 12 and 13 again functions to operate the auger feeding mechanism for the time interval determined by the setting of the handwheel 142.

The manually operable handle or lever 153 normally is in the illustrated position. It may be rotated in a counterclockwise direction from the position shown in Fig. 13 until the end of the latching member 160 is moved into the path of the dog 131. When this occurs, the dog 131 will not be released by the cam 150 and lever 151. Thus, though the latching member 132 is moved to a disengaged position, it will be evident from Figs. 12 and 13 that the latching member 160 will remain in the engaging position until manually moved therefrom by the handle 153. The handle 153 is provided for the purpose of preventing operation of the feeding mechanism during the starting of the machine or at such other times during which observation of the operation of the machine is desired without actually filling any of the bags or containers. As shown, the handle 153 is provided with a spring plunger 162 to retain the handle 153 and the latching member 160 in one or the other of their positions.

Further in accordance with the invention, it is sometimes desirable to seal each bag while under vacuum, or in some cases it is desirable after filling to supply a gas of a character which will be beneficial to the contents of each bag or container. Accordingly, in the modification illustrated in Figs. 14-17, bags or containers, made in accordance with the modification of Figs. 1-11, or in accordance with Figs. 12 and 13, may be sealed either under vacuum, or with gas of suitable character within each bag or container. Thus, a valve 165, Fig. 12, connected in a pipe leading to the valve 116, may be moved to its illustrated position for flow of a suitable gas to the container, or it may connect the valve 116 to atmosphere, as already described. When the bags, after filling, are to be sealed, with a gas therein, additional cams and valves may be

provided so that as the suction valve 100 is closed, the hose 103 will be connected to atmosphere while the pipe 22 will be connected to a source of a suitable gas or atmosphere. When the bags are to be sealed under a vacuum the apparatus of Figs. 1-11 and/or Figs. 12 and 13, may be utilized with the suction box and sealing means changed in manner now to be described.

In Fig. 14, there have been added to the members 31 and 32, and within the suction box, additional sealing elements 175 and 176 actuated by levers 177 and 178. The lever 177 is secured at one end to a shaft 179. The opposite end of the lever carries a roller 180 which rides in a track 181 provided in the sealing element 175. When the shaft 179 is rotated in a counterclockwise direction, from the position shown in Fig. 14, the roller 180 moves the sealing element 175 to the right. Similarly, the lever 178 is secured to a shaft 182. The opposite end of lever 178 carries a roller 183 disposed in a track 184 provided in the sealing element 176. Clockwise rotation of the shaft 182 moves the sealing element 176 to the left as viewed in Fig. 14. The sealing members 175 and 176 are in other respects similar in construction to those described at length in connection with Figs. 8-11, two of the guide rods 39 being shown in Fig. 14. Additional guide rods are also provided, but the spring 42 and the guide rod 41 are preferably omitted. The sealing elements 33 and 44 are identical in construction with those shown in Figs. 8-11.

The rods 179 and 182 extend outwardly through the respective end walls of the suction boxes, through suitable air-tight packing glands. They are also journaled in the ends 31a and 32a of the channels 31 and 32. On one or both ends of rods 179 and 182 are secured levers 186 and 187. On the respective free ends thereof there are secured cam rollers 188 and 189 disposed adjacent each other for engagement by a thrust cam 190. The cam 190 is carried by a rod 191 actuated by a crank arm 192 pivoted at 193 and having a cam roller 194 engaging a cam 195 secured to the shaft 96. To brace the rod 191 and to provide parallel motion thereof, a link 193 may be pivoted at 197 from the frame of the machine.

The positions of the parts in Fig. 14 in general correspond with the positions of the parts in Figs. 1-3. The web 10 is to be pulled downwardly by movement of the suction box 30 and the sealing elements 38, 44 which, it will be observed, are in clamping engagement with the web. The suction box 30 moves downwardly in manner already described in connection with Figs. 1-11. However, in accordance with the modification of Figs. 14-17, the cam 66 has a shape such that the box 30 and the sealing and gripping elements 38 and 44 after moving downwardly a distance corresponding with Fig. 5, are moved upwardly a slight amount to provide slack for the subsequent filling operation.

More specifically, the lowermost position of the suction box 30 is shown in the fractional view of Fig. 15 where, it will be observed, the upper end of the element 31 of the suction box has been moved downwardly just below the lower end of the tubular guide 16. In the final position, Fig. 16, the suction box 30 has been moved upwardly until the sealing elements or gaskets 36 and 37 are disposed in positions for engagement with the lower end of the guide 16.

The sequence of operation is as follows: With the parts in the positions illustrated in Fig. 14, the suction box 30 is lowered to withdraw a suit-

able length of webbing 10 to form a bag or container. The suction box 30 is then moved upwardly from its position in Fig. 15 to that shown in Fig. 16. At this time, the vertical rods 55 and 56, Figs. 1, 2 and 7, are actuated to move the members 31 and 32 towards each other to seal the container within the suction box 30. Thereafter, suction is applied as previously described and the auger feeding mechanism functions to fill the bag.

After the feeding mechanism has completed its cycle of operations, the cam 195 engages the cam roller 194 for actuation of the sealing elements 175 and 176. They are moved together to seal the upper end of the bag. Thus, it will be observed, the bag is filled and sealed while subject to application of suction or while a partial vacuum exists interiorly and exteriorly thereof. The valve operating cams 95 and 115 provide for any desired sequence of operations of the valves which control the application of suction and the flow of gas or air to each container. It will be obvious that after the auger feeding mechanism has filled the bag, gas may be admitted to the interior thereof by way of the flow passage provided between the tubular guide 16 and the auger casing 19a. At the same time, or before, depending upon the setting of the cams 95 and 115, the suction box 30 may be connected to atmosphere by a valve controlling the application of suction and flow of air thereto. When this is done the bag or container will be sealed while a differential of pressure exists between the exterior and interior thereof.

Where gas is admitted to the bag, its flow through the screen 24, Fig. 18, of the filling head will clean it. Where the bag is sealed under partial vacuum, the cleaning is delayed until after the sealing operation. Thus, after the sealing elements 175 and 176 have completed the sealing operation they are withdrawn and, at the same time, the cam 115 may operate the valve 116 to admit the atmosphere to the pipe 102. The flow of air downwardly through the screen 24 cleans it and the material which may have lodged therein falls into the lower end of what will be the next bag.

While preferred embodiments of the invention have been described, it will be understood that further modifications may be made within the spirit and scope of the invention as set forth in the appended claims.

What is claimed is:

1. The method which comprises making containers in succession from a continuous web of sheet material, before separation of a container therefrom simultaneously producing a partial vacuum within said container and externally thereof, during production of said partial vacuum filling said container, and thereafter sealing said container.

2. The method which comprises making containers in succession from a continuous web of sheet material, before separation of a container therefrom withdrawing air from around the outside of said container and from within said container by applying suction interiorly and exteriorly thereof, filling the container during application of said suction, and thereafter sealing said container under atmospheric pressure.

3. The method of making containers in succession from a continuous web of sheet material which comprises forming the sheet material into a tube, sealing the end and the side thereof,

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enclosing a section of the tube above the sealed end thereof, withdrawing air from around the enclosed section by applying suction thereto, withdrawing air from within the tube by applying suction thereto, during application of said suction filling the container, and thereafter sealing the container.

4. The method of forming in succession a series of containers from a continuous web of sheet material, which comprises forming the sheet material into a tube, sealing the longitudinal seam thereof, intermittently forming seals along the length of the tube thereby to form individual containers, after sealing one end of each container enclosing it, withdrawing air from around the outside of the enclosed container by applying suction thereto, withdrawing air from within the enclosed container by applying suction thereto, during application of said suction filling said container through the opposite end thereof, and thereafter sealing said opposite end.

5. The method which comprises making containers in succession from a continuous web of sheet material which comprises forming the sheet material into a tube with the edges overlapping to form a longitudinal seam, applying heat and pressure to produce a continuous seal along said longitudinal seam, sealing said tube transversely of the length thereof, forming an enclosure around a predetermined length of said tube located above said seal, withdrawing air from the interior and exterior of said length of tube by applying suction thereto, during application of said suction filling said predetermined length of said tube, thereafter forming a seal transversely of the tube and across a portion thereof which was located above the point of entry of the filling for said length of tube.

6. A continuous method of making containers from a continuous web of sheet material which comprises forming the sheet material into a tube with the edges thereof overlapping, sealing said edges to form a longitudinal seam, sealing said tube transversely of the length thereof, forming an enclosure around a predetermined length of said tube located above said seal, withdrawing air from the interior and exterior of said length of tube by applying suction thereto, during application of said suction introducing material into said tube at a point a predetermined distance above said seal, and after introduction of said material forming a second seal transversely of said tube at a substantially greater distance from said first-named seal.

7. A continuous method of making containers in succession from a continuous web of sheet material which comprises forming the sheet material into a tube, applying heat and pressure to form a seal transversely thereof, forming an enclosure around a predetermined length of said tube located above said seal, withdrawing air from the interior and exterior of said length of tube by applying suction thereto, during application of said suction introducing material into said tube from a predetermined distance from the sealed end thereof and later forming a transverse seal uncontaminated by material introduced during the filling thereof by applying heat and pressure to said tube at a point removed from the point of admission of material thereto.

8. In a machine for making containers from web material, the combination of a hollow tube-forming element, means associated therewith to form in succession from said material a plurality of containers which in turn are disposed adja-

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cent the end of said element, an enclosure forming an air-tight seal around said element and the container adjacent the end thereof, means for applying suction interiorly and exteriorly of the enclosed container, and means for filling said container through said element during application of suction thereto.

9. In a machine for making containers from web material, the combination of a tube-forming element, means associated therewith to form in succession a plurality of containers which in turn are disposed below said element, a suction box formed in at least two parts, means for moving said parts toward each other to form an air-tight enclosure around the lower end of said tube-forming element and around the container then disposed therebelow, means for applying suction interiorly and exteriorly of the container, and means for filling said container during application of suction thereto.

10. A system of forming and filling receptacles from sheet material comprising a forming tube, filling means disposed within said tube, means for drawing lengths of sheet material from the end of said forming tube to form a receptacle, means for sealing one end of said receptacle, means for enclosing said receptacle, means associated with said forming tube for exhausting air from within the receptacle, means associated with said enclosing means for exhausting air from around the outside of said receptacle, sealing means forming an air-tight seal on one end of said receptacle, means for operating said filling means to fill said receptacle during exhaustion of air therefrom, and means for thereafter sealing the other end of said receptacle.

11. In a machine for making containers from web material, the combination of a hollow tube-forming element, an enclosing means, of greater length than a container, forming an air-tight seal around a portion of said element and forming an air-tight chamber adjacent the end of said element, means disposed within said chamber for pulling sheet material from around said element to form a container therein, means for applying suction interiorly and exteriorly of the enclosed container, and means for filling said container through said element during application of suction thereto.

12. In a machine for making containers from web material, the combination of a hollow tube-forming element, an enclosing means, of greater length than a container, forming an air-tight seal around a portion of said element and forming an air-tight chamber adjacent the end of said element, sealing means disposed within said chamber for pulling sheet material from around said element and for forming transverse seals to form a container therein, means for applying suction interiorly and exteriorly of the enclosed container, and means for filling said container through said element during application of suction thereto.

13. In a machine for making and filling containers in succession from web material, the combination of a hollow tube-forming element around which said material is shaped into a tube, gripping means movable lengthwise of said element for pulling therefrom a predetermined length of said tube, means for introducing a filling into said length of said tube through said element, means operable after introduction of said filling for moving said gripping means to pull a further length of said tube from said ele-

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ment, and means forming a transverse seal across said further length of said tube.

14. Apparatus for forming containers from a tube of webbing and for filling said containers under a partial vacuum comprising means for transversely sealing said tube at intervals to define containers, means for forming an air-tight enclosure around a container after sealing of one end thereof, means for applying suction to the interior and exterior of said one container and means for introducing filling into said one container during application of said suction.

15. In an apparatus for forming containers from a tube of webbing, the combination of a suction box formed by at least two parts, said parts having resilient means adapted to form an air-tight seal therebetween, means for moving said parts into and out of air-tight engagement to form an air-tight seal therebetween, sealing means carried by said parts for transversely sealing said tube when said air-tight seal is formed, means for moving said parts a predetermined distance one from the other and spring means for maintaining said sealing means in gripping engagement with said tube while said parts are spaced apart by said predetermined distance.

16. In a machine for making containers from web material, the combination of a hollow tube-forming element, a suction box disposed adjacent one end of said element, sealing means carried by said suction box operable to form an air-tight seal around said element, sealing tools carried by said suction box and movable into and out of transverse sealing engagement with one end of a container, means for moving said box and said tools lengthwise of said element to draw web material therefrom and for returning said box to its first position with said tools clear of said container, means for rendering said sealing means effective to form said air-tight seal, means for applying suction to said suction box and to the interior of said container, means for introducing filling into said container through said element, and means for operating said tools to seal the opposite end of said container.

17. Apparatus for forming containers from a tube of webbing comprising a tubular element for supporting said tube, tube-enclosing walls movable toward each other, said walls having opposing surfaces of shape complementary to each other and to said tubular element to form an air-tight enclosure extending about the length of a container from the end of said element, tools movable with said walls transversely to seal the tube for closure of one end of said container, means for applying suction to said enclosure and through said element to the interior of said container, means for delivering through said element filling for said container, and means for sealing said opposite end of said container.

18. Apparatus for forming containers from a tube of webbing comprising a tubular element for supporting said tube, tube-enclosing walls movable toward each other, said walls having opposing surfaces of shape complementary to each other and to said tubular element to form an air-tight enclosure extending about the length of a container from the end of said element, tools movable with said walls transversely to seal the tube for closure of one end of said container, means for applying suction to said enclosure and through said element to the interior of said container, means for delivering through said element filling for said container, and means for moving said walls and said tools laterally and

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longitudinally of said element to seal the opposite end of said container.

19. Apparatus for forming containers from a tube of webbing comprising a tubular element for supporting said tube, gripping means movable transversely of said tube adjacent the end of said element to flatten said tube and to form a driving engagement therewith, complementary enclosing walls respectively supporting said gripping means, means for moving said walls and gripping means away from the end of said element to draw a length of said tube therefrom, means for moving said walls together to form an air-tight enclosure around the end of said element and around said withdrawn length of said tube, means operable by said walls for applying a sealing pressure to said gripping means to seal one end of said length of said tube thereby to define one end of a container, means for applying suction to the interior and exterior of said container, means for delivering filling to said container through the end of said element, and means for moving said walls and gripping means away from each other to clear said container and thereafter toward the end of said element and then toward each other again to flatten and transversely to seal said tube to define the opposite end of said container.

20. Apparatus for forming containers from a tube of webbing comprising a tubular element for supporting said tube, gripping means movable transversely of said tube adjacent the end of said element to flatten said tube and to form a driving engagement therewith, complementary enclosing walls respectively supporting said gripping means, means for moving said walls and gripping means away from the end of said element to draw a length of said tube therefrom, means for moving said walls together to form an air-tight enclosure around the end of said element and around said withdrawn length of said tube, means operable by said walls for applying a sealing pressure to said gripping means to seal one end of said length of said tube thereby to define one end of a container, means for applying suction to the interior and exterior of said container, means for delivering filling to said container through the end of said element comprising a screw-conveyor disposed within said element for delivering a predetermined quantity of filling to said container, and means for moving said walls and gripping means away from each other to clear said container and thereafter toward the end of said element and then toward each other again to flatten and transversely to seal said tube to define the opposite end of said container.

21. Apparatus for forming containers from a tube of webbing comprising a tubular element for supporting said tube, gripping means movable transversely of said tube adjacent the end of said element to flatten said tube and to form a driving engagement therewith, complementary enclosing walls respectively supporting said gripping means, means for moving said walls and gripping means away from the end of said element to draw a length of said tube therefrom, means for moving said walls together to form an air-tight enclosure around the end of said element and around said withdrawn length of said tube, means operable by said walls for applying a sealing pressure to said gripping means to seal one end of said length of said tube thereby to define one end of a container, means for apply-

ing suction to the interior and exterior of said container, means for delivering filling to said container through the end of said element, means for moving said walls out of sealing engagement with said element and thence further away from the end thereof to withdraw a further length of said tube therefrom, and means for moving said walls and gripping means away from each other entirely to clear said container, then toward the end of said element, and then toward each other to flatten and to seal said further length of said tube.

22. The method of making containers in succession from a continuous web of sheet material which comprises forming the sheet material into a tube, sealing the end and the side thereof, enclosing a section of the tube above the sealed end thereof, withdrawing air from around the enclosed section by applying suction thereto, withdrawing air from within the tube by applying suction thereto, and during application of said suction, filling and sealing said container.

23. The method of making a plurality of containers which comprises forming them one after the other from a continuous tube of web material, before separation of a container therefrom simultaneously producing a partial vacuum within said container and externally thereof, and during production of said partial vacuum filling and sealing said container.

24. The method of forming in succession a series of containers from a continuous web of sheet material, which comprises forming the sheet material into a tube, sealing the longitudinal seam thereof, intermittently forming seals along the length of the tube thereby to define individual containers, after sealing one end of each container enclosing it, withdrawing air from around the outside of the enclosed container by applying suction thereto, withdrawing air from within the enclosed container by applying suction thereto, during application of said suction filling said container through the opposite end thereof, and during application of suction thereafter sealing said opposite end.

25. In a machine for making containers from web material, the combination of a hollow tube-forming element, means associated therewith to form in succession from said material a plurality of containers which in turn are disposed adjacent the end of said element, an enclosure forming an air-tight seal around said element and the container adjacent the end thereof, means for applying suction interiorly and exteriorly of the enclosed container, means for filling said container through said element during application of suction thereto and sealing means disposed within said enclosure for sealing said container after the filling thereof.

26. In a machine for making containers from web material, the combination of a hollow tube-forming element, means associated therewith to form in succession from said material a plurality of containers which in turn are disposed adjacent the end of said element, an enclosure forming an air-tight seal around said element and the container adjacent the end thereof, means for applying suction interiorly and exteriorly of the enclosed container, sealing means located within said enclosure and adjacent the respective ends of the container enclosed thereby, means for actuating one sealing means to seal one end of said container, means for introducing filling into the container through its opposite end and through said tube forming element, and means

for thereafter actuating said other sealing means to seal the opposite end of said container.

27. In a system for making a plurality of containers from a continuous web of material by forming the material around a tubular element, the combination of a suction box having a length adapted to receive a container extending below said element, said box having means movable into and out of air-tight engagement with said tubular element and the material encircling it, means disposed within said box for sealing one end of said container leaving open the opposite end adjacent said element, means for introducing filling into said container, and sealing means disposed within said box adjacent said opposite end for sealing said container after introduction of said filling.

28. In a system for making a plurality of containers from a continuous web of material by forming the material around a tubular element, the combination of a suction box having a length adapted to receive a container extending below said element, said box having means movable into and out of air-tight engagement with said tubular element and the material encircling it, means disposed within said box for sealing one end of said container leaving open the opposite end adjacent said element, means for applying suction interiorly and exteriorly of said container, means for introducing filling into said container, and sealing means disposed within said box adjacent said opposite end for sealing said container after introduction of said filling.

29. Apparatus for making containers from a tube of web material comprising a suction box for enclosing each container, means including a filling means for applying suction to the interior of said container, means operable through a cycle of operations to form a container sealed at one end and disposed within said suction box, means for applying suction to the exterior and interior of said container, means responsive to the application of said suction for interrupting said cycle of operations, means for rendering said filling means effective to introduce filling into said container through the open unsealed end thereof, means for restoring normal pressure within and without said container, said means responsive to suction thereupon rendering effective said means operable through a cycle of operations to seal the open opposite end of said container.

30. The combination set forth in claim 29 in which said last-named means seals said opposite end of said container from a part of said tube previously disposed outside of said suction box.

31. In a system for making a series of containers from a tube of web material, the combination of filling means disposed within said tube, sealing means for forming a transverse seal across said tube to define the lower end of a container, a suction box enclosing the major part of said partially defined container, means rendering said filling means effective to introduce filling into said container while disposed within said box, and means for producing a transverse seal across a part of the tube which during the filling was located outside of said box thereby to define the other end of said container.

32. The method of making a plurality of containers which comprises forming them one after the other from a continuous tube of web material, before separation of a container therefrom simultaneously producing a partial vacuum within said container and externally thereof, during produc-

tion of said partial vacuum introducing filling into said container, and sealing said container during application of a differential pressure between the exterior and interior thereof.

33. In a machine for making and filling containers, a tubular structure about which web material is shaped to form a tube and through which filling material is introduced, sealing and gripping members relatively movable to flatten and transversely seal said tube beyond an end of said tubular structure so to define a closed end for a container, and a suction box comprising parts carrying said sealing and gripping members and movable to embrace said end of said structure to define an air-tight enclosure about said end

and about that part of said container disposed beyond said end during introduction of filling material therein.

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