June 30, 1953 W. S. CLOUD 2,643,496

ENCLOSING ARTICLES IN TUBULAR WRAPPERS

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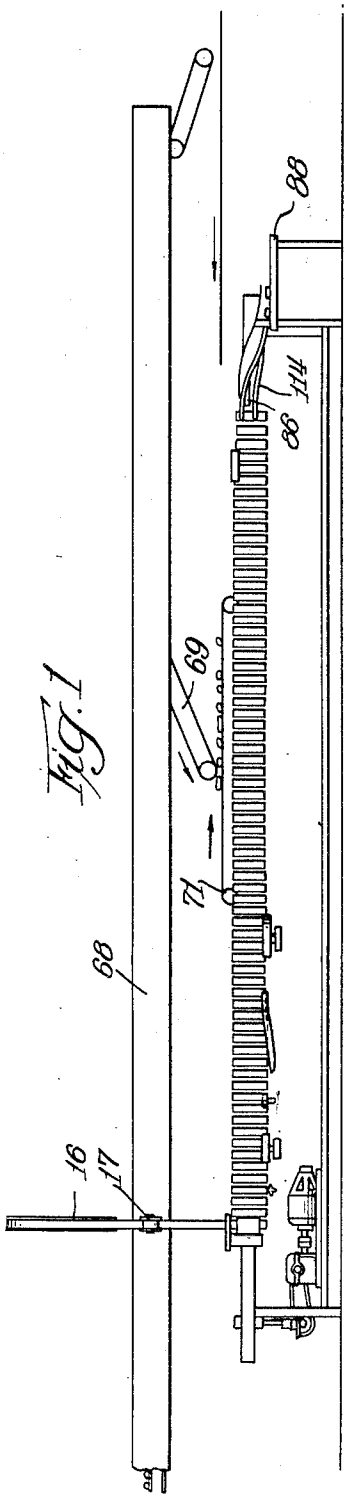

Fig. 1

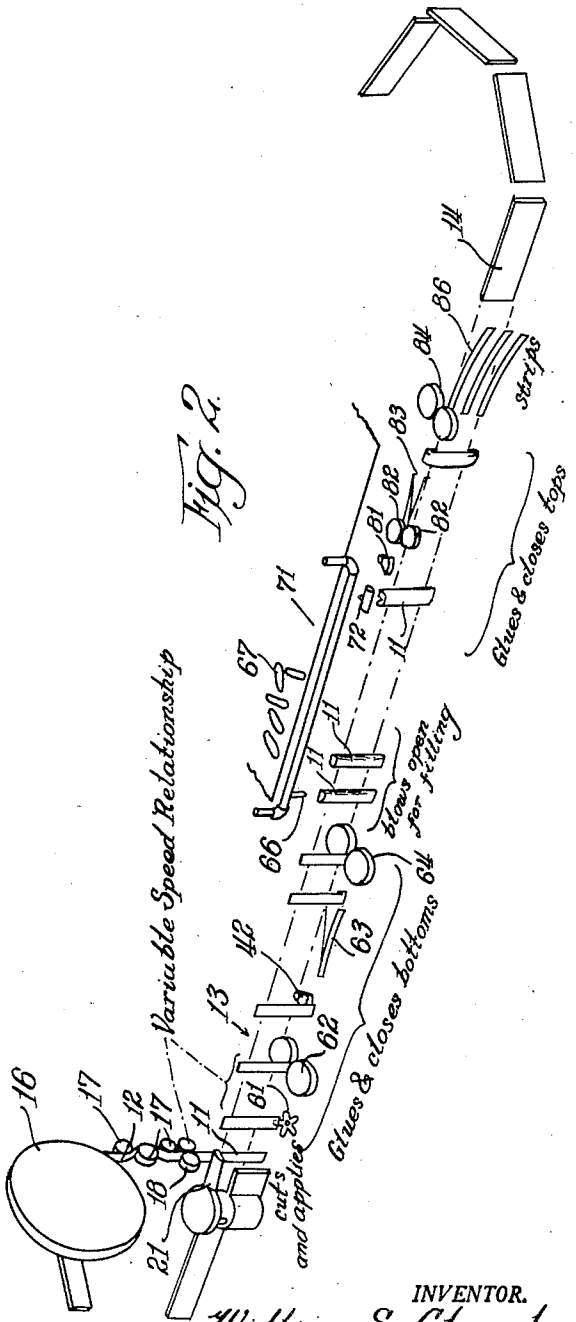

Fig. 2

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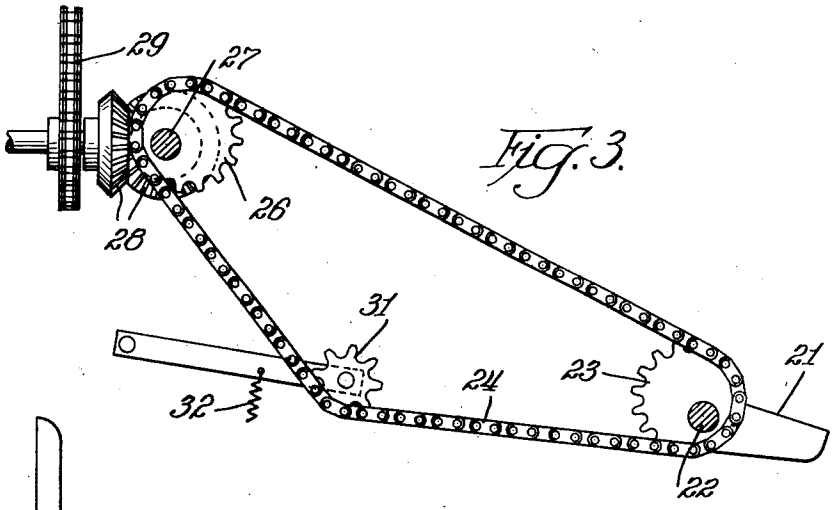

Fig. 3.

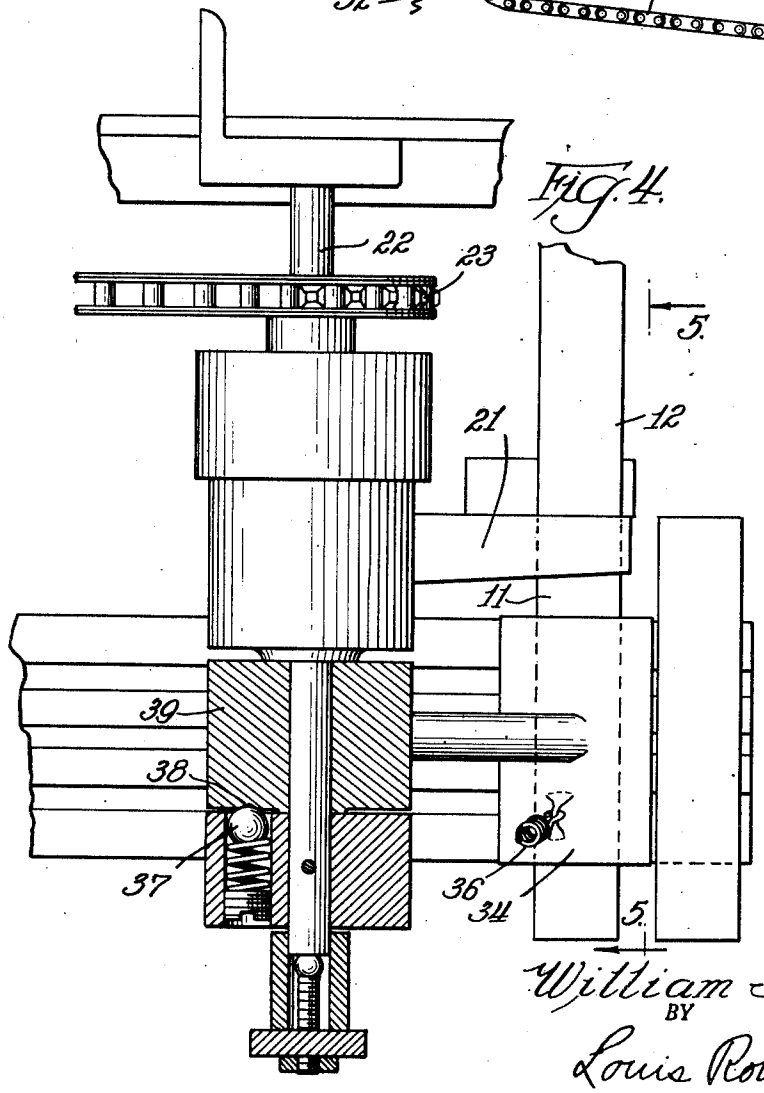

Fig. 4.

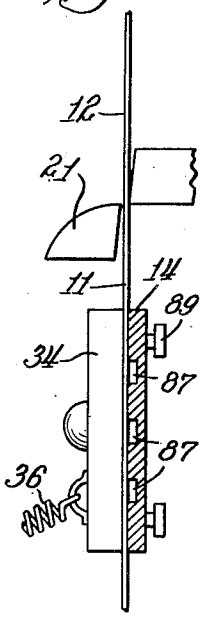

Fig. 5

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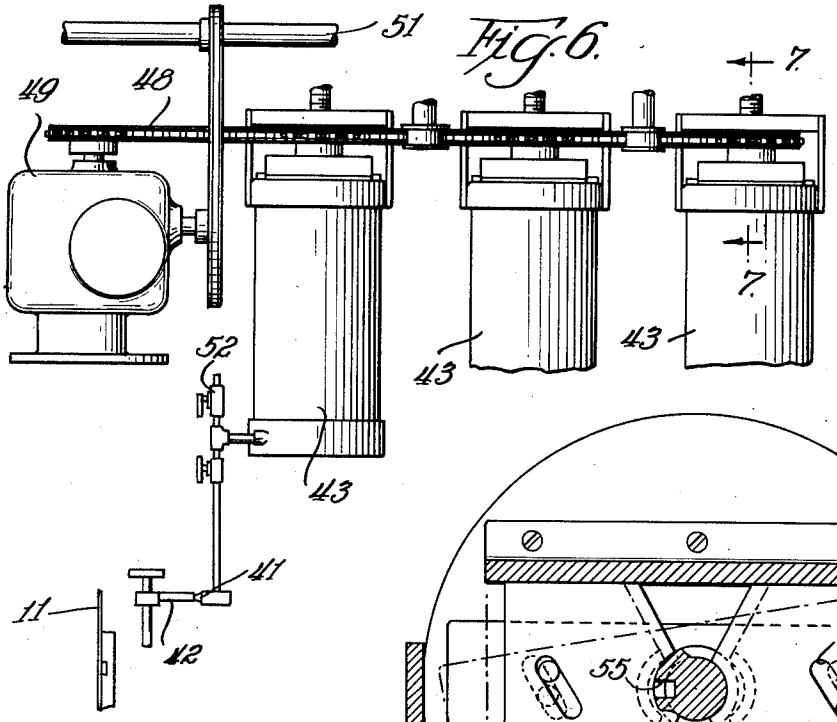
Fig. 6.



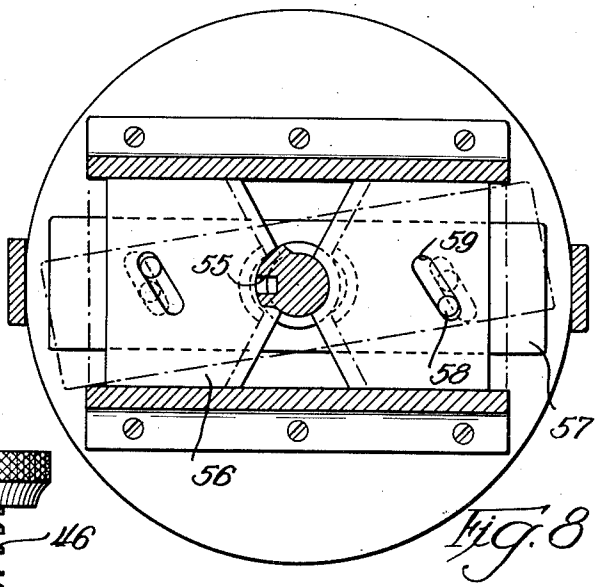
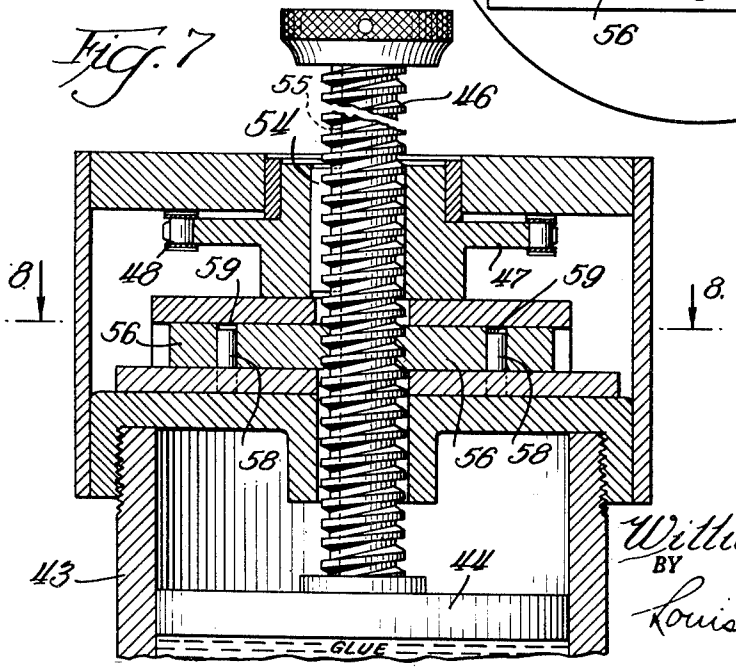


Fig. 8

Fig. 7



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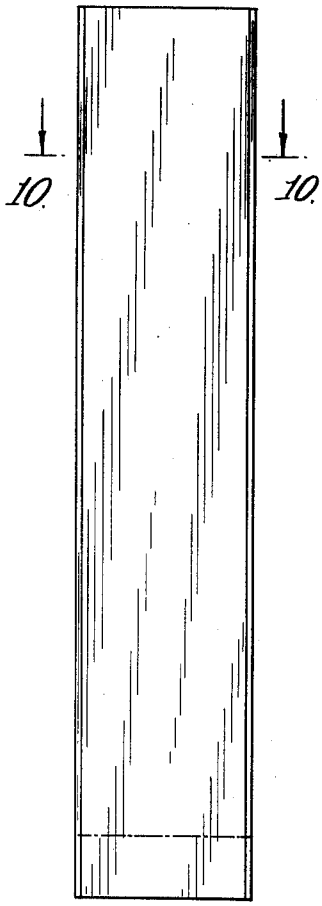

Fig. 9

Fig. 10

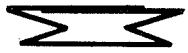

Fig. 11

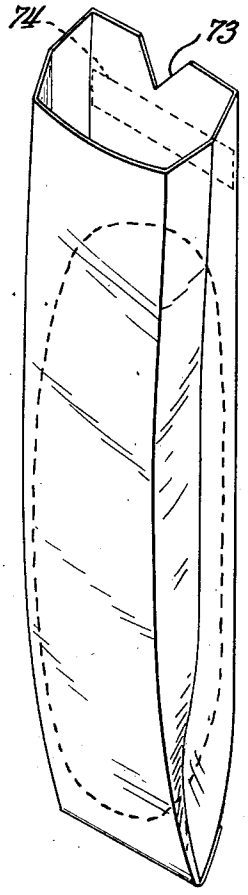

Fig. 12

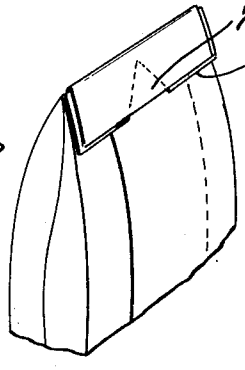

Fig. 13

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ENCLOSING ARTICLES IN TUBULAR WRAPPERS

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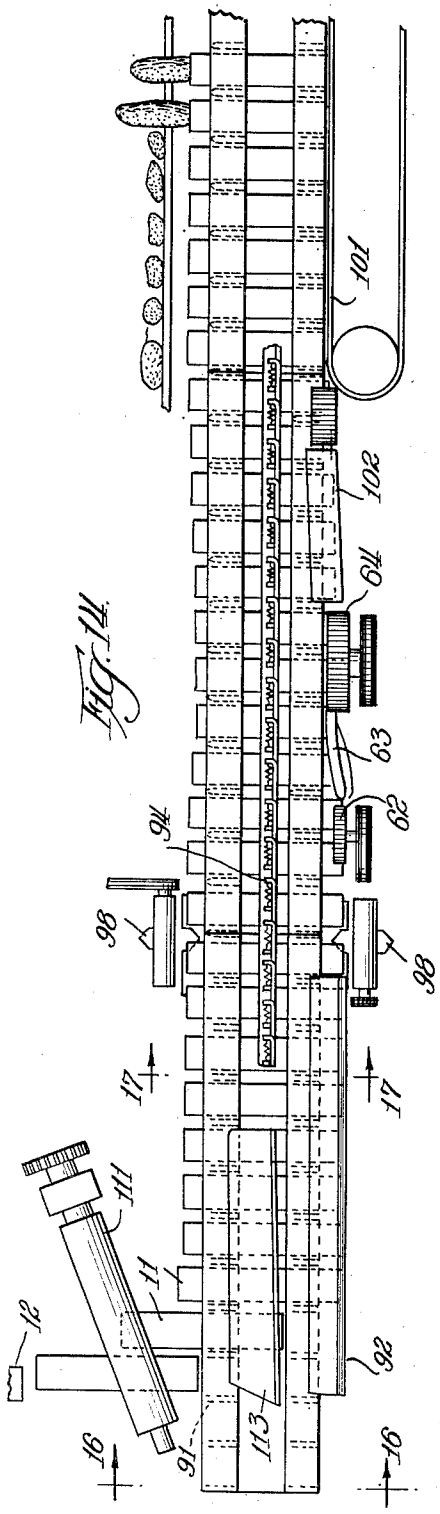

Fig. 14.

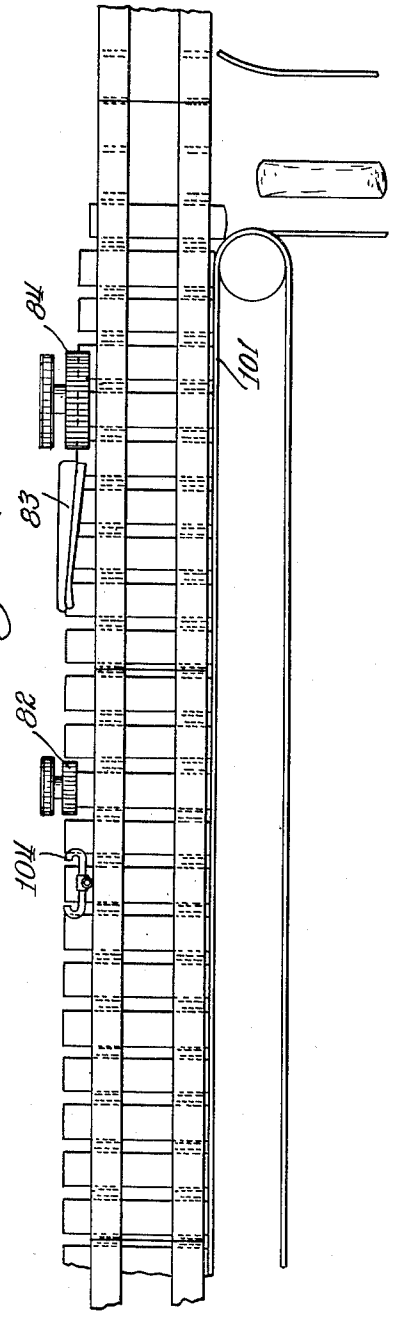

Fig. 15.

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ENCLOSING ARTICLES IN TUBULAR WRAPPERS

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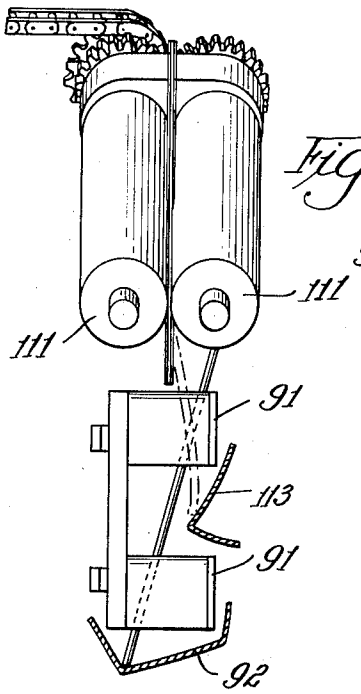

Fig. 16.

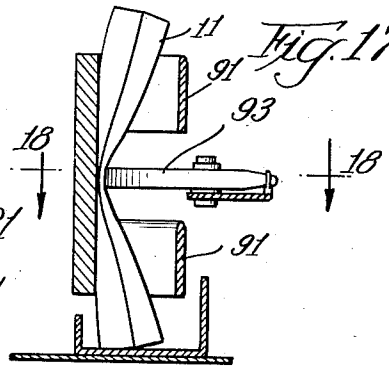

Fig. 17

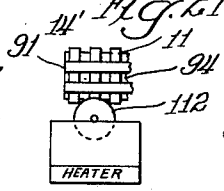

Fig. 21

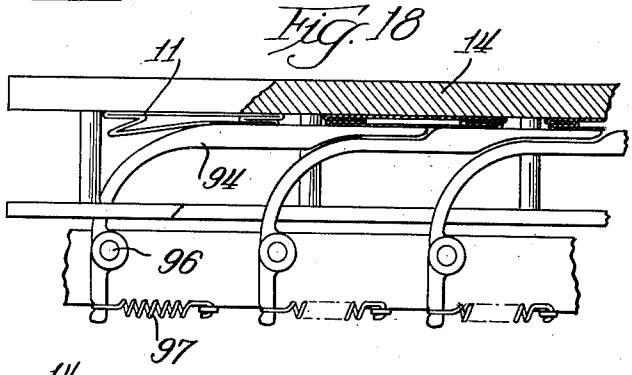

Fig. 18

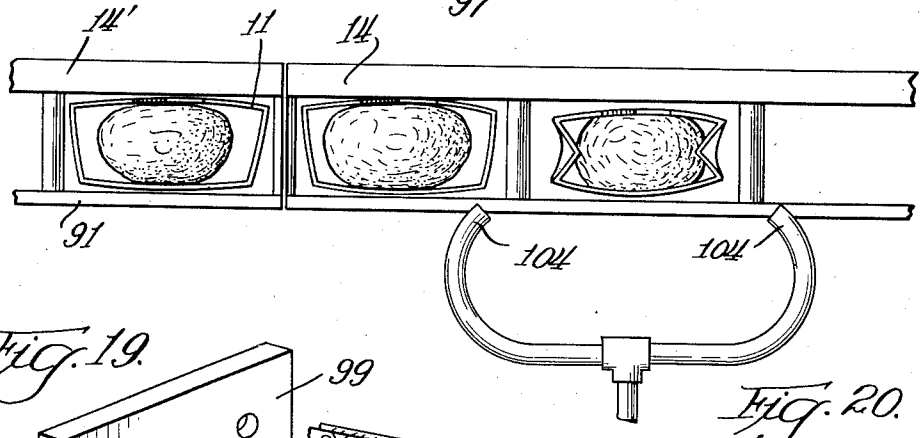

Fig. 20.

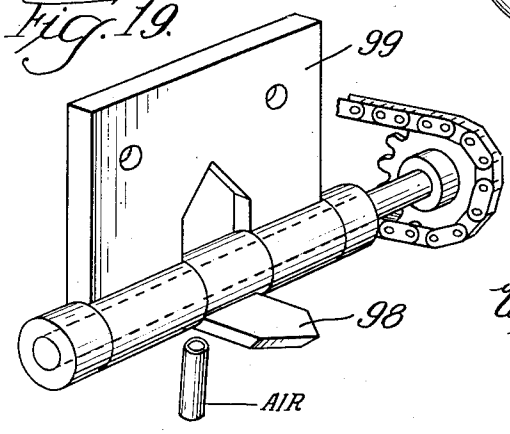

Fig. 19.

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UNITED STATES PATENT OFFICE

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ENCLOSING ARTICLES IN TUBULAR WRAPPERS

William S. Cloud, Wilmette, Ill.

Application March 15, 1947, Serial No. 734,933

5 Claims. (Cl. 53—89)

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In the wrapping of candy bars which are sold by the millions, very small savings in the cost of wrapping become important. Accordingly, a great deal of effort has already been spent in reducing the cost of wrapping candy bars.

One of the most economical forms of wrapping has comprised the manufacture of tubes closed at one end, and into which candy is inserted at the other end, this latter end then being closed. Tubes suitable for this method of wrapping have been manufactured very economically, but the closing and filling thereof has, in spite of various improvements, remained less efficient than seemed to be reasonably expectable. The most efficient filling before the present invention has involved the use of gangs or sets of tubular wrappers, mounted on a common backing sheet so that the whole set could be handled at once. It would be placed in a rack, the tubes would be opened by jets of air directed at the open end, the candy bars would be inserted, and a manually controlled closing device would simultaneously close and bend over all of the tops of the bags. This was inefficient in requiring the operators' time in shifting the bag sets into place, closing the bags and moving the bag set out of the rack. Also, it did not seem to lend itself to gluing an end closed without substantial additional cost.

According to the present invention, the girls inserting the candy bars into the bags may spend their entire time at this operation, all other steps in handling the bags being done automatically. To this end, a roll of tubing is cut into successive suitable wrapper lengths, each length is placed on a conveyor, the bottom end glued and closed, its upper end opened with an air blast and held open during the manual insertion of the candy bars and its upper end then glued and closed automatically after which the wrapped bar is removed from the conveyor.

Additional objects and advantages of the invention will be apparent from the following description and from the drawings, in which:

Fig. 1 is a side elevation of one form of apparatus chosen for illustration of the invention;

Fig. 2 is a diagrammatic, perspective view of the conveyor of Fig. 1 and associated parts;

Fig. 3 is a detailed view showing the manner of speeding up the movement of the cutter blade during the portion of its cycle in which the cutting takes place;

Fig. 4 is a view illustrating the driving of the

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slapper which presses the cut tube onto the adhesive conveyor.

Fig. 5 is a fragmentary, sectional view taken approximately on the line 5—5 of Fig. 4;

Fig. 6 is a partially diagrammatic view illustrating the glue applying apparatus;

Fig. 7 is a fragmentary, detailed view taken approximately on the line 7—7 of Fig. 6 and illustrating a vertical section through one of the glue pots;

Fig. 8 is a horizontal, sectional view taken approximately on the line 8—8 of Fig. 7;

Fig. 9 is a face view of the tubular wrapper used in this invention;

Fig. 10 is a horizontal section therethrough approximately on the line 10—10 of Fig. 9.

Fig. 11 shows the bottom of the tube closed.

Fig. 12 shows the tube with its bottom closed, thus forming a bag, into which the candy has been inserted and with the top notched for a double gluing operation;

Fig. 13 shows the bag glued and closed at its top;

Figs. 14 and 15 are fragmentary views which together show a modified form of the invention in which the bags are carried in racks rather than on adhesive plates;

Fig. 16 is a view of the tube-feeding features of Fig. 14, taken approximately on the line 16—16;

Fig. 17 is a vertical sectional view showing a bag on the conveyor being pressed at its middle against the conveyor by a holding finger, the view being taken approximately on the line 17—17 of Fig. 14;

Fig. 18 is a fragmentary, partly sectional view, the section being taken approximately on the line 18—18 of Fig. 17;

Fig. 19 is a somewhat diagrammatic perspective view showing the bag notching cutter; and

Fig. 20 is a fragmentary plane view showing the air blast directed against the sides of the filled bags or tubes for ensuring proper closing of the bags.

Fig. 21 is a diagrammatic representation of apparatus for sealing the bags with a thermoplastic.

Although the law requires a full and exact description of at least one form of the invention, such as that which follows, it is, of course, the purpose of a patent to cover each new inventive concept therein; no matter how it may later be disguised by variations in form or additions of further improvements; and the appended claims are intended to accomplish this purpose by par-

ticularly pointing out the parts, improvements, or combinations in which the inventive concepts are found.

General operation

In the form of the invention shown in Figs. 1 to 13, the tubular wrappers 11 are cut from a continuous tube 12 and applied to a conveyor 13 made up of a plurality of plates 14 coated with a pressure-sensitive adhesive.

As the wrappers 11 move along, the first step in their treatment is to glue and close the bottoms automatically. Then the candy bars are inserted by hand while the bags are held open by blasts of air. Next the tops of the bags are glued and closed. Finally, the bags are stripped from the adhesive conveyor so that they may be manually packed in boxes.

Tube feed

The tube 12 is drawn from a roll 16. There may conveniently be twin roll-supports so that, when one roll is nearly exhausted, the second roll may be made ready; and the tube fed past the guide rolls 17 to follow the end of the preceding tube.

The guide rolls 17 may flex the tube to remove any tendency to curl and deliver it to feed rolls 18 driven at a speed proportional to the speed of the conveyor 13. Because there are variations in the length of the paper and because the tube 12 is printed, and the printing should be centered on the final wrapper, the drive of the rolls 18 is variably controlled with respect to the drive of the conveyor 13, as for example through a Reeves type of drive. If the control is manual, the adjustment is preferably set, and frequently changed, so that any departures from registration will be on the slow side, and a manual lever is provided for manually adding a small increment to the drive of rolls 18 so that as the rolls start to lag the lever will be moved to draw the tube 12 down the extra amount required for registration of the printing thereon with the center of the cut tubular wrappers.

Cutting and applying

The wrappers 11 are cut from the tube 12 by rotating knife 21 which is driven in timed relationship with the conveyor 13. It is desirable for the knife 21 to move more rapidly during its cutting operation than during the remainder of its cycle. In this way it will cut better and will avoid blocking movement of the tube 12. One of the ways to accomplish this increase of speed is shown in Fig. 3. The shaft 22 which bears the cutter 21 is driven by a sprocket 23 mounted eccentrically on cutter shaft 22. The sprocket 23 is driven by a chain 24 which in turn is driven by another eccentric sprocket 26, on a drive shaft 27 which is driven in fixed speed relationship to the conveyor 13, the drive in the illustrated machine being through bevel gears 28 and chain 29. As seen in Fig. 3, the sprocket 26 is approaching a position in which it will draw the chain at approximately maximum speed, at which time the sprocket 23 will be in the opposite position so that it has maximum rotative speed compared to the speed of movement of the chain. An idler sprocket 31 is drawn by spring 32 in a direction to maintain a suitable tension on the chain 24, being applied to the idle run of the chain. The knife 21 is, of course, positioned with respect to sprocket 23 so that it has its maximum speed approximately at the instant of cutting the tube 12.

Approximately at the instant of cutting, the cut length 11, or the tube 12 which is about to be cut, should be pressed against the conveyor plate 14, as seen in Fig 5. This is accomplished by a slapper 34 which is driven in the manner best seen in Fig. 4. During most of the cycle of shaft 22, the slapper 34 remains idle, being drawn by a return spring 36 to a position somewhat spaced from the conveyor plate 14. As the knife approaches the tube 12, a spring detent, such as a ball 37, engages a recess 38 in collar 39 which carries the slapper 34, thus engaging the slapper 34 to the shaft 22. The slapper is thus moved with the shaft 22 during the high speed movement of the shaft so that it slaps the wrapper 11 firmly against the adhesive face of the plate 14. Because further movement of the slapper 34 is blocked, the spring detent ball 37 slips out of the recess 38, thus disconnecting the slapper 34 from the shaft 22 so that the return spring 36 again draws the slapper 34 to its idle position spaced from the plate 14.

Glue applying

According to the present invention, the glue is applied in an accurately metered quantity with an exceptional degree of dependability. For each wrapper a predetermined amount of glue is made to ooze through a nipple 41 (Fig. 6) from which it is picked up by a wiper 42 and applied to the desired point on the wrapper 11.

The metering of the glue through nipple 41 is accomplished by providing each nipple with a separate glue pump cylinder 43. A piston 44 operates within the cylinder 43, the space below the piston being completely filled with glue so that there is no spurting due to air pressure. In other words, the glue is ejected exactly in conformance with the downward movement of the piston 44. The piston is lowered by screw 46 which is operated by turning a sprocket 47. The sprockets 47 and the various glue pump cylinders 43 are driven by a chain 48 which is driven through a reduction gear 49 by a shaft 51 which is either the main drive shaft for the conveyor 13 or a shaft driven in fixed speed relationship therewith.

The glue cylinders 43 are preferably provided with means for releasing the screw means of the piston so that the pistons may be raised by the hydrostatic pressure of the glue forced into the pump cylinder 43 through a normally closed valve 52. One suitable means for releasing the screw mechanism is shown in Figs. 7 and 8. In Fig. 7, it is seen that during operation the screw 46 is rotated by the sprocket 47 by means of a key 54 carried by sprocket 47 and slidable in a groove 55 in screw 46 extending the full length thereof. Thus, the screw 46 may be lowered while still being turned by sprocket 47. The lowering of the screw is accomplished by engaging it with normally fixed threaded jaws 56. When it is desired to fill the glue cylinders 43, the jaws 56 are withdrawn from the screw 46. In the illustrated construction, this is accomplished by shifting a lever 57 from the full line position seen in Fig. 8 to the dotted line position. During this shifting, the pins 58 carried by lever 57 slide in slots 59 of jaws 56 to shift the jaws away from the screw 46.

The form of glue applying wiper 42 illustrated in Fig. 6 is also seen in Fig. 2. This form of wiper applies glue to the outside of wrapper 11, being driven in timed relationship with the conveyor 13. If only the outside of the wrapper is

glued, the end of the wrapper will be held, after being folded over, sufficiently to prevent the candy bar from dropping therefrom. However, the package will not be neat looking because the folded over portion includes two layers, the outer of which will not be glued. One manner of gluing it involves the use of a finger glue applicator 61 which wipes glue from a nipple, such as the nipple 41 of Fig. 6 and slips it inside of each wrapper 11, the wrappers being opened at their bottom preferably by an air blast, while being temporarily choked at a mid-point.

The bottom of the bag which is thus glued by such means as applicators 61 and 42 may be folded up in any conventional, suitable manner. For example, it may be creased by rolls 62, turned up by guide cams 63 and squeezed by ironing rolls 64.

In this application the word "glue" is used in a generic sense indicating any adhesive or sealing medium. The particular adhesive used will vary with the materials being glued. Any conventional glues appropriate for the materials being glued may be used. A quick-setting glue is preferably used which is tacky enough to hold the fold by the time it ceases to be squeezed. The time may be extended, if desired, by pressure belts holding the fold before or after the wrappers pass between ironing rolls such as rolls 64.

Bag filling

The bags which have thus been formed next pass under a series of nozzles 66 (only one having been illustrated) which are connected to a compressed air source so that jets of air are blown against the upper ends of the bags or wrappers 11 to blow the bags open and hold them open while candy bars are dropped into them. The candy bars 67 are brought from the candy machine through a cooler 68 and are delivered as by a transfer conveyor 69, to a conveyor 71 which passes fairly closely above the top of the bags in the bag filling position. Thus, an attendant may quite rapidly lift a bar 67 from the conveyor 71 and drop it into one of the bags 11.

Two-in-one gluing

Although the top of the bag may be glued in substantially the same manner as the bottom, an alternative method of gluing is illustrated which has the advantage that a single application of glue serves two purposes. While the bag 11 is held open by the air blasts, a notcher 72 cuts a notch 73 in the top of the bag at the back thereof. This notch 73 is best seen in Fig. 12. Glue is then applied to the outside of the bag along the area of the bag indicated by dotted lines at 74 in Fig. 12. From Fig. 13, it will be evident that the upper portions 76 at the back of the bag will be glued down by the side portions of the glue 74 while the front portion 77 which has been bent over will be glued down through the notch 73 by the central portion of the glue 74.

The gluing and folding-over may be accomplished in any desired manner. Thus, a wiper 81 will wipe glue from a glue nipple 41 as in Fig. 6 and apply the glue to the passing bag 11. A pair of creasing rolls 82 will then crease the bag after which its end will be folded over by cam bars 83 and then passed through ironing rolls 84. Thereafter, stripping fingers 86 will strip the bags from the adhesive plates 14. The stripper fingers 86 extend into longitudinally extending grooves 87 in the plates 14 so that they slip behind the packaged candy and easily pull the candy from the adhesive material. The candy will fall or may be guided onto a table 88 on which it may be boxed by hand.

The adhesive material used may be any material of appropriate adhesive qualities, preferably one which maintains the same adhesive qualities for an extended period of time. It is important that it be one which is only reasonably tacky and which does not harden while the bag is thereon, since, of course, the bag must be removed without being torn or disfigured by having the adhesive pull off with it. Of course, any adhesive material is likely to become less adhesive during the day as dust particles or papers adhere to it. Accordingly, it has at present been found necessary to renew the surface of the adhesive material occasionally, perhaps several times a day, by spraying the adhesive material on the plate and drying it to the tacky state desired. As seen in Fig. 5, the plates 14 are provided with mounting lugs 89 by which they may easily be removed from the conveyor for easy replacement. It will probably be preferred, however, to spray an extremely light coat of adhesive at fairly frequent intervals, perhaps even every cycle of the conveyor, the coating being thin enough to be dried almost instantaneously, heat lamps or a blast of warm air being used if necessary.

A preferred adhesive is a Paisley pressure sensitive adhesive, comprising forty parts hydrogenated wood rosin, ("Staybelite") forty parts methylabietate, and eight parts ethyl cellulose. Of course, any pressure sensitive adhesive may be used which will hold the bag as it is filled and let it be pulled off without tearing.

Basket type of conveyor

If desired, in order to avoid the necessity of renewing the adhesive, a form of the invention shown in Figs. 14 to 20 may be used. In this form of the invention, the plates 14' carry bottomless baskets 91 instead of an adhesive coating. As seen in Figs. 14 and 16, the tubular wrappers 11 are dropped into the baskets 91. The downward movement of the wrappers is limited by a stationary pan or guard 92. After the tubular wrappers have had time to come to rest on the pan 92 upon which they are slid by the baskets 91, they are squeezed or choked at a midpoint as seen in Fig. 17 by spring fingers 93. The spring fingers may be formed of springs or they may be formed as shown in Fig. 18 of relatively rigid fingers 94 pivoted at 96 and urged in a direction by a spring 97 to squeeze the tubes 11 against the plate 14'.

While the tubes are thus held against the plate 14' by the spring fingers 94, they are blown open at both ends and the back wall thereof is notched at both ends by the notchers 98 seen in Fig. 14. Such a notcher together with its associated air jet used with it is seen in greater detail in Fig. 19. The notcher blade 96 cuts the notch with the help of shear plate 99 through which it passes.

After thus being notched, the bottom of the bag is glued and closed, the bag is then run onto a supporting belt 101, an inclined guideway 102 being used if necessary, and the bags are filled. Thereafter, the bags are glued and closed at the tops as in the form of the invention shown in Figs. 1 to 13. The wrapped candy bars may be removed from the conveyor simply by running past the support conveyor 101 as seen in Fig. 15.

In both forms of the invention, it is preferred that sides of the bag be blown inwardly as seen in Fig. 20 by laterally directed nozzles 104 so as to ensure proper closing of the bag. Most of the bags will close, anyway, but occasionally one will have the side walls fold outwardly instead of inwardly unless they are tucked inwardly as by a blast from nozzles 104. This, of course, should be done after the bags have passed out from under the nozzles which tend to blow the bags open.

The wrappers 11 may be fed into the baskets 91 in any suitable manner. For example, as each is cut off, it could be zipped into a basket by rollers moving at high speed. They could be arranged to seize the cutoff wrapper only after its cutting was complete so that no high speed pull would be exerted on the main uncut tube. This arrangement could result from either their positioning or from having two fragmentary rollers rotating at two different numbers of revolutions per minute, so that the fragments only come together to form a bite and seize the wrapper when the wrapper is ready to be zipped into the basket.

The form of feed which is shown in Figs. 14 and 16 is not the invention of the present applicant but is preferred. In this form, the wrappers 11 may continue to move downwardly at the same speed as the downward movement of the main tube 12, or slightly faster, being moved forwardly at the speed of the conveyor while it is moved downwardly. This is accomplished by means of inclined rollers 111 which preferably engage the new length of tube just below its cutoff. The inclination of the roller 111 will determine the relationship of the forward speed of the wrapper 11 to its downward speed. Hence, for any given downward speed, an inclination may be chosen which will produce a forward speed equal to the speed of the conveyor, assuming that the two speeds are within the relationship for which this method of feeding is suitable.

The side blasts 104 are preferably provided in conjunction with the form of the invention shown in Figs. 1 to 13, as well as in the other form. In general, it may be noted that any features shown in connection with one form of the invention may be used in connection with the other form, to the extent appropriate. For example, it will probably be preferred to close and glue both ends by the use of notches as in Fig. 14, even though an adhesive type of conveyor is used, as seen in Figs. 1 to 13. Alternatively, both ends could be glued with the use of the gluing fingers 61 shown in Fig. 2.

Although the invention has been disclosed with respect to a single tube 12, it is apparent that a plurality of tubes could be cut off and applied to the conveyor at once. For some aspects of the invention, the tubes could be made up in sets, with the individual tubes easily torn apart. This would not be making full use of all aspects of the invention, however, inasmuch as one of the advantages of the invention is its ease of handling individual tubes. On the other hand, it would facilitate boxing the packaged candy. If the bag sets were fairly large, perhaps including a dozen bags, they could be placed on the conveyor by hand, if preferred, but again one of the features of the invention is in avoiding the necessity for such a hand operation.

Although wipers have been shown for passing the glue from the nipples to the wrappers, other means could be used. For example, an air jet could blow the glue from the nipple to the wrapper or the conveyor could wipe the wrapper itself across the nipple. Some aspects of the invention could be used with very different closing means. For example, as seen in Fig. 21, the conveyor could carry the tubes 11 past one or more wheels 112 running in a molten thermoplastic bath, so that the wheels could apply the molten thermoplastic around the open end of the tube. Although this would perhaps be more of a coating than a glue, it may be considered a glue for the purpose of this invention. With such a coating over the open end of the tube, it would not be necessary to fold the tube over, and a shorter tube length could be used for the wrapper. The top could be closed in similar manner, the plastic being passed from one wheel or roll to another, or being dripped onto the applying wheel, or being otherwise applied.

The exact position along the conveyor at which the glue is applied is unimportant except as it may affect the tackiness of the glue to be used. For example, the glue may be applied either before or after the wrapper passes between the creasing rolls, it being merely necessary that it be applied before the fold over is complete.

If any trouble is encountered in getting the tubes or wrappers to pass independently along their desired course or in proper relation with successive devices acting thereon, suitable guides may be added, guides 113 and 114 being illustrative.

From the foregoing it is seen that an apparatus and method have been devised for packing candy bars in tubular packages in a very satisfactory and inexpensive manner, in which practically everything is done entirely automatically except for the insertion of the candy bar into the bag-like wrappers.

Although manual insertion of the candy has been disclosed, that is partly because the particular candy with which the inventor is working is of irregular shape and not very easily handled by a machine. Machine insertion could be used, however, especially with other articles to be wrapped.

I claim:

1. Apparatus for cutting a tube into wrapper lengths and applying it to an adhesive conveyor including means for feeding the tube to a position adjacent to the adhesive surface of the conveyor, a rotating knife adapted to cut wrapper lengths from the tube, means for driving the knife with varying speed to have a higher speed at the time of cutting, a slapper biased to a position spaced from the conveyor with the tube passing between them, and spring detent means adapted to engage the slapper to means rotating with the knife and effective approximately as the knife cuts the tube whereby the slapper will promptly slap the wrapper length against the adhesive surface of the conveyor, the spring detent permitting the knife to continue its rotation and the slapper to be returned by its biasing means.

2. Apparatus for cutting a tube into wrapper lengths and applying it to an adhesive conveyor including means for feeding the tube to a position adjacent to the adhesive surface of the conveyor, a rotating knife adapted to cut wrapper lengths from the tube, means for driving the knife, a slapper biased to a position spaced from the conveyor with the tube passing between them, and spring detent means adapted to engage the slapper to means rotating with the knife and effective approximately as the knife cuts the tube whereby the slapper will promptly slap the wrap-

per length against the adhesive surface of the conveyor, the spring detent permitting the knife to continue its rotation and the slapper to be returned by its biasing means.

3. Apparatus for applying articles to an adhesive conveyor including means for feeding the article to a position adjacent to the adhesive surface of the conveyor, a slapper biased to a position spaced from the conveyor with the articles passing between them, a rotating drive member, and spring detent means adapted to engage the slapper to the drive member whereby the slapper will slap the article against the adhesive surface of the conveyor, the spring detent permitting the drive member to continue its rotation and the slapper to be returned by its biasing means.

4. Packaging apparatus including means for feeding tube stock, means for cutting the tube stock into individual wrappers, means for applying one side of the wrappers to an adhesive conveyor in vertical disposition thereon, with at least the bottom end of the wrapper extending vertically beyond the adhesive portion of the conveyor, means for gluing and closing the bottoms of the wrappers as they move along the conveyor held up by adhesion, means for thereafter blowing the wrappers open while they are held on one side by the adhesive portion of the conveyor and holding them open at a position convenient for inserting the articles to be wrapped or to be packaged, means for thereafter gluing and closing the tops of the wrappers and means for removing the wrappers from the conveyor.

5. Apparatus for cutting a tube into wrapper lengths and applying it to an adhesive conveyor including means for feeding the tube to a position adjacent to the adhesive surface of the conveyor, a rotating knife adapted to cut wrapper lengths from the tube, means for driving the knife, a slapper biased to a position spaced from the conveyor with the tube passing between them, and means effective approximately as the knife cuts the tube to drive the slapper to promptly slap the wrapper length against the adhesive surface of the conveyor and release the slapper to be returned by its biasing means.

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