June 18, 1957 W. M. ADE 2,795,909

PACKAGING MACHINE

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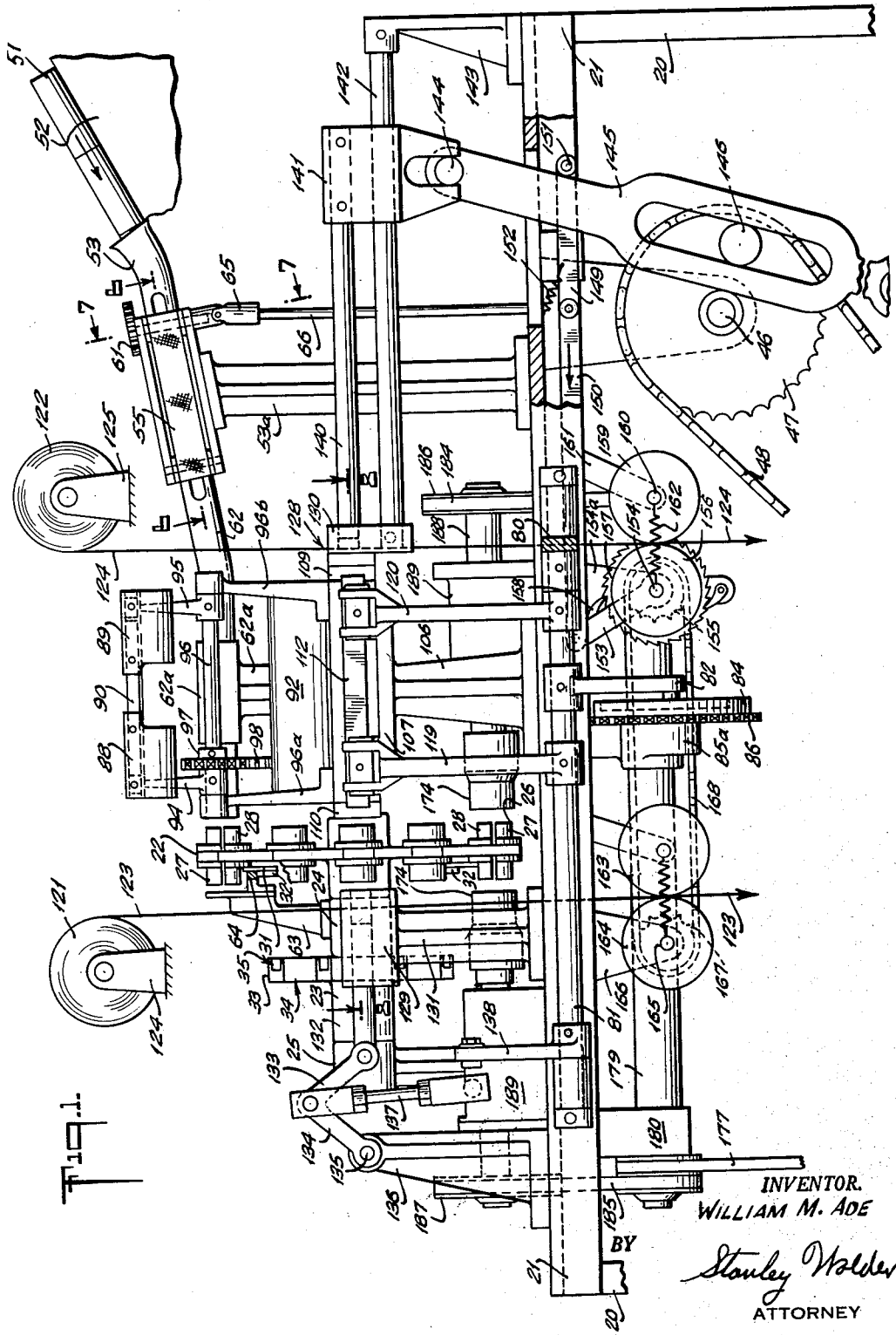


Fig. 1.

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PACKAGING MACHINE

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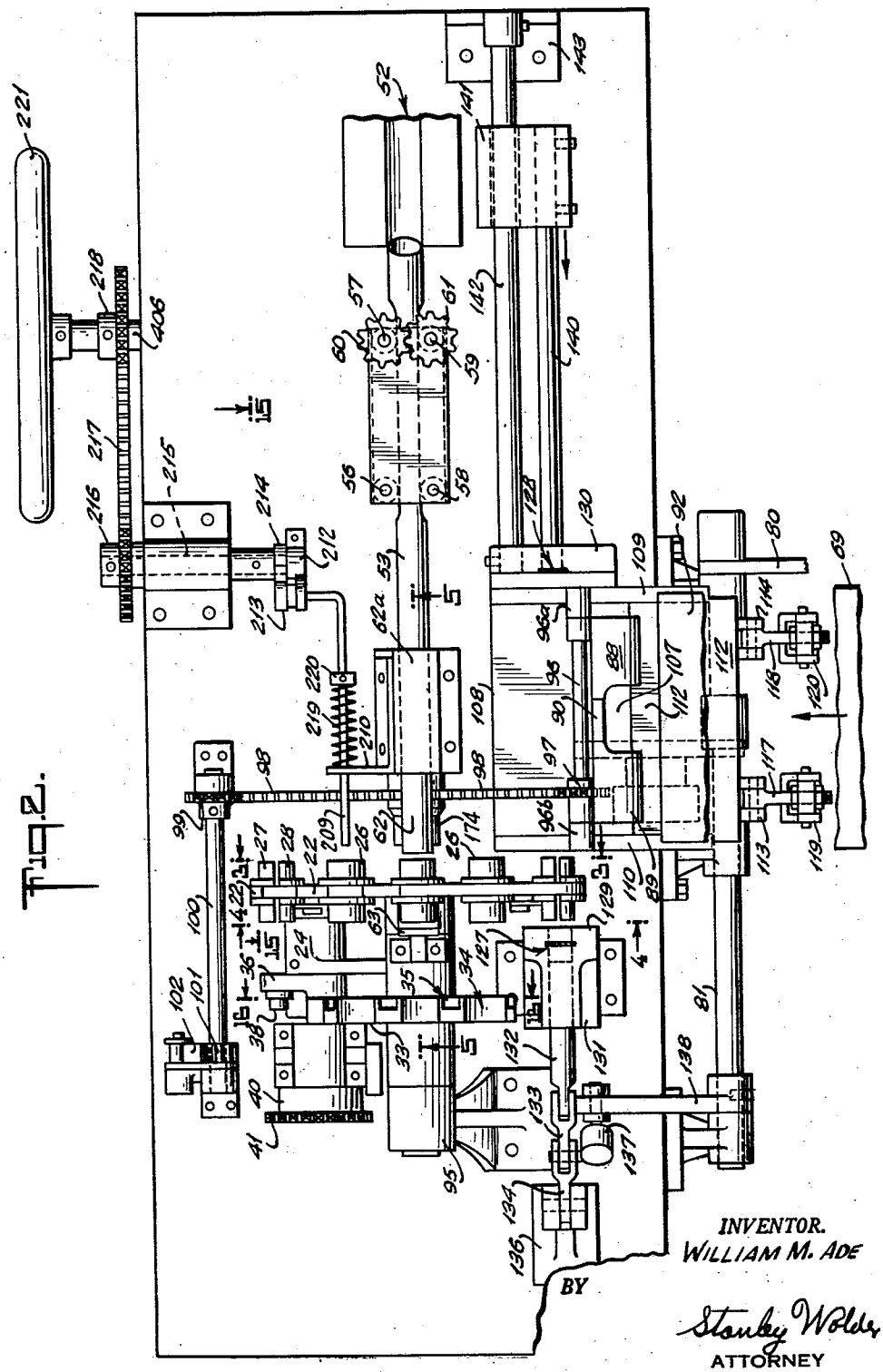


Fig. 2.

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June 18, 1957 W. M. ADE 2,795,909

PACKAGING MACHINE

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Fig. 3.

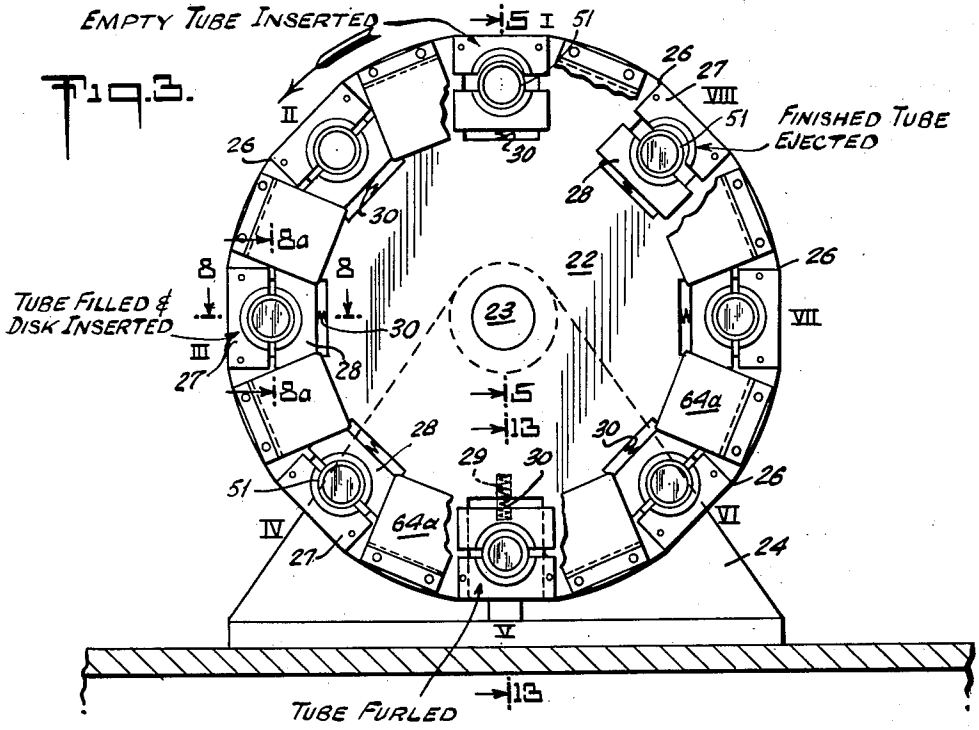
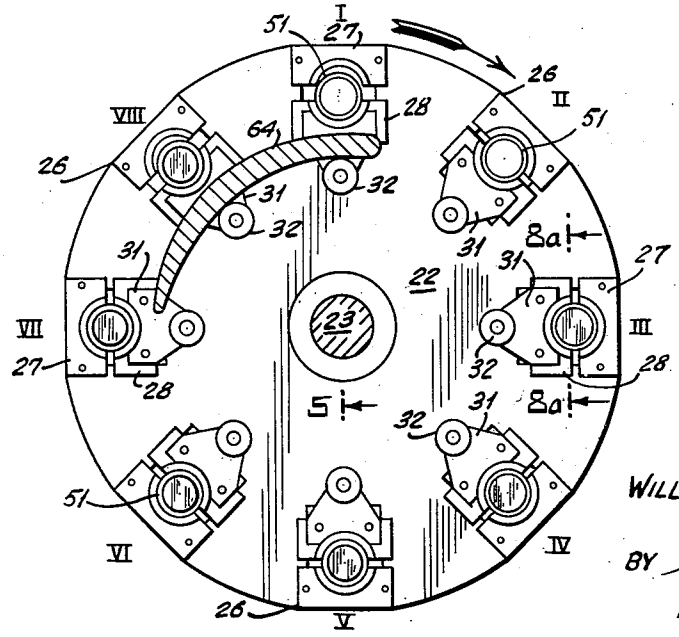


Fig. 4.



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June 18, 1957 W. M. ADE 2,795,909

PACKAGING MACHINE

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Fig. 5.

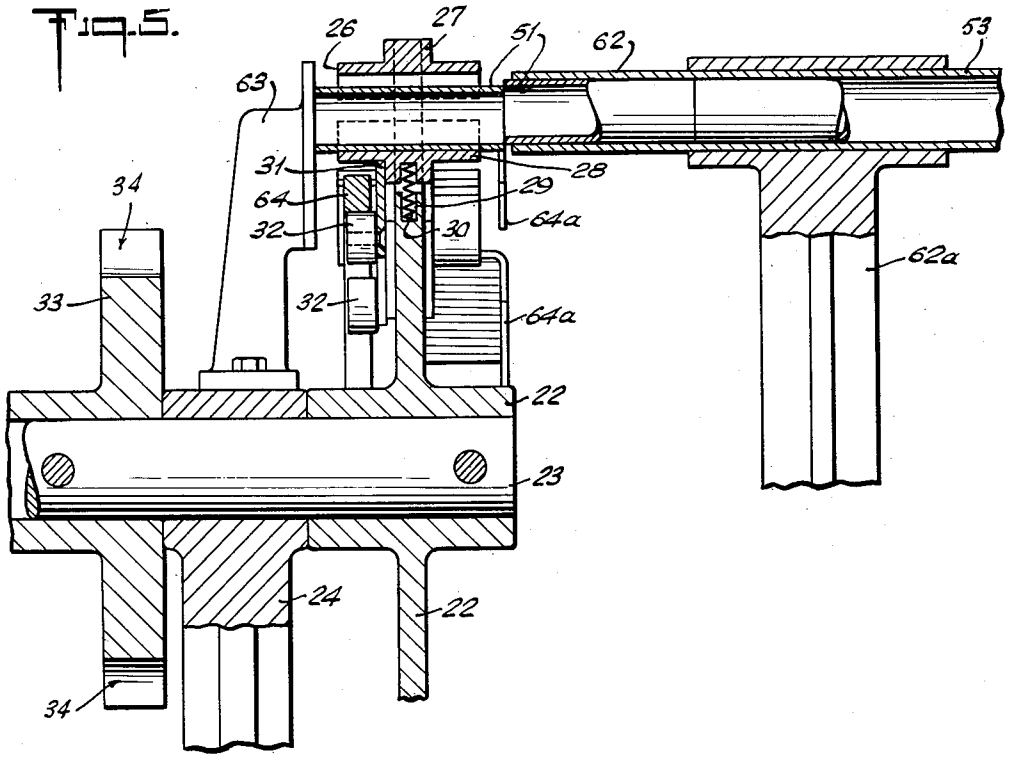


Fig. 6.

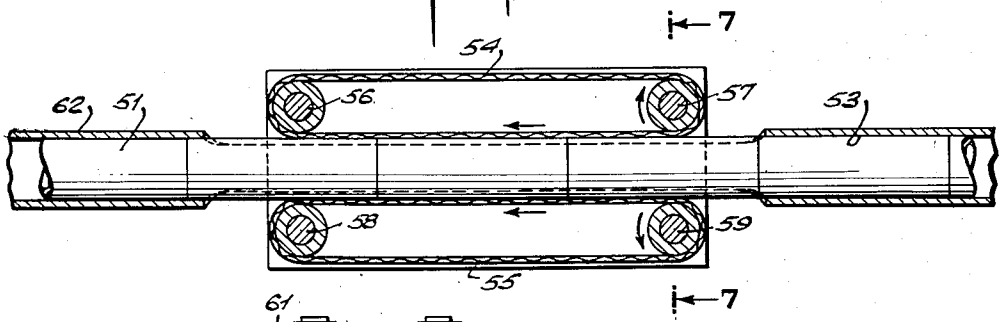
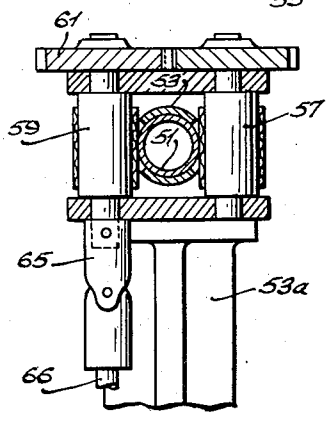


Fig. 7.



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PACKAGING MACHINE

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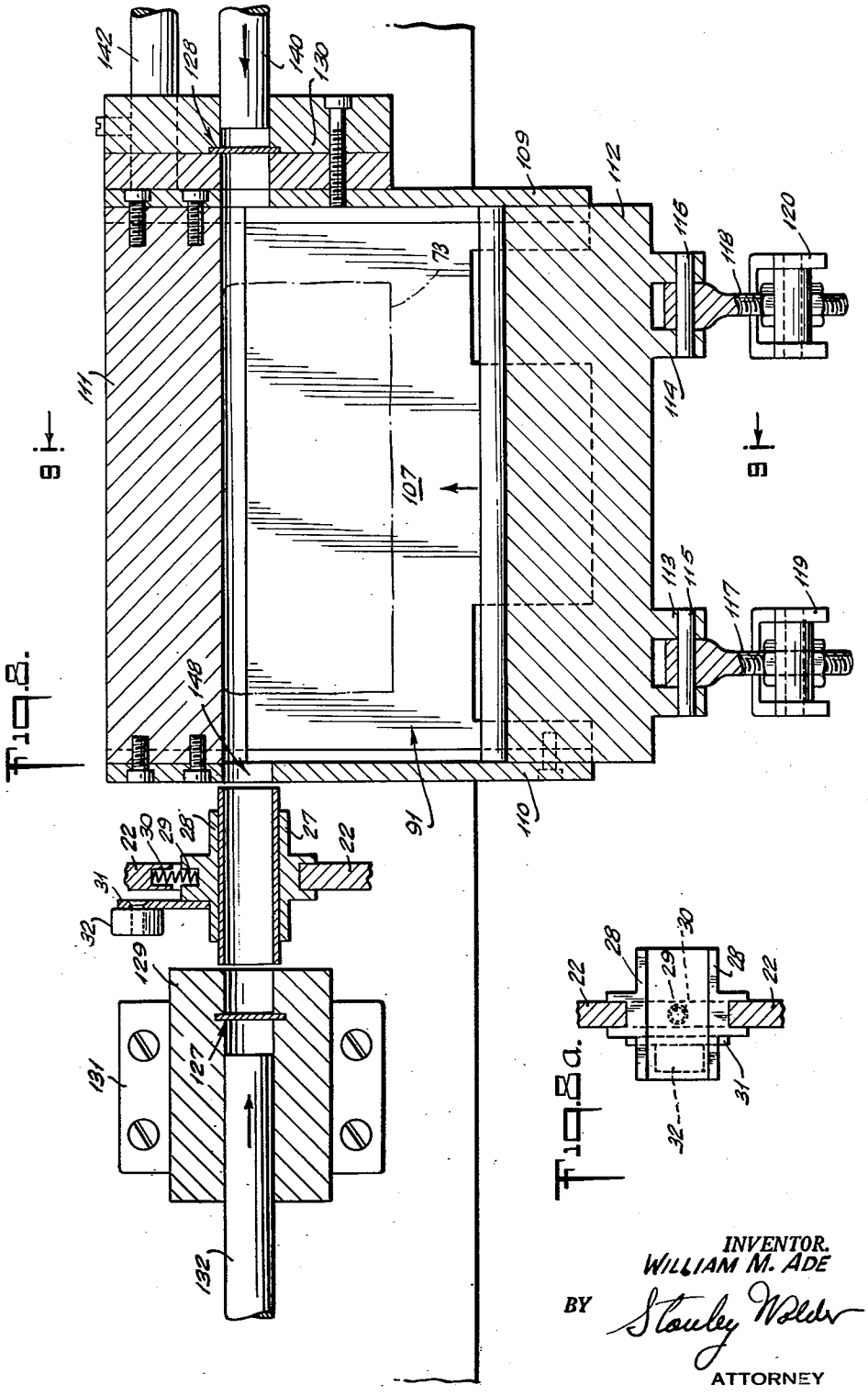


Fig. 8.

Fig. 8a.

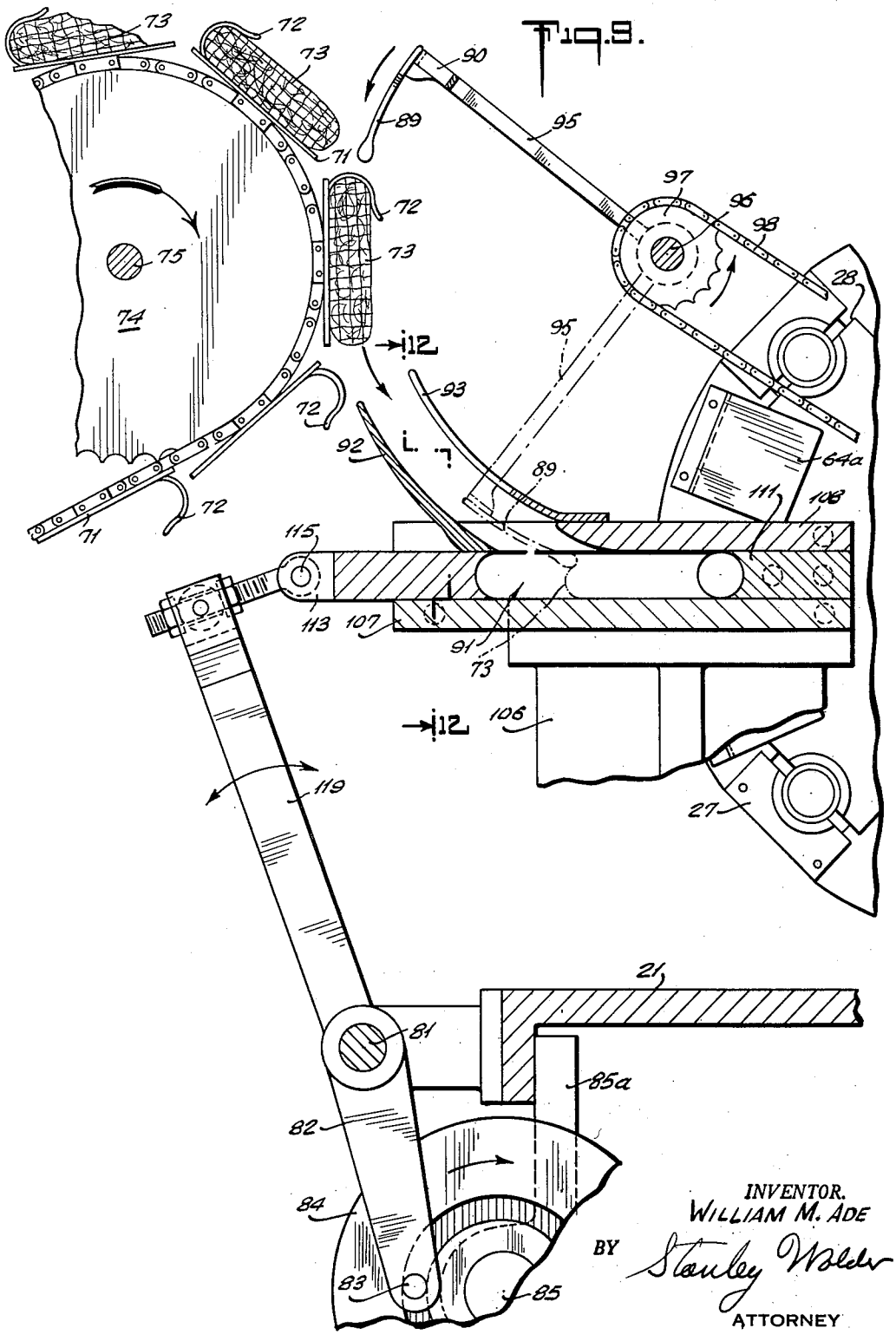
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June 18, 1957 W. M. ADE 2,795,909

PACKAGING MACHINE

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Fig. 8.



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PACKAGING MACHINE

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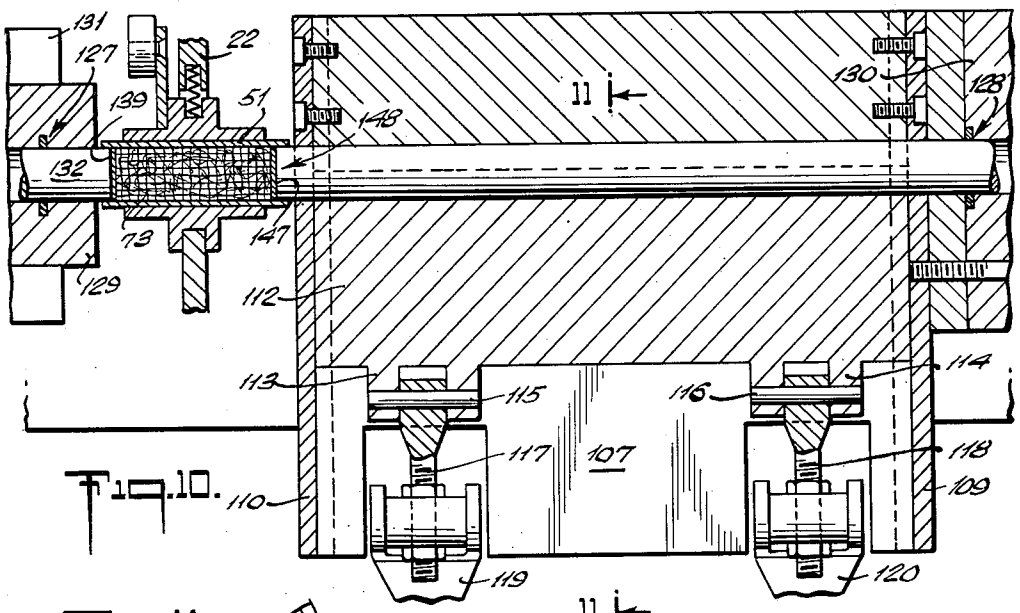


Fig. 10.

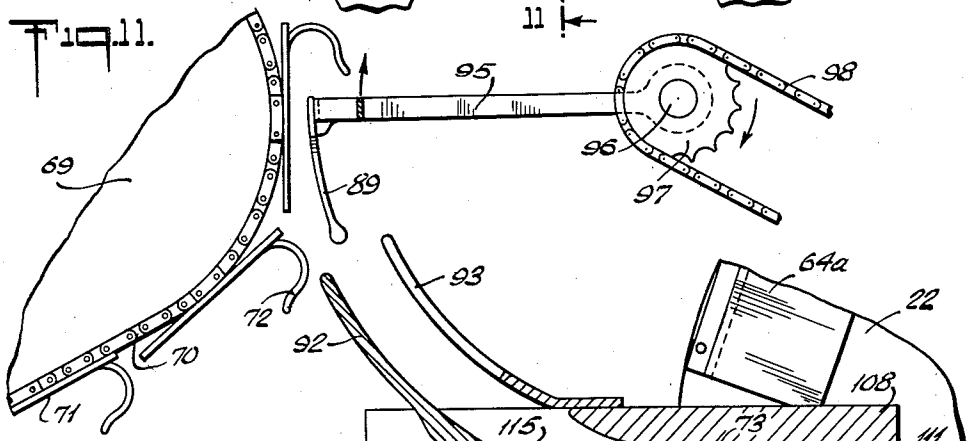
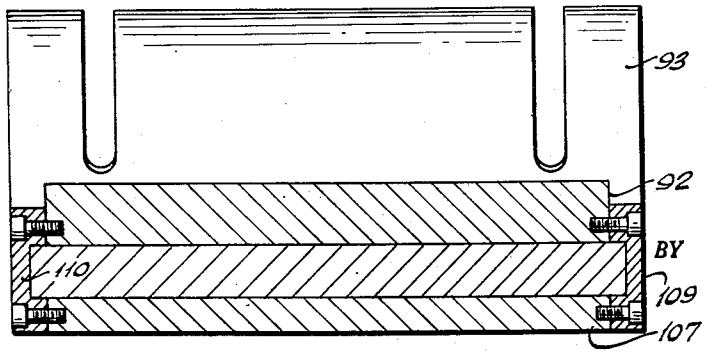


Fig. 11.

Fig. 12.



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June 18, 1957 W. M. ADE 2,795,909

PACKAGING MACHINE

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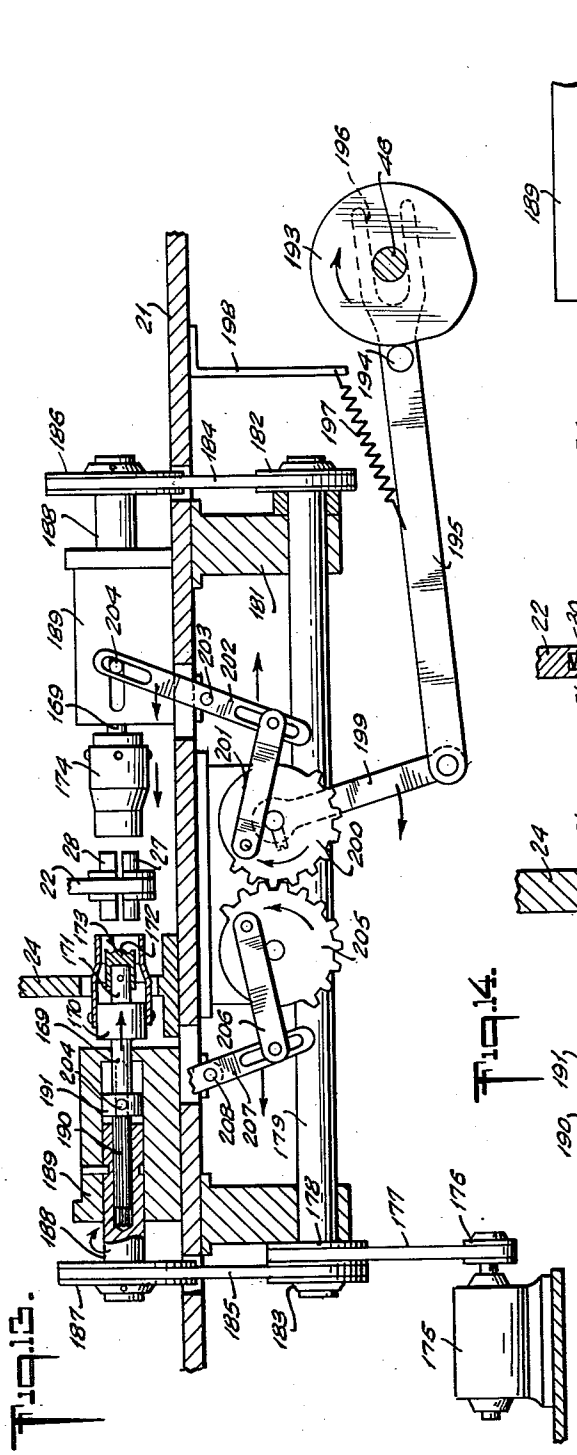


Fig. 13.

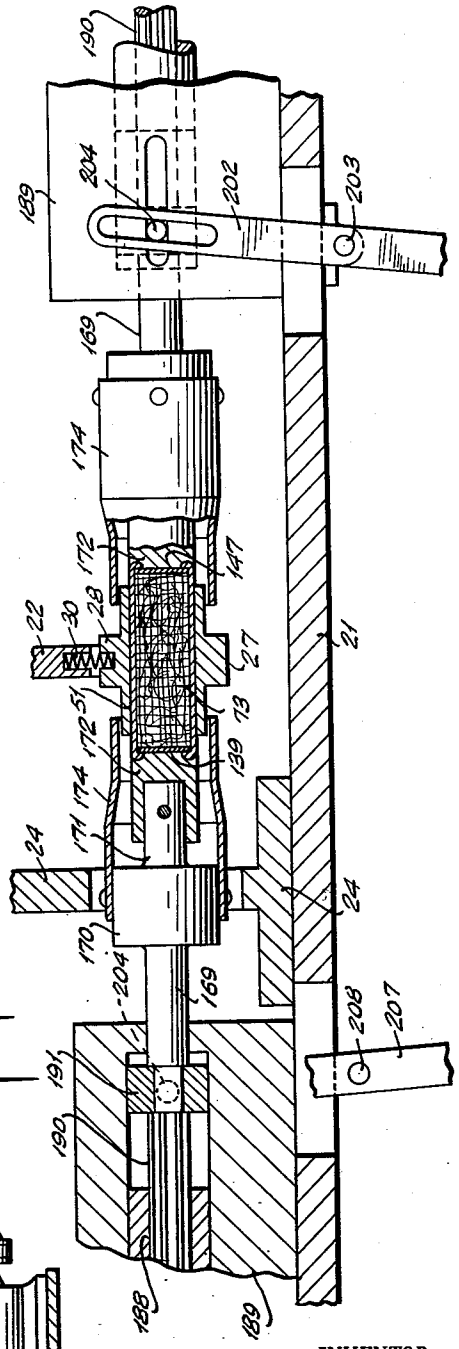


Fig. 14.

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June 18, 1957 W. M. ADE 2,795,909

PACKAGING MACHINE

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Fig. 15.

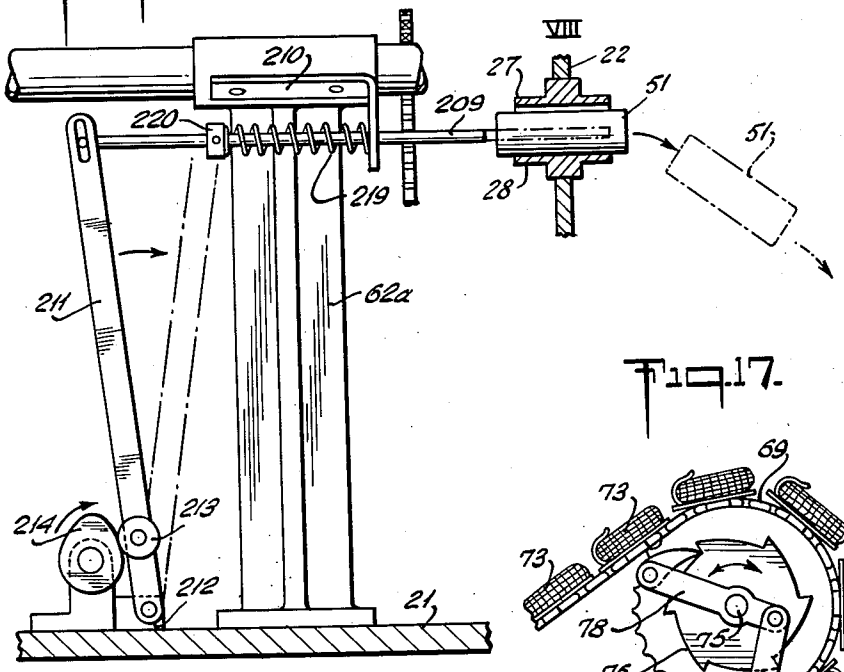


Fig. 17.

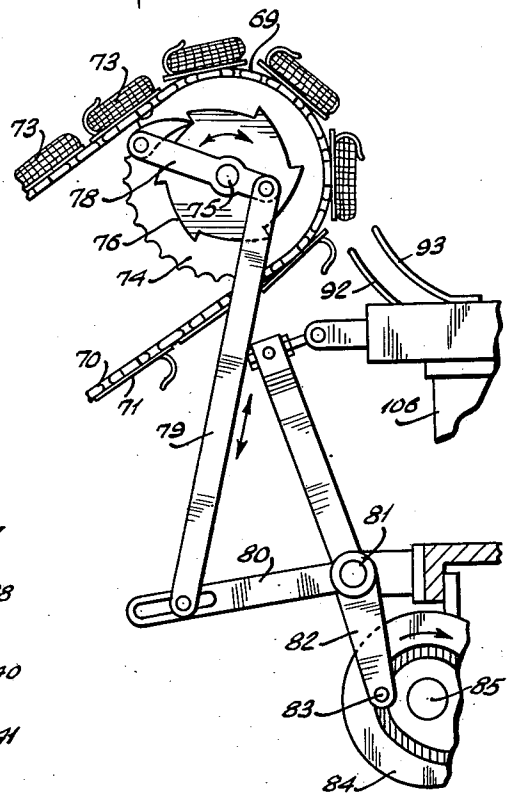
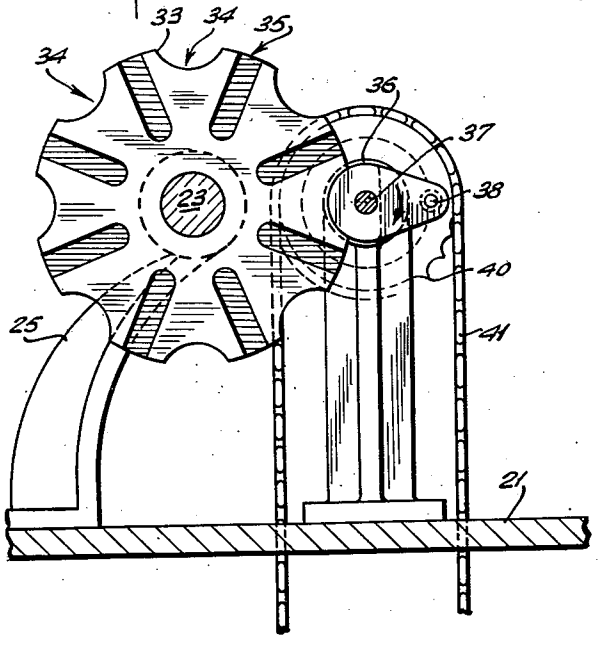


Fig. 16.



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PACKAGING MACHINE

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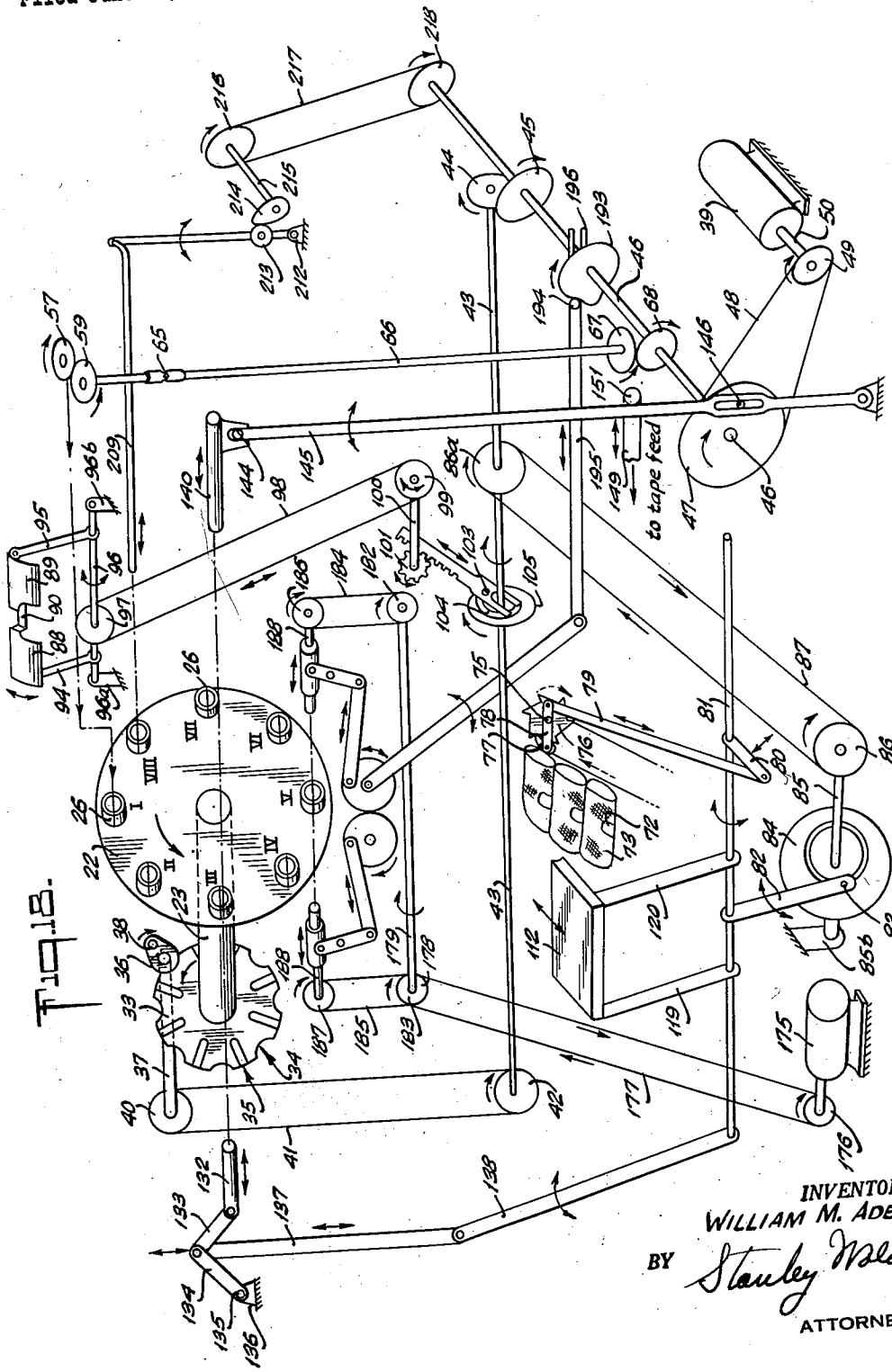


Fig. 18.

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United States Patent Office 2,795,909 Patented June 18, 1957

2,795,909

PACKAGING MACHINE

William M. Ade, New York, N. Y., assignor to Compressed Products Corporation, New York, N. Y., a corporation of Nevada

Application June 21, 1952, Serial No. 294,863

26 Claims. (Cl. 53—124)

The present invention relates to improvements in packaging machines and more particularly to one adapted to compress the article to be packaged and to pack the same in such compressed state.

An object of the present invention is to provide a packaging machine which will compress and neatly package an article.

A further object thereof is to provide a machine which accepts compressible articles to be packaged as well as elements of the packaging, and delivers a compressed packaged article.

Another object thereof is the provision of a synchronized and rapid compressing packaging machine which positively controls the travel of articles and elements of packaging therethrough without employing gravity.

These and other objects are attained in the preferred form, described more fully hereinafter, and adapted particularly to package sanitary napkins or catamenial pads in a compressed tubular package wherein the ends of the tube body are furled around circular end pieces, comprising an intermittently-driven disc-like turret mounted for rotation about a horizontal axis and having preferably eight chucks or tube holders mounted therethrough, there being positioned proximate to Station I of said turret (a particular position of a tube holder) a feeding device which introduces an open-ended packaging tube into said tube holder, whereupon said turret rotates to another position (designated Station III) at which a previously received pad, already transversely compressed in a transverse compression chamber is pushed into said tube and longitudinally compressed therein by a first punch rod against a second punch rod, said rods having passed through tapes at die openings in the course of their converging travel and thus punched out circular end elements which are positioned within said tube against said compressed pad closing the ends thereof, whereupon such chuck is then rotated to a third position (designated Station V) where oppositely positioned furling tools are caused to converge upon the ends of said tube and inwardly turn the ends thereof about the end elements to seal the package, after which the turret again revolves to place said chuck at a fourth position (Station VIII) at which point a rod pokes the completed package out of the machine; the chuck being clamped about said tubular body in all positions but those at Stations I and VIII at which respectively said body is inserted and said completed package removed.

Other objects and a fuller understanding of the present invention may be had by referring to the following detailed description and claims, taken in conjunction with the accompanying drawings which illustrate a preferred embodiment thereof, it being understood that the foregoing statement of the objects of the invention and the brief summary thereof is intended to generally explain the same without limiting it in any manner.

Fig. 1 is a side elevational view of the packaging machine embodying the present invention, parts being

omitted and parts being shown in section in order to reveal the internal construction.

Fig. 2 is a plan view thereof, likewise omitting certain parts.

Fig. 3 is a front elevational view of the turret of the machine taken along the line 3—3 of Fig. 2.

Fig. 4 is a rear elevational view of said turret taken along the line 4—4 of Fig. 2.

Fig. 5 is a fragmentary side elevational view of the turret and associated parts at Station I, the tube inserting Station, being taken along line 5—5 of Figs. 2, 3 and 4.

Fig. 6 is a fragmentary plan view in section of the tube-feeding device and more particularly the frictional drive thereof taken along line 6—6 of Fig. 1.

Fig. 7 is a front sectional view thereof taken along line 7—7 of Fig. 6.

Fig. 8 is a section taken on line 8—8 of Figs. 1 and 3 running through Station III, the compression Station, and showing the compression chamber in open condition, as well as the punch rods and punch dies.

Fig. 8*a* is a fragmentary detailed section taken on line 8*a*—8*a* of Figs. 3 and 4 with the tube omitted, showing the means of mounting the movable jaw of the tube holders.

Fig. 9 is an elevational sectional view taken along the plane 9—9 of Fig. 8 showing the pad conveyor and the pad pusher plates as well as the transverse compression plate and means of driving the same.

Fig. 10 is the same view as Fig. 8 at the instant that longitudinal compression has been completed.

Fig. 11 is a view similar to Fig. 9 but taken in section along the line 11—11 of Fig. 10 showing the compression chamber in closed condition.

Fig. 12 is a section taken on line 12—12 of Fig. 9 showing the back guide plate, and the transverse compression chamber in section.

Fig. 13 is an enlarged fragmentary elevational view along line 13—13 of Fig. 3 taken about the area of Station V, the furling Station, showing the furling tools and the drives therefor but omitting the tube.

Fig. 14 is a still further enlarged fragmentary view of the view shown in Fig. 13 showing the furling action on the ends of the packed tube.

Fig. 15 is a sectional view taken on the line 15—15 of Fig. 2 illustrating the action at ejection Station VIII.

Fig. 16 is a sectional view taken along line 16—16 of Fig. 2 through the Geneva movement which drives the turret.

Fig. 17 is a fragmentary side elevational view showing the pad conveyor and the drives therefor.

Fig. 18 is a schematic illustration of the various drives involved in the subject machine.

The turret and associated elements

Referring now to the preferred embodiment set forth in the drawings, a detailed description will be given by taking up the important elements and the units which feed into and power them. In conventional form, the machine incorporates a frame having legs 20 and a table 21. The key element of the machine is a turret 22 which consists of a large metal disc centrally apertured and keyed to a horizontally mounted shaft 23 which rests in front and rear turret bearings 24 and 25 respectively. Angularly spaced around the periphery of the disc of said turret is a series of eight tube holders 26 (see Figs. 3 and 4) each consisting of an outwardly positioned stationary jaw 27 and a radially inward, opposed, movable jaw 28, each of said jaws being of greater longitudinal than transverse extent and having semi-circular sections so that when they come together the enclosed volume is cylindrical (see Fig. 5). The jaws each have lateral grooves

and are slid into radially inwardly extending slots in turret **22**, the outer or stationary jaw **27** being bolted in place and the inner or movable jaw **28** being slideable into and out of contact with said stationary jaw but being biased against said stationary jaw by means of compression spring **30** which is seated in bore **29** in the base of the slot in said turret (see Fig. 8*a*). On the rearward portion of each movable jaw **28** there is a radially-inwardly extending cam follower support plate **31** which bears a cam follower **32**. Said cam followers are engageable by a cam as hereinafter described and operate to open the jaws of said tube holders **26** at certain Stations. Turret **22** is intermittently rotated by means of a Geneva movement which includes Geneva wheel **33** (see Fig. 16) the periphery of which contains alternate semi-circular grooves **34** and radially extending slots **35** and is keyed to turret shaft **23** intermediate front and rear turret bearings **24** and **25**, said grooves and slots being alternately engageable by a Geneva driver **36** which is a crank member having a base portion concentric with its drive shaft **37** and engageable with grooves **34** so that while said driver is rotating and said base portion is in contact with grooves **34** in the Geneva wheel, said wheel does not rotate, said driver **36** also having a cammed apex portion bearing a drive wheel **38** which is engageable with slots **35**. During the portion that said drive wheel **38** engages said slots the Geneva wheel is rotated. Geneva driver **36** is kept rotating at a constant speed, the linkage to main motor **39** being as follows: shaft **37** is keyed to sprocket **40** which in turn is driven by chain **41** by means of sprocket **42** keyed to drive shaft **43** which by means of bevel gears **44** and **45** is driven by main drive shaft **46** which is coupled to main motor **39** by means of sprocket **47** keyed to said shaft which engages chain **48** which in turn engages sprocket **49** keyed to motor shaft **50**. The Geneva wheel having eight slots **35**, it follows that once in each rotation of Geneva driver **36** turret **22** will be caused to rotate an angular distance of 45° or put otherwise, caused to rotate the angular distance between two tube holders.

Introduction of tubes into turret

The output of the machine is a tubular package. The main portion of the package is a hollow cylindrical cardboard tube **51** which is introduced into the machine through a tube feeder tube **52** which leads to a section **53** having oppositely slotted sides. Slotted section **53** is maintained in place by support member **53***a* which rests on table **21**. There extends into and along each slot endless belts **54** and **55** suspended respectively on rollers **56** and **57** and rollers **58** and **59**, rollers **57** and **59** having keyed to their upper ends inter-meshing gears **60** and **61** respectively so that as roller **59** is rotated in a clockwise direction, viewed from below, it moves the inner surface of its associated belt **55** in a direction away from feeder tube **52** and toward turret **22**. At the same time, by reason of the inter-meshing gears, the inner portion of belt **54** is caused to move in the same direction. The inner surfaces of belts **54** and **55** contacting the outer surfaces of packaging tubes **51** and frictionally urge said packaging tubes toward said turret through feeder tube extension **62** which is maintained in place by means of support **62***a*. Since the tubes are end to end in the feeder tubes assembly, the frictional drive just described maintains enough pressure on the packaging tubes **51** to cause the forward tube to enter a tube holder **26** when one of such tube holders is presented at the mouth of feeder tube extension **62**. This position of a tube holder is herein designated Station I.

Generally throughout this specification "Stations" will be designated by Roman numerals and although they are only four Stations at which operations take place, Stations as indicated in Figs. 3 and 4 are eight in number, one for each possible position of a tube holder, and are numbered counterclockwise commencing with the holder at "12:00 o'clock" when the turret is viewed from the front.

The further outward travel of such packaging tube through such tube holder **26** at Station I is prevented by a tube-locating detent **63**, the lower end of which is mounted atop front turret bearing **24**. Jaws **27** and **28** of tube holder **26** are open at Station I by reason of the action of arcuate strip cam **64** which is supported from detent **63** in a position to first engage cam followers **32** on movable jaws **28** of tube holders **26** as they approach Station VIII, a position 45° in advance of Station I, thus moving the movable jaw **28** radially inward and opening a holder **26** at such position (see Fig. 4). The cam maintains the holder in an open position while it remains in Station I. As turret **22** rotates away from Station I cam follower **32** falls out of contact with cam **64** and by reason of the biasing action of spring **30** movable jaw **28** closes upon the packaging tube previously placed therein and maintains it in said holder until said turret revolves to the point where said holder is again approximately 45° in advance of Station I (Station VIII) at which time movable jaw **28** by reason of the contact of cam follower **32** with cam **64** is again caused to open and the then completely filled tube is ejected.

It will be noted that the frictional drive in slotted tube section **53** is continuous in its operation, urging packaging tubes **51** against turret **22**. When the turrret moves from Station I to Station II the next tube would tend to be pushed against and jam the turret. To guard against this, guide plates **64***a* are inserted between tube holders **26** so that as the tube holder moves away from Station I the front of the next empty packaging tube **51** engages said guide plate and slides therealong until it reaches the next tube holder which it then enters.

The frictional drive assembly for the packaging tubes described above is linked to the main power motor **39** by means first of a universal coupling **65** which is affixed at one end to roller **59** and at the other to shaft **66** to which is keyed a bevel gear **67** which meshes with another bevel gear **68** driven by main drive shaft **46**.

Introduction of pads

An endless belt conveyor **69** is mounted to said machine and includes parallel chain loops **70** connected by cross platelets **71** bearing clips **72** which are adapted to retain in place catamenial pads **73** fed to said conveyor. At the discharge end of the conveyor oppositely positioned sprockets **74** engage chain loops **70** and are keyed to shaft **75** which in turn is driven by means of a six-toothed ratchet **76** likewise keyed to said shaft and caused to rotate by a driving pawl **77** which in turn is connected to rocker lever **78** intermediately pivoted on shaft **75**, the other end of said link being pivotally connected to a push rod **79** which is slidably connected at its other end to an arm of slotted crank **80** which crank is keyed to rocker shaft **81**. Said shaft is caused to be angularly reciprocated by means of a keyed link **82** which acts as a cam follower engaging by means of its roller **83** the eccentric grooves in rotary cam **84** which cam is keyed to shaft **85** which shaft is supported dependently from table **21** by bearings **85***a* and **85***b* and which shaft is driven by a sprocket **86** keyed thereto which in turn is driven by chain **87** connected to a sprocket **86***a* keyed to drive shaft **43** which is linked to main drive shaft **46** by means of bevel gears **44** and **45** as explained previously.

As pads **73** pass the apex of said conveyor pusher plates **88** and **89** which are centrally supported with a space between them by a recessed channel strap **90** (see Fig. 18) push between cross platelet **71** and pad **73** to remove said pad from clip **72** and to sweep the same into transverse compression chamber **91** between front and rear guide plates **92** and **93**, rear guide plate **93** being slotted (see Fig. 12) to accommodate pusher plate arms **94**, and **95** upon which said pusher plates are mounted. Said conveyor-removal and insertion mechanism is linked to main motor **39** as follows: arms **94** and **95** are keyed to shaft **96** mounted in bearings **96***a* and **96***b* and secured atop trans-

verse compression chamber 91 which in turn is keyed to sprocket 97 which is actuated by chain 98 which engages sprocket 99 keyed to rocker shaft 100 which bears a toothed gear 101 which is actuated by a reciprocating rack 102 having a forked end straddling shaft 43 and a pin 103 which engages the annular eccentric groove 104 of a circular cam 105 keyed to drive shaft 43 which, as previously described, in turn is driven by main drive shaft 46 by means of bevel gears 44 and 45.

Transverse compression mechanism

After a pad 73 is inserted into the transverse compression chamber 91 as above described, it is then transversely compressed, by an action to be presently described, to a cylindrical shape. The chamber itself is supported on a pedestal 106 and consists of a bottom plate 107 and a shorter top plate 108, said plates being joined by lateral channel plates 109 and 110 and joined at the rear by back plate 111, said back plate being much shorter than either of bottom and top plates 107 and 108 and having a concave side facing the inside of transverse compression chamber 91 thus formed between plates 107, 108, 109, 110 and 111, said concave side being semi-circular in cross-section and extending the lateral length of said plate (see Figs. 9, 11 and 12). Rear guide plate 93 is secured at its lower end over top plate 108 and front guide plate 92 is affixed to channel sections 109 and 110 to provide the path, described above, for the descending pad which is pushed into transverse compression chamber 91 by pusher plates 88 and 89. In the "open" side of said chamber there is mounted for reciprocal motion a compression plate 112 which has an inner lateral wall of concave section similar in all respects to the concave section of back plate 111 so that when the two walls come together at their upper and lower ends there is left between them a cylindrical volume. As shown in Fig. 9, by a drive means to be presently described, compression plate 112 may be withdrawn from said chamber beyond the point of communication of the inner surface of front guide plate 92 with said chamber and then after a napkin or pad 73 is inserted in said chamber it is then driven forwardly into said chamber as shown in Fig. 11 compressing the pad into the space between the arcuate sides of back plate 111 and compression plate 112. At the rear of compression plate 112 there are located spaced swivel studs 113 and 114 to which there are respectively hingedly connected by means of pins 115 and 116 adjustable tie rods 117 and 118 which in turn are secured to connecting rods 119 and 120 which are keyed to rocker shaft 81, which shaft is powered as described above in connection with the power chain of pad conveyor 69.

Longitudinal compression and end disc cutting

As indicated above, at the completion of the transverse compression stroke, the pad 73 to be packaged resides in the transverse compression chamber 91 and is then in the form of an elongated cylinder. The next operation is designed to compress that cylinder longitudinally and at the same time place the same within the packaging tube 51 at Station III while the end discs of the package are affixed within packaging tube 51. As shown schematically in Fig. 1 reels 121 and 122 of cardboard packaging tapes 123 and 124 are rotatably mounted on bearings 125 and 126 secured to table 21. The tapes 123 and 124 from said reels are led through slots 127 and 128 in blanking dies 129 and 130 respectively. Die 130 is mounted on the side of transverse compression chamber 91 remote from turret 22 and in addition to the vertical slot which admits the passage of tape 124, has a transverse aperture therein aligned and in communication with the cylindrical volume enclosed by the contacting concave lateral surfaces of back plate 111 and compression plate 112 of said chamber. On the other hand, blanking die 129 is separately supported on pedestal 131 and in addition to vertical slot 127 through which passes tape 123, it too has a transverse horizontal bore aligned with the bore in blanking die 130 and with the tube in the tube holder 126 at Station III, the compression and loading station. A punch rod 132 is slideably mounted in the bore in blanking die 129 and is pivotally connected at its other end to a punch link 133 which is part of a punch linkage, being pivotally connected at its other end to a similar punch link 134 which in turn is journalled by means of pin 135 in punch-link bearing 136 which is secured to table 21. At the pivotal connection of links 133 and 134 there is pivotally connected an adjustable tie rod 137 which rod is pivotally connected to a punch crank 138 which is keyed to rocker shaft 81. Hence, as rocker shaft 81 is angularly reciprocated so as to lower crank 138 from the position shown in Fig. 1, tie rod 137 and hence the pivotal connection of links 133 and 134 is depressed causing punch rod 132 to be pushed through blanking die 129. On its way through said die, said rod acts to punch out of tape 123 a circular end disc 139 and carries it into the packaging tube 51 in the tube holder 26 at Station III (see Fig. 10).

Punch rod 140 is slidably mounted in the bore of blanking die 130 and at its other end is secured to a cross head 141 which travels along guide shaft 142. Said shaft is mounted parallel to said rod being secured at one end to blanking die 130 and at the other to a standard 143 secured atop table 21. A lower portion of cross head 141 is slotted and slideably engages a pin 144 on a slotted yoke lever 145 which is pivotally secured to a shelf (not shown) running between legs 20 of the frame, the slot in said yoke being engaged by an eccentric bushing 146 mounted on sprocket 47 on main drive shaft 46. Hence, as sprocket 47 rotates, bushing 146 engaging the walls of the slot of yoke 145 causes the same to be displaced laterally, pin 144 at the upper end thereof pushing cross head 141 and punch rod 140 keyed to it through blanking die 130, said rod perforating tape 124 and carrying on its front face the punched out end disc 147 into contact with pad 73 in closed transverse compression chamber 91, and then pushing said pad out of an aperture 148 in said chamber into the packaging tube 51 at Station III. Since, meanwhile, punch rod 132 has already entered the other side of said packaging tube, the continued lateral travel of punch rod 140 toward turret 22 causes pad 73 to be compressed between the two punch rods, punch rod 140 continuing on through transverse compression chamber 91 and into the packaging tube 51 at Station III as shown in Fig. 10, the longitudinal compression of pad 73 taking place primarily within said packaging tube. Tapes 123 and 124 are pulled through slots in dies 129 and 138 by means of a friction roller system. The power take-off of said system commences with yoke lever 145. As said yoke proceeds to the right (in Fig. 1) it carries takeup slide 149 and link 150 pivotally connected to said slide to the right, engaging roller 151 on the end of said slide 149. Said slide is biased against yoke 145 by spring 152 and hence follows it as it reciprocates. To the other end of link 150 there is pivotally connected a crank 153 which is keyed to a shaft 154 which shaft likewise bears a sprocket 155, a roller 156 and a gear 157, shaft 154 being mounted on the underside of table 21 by means of spaced bearings 154*a*. Crank 153 has pivotally mounted to it a driving pawl 158 which when link 150 is caused to be pulled to the right, engages the teeth of gear 157 causing said gear and shaft 154 to be rotated clockwise (as seen in Fig. 1). A second roller 159 is rotatably suspended on a shaft 160 mounted between two hang rods 161 pivotally mounted to the underside of table 21, roller 159 being biased against roller 156 by means of compression spring 162. Hence, as roller 156 is caused to rotate roller 159 which frictionally engages it will rotate likewise and tape 124 will be drawn therebetween. In the case of tape 123, it is drawn between a similar system incorporating rollers 163 and 164, roller 164 being keyed to a shaft 165 hung underneath table 21 by spaced bearings 166 and having likewise keyed thereto a sprocket 167 which is driven by

chain 168 which engages sprocket 155 on shaft 154 on which is mounted the roller for the other tape. Hence, the tapes are intermittently pulled through the dies in synchronization with the intermittent passage therethrough of the punch rods. Rods 132 and 140 are retracted before the turret moves again.

After completion of the packing of pad 73 into the packaging tube at Station III, the turret rotates that particular tube through Station IV and then to Station V at which point the furling about to be described takes place.

Furling of the ends of the package

As may be observed from Fig. 10, when the package leaves Station III end discs 139 and 147 are recessed within packaging tube 51 and the ends are not yet sealed. At Station V the ends of the tube are rolled inwards to seal the package. This is accomplished by the furling tools at Station V. The furling tools are positioned on opposite ends of Station V and aligned with packaging tube 51 in turret 22 thereat and each consists of a rod 169 at the end of which is mounted a cylindrical block 170 from which extends axially of said first rod a second rod 171 of smaller diameter which bears a furling bit 172 which consists of a generally cylindrical block on the front end of which is an annular groove 173 recessed radially inwardly from the periphery thereof, the edges of said groove being rounded and said groove being generally of such a configuration as will match the desired configuration of the end of the finished package. About the tool is a generally cylindrical housing 174 tapering over the front edge of bit 172. The furling operation takes place when the oppositely positioned bits 172 are caused to simultaneously engage the free ends of packaging tube 51 rotating while they are pushed toward each other and so furling or turning inward the ends of said package thereby sealing the same. Hence, it will be observed that there are necessary two sets of drives at furling Station V, one set to cause the furling tools to be reciprocated toward and from each other and the second to cause the tools to be rotated.

The source of power for the rotation of the tools is an entirely separate motor, furling motor 175 (see Fig. 13), on the drive shaft of which is keyed a pulley 176 which rotates belt 177 which in turn rotates a pulley 178 keyed to shaft 179 journalled in brackets 180 and 181 suspended under table 21, there also being keyed to said shaft pulleys 182 and 183 which drive belts 184 and 185 which in turn rotate pulleys 186 and 187, each of which are keyed to spline-bearing shafts 188 journalled in housings 189 atop table 21, the interior of said shafts being grooved to accept matching spline shafts 190. The unengaged end of spline shaft 190 terminates in a cylindrical guide block 191 which is integral with rod 169 of the furling tools. It is to be noted that furling tool motor 175 is constantly actuated and hence that the furling tools are constantly being rotated.

The power for imparting reciprocal motion to said furling tools is derived from main motor 39 and more immediately from main drive shaft 46 upon which there is keyed a rotary cam 193 which engages a cam follower 194 on a push rod 195 having bifurcated guide ends 196 engaging shaft 46, said push rod 195 being biased against said cam by compression spring 197 which is attached to said rod and to an L member 198 suspended from table 21, the free end of said push rod being pivotally connected to a crank 199 which is keyed to a segmentary gear 200, so that as said push rod and crank are reciprocated, said gear 200 is angularly reciprocated. A link 201 is pivotally eccentrically mounted to gear 200 and linked at its other end to a rocker link 202 which is slotted at both ends and pivotally mounted by pin 203 to extend through table 21, the slot in the upper end of said rocker link being engaged by a pin 204 extending laterally from cylindrical guide block 191 thus imparting the reciprocal lateral motion of the end of said link to the right hand furling tool shown in Fig. 13. The left hand tool is similarly actuated by means of a second segmentary gear 205 mounted so as to mesh with segmentary gear 200, there being similarly eccentrically pivotally connected to said gear 205 a link 206 which slideably engages one slotted end of a rocker link 207 pivoted to a pin 208 to extend through table 21, the upper slotted end of said rocker link 207 (not shown) engaging pin 204 of the left hand furling tool and imparting its reciprocal motion thereto. By reason of the use of the segmentary gear, the reciprocal motions of the furling tools to and from each other are synchronized.

Ejection of package

Ejection of the finished package takes place at Station VIII which, it will be recalled, is met 45° prior to the return of a tube holder 26 of turret 22 to Station I. It will also be recalled that when such tube holder reaches Station VIII by reason of the action of the arcuate strip cam 64 the jaws of said holder have opened and the packaging tube (now the finished package) is no longer held in such jaws. Ejection is effected simply by means of the action of ejector rod 209 (see Figs. 2 and 15) which is caused to reciprocate into and out of the tube holder at Station VIII. Rod 209 is slideably mounted in a bracket 210 secured to feeder tube extension support 62*a*, the end of said rod remote from turret 22 being bent at right angles and slideably engaging the slotted end of a lever 211 which is pivoted at its lower end to an ear 212 secured to table 21. Proximate the pivoted end of said lever, there is mounted thereon a cam follower 213 which engages a cam 214 keyed to a shaft 215 journalled on table 21, there being keyed to said shaft a sprocket 216 which is connected by chain 217 to a sprocket 218 keyed to main drive shaft 46. Since main drive shaft 46 is continuously rotating during the periods of operation of the device shaft 215, carrying cam 214, will be continuously rotated and will cause lever 211 to intermittently advance ejector rod 209 to Station VIII (see dotted lines in Fig. 15), said rod being retracted therefrom by the spring bias furnished by spring 219 which is secured to said rod by pin 220 and exerts pressure against the apertured ear of bracket 210 to continuously bias rod 209 in a direction opposite to the direction it is urged by lever 211 and hence maintains cam follower 213 in contact with cam 214. It will be noted that there is a hand wheel 221 keyed to main drive shaft 46. This is done for the conventional purpose of enabling manual positioning of the elements for initial loadings, repair purposes and the like.

It will be further noted that throughout the device chain drives are used to transmit power except in the case of the drives for rotating the furling tool and frictionally urging the empty packaging tubes into holders at Station I. Since these excepted drives are not critical in the sense that they need not be synchronized being continuous, it was not necessary to use non-slipping drives for them. All of the other power transferances, however, made by means of chains and sprockets, shafts and linkages, cams and followers and the like, are positive drives in the sense that they cannot slip and hence enable the accurate synchronization of the various moving elements of the device.

Summary of action

Empty packaging tubes 51 are pushed into the tube holder 26 in turret 22 at Station I, the turret then rotating and when said tube holder reaches Station III, a pad 73, which has previously been fed by conveyor 69 to within the reach of pusher plates 88 and 89 and introduced by such plates into transverse compression chamber 91 and transversely compressed therein, is then pushed by punch rod 140, which, prior to contacting said pad has passed through blanking die 130 and punched out an end disc 147 into said tube holder 26 at Station III, against the detent action furnished by punch rod 132 which had pre-

viously passed through blanking die **129** and carried with it the punched out end disc **139**, so that longitudinal compression is completed within said tube holder at said Station. As the operation is completed, turret **22** revolves again and the same operation is repeated at Station III in connection with the next tube, pad, set of end discs, etc. When the first mentioned container, now filled with the compressed pad and having the end discs placed therein (as illustrated in Fig. 10) reaches Station V, the extending ends of packaging tube **51** are furled inwardly by furling bits **172**. Thereupon, turret **22** moves said now completed package through Stations VI and VII to Station VIII, at which point the jaws of tube holder **26** open and ejector rod **209** enters said holder and pokes out the finished package.

Although the present invention has been described with a certain degree of particularity, it is understood that the disclosure has been made only by way of example and that numerous additional changes in the details of construction, combination and arrangement of parts may be resorted to without transcending the scope of the invention as hereinafter claimed.

What is claimed is:

1. A machine for packaging articles in packaging tubes comprising a carrier for engaging and transporting a packaging tube along a predetermined path, said carrier comprising a rotatably mounted turret, a plurality of tube holders including clamp elements disposed on said turret equally radially distant from the axis of rotation thereof, said holders having openings parallel to said axis to receive and discharge packaging tubes, means connected to said carrier to intermittently advance the same along said path, tube-feeding means disposed along said path adapted to deposit a packaging tube in said carrier while said carrier is stationary, filling means disposed along said path following said tube-feeding means including an arrangement for inserting and compressing an article into said packaging tube, tube-closing means disposed along said path following said filling means adapted to close said tube, and means to maintain said holders in open position opposite said tube-feeding means and to maintain said holders in closed position opposite said filling and tube-closing means.

2. A machine as described in claim 1, said filling means including a detent element at a first end of a packaging tube in said carrier while said carrier is at rest, a compression chamber confronting the other end of said tube, having openings in opposite walls thereof aligned with the longitudinal axis of said tube, including a back plate and a compression block having confronting faces of transverse concave cross-section, means for intermittently reciprocating said compression block between retracted and advanced positions whereby the confronting faces of said block and plate define a cavity in alignment with said openings in said chamber when said block is in an advanced position, means for depositing an article to be packaged between said block and plate when said block is in a retracted position, a punch rod mounted to travel reciprocally through said openings in said chamber, means, synchronized with said means for intermittently reciprocating said compression block, for advancing said punch rod when said block is in the advanced position and advance the end of said rod into abutment with said compressed article, and urge said article along said cavity and into said packaging tube against said detent element to compress said article into said tube.

3. A machine as described in claim 2 and ejection means disposed along said path following said tube-closing means for removing said tube from said carrier.

4. A machine for packaging articles in packaging tubes comprising a carrier for engaging and transporting a packaging tube along a predetermined path, means connected to said carrier to intermittently advance the same along said path, tube-feeding means disposed along said path adapted to deposit a packaging tube in said carrier while said carrier is stationary, filling means disposed along said path following said tube-feeding means, said filling means including a detent element at a first end of a packaging tube in said carrier while said carrier is at rest, a compression chamber confronting the other end of said tube, having openings in opposite walls thereof aligned with the longitudinal axis of said tube, including a back plate and a compression block having confronting faces of transverse concave cross-section, means for intermittently reciprocating said compression block between retracted and advanced positions whereby the confronting faces of said block and plate define a cavity in alignment with said openings in said chamber when said block is in an advanced position, means for depositing an article to be packaged between said block and plate when said block is in a retracted position, a punch rod mounted to travel reciprocally through said openings in said chamber, means synchronized with said means for intermittently reciprocating said compression block, for advancing said punch rod when said block is in the advanced position and advance the end of said rod into abutment with said compressed article, and urge said article along said cavity and into said packaging tube against said detent element to compress said article into said tube, said detent element comprising a detent rod mounted for reciprocal travel in alignment with said openings in said chamber and the longitudinal axis of said tube so as to enter said first end of said tube when in an advanced position, means synchronized with said means for advancing said punch rod for advancing said detent rod to its most advanced position when said punch rod advances and present the end of said detent rod within said first end of said tube for abutment with said compressed article pushed thereagainst by said punch rod, and tube-closing means disposed along said path following said filling means adapted to close said tube.

5. A machine as described in claim 4 and ejection means disposed along said path following said tube-closing means for removing said tube from said carrier.

6. A machine for packaging articles in packaging tubes comprising a carrier for engaging and transporting a packaging tube along a predetermined path, means connected to said carrier to intermittently advance the same along said path, tube-feeding means disposed along said path adapted to deposit a packaging tube in said carrier while said carrier is stationary, filling means disposed along said path following said tube-feeding means, said filling means including a detent element at a first end of a packaging tube in said carrier while said carrier is at rest, a compression chamber, confronting the other end of said tube, having openings in opposite walls thereof aligned with the longitudinal axis of said tube including a back plate and a compression block having confronting faces of transverse semi-circular concave cross-section, means for intermittently reciprocating said compression block between retracted and advanced positions whereby the confronting faces of said block and plate define a cylindrical cavity in alignment with said openings in said chamber when said block is in an advanced position, means for depositing an article to be packaged between said block and plate when said block is in a retracted position, a punch rod mounted to travel reciprocally through said openings in said chamber, a die mounted in the path of said punch rod between said rod in the retracted position and said chamber, a tape, means for intermittently feeding said tape between said die and said rod in the retracted position, means, synchronized with said means for intermittently reciprocating said compression block, for advancing said punch rod when said block is in the advanced position to punch an end piece from said tape and advance said piece into abutment with said compressed article, and urge said article along said cavity and into said packaging tube against said detent element to compress said article into said tube, and tube-closing

means disposed along said path following said filling means adapted to close said tube.

7. A machine as described in claim 6, said detent element comprising a detent rod mounted for reciprocal travel in alignment with said openings in said chamber and the longitudinal axis of said tube so as to enter said first end of said tube when in an advanced position, a die mounted in the path of said detent rod between said detent rod in the retracted position and said first end of said tube, a tape, means for intermittently feeding said tape between said die and said detent rod in the retracted position, means synchronized with said means for advancing said punch rod for advancing said detent rod to its most advanced position when said punch rod advances to punch an end piece from said tape and present said piece for abutment with said compressed article being pushed thereagainst by said punch rod.

8. A machine for packaging articles in packaging tubes comprising a rotatably mounted turret, a plurality of tube holders, including clamp elements disposed on said turret equally radially distant from the axis of rotation thereof and equally angularly distant from each other, said holders having openings parallel to said axis to receive and discharge packaging tubes, means to intermittently rotate said turret an angular distance equal to the angular distance between adjacent tube holders, said tube holders thereby following a rotary path upon the rotation of said turret, tube-feeding means having a discharge end disposed along said path adapted to deposit a packaging tube in a tube holder halted in confrontation to said discharge end, filling means, disposed along said path following said tube-feeding means, including an arrangement for inserting and compressing an article into said packaging tube means to cause said clamp elements to grip said tubes at least opposite said filling means, tube-closing means, disposed along said path following said filling means, adapted to close said tube and ejection means, disposed along said path following said tube-closing means, for removing said tube from said carrier.

9. A machine for packaging articles in packaging tubes comprising a rotatably mounted turret, a plurality of tube holders, including clamp elements disposed on said turret equally radially distant from the axis of rotation thereof and equally angularly distant from each other, said holders having openings parallel to said axis to receive and discharge packaging tubes, means to intermittently rotate said turret an angular distance equal to the angular distance between adjacent tube holders, said tube holders thereby following a rotary path upon the rotation of said turret, tube-feeding means having a discharge end disposed along said path adapted to deposit a packaging tube in a tube holder halted in confrontation to said discharge end, filling means, disposed along said path following said tube-feeding means, said filling means including a detent element at a first end of a packaging tube in a holder halted in confrontation to said means, a compression chamber confronting the other end of said tube, having openings in opposite walls thereof aligned with the longitudinal axis of said tube, including a back plate and a compression block having confronting faces of transverse concave cross-section, means for intermittently reciprocating said compression block between retracted and advanced positions whereby the confronting faces of said block and plate define a cavity in alignment with said openings in said chamber when said block is in an advanced position, means for depositing an article to be packaged between said block and plate when said block is in a retracted position, a punch rod mounted to travel reciprocally through said openings in said chamber, means, synchronized with said means for intermittently reciprocating said compression block, for advancing said punch rod when said block is in the advanced position and advance the end of said rod into abutment with said compressed article, and urge said article along said cavity and into said packaging tube against said detent element to compress said article into said tube, tube-closing means, disposed along said path following said filling means, adapted to close said tube and ejection means, disposed along said path following said tube-closing means, for removing said tube from said carrier.

10. A machine as described in claim 9, said detent element comprising a detent rod mounted for reciprocal travel in alignment with said openings in said chamber and the longitudinal axis of said tube so as to enter said first end of said tube when in an advanced position, means synchronized with said means for advancing said punch rod for advancing said detent rod to its most advanced position when said punch rod advances and present the end of said detent rod within said first end of said tube for abutment with said compressed article pushed thereagainst by said punch rod.

11. A machine as described in claim 9, said detent element comprising a detent rod mounted for reciprocal travel in alignment with said openings in said chamber and the longitudinal axis of said tube so as to enter said first end of said tube when in an advanced position, a die mounted in the path of said detent rod between said detent rod in the retracted position and said first end of said tube, a tape means for intermittently feeding said tape between said die and said detent rod in the retracted position, means synchronized with said means for advancing said punch rod for advancing said detent rod to its most advanced position when said punch rod advances to punch an end piece from said tape and present said piece for abutment with said compressed article being pushed thereagainst by said punch rod.

12. A machine for packaging articles in packaging tubes of smaller dimensions than the initial dimensions of said articles including a rotatably mounted turret, tube holders mounted on said turret equally radially spaced from the axis of rotation thereof and equally angularly distant from adjacent holders, means to intermittently rotate said turret the angular distance between adjacent holders, each of said holders including a clamp which when in an open position provides a cavity proportioned to contain a packaging tube and which when in a closed condition about such tube grips and retains the same in said holder, successive operational stations disposed about said turret in confrontation to tube holders halting at such stations, a first such station comprising means to insert a packaging tube in a holder, a second such station angularly distant relative to said first station comprising means to insert and compress an article in a tube contained in a holder at such second station, a third such station angularly distant from said second station comprising means to close a tube at such station about the contained compressed article, a fourth such station angularly distant from said third station comprising means to eject such closed tube at said station, and means to maintain said clamps in an open condition at said first and fourth stations and to maintain said clamps in a closed condition at said second and third stations.

13. A machine as described in claim 12, said means at said second station including a detent element mounted for reciprocal travel to enter and leave a first end of a tube in a holder at said station, a compression chamber confronting the other end of said tube having openings in opposite walls thereof aligned with the longitudinal axis of such tube, including a stationary back plate and a compression block having confronting faces of transverse concave cross-section, means for intermittently reciprocating said compression block between retracted and advanced positions whereby the confronting faces of said block and plate define a cavity having a longitudinal axis in alignment with said openings in said chamber when said block is in an advanced position, means for depositing an article to be packaged between said block and plate when said block is in a retracted position, a punch rod mounted to reciprocally travel through said openings in

said chamber, means, synchronized with said means for intermittently reciprocating said compression block, for advancing said punch rod when said block is in the advanced position and advance the end of said punch rod into abutment with said compressed article, to urge said article along said cavity and into said packaging tube against said detent element to compress said article into said tube.

14. A machine as described in claim 13, said detent element comprising a detent rod mounted for reciprocal travel in alignment with said openings in said chamber so as to enter said first end of said tube when in an advanced position, means, synchronized with said means for advancing said punch rod, for advancing said detent rod to its most advanced position when said punch rod advances and present the end of said detent rod within said first end of said tube for abutment with said compressed article pushed thereagainst by said punch rod.

15. A machine as described in claim 12, said means at said second station including a detent element mounted for reciprocal travel to enter and leave a first end of a tube in a holder at said station, a compression chamber confronting the other end of said tube having openings in opposite walls thereof aligned with the longitudinal axis of such tube, including a stationary back plate and a compression block having confronting faces of transverse semi-circular concave cross-section, means for intermittently reciprocating said compression block between retracted and advanced positions whereby the confronting faces of said block and plate define a cylindrical cavity having a longitudinal axis in alignment with said openings in said chamber when said block is in an advanced position, means for depositing an article to be packaged between said block and plate when said block is in a retracted position, a punch rod mounted to reciprocally travel through said openings in said chamber, a die mounted in the path of said punch rod between said rod in the retracted position and said chamber, a tape, means for intermittently feeding said tape between said die and said punch rod in the retracted position, means, synchronized with said means for intermittently reciprocating said compression block, for advancing said punch rod when said block is in the advanced position to punch an end disc from said tape and advance said disc into abutment with said compressed article, to urge said article along said cavity and into said packaging tube against said detent element to compress said article into said tube.

16. A machine as described in claim 13, said detent element comprising a detent rod mounted for reciprocal travel in alignment with said openings in said chamber so as to enter said first end of said tube when in an advanced position, a die mounted in the path of said detent rod between said detent rod in the retracted position and said holder at said second station, a tape, means for intermittently feeding said tape between said die and detent rod in the retracted position, means, synchronized with said means for advancing said punch rod, for advancing said detent rod to its most advanced position when said punch rod advances to punch an end disc from said tape and urge said disc toward said first end of said tube.

17. A machine as described in claim 8, said packaging tubes extending at at least one end laterally beyond said tube holder and said tube-closing means comprising means to engage said extending end and infold the same.

18. A machine as described in claim 12, said packaging tubes extending at at least one end laterally beyond said clamp and said tube-closing means comprising means to engage said extending end and infold the same.

19. A machine for packaging articles in packaging tubes comprising a rotatably mounted turret, a plurality of tube holders, including clamp elements disposed on said turret equally radially distant from the axis of rotation thereof and equally angularly distant from each other, said holders having openings parallel to said axis to receive and discharge packaging tubes, means to intermittently rotate said turret an angular distance equal to the angular distance between adjacent tube holders, said tube holders thereby following a rotary path upon the rotation of said turret, tube-feeding means having a discharge end disposed along said path adapted to deposit a packaging tube in a tube holder halted in confrontation to said discharge end, filling means, disposed along said path following said tube-feeding means, said filling means including a detent element at a first end of a packaging tube in said carrier while said carrier is at rest, a compression chamber, confronting the other end of said tube, having openings in opposite walls thereof aligned with the longitudinal axis of said tube, including a back plate and a compression block having confronting faces of transverse semi-circular concave cross-section, means for intermittently reciprocating said compression block between retracted and advanced positions whereby the confronting faces of said block and plate define a cylindrical cavity in alignment with said openings in said chamber when said block is in an advanced position, means for depositing an article to be packaged between said block and plate when said block is in a retracted position, a punch rod mounted to travel reciprocally through said openings in said chamber, a die mounted in the path of said punch rod between said rod in the retracted position and said chamber, a tape means for intermittently feeding said tape between said die and said rod in the retracted position, means, synchronized with said means for intermittently reciprocating said compression block, for advancing said punch rod when said block is in the advanced position to punch an end piece from said tape and advance said piece into abutment with said compressed article, and urge said article along said cavity and into said packaging tube against said detent element to compress said article into said tube, and tube-closing means, disposed along said path following said filling means, adapted to close said tube and ejection means, disposed along said path following said tube-closing means, for removing said tube from said carrier.

20. A machine for packaging articles in packaging tubes comprising a carrier for engaging and transporting a packaging tube along a predetermined path, means connected to said carrier to intermittently advance the same along said path, tube-feeding means disposed along said path adapted to deposit a packaging tube in said carrier while said carrier is stationary, filling means disposed along said path following said tube-feeding means, said filling means comprising means to transversely compress said article, a pair of rods mounted for opposite reciprocal aligned travel, one on each side of said carrier, means to reciprocate each of said rods so that in the advanced position each enters an opposite end of a tube on said carrier at said filling means and in the retracted position each are withdrawn therefrom, and so that as one of said rods advances towards the other it pushes said transversely compressed article into contact with said other rod within said tube on said carrier thereby completing the compression of said article within said tube, and tube-closing means disposed along said path following said filling means adapted to close said tube.

21. A machine as described in claim 20, a die mounted between each of said rods in the retracted position and the positions at which they first contact said compressed article, tapes mounted for intermittent travel between each of said dies and each of said rods in the retracted position whereby when said rods advance they punch end pieces from said tapes and place the same in contact with the ends of said compressed article within said tube.

22. A machine for packaging articles in packaging tubes comprising a rotatably mounted turret, a plurality of tube holders, including clamp elements disposed on said turret equally radially distant from the axis of rotation thereof and equally angularly distant from each other, said holders having openings parallel to said axis to receive and

discharge packaging tubes, means to intermittently rotate said turret an angular distance equal to the angular distance between adjacent tube holders, said tube holders thereby following a rotary path upon the rotation of said turret, tube-feeding means having a discharge end disposed along said path adapted to deposit a packaging tube in a tube holder halted in confrontation to said discharge end, filling means, disposed along said path following said tube-feeding means, said filling means comprising means to transversely compress said article, a pair of rods mounted for opposite reciprocal aligned travel, one on each side of said turret, means to reciprocate each of said rods so that in the advanced position each enters an opposite end of a tube in a tube holder at said filling means and in the retracted position each are withdrawn therefrom, and so that as one of said rods advances towards the other it pushes said transversely compressed article into contact with said other rod within said tube in such tube holder thereby completing the compression of said article within said tube, and tube-closing means, disposed along said path following said filling means, adapted to close said tube and ejection means, disposed along said path following said tube-closing means, for removing said tube from said carrier.

23. A machine as described in claim 22, a die mounted between each of said rods in the retracted position and the positions at which they first contact said compressed article, tapes mounted for intermittent travel between each of said dies and each of said rods in the retracted position whereby when said rods advance they punch end pieces from said tapes and place the same in contact with the ends of said compressed article within said tube.

24. A machine as described in claim 12, said means at said second station comprising means to transversely compress said article, a pair of rods mounted for opposite reciprocal aligned travel, one on each side of a holder at such station, means to reciprocate each of said rods so that in the advanced position each enters an opposite end of a tube in a clamp at said station and in the retracted position each are withdrawn therefrom, and as one of said rods advances towards the other it pushes said transversely compressed article into contact with the rod within said tube in said clamp, thereby completing the compression of said article within said tube.

25. A machine as described in claim 24, a die mounted between each of said rods in the retracted position and the positions at which they first contact said compressed article, tapes mounted for intermittent travel between each of said dies and each of said rods in the retracted position whereby when said rods advance they punch end pieces from said tapes and place the same in contact with the ends of said compressed article within said tube.

26. A machine for packaging articles in packaging tubes comprising a carrier for engaging and transporting a packaging tube along a predetermined path, said carrier comprising a rotatably mounted turret, a plurality of tube holders including clamp elements disposed on said turret equally radially distant from the axis of rotation thereof, said holders having openings parallel to said axis to receive and discharge packaging tubes, means connected to said carrier to intermittently advance the same along said path, tube-feeding means disposed along said path adapted to deposit a packaging tube in said carrier while said carrier is stationary, filling means disposed along said path following said tube-feeding means including an arrangement for inserting and compressing an article into said packaging tube, tube-closing means disposed along said path following said filling means adapted to close said tube, each of said clamp elements comprising a fixed jaw and a movable jaw, a cam follower connected to each said movable jaw, cam means positioned in the path of said cam followers to cause said movable jaw to move away from said fixed jaw opposite said tube-feeding means and to cause said movable jaw to approach said fixed jaw opposite said filling and tube-closing means.

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