Sept. 22, 1931. E. L. SMITH 1,824,378

WRAPPING MACHINE

Filed Sept. 27, 1928 5 Sheets-Sheet 1

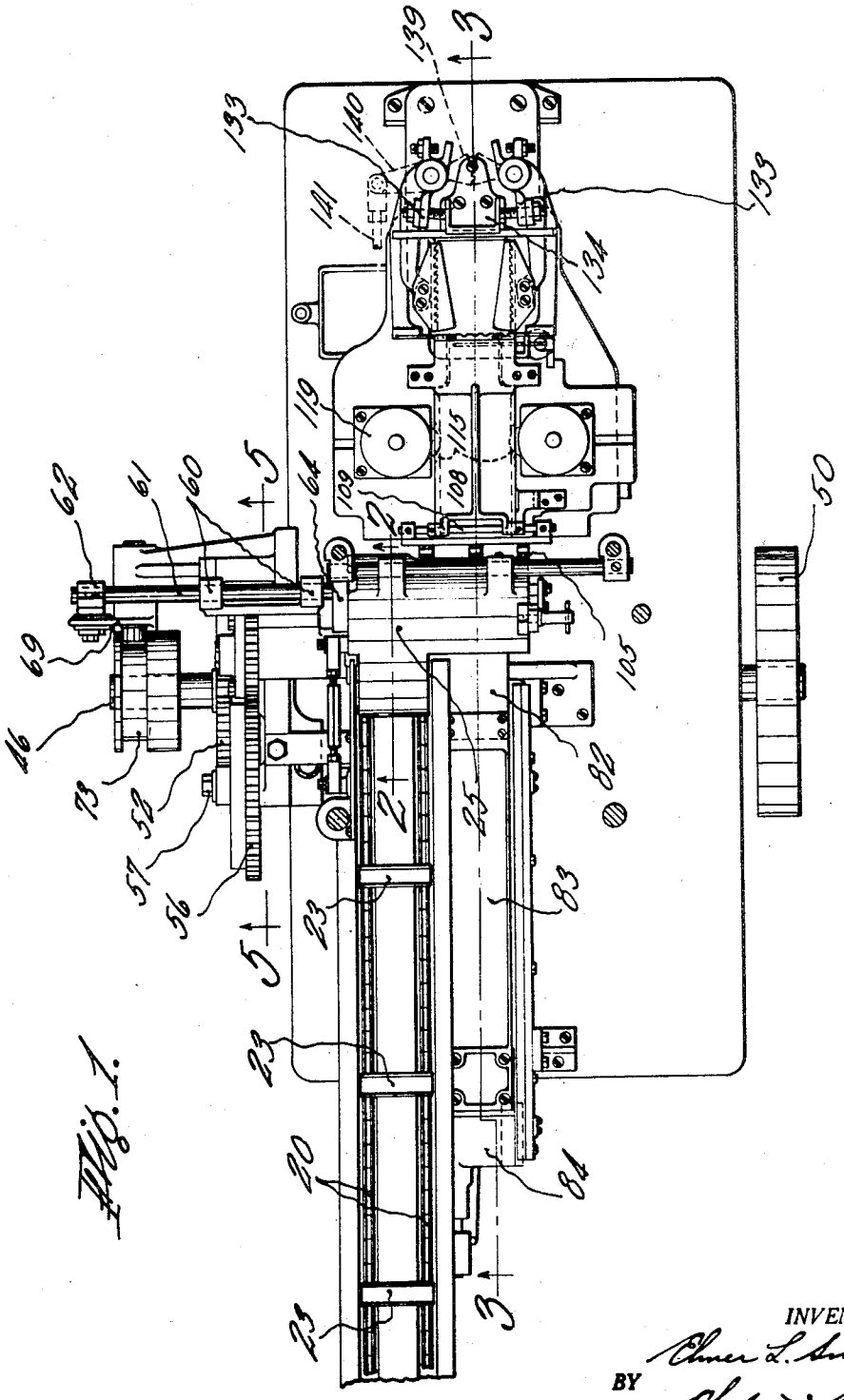

Fig. 1.

INVENTOR.
Elmer L. Smith
BY
Chapin & Neal
ATTORNEYS.

Sept. 22, 1931. E. L. SMITH 1,824,378

WRAPPING MACHINE

Filed Sept. 27, 1928 5 Sheets-Sheet 2

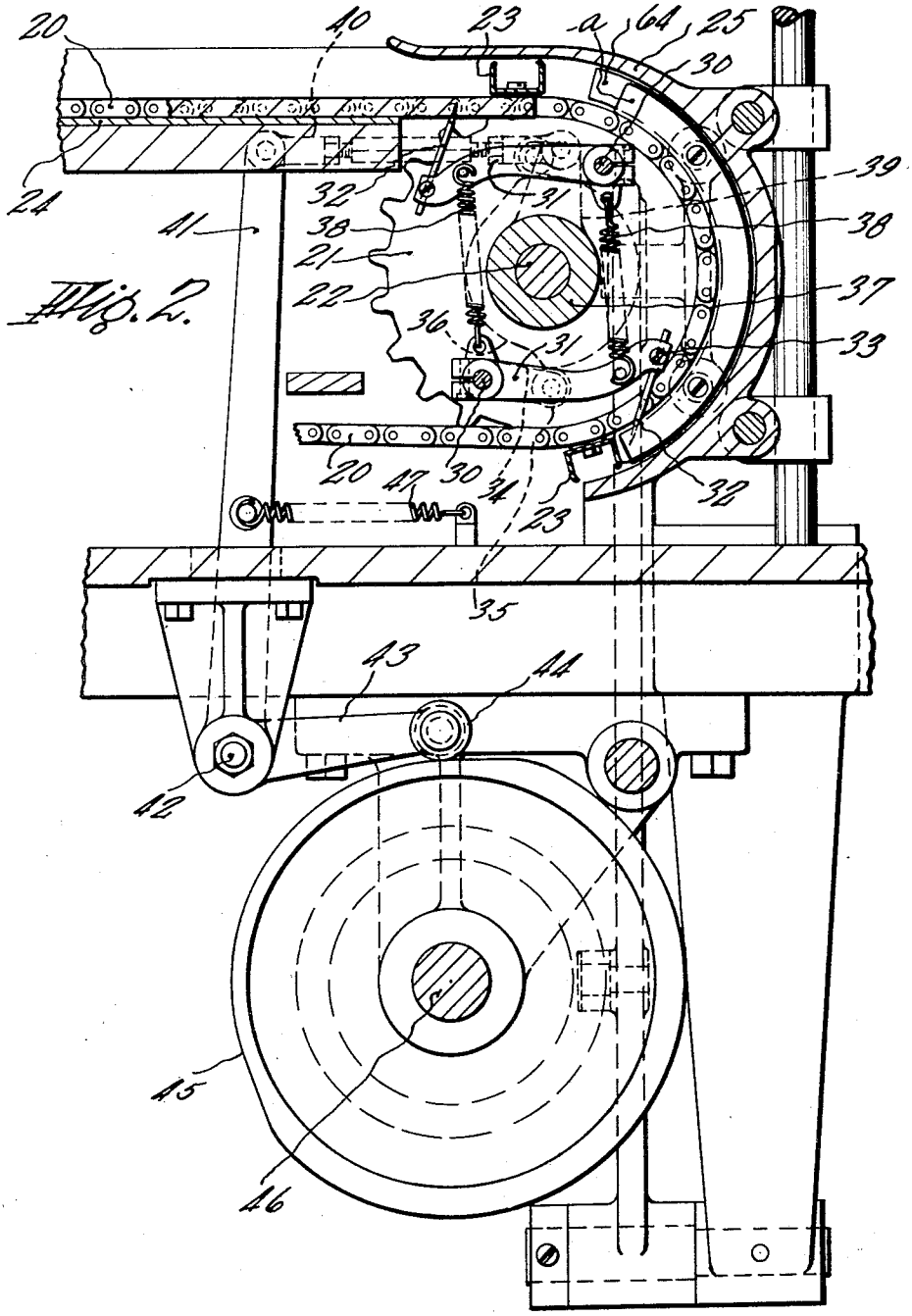

Fig. 2.

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WRAPPING MACHINE

Filed Sept. 27, 1928 5 Sheets-Sheet 3

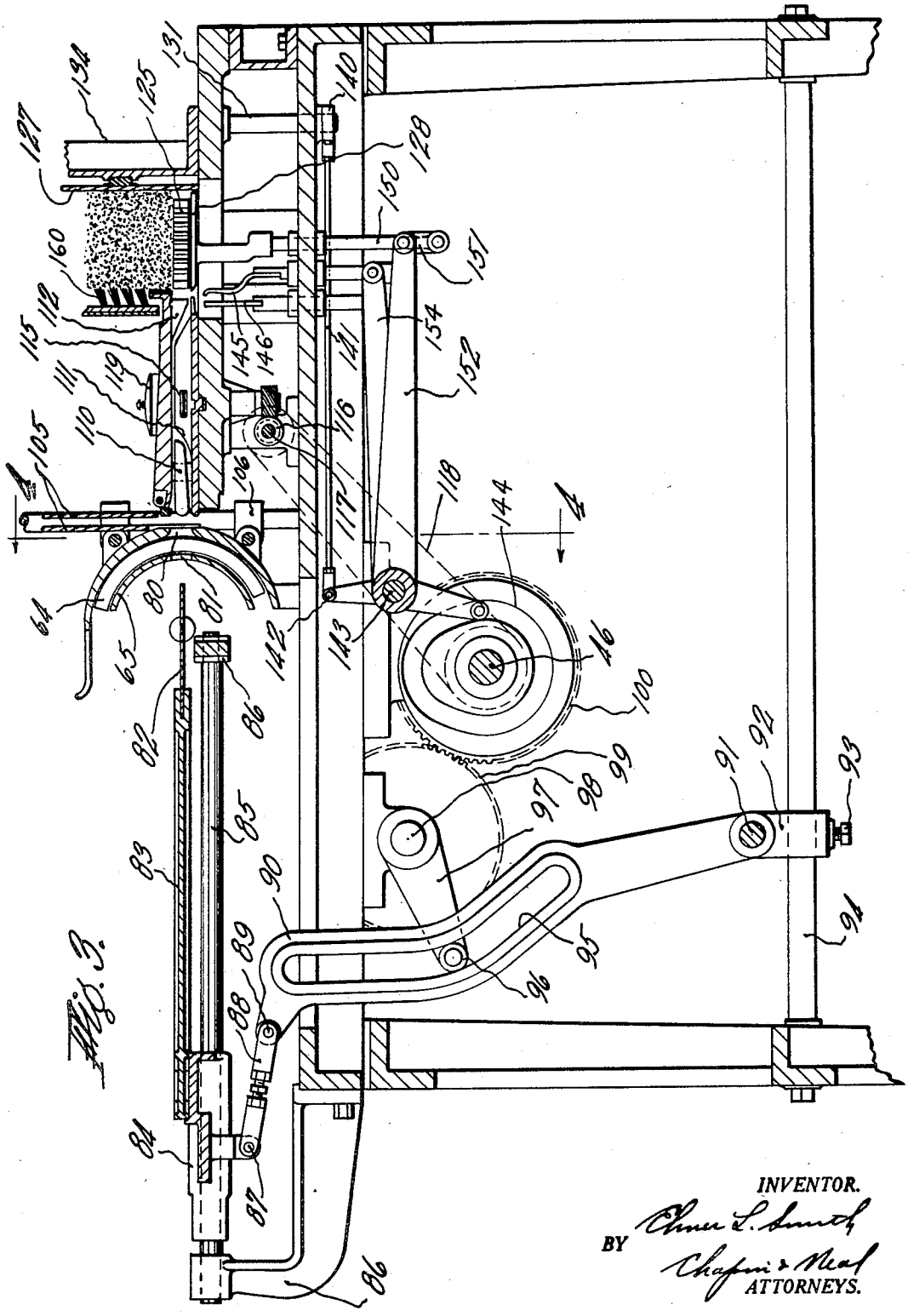

Fig. 3.

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Sept. 22, 1931. E. L. SMITH 1,824,378

WRAPPING MACHINE

Filed Sept. 27, 1928 5 Sheets-Sheet 4

Fig. 4.

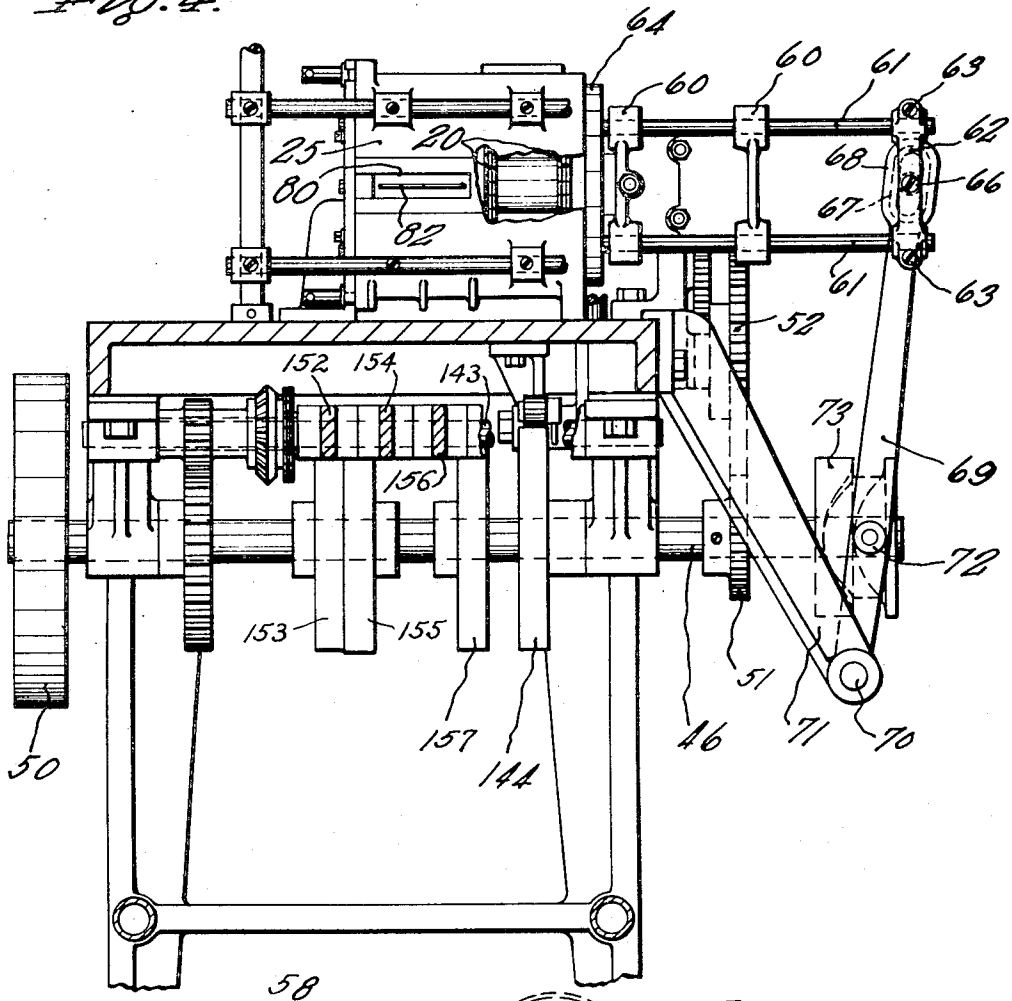
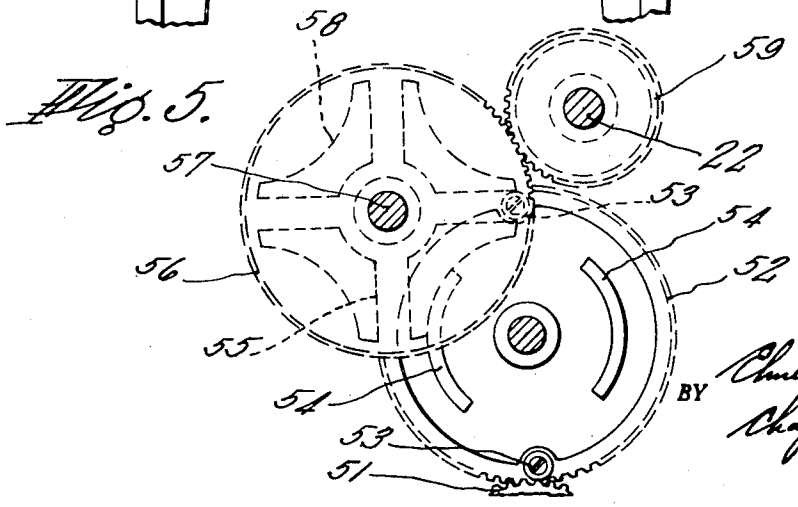


Fig. 5.



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Sept. 22, 1931. E. L. SMITH 1,824,378

WRAPPING MACHINE

Filed Sept. 27, 1928 5 Sheets-Sheet 5

Fig. 6.

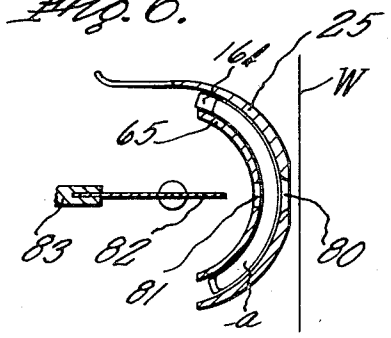


Fig. 7.

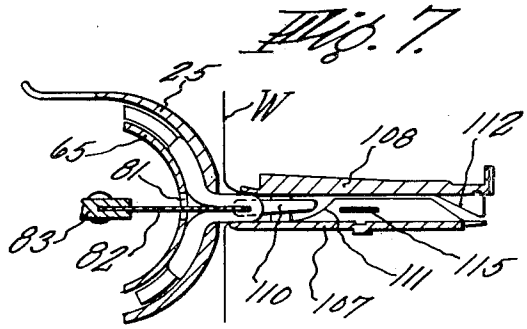


Fig. 8.

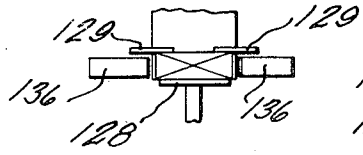


Fig. 9.

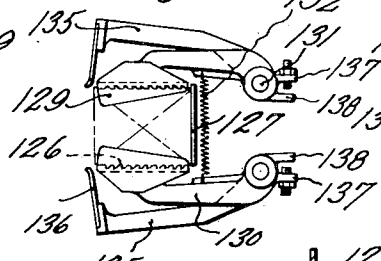


Fig. 11.

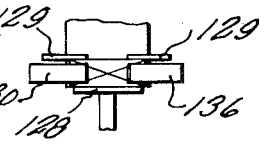


Fig. 10.

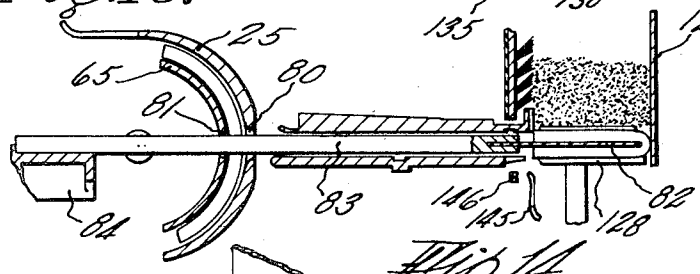


Fig. 12.

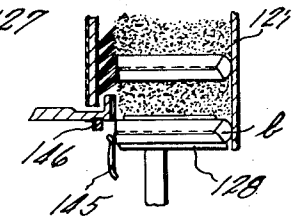


Fig. 13.

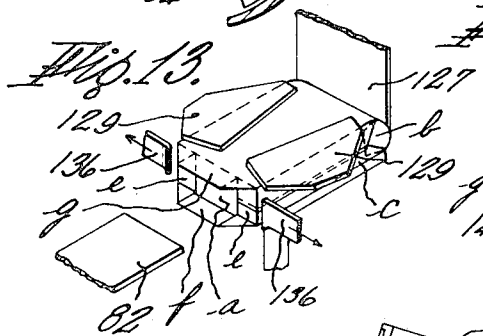


Fig. 14.

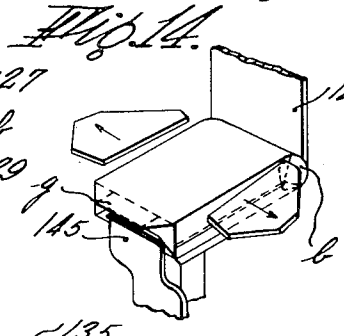


Fig. 15.

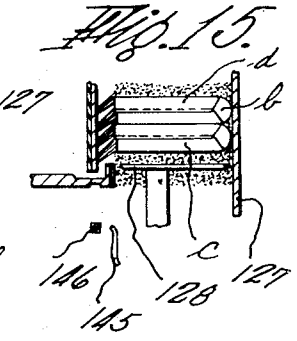
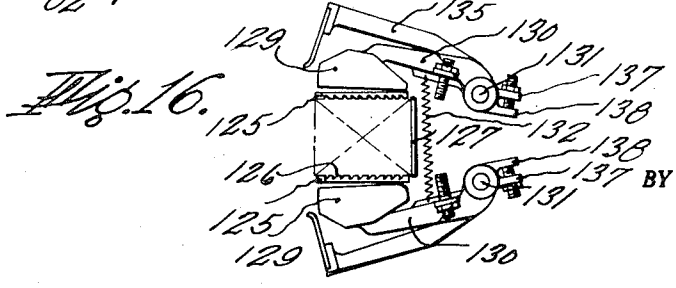


Fig. 16.



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Patented Sept. 22, 1931 1,824,378

UNITED STATES PATENT OFFICE

ELMER L. SMITH, OF LONGMEADOW, MASSACHUSETTS, ASSIGNOR TO PACKAGE MACHINERY COMPANY, OF SPRINGFIELD, MASSACHUSETTS, A CORPORATION OF MASSACHUSETTS

WRAPPING MACHINE

Application filed September 27, 1928. Serial No. 308,802.

This application relates to machines for wrapping articles in an outer covering of paper or the like. One object of the invention is to provide a machine of this character which will wrap soft, flexible articles with a tight covering of paper. A further object is to provide a machine which will fold the article prior to wrapping it. A further object is to provide a machine in which a flexible, compressible article will be folded and wrapped while giving support to the article at all times so that the several folding operations will not cause distortion sufficient to destroy the desired tightness of the wrapping. A further object is to provide a machine of this character which will wrap articles of a flexible and compressible nature with neatness and at a high speed. Additional objects will appear from the following description and claims.

The drawings

Referring to the drawings:

Fig. 1 is a top plan view of a machine embodying my invention;

Fig. 2 is a section on line 2—2 of Fig. 1;

Fig. 3 is a section on line 3—3 of Fig. 1;

Fig. 4 is a section on line 4—4 of Fig. 3;

Fig. 5 is a detail of gearing, taken on the line 5—5 of Fig. 1;

Fig. 6 is a diagrammatic section showing the article about to be folded;

Fig. 7 is a similar view showing the start of the folding and wrapping operations;

Fig. 8 is a detail showing the package placed in the folding box;

Fig. 9 is a plan showing the same mechanism;

Fig. 10 is a view similar to Fig. 7 but showing the manner in which the article is carried into the folding box by the folding blade;

Fig. 11 is a view similar to Fig. 8 showing the operation of the end tuckers;

Fig. 12 is a detail corresponding to Fig. 10 showing the folding of one end flap and the pasting of the other;

Figs. 13 and 14 are perspective views showing the article in the conditions of Figs. 11 and 12 respectively;

Fig. 15 is a detail corresponding to Fig. 12 showing the ejection of the article and the formation of the last fold; and

Fig. 16 is a plan corresponding to Fig. 9 showing the opening of the folding box to permit the ejection of the article into the delivery chute.

General description

Before considering the several parts in detail, the machine will be described briefly as a whole. The mechanism is designed to handle long flexible articles such as absorbent gauze pads, fold them upon themselves to form a package half the length of the pads, and wrap and seal the folded package in a covering of paper. The machine will be described in its preferred embodiment, in which the several functional groups of mechanism coact to produce the desired results in the best manner of which I am now aware. These functional groups, however, may be replaced by other specific forms performing equivalent steps, and in themselves possess features of novelty which may find utility in other assemblies. I will now describe the machine generally, and will then consider the several functional groups of mechanism separately. The articles are received on a long conveyor, which, in passing around a chain sprocket, positions the articles centrally with respect to a horizontal plane through the axis of the sprocket. Releasable pins, moving with the sprocket, are employed to assist in the centering of the article. When the article is properly centered, the motion of the conveyor stops and the article is pushed sideways off the conveyor into the path of a folding blade.

This folding blade carries the article through an aperture serving to fold the ar-

ticle against both sides of the blade, and then carries the folded article through a wrapping mechanism generally similar to that described in the patent to Armstrong, 1,244,277, granted Oct. 23, 1917. While the operation of the present wrapping machine resembles that of the Armstrong patent in many respects, it differs therefrom in certain features rendering it adaptable for the compressible and flexible articles with which the present machine is intended to deal. To this end, the wrapping channel of the prior patent is terminated, in accordance with my present invention, in a folding box normally practically closed except at its entrance side, but having its side adjoining the delivery chute formed so as to open just prior to the ejection of the article. This keeps the shape of the article under control at all times, and prevents shifting or distortion of the articles by the operation of the various folding devices. A somewhat similar office is performed by the blade which initially folds the article, as it remains enclosed within the folded article as the latter is carried past the wrapper side folders and until it is positioned within the terminal folding box.

Article conveyor

The article feeding conveyor is formed by a pair of spaced chains 20, running at the machine end of the conveyor upon sprockets 21 fixed to a shaft 22 and at its outer end upon other idle sprockets (not shown). Bridging the two chains at regular intervals are lugs 23, conveniently formed by lengths of channel iron and acting as pushers for the articles. The chains on their upper reaches are borne by a runway 24 forming a support for the bottom of the articles, and as they pass around the sprockets 21 travel within an outer guide 25.

Article retaining means

Due to the fact that the pushers 24 and the articles *a* in traveling around the sprockets lie on a greater circumference than that of the pitch circle of the chains, the pushers will separate, leaving a space between them longer than the length of the articles. The pushers therefore cannot be relied on to position the article with absolute accuracy. I have provided article holding devices, preferably in the form of needles projected into the articles, which hold the articles against the rear side of the pusher just ahead of them until the conveyor stops, whereupon the needles are retracted to release the articles for the action of the transferring plunger.

Mounted between the two sprockets 21 are diametrically opposed pivot shafts 30 bearing needle carriers 31 each having a needle 32 held in place by a set screw 33. Also attached to each pivot shaft is an arm 34 having at its end a roll 35 adapted to bear against the surface of a cam 36 carried upon a sleeve 37 freely rotatable upon the shaft 22. Springs 38 constantly urge the cam rolls against the cam. The sleeve 37 bears an arm 39 joined by a link 40 with an arm 41 pivoted upon a shaft 42 and bearing an arm 43. Upon this latter arm is a cam roll 44 resting upon the outer surface of a cam 45 rotatable with the main cam shaft 46. A spring 47, strained between the arm 41 and a fixed point on the frame, constantly urges the parts in a direction to keep the cam roll against the surface of the cam.

Considering now the operation of the article retaining needles, the sequence of that needle at the top in Fig. 2 will be described. The cam roll controlling this needle is shown as being on the high spot of the cam, and the needle is therefore projected its maximum distance radially of the sprocket. In further clockwise rotation of the sprocket, however, the motion of the end of the needle on an arc concentric with shaft 22 will carry it upwardly into the leading end of an article adjacent the cross lug 23. This is for the reason that the needle in its motion along the arc referred to has, in the position shown at the top of Fig. 2, not yet intersected the straight portion of the path of the chain 20. By the time the needle and the chain are both traveling around the sprocket, the needle, while not having changed its radial distance from the center of the sprocket, will have assumed a position relative to the chain similar to that in which that needle at the bottom in Fig. 2 is shown. Besides moving upward, the needle also moves slightly ahead relative to the lug, so that the article will be positioned accurately and firmly against the rear of the lug. During the movement to the position assumed by the lowermost needle in Fig. 2, no relative movement between the needle, lug and article takes place. At this position, however, and as the conveyor comes to rest, the cam 36 is rocked counterclockwise by cam 45 and the intermediate linkage, permitting the spring 38 to retract the needle from the article. The article is then in position and free of restraint so that it may be carried sideways off the conveyor by the transfer plunger to be described below. The cam 39 is reset in the position shown in Fig. 2 during the next half-revolution of the sprockets 21, so that the parts are ready to repeat the sequence of operations described.

Article conveyor drive

The conveyor is driven intermittently by suitable gearing from the main cam shaft 46 already referred to. This shaft may receive continuous motion from any desired source, a pulley 50 being shown permitting it to be belted to a suitable motor. On the shaft 46 is mounted a gear 51 (Figs. 4 and 5) meshing with a gear 52 which carries diametrically

opposed Geneva pins 53 and stop plates 54. The pins coact with slots 55 formed in the side of a gear 56 mounted upon an idle shaft 57. The stop plates 54 coact with curved stop plates 58 also mounted on the side of the gear 56 so as to prevent rotation of the latter intermediate the periods of action of the Geneva pins 53 in the usual manner. Gear 56 meshes with a gear 59 fixed to the conveyor shaft 22.

Gear 51 is of half the number of teeth of gear 52, imparting to it half a revolution for each revolution of the cam shaft, one revolution of the latter fixing the complete cycle of the machine. As gear 52 rotates a half revolution, it imparts a quarter revolution to gear 56. The gear 59, with which gear 56 meshes, is of half its number of teeth and thus rotates twice as fast, or a half revolution during one cycle. This arrangement of gearing brings the two needles alternately into operation during successive cycles of the machine.

Article transferring plunger

Mounted on guides 60 at one side of the machine (Figs. 1 and 4) are rods 61 bearing at their outer ends a cross-head 62 held fixed to the rods by set-screws 63. At their inner ends, the rods bear jointly an arc-shaped plunger 64 shaped to pass between the conveyor chain and the outer guide 25. The plunger is adapted for movement from the position shown in Fig. 4 to a position where it has moved the article completely off the conveyor chains and between the outer guide 25 and an inner guide 65 concentric therewith but spaced therefrom.

To operate the plunger at intervals timed with the rest of the machine, a pin 66 is attached to the cross-head 62 and runs in a slot 67 formed in the enlarged end 68 of an arm 69. This arm is pivoted at 70 to a bracket 71 and bears intermediate its length a roll 72 riding in a groove in a cylinder cam 73 fixed to the main driving and cam shaft 46. During each cycle of operation of the machine, this cam actuates the plunger to shift an article from the conveyor and then returns it to its inactive position shown in Fig. 4.

Article folding mechanism

In the outer guide 25 is an aperture 80 of a width equal to the article and of a depth permitting the passage of the article when folded upon itself. The plunger 64 transfers the article from the conveyor to a position where it is centrally disposed with respect to this aperture. In line with this aperture is a second aperture 81 in the inner guide 65, through which a folding blade 82 is adapted to pass. This blade is carried upon the forward end of an arm 83 extending from a slide 84 reciprocable upon rods 85 suspended between brackets 86.

To reciprocate the slide and the folding blade 82 carried thereby, the slide is provided with a pin 87 (Fig. 3) by which it is pivoted to a link 88, preferably adjustable in length by means of the usual turnbuckle construction. The other end of this rod is pivoted at 89 to a rocking arm 90 pivoted at 91 to a bracket 92 adjustably secured by a set screw 93 to a rod 94 mounted on the machine frame. In the arm is formed a slot 95 in which runs a roll 96 carried by a crank 97 fixed upon a shaft 98. Gearing 99, 100 connects this shaft to the main drive shaft 46 so that the crank, and hence the slide, goes through a complete cycle for each cycle of the machine. The crank and slot connection described gives to the folding blade a relatively slow forward movement, during which the article is folded upon itself and a wrapper partially formed around it, and then a rapid return movement to its inactive position.

Wrapping channel

As the folding blade moves forwardly, it engages the center of the article and forces it through the aperture 80, causing it to be folded upon the blade. When the article emerges from the aperture, it meets a sheet of wrapping material *w*, delivered by hand or by any suitable feeding mechanism between guides 105 with its edge upon a positioning stop 106. Further motion of the folding blade carries the article and the wrapper through a wrapping channel of the same general type as shown in the Armstrong patent above referred to.

This channel is formed with a base 107 and a top plate 108 preferably hinged at 109 to permit ready access to its interior in case of trouble. A pair of stationary folders 110 at the sides of the channel make the first side tucks *b* in the wrapper, and a second pair of stationary folders 111 then make the bottom side folds *c*. The final side folds *d* are made by a third pair of stationary folders 112. At a point in the channel intermediate the two side folders 111 and 112 are located rolls 115 for applying paste or other adhesive. The shafts of these rolls are geared at 116 to a cross shaft 117 driven by means of a chain connection 118 from the main shaft 46. The rolls are thus driven at substantially the same surface speed as the advancing article, and apply a line of paste to the turned up side folds *c*. In order to supply paste to these rolls, they extend into slots in the sides of adhesive reservoirs 119.

Wrapper folding box

After the side folds of the wrapper have been made and pasted during the passage through the wrapping channel, the article, with the wrapper folded about it on all but one side, is deposited in a folding box positioned directly under the delivery chute.

This folding box is formed at the sides of the article by stationary plates 125 (Fig. 16) preferably having dull ratchet-like teeth 126 formed in their surfaces to prevent retrograde movement of the article as the folding blade is withdrawn. The end of the box is formed by a back wall 127 also forming the back wall of the delivery chute. The bottom of the box is formed by an elevator plate 128 which is stationary at the time the article is introduced but is moved vertically thereafter to discharge the wrapped article into the chute above.

The top of the box deserves special attention, and differs from prior constructions in features adapting it especially to the flexible, compressible article with which the present machine deals. At the time when the partially wrapped article is introduced, the top of the box is partly closed by two plates 129. Each of these plates is carried by an arm 130 freely rotatable on a vertical shaft 131. During the folding of the end tucks and of the bottom end fold, these plates remain in place, giving to the article an artificial rigidity preventing it from being shifted or seriously distorted by the action of the movable folders. Just prior to the ejection of the article into the delivery chute, during which movement the last end fold is made, the plates are withdrawn so that the article is free to be moved vertically.

The arms 130 carrying the plates 129 are drawn together by a spring 132 into a limiting position determined by the contact of stop screws 133 on the arms with a bracket 134 supporting the rear wall of the discharge chute. This limiting position is that in which the arms appear in Figs. 1 and 9. The arms are moved outwardly from this position at periodic intervals by an interengagement with a pair of arms 135 carrying the end tuckers 135. These second arms are fixed upon the shafts 131 on which the arms 130 are freely pivoted, and have rearwardly extending lugs 137 abutting lugs 138 on the arms 130. Gear segments 139 join the two shafts 131 for simultaneous oscillation, which is attained by means of a crank 140 joined by a link 141 with a lever 142 pivoted on a cross shaft 143 and bearing a suitable roll actuated by a cam 144 on the shaft 46.

Assuming a package with the wrapper sides folded and the tubular rear extension of the wrapper unfolded to have been placed within the folding box while plates 129 are in the position of Fig. 9, the folding blade 82 is first withdrawn from the article, which is prevented from moving with the blade by the friction of the compressed package, and particularly by the ratchet-like teeth 126. The arms 135 are rocked inwardly and then returned to the position of Fig. 9, thereby making the end tucks *e* best shown in Fig. 13. The bottom end fold *f* is made by a vertically reciprocable folding blade 145, which remains in its upper position until the article is ejected. At about the same time, a pasting arm 146 is raised from a reservoir in which it is normally immersed, applying a stripe of paste to the bottom surface of the top end flap *g*. This latter flap is folded by contact with the top plate 108 of the folding channel as the article is ejected by the plunger 128.

Just before this ejection of the article takes place, however, the arms 135 are given a supplementary outward movement by means of their operating cam 144, which brings the lugs 137 and 138 into contact and swings the arms 130 to withdraw the plates 129 from engagement with the top of the package. After the package has been discharged into the chute and the ejecting plunger 128 has lowered, the arms 135 return to their initial position of Fig. 9 in which the plates 129 are carried by their springs into position above the box to receive the package next to be delivered.

The elevator 128 is mounted upon a slide rod 150 joined by a link 151 to a bell crank lever 152 pivoted to the shaft 143 and actuated by a cam 153 on the shaft 46. The folding blade 145 is similarly actuated by a lever 154 actuated by a cam 155 on the shaft 46. A lever 156 is connected to the pasting arm 146 and is controlled by a cam 157 on the main cam shaft 46. The folder operating devices, as well as the delivery chute, are in general of the type shown in the Armstrong patent referred to. The delivery chute, however, is provided with upwardly slanting bristles 160 on its inner surface, instead of the conveyor belt illustrated in the patent.

It will be observed that the plates 129, since they remain in position during the insertion of the package into the folding box and during the making of the folds *e* and *f*, give an artificial rigidity to the package similar in result to that given by the folding blade 82 during the passage through the folding channel. This action results in a tightness of wrap greater than otherwise could be accomplished on articles as flexible and compressible as those which the present machine is designed to wrap.

What I claim is:

1. A wrapping machine for long, flexible articles comprising a curved guideway having a radial aperture at one point, means for feeding an article to the guideway, an arc-shaped plunger for feeding the article longitudinally of the guideway to a point in front of the aperture, and means forcing the articles through the aperture to fold it.

2. A wrapping machine comprising a wrapping channel having stationary folders positioned to form side tucks and side folds, means for holding a wrapper across the channel, an article folding throat aligned with the

wrapping channel, means for positioning an article across the folding throat, and a folding blade movable through the throat and into the channel to fold an article and carry it into the wrapper and past the folding devices.

3. A wrapping machine comprising a delivery chute, a pair of end tuckers situated adjacent the entrance of the chute, a folder movable towards the chute to make an end fold in the wrapper, means for forcing the article into the delivery chute, a pair of plates movable between the article and the chute to give suport to it during the action of the tuckers and the folder, spring means normally holding the plates in operative position, means for operating the tuckers into an operative, an inoperative and an intermediate position, and a lost motion connection between the tuckers and said plates to operate the latter.

4. A wrapping machine comprising a folding chute, an intermittently driven conveyor chain having spaced article-positioning flights, sprocket wheels around which the conveyor chain passes, means for holding an article against that one of the flights which is adjacent the leading end of the article as the conveyor chain passes around one of the sprockets to position it in definite relation to the chute as the conveyor stops, mechanism for delivering the positioned article into the folding chute so as to fold it upon itself, and means for enclosing the folded article in a covering.

5. A wrapping machine comprising a folding chute, an intermittently driven conveyor chain having spaced article-positioning flights, sprocket wheels around which the conveyor chain passes, means coaxial with and movable synchronously with one of the sprockets for holding an article against that one of the flights which is adjacent the leading end of the article as the conveyor chain passes around that sprocket to position it in definite relation to the chute as the conveyor stops, mechanism for delivering the positioned article into the folding chute so as to fold it upon itself, and means for enclosing the folded article in a covering.

6. A wrapping machine comprising a folding chute, a conveyor mounted at one side of the folding chute, a sprocket around which the conveyor passes, a curved guideway extending both across the chute and across the conveyor where the latter passes around the sprocket, said guideway being apertured adjacent the entrance to the chute, an inner guideway at the side of the conveyor and forming with the first-named guideway an arcuate channel in which the article may be positioned, a member shiftable to carry an article from the conveyor into said arcuate channel, a folding member movable against the article so positioned to carry the article into the folding chute and thereby fold it upon itself, and means for enclosing the folded article in a covering.

7. A wrapping machine for yieldable articles comprising a transporting member engageable with an article and a wrapper to cause them to be moved along a predetermined path with the wrapper extending beyond the article, and folding devices operable while the article is in said path to fold the extensions of the wrapper against the article, said transporting member being shaped to engage the article internally and thereby impart artificial rigidity to it during the folding of the wrapper extensions against the article.

8. A wrapping machine comprising means for folding upon itself a flexible article of substantial thickness so as to form a generally prismatic solid of increased thickness having one folded side, three composite sides each formed of two abutting thicknesses, and two integral sides, means for bending a wrapper over the folded side of the solid and onto its integral sides, and means for folding the edges and ends of the wrapper onto the composite sides of the article.

9. A wrapping machine comprising a wrapping channel, means for positioning an article and a wrapper across the channel, a folding blade movable in the channel to force the article into and along the channel and to fold them transversely by their entrance into the channel, and wrapper folding instrumentalities positioned along the channel to form folds in the sides of the wrapper.

10. A wrapping machine comprising a folding box normally closed on five sides, a plunger having a part adapted to lie within a compressible article and movable through the sixth side of the folding box to position and compress the article therein, and out of the folding box to leave the article therein, means acting subsequent to the removal of the plunger to fold wrapper extensions at the sixth side of the box, means to open an additional side of the box, and means to eject the wrapped article through the last named side.

11. A wrapping machine comprising a folding box normally closed on five sides, a plunger having a part adapted to lie within a compressible article and movable through the sixth side of the folding box to position and compress the article therein, and out of the folding box to leave the article therein, members having inclined teeth positioned at opposite sides of the folding box to prevent the article being drawn out by the plunger, means acting subsequent to the removal of the plunger to fold wrapper extensions at the sixth side of the box, means to open an additional side of the box, and means to eject the wrapped article through the last named side.

12. A wrapping machine for flexible articles comprising opposed article folding and

wrapping members, means for curving an article in generally arc shaped form and presenting it across said members, means for holding a wrapper between the arc shaped article and said members, and a device engageable with the article while so held in curved form to deliver it and the wrapper between the members whereby the article will be folded upon itself and the wrapper folded about it.

In testimony whereof I have affixed my signature.

ELMER L. SMITH.