Jan. 29, 1963 F. L. WAITE 3,075,326

WRAPPING MACHINE

Filed Dec. 8, 1959 6 Sheets-Sheet 1

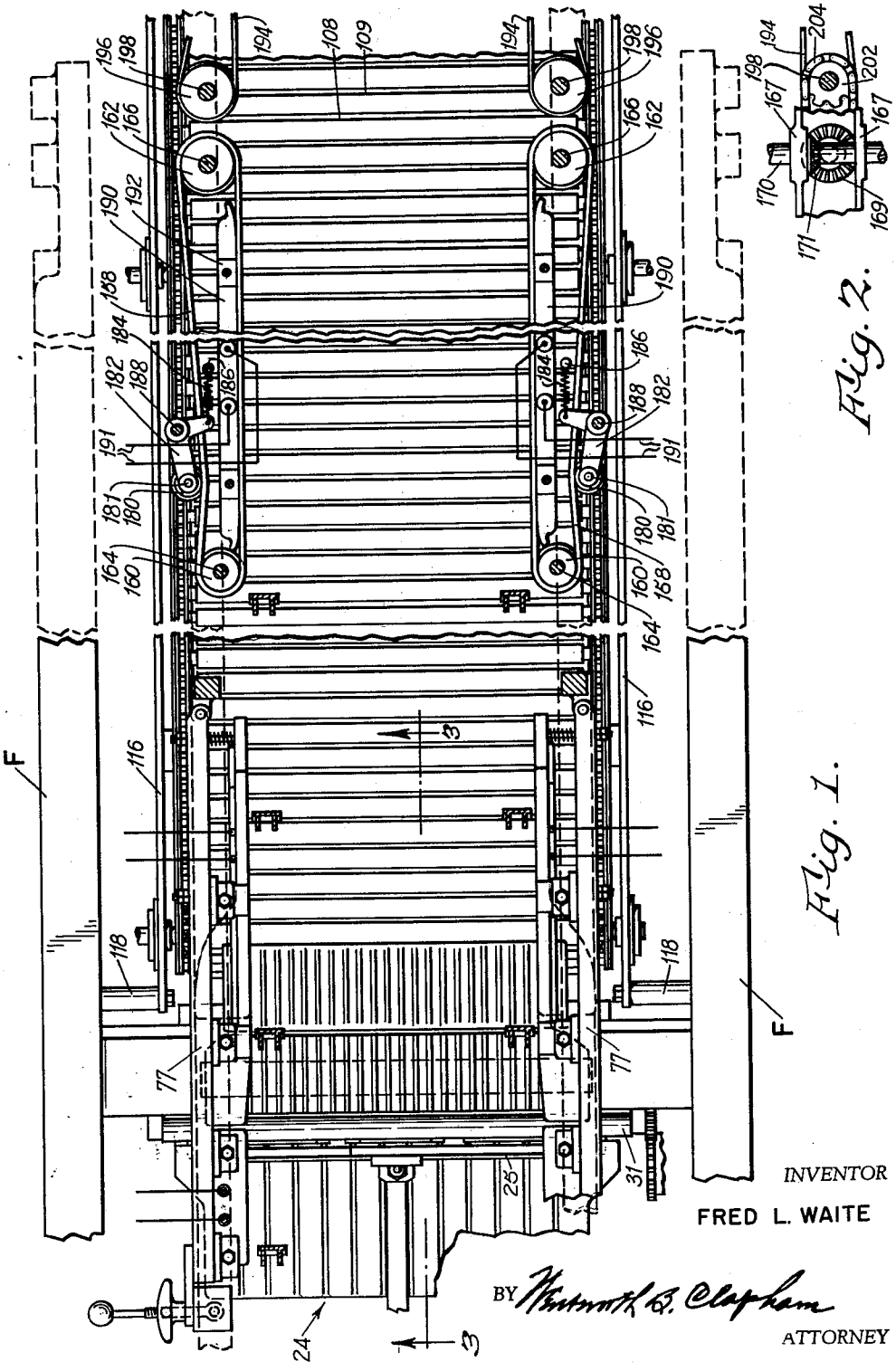


Fig. 1.

Fig. 2.

INVENTOR
FRED L. WAITE

BY Whitmore & Clapham
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Jan. 29, 1963 F. L. WAITE 3,075,326

WRAPPING MACHINE

Filed Dec. 8, 1959 6 Sheets-Sheet 2

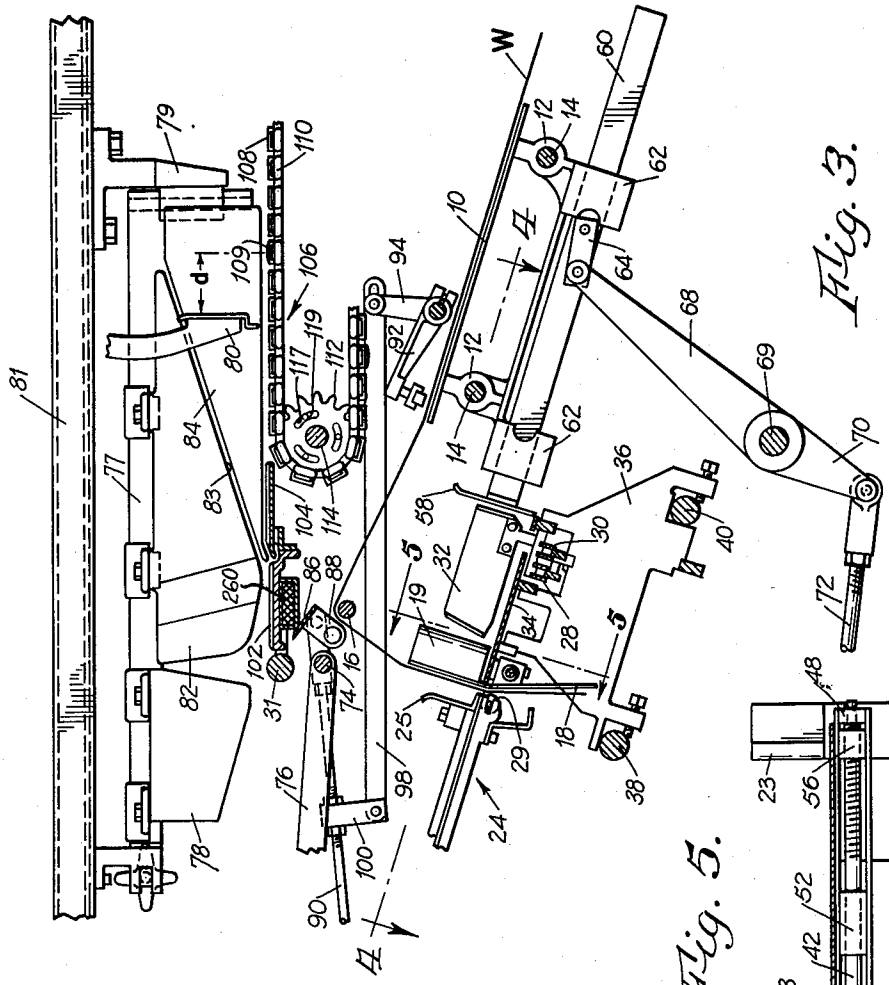


Fig. 3.

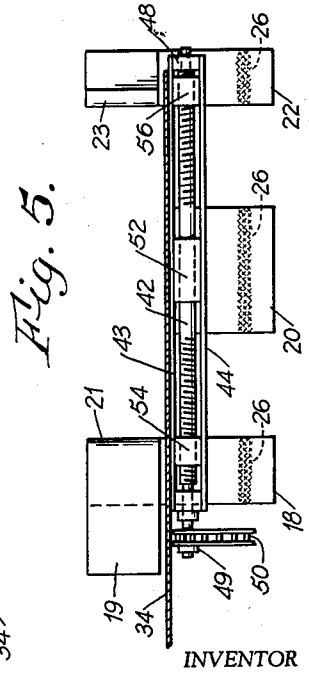


Fig. 5.

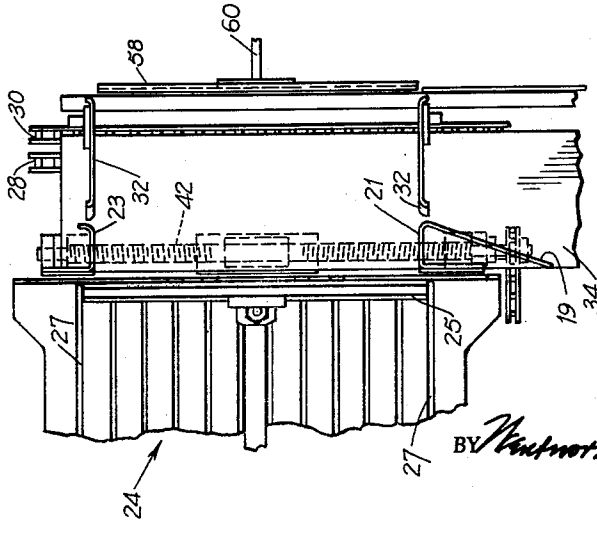


Fig. 4.

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FRED L. WAITE

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WRAPPING MACHINE

Filed Dec. 8, 1959 6 Sheets-Sheet 3

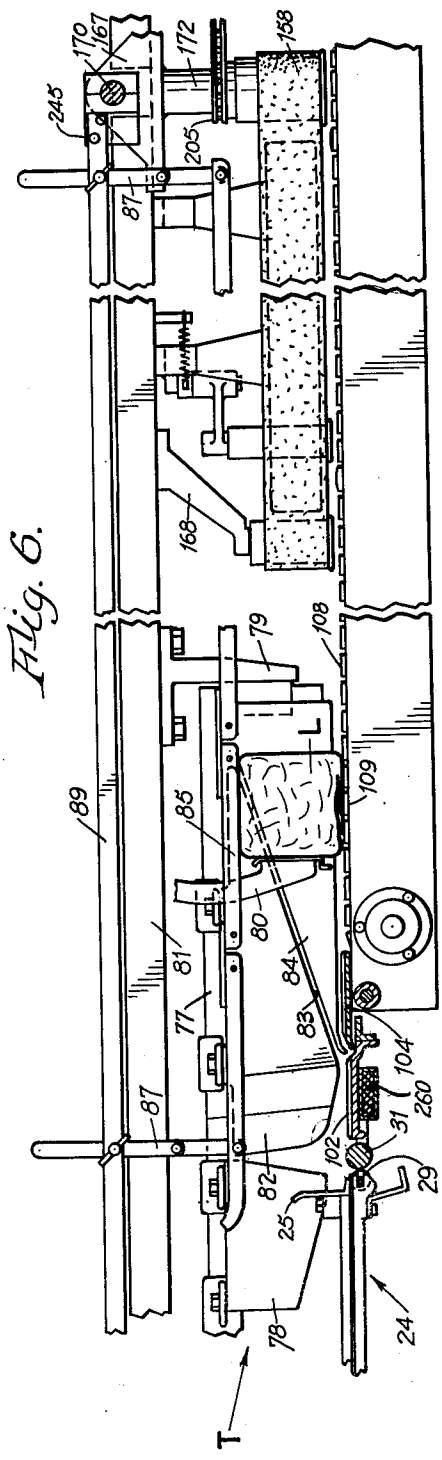


Fig. 6.

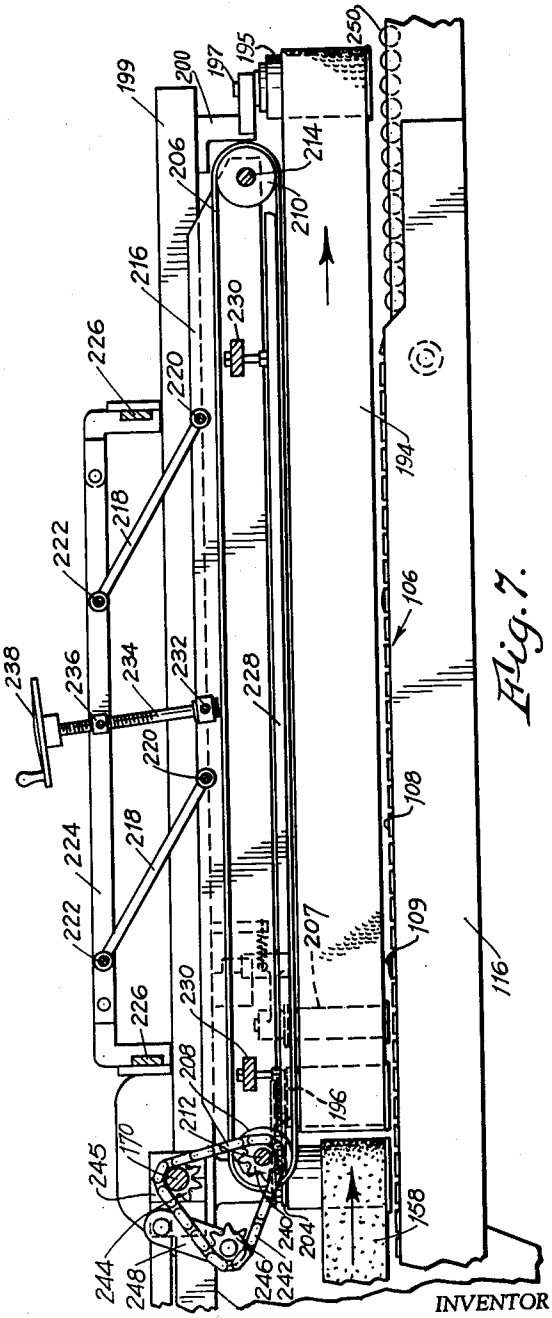


Fig. 7.

INVENTOR
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Jan. 29, 1963 F. L. WAITE 3,075,326

WRAPPING MACHINE

Filed Dec. 8, 1959 6 Sheets-Sheet 4

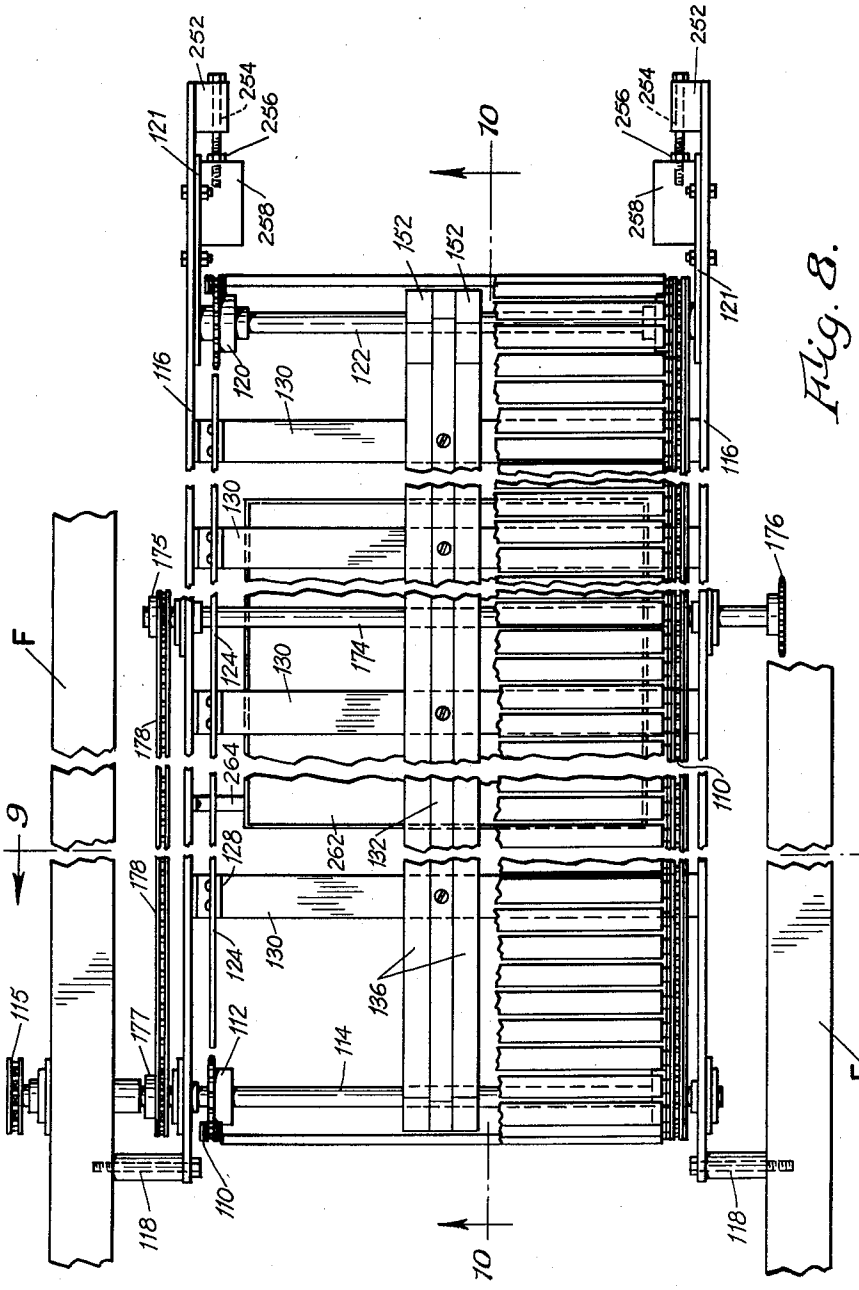


Fig. 8.

INVENTOR
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ATTORNEY

Jan. 29, 1963 F. L. WAITE 3,075,326

WRAPPING MACHINE

Filed Dec. 8, 1959 6 Sheets-Sheet 5

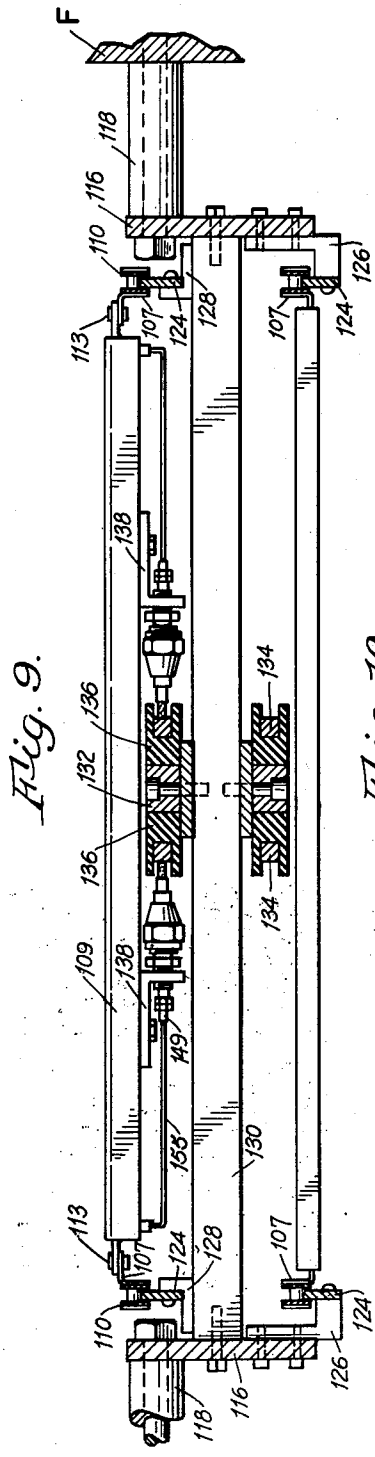


Fig. 9.

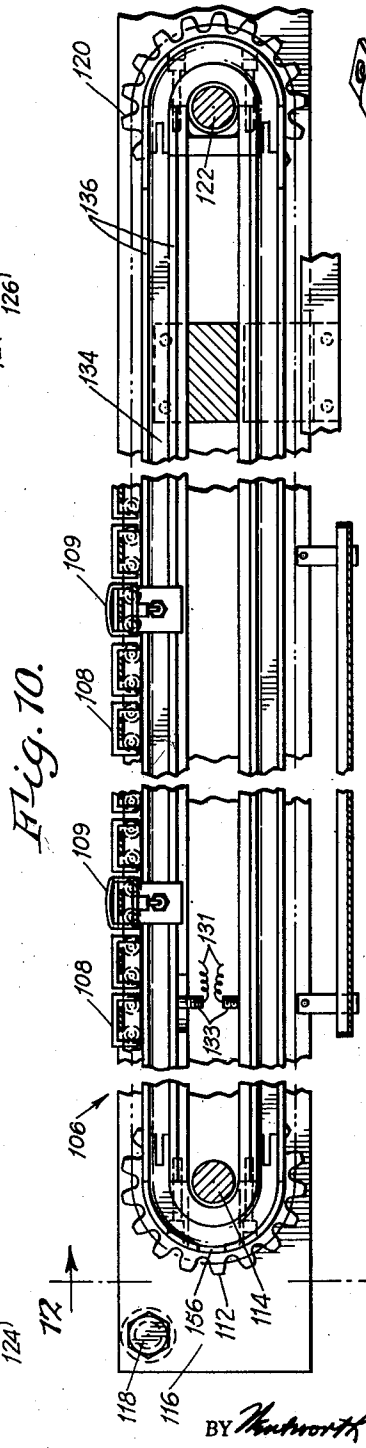


Fig. 10.

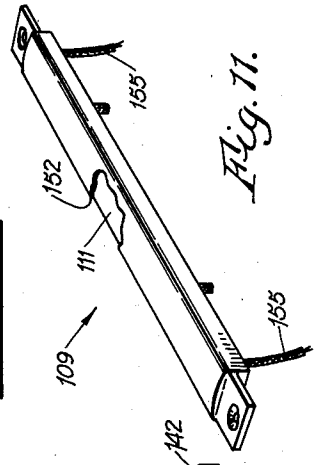


Fig. 11.

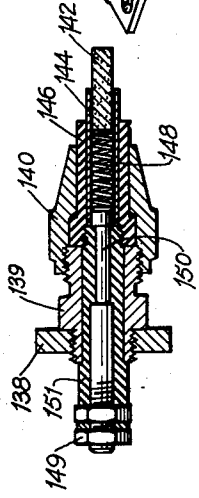


Fig. 13.

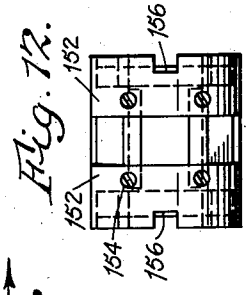


Fig. 12.

INVENTOR

FRED L. WAITE

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Jan. 29, 1963 F. L. WAITE 3,075,326

WRAPPING MACHINE

Filed Dec. 8, 1959 6 Sheets-Sheet 6

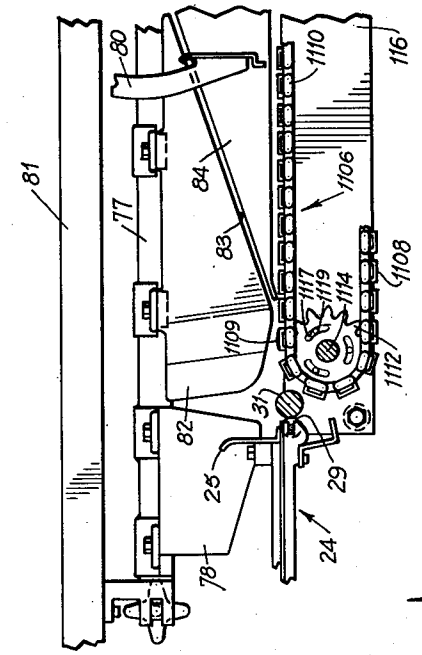


Fig. 15.

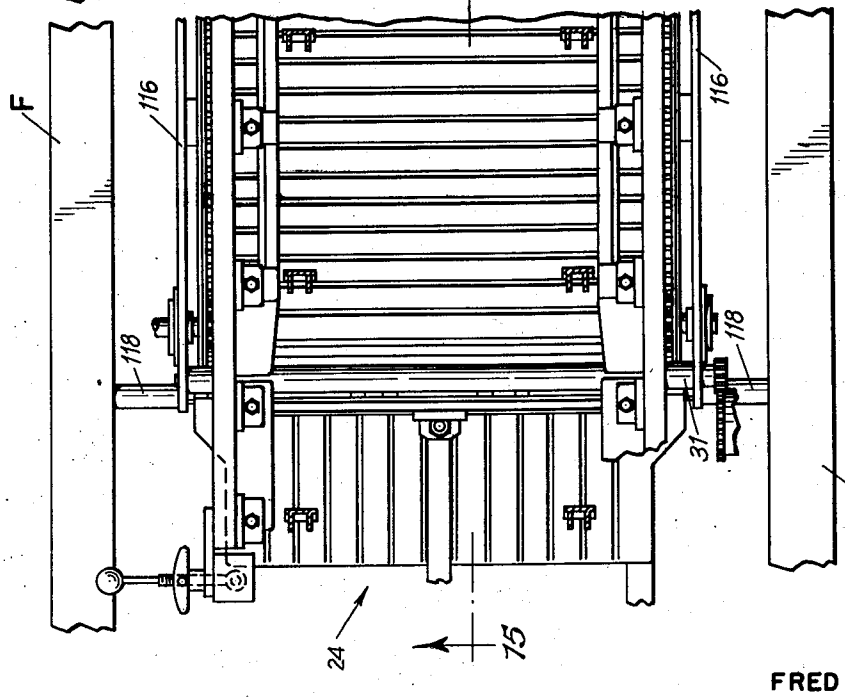


Fig. 14.

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United States Patent Office

3,075,326
Patented Jan. 29, 1963

3,075,326

WRAPPING MACHINE

Fred L. Waite, East Williston, N.Y., assignor to American Machine & Foundry Company, a corporation of New Jersey

Filed Dec. 8, 1959, Ser. No. 858,138
20 Claims. (Cl. 53—33)

The present invention relates to wrapping machines and more particularly to improvements in mechanism for forming, from a continuous wrapper web, an outer wrapper for articles and sealing it thereabout.

In wrapping machines for articles such as loaves of bread, a self-measured length from the leading edge of a continuous wrapper web is draped about the article to be wrapped, with the web forming an overlapping bottom lap. Heretofore, the extent of the bottom overlap has been dictated by the frictional drag acting upon the web to separate it as the article is pushed through the wrapping machine for the folding and sealing operations. The present invention is characterized by the provision of a novel travelling bottom conveyor provided with spaced heater members operative to form the bottom seal as the article is being conveyed thereon through the wrapping machine and during the formation of the end folds and seals. The travelling heater members include heater bars removably connected to an electrically-energized continuous current-carrying device. The bars are mounted in spaced relationship on the conveyor and in adjustable relationship with the front face of the pusher flights generally provided in wrapping machines of this type.

Further, in wrapping machines heretofore, difficulty was experienced in utilizing wrapper web materials which have a narrow interval between their sealing and melting temperatures. Hence, heretofore it has been a problem in a machine adapted to handle cellophane or waxed-coated paper in obtaining proper sealing when a material such as polyethylene was used because, due to the short heat-applying period for forming the bottom seal in prior wrapping machines, the proper temperature needed to obtain a proper seal resulted in a scorched or melted wrapper. However, by utilizing travelling bottom heaters, the heat-applying period is substantially increased, allowing the proper sealing and release temperatures to be maintained, ensuring neat strong seals about the article without scorching or in any other manner damaging or destroying any type of wrapper material used. Coacting with the bottom conveyor are a pair of spaced, travelling side belts engaging each side of the article on the bottom conveyor. The side belts are plastic-coated and heated to complete the sealing operations, the plastic-coating ensuring positive release between the belts and highly adhering wrapping materials; such as polyethylene.

With the advent of lighter wrapper materials, such as polyethylene and rubber hydrochloride film, problems have been experienced in maintaining the leading edge of the wrapper in proper position relative to the article infeed mechanism. To overcome this, means is provided for ensuring that the leading edge of the wrapper web will be properly positioned relative to the article infeed. To accomplish this there is provided a support plate having a knurled or embossed section in contact with the leading edge of the wrapper web. This embossed section holds the leading edge thereagainst, maintaining the wrapper

web in proper position for disposing about the article to be wrapped by the machine. In addition there is provided means for heating the wrapper web cutoff knife to ensure continuous proper operation thereof and prevent accumulation of wax or other foreign material thereon.

It is therefore an object of the present invention to provide in a wrapping machine novel heater elements for forming the bottom seals of wrappers disposed about articles wrapped in the machine.

It is another object of the present invention to provide a novel wrapping machine having a bottom conveyor including heater elements spaced therein for forming the bottom seal in a wrapper web disposed about the article as the article is conveyed thereon through the machine.

It is another object of the present invention to provide in a wrapping machine having a series of article conveyor flights a bottom conveyor having heater elements in spaced relationship with the flights for forming the bottom seal in a wrapper web disposed about the article as the article is conveyed thereon through the machine by the flights.

Another object of the present invention is to provide in a wrapping machine travelling heater elements for forming the bottom seal of a polyethylene or similar plastice material wrapper disposed about an article in the machine, the heater elements being energized from a common endless, electrical current-carrying element and wherein an extremely fine and efficient seal is formed without in any way adversely effecting the strength and appearance of the wrapper.

It is likewise an object of the present invention to provide, in a machine adapted to wrap a precut length of wrapper web about an article, a conveyor for moving the article to be wrapped through the machine, the conveyor provided with sealing elements for forming the bottom seal in the wrapper web during the passage of the articles thereon through the wrapping machine.

Another object of this invention is to provide a bottom conveyor for moving an article through a wrapping machine foldway, the bottom conveyor provided with heated sealing elements for forming the bottom seal in a length of wrapper about the article, said article remaining substantially stationary relative to said sealing element during its movement through the foldway.

It is another object of the present invention to provide in an article wrapping machine, the combination of a travelling article supporting conveyor having a plurality of spaced plastic-coated travelling heater elements and heated plastic-coated travelling side conveyors for forming the bottom and side seals in a length of wrapper web folded about the article on the supporting conveyor.

A further object of this invention is to provide a novel heated sealer including a metal shell having a plurality of internal electrical elements and provided with an outer plastic coating.

Another object of the present invention is to provide, in an article wrapping device, a support for the leading edge of a continuous wrapper web, the support having embossed sections maintaining the leading edge of the web in position to be disposed about an article to be wrapped.

It is another object of this invention to provide a novel method of folding and sealing a wrapper about an article.

It is likewise an object of the present invention to pro-

vide a novel method of forming a longitudinal bottom seal in a wrapper folded about the girth of an article.

Other objects and features of the invention will appear as the description of the particular physical embodiment selected to illustrate the invention progresses. In the accompanying drawings, which form a part of this specification, like characters of reference have been applied to corresponding parts throughout the several views which make up the drawings.

FIGURE 1 is a plan view of a wrapping machine provided with the preferred embodiment of the present invention.

FIGURE 2 is a plan view partially in section of the heated side belt drive mechanism.

FIGURE 3 is a side elevation of the article infeed mechanism.

FIGURE 4 is a plan view taken along line 4—4 in FIGURE 3.

FIGURE 5 is a side sectional view taken along line 5—5 of FIGURE 4.

FIGURE 6 is a partial side elevation of the wrapping machine foldway.

FIGURE 7 is a side elevation of the discharge end of the wrapping machine.

FIGURE 8 is a plan view of the bottom conveyor assembly.

FIGURE 9 is a sectional view taken along line 9—9 of FIGURE 8.

FIGURE 10 is a side sectional view taken along line 10—10 of FIGURE 8.

FIGURE 11 is a perspective view, partly in section, of a bottom conveyor heater element.

FIGURE 12 is an end view of the bottom conveyor taken along line 12—12 of FIGURE 10.

FIGURE 13 is a sectional view of the bottom conveyor heater element energizing means.

FIGURE 14 is a partial plan view of a wrapping machine provided with a modified form of the present invention.

FIGURE 15 is a side sectional view of the mechanism shown in FIGURE 14 and taken along line 15—15 of FIGURE 14.

Referring to the drawings, the wrapping web material W which is of heat-sealable material or material coated therewith, is preferably drawn from a source of supply such as a reel (not shown) and fed on demand by continuously operating feeding mechanism (not shown) along an inclined web support plate 10 mounted on brackets 12, supported on cross rods 14, mounted in side frames F of the associated wrapping machine. After passing the upper end of plate 10 the web passes over a guide roller 16 so that the leading or free end of the wrapper web W hangs or is draped freely between web support plates 18, 20 and 22 and the forward edge of a suitable conveyor, such as, lifter table 24 of the associated wrapping machine. Lifter table 24 is provided with a back tension plate 25 and may be similar in construction and operation to that shown in Gladeck et al. Patent 1,888,797 and Schmitt Patent 1,851,295. Each web support plate 18, 20 and 22 is provided with an embossed or knurled section 26 on the face thereof adjacent lifter table 24. Knurled sections 26 engage web W adjacent the leading edge thereof, maintaining it against the web support plates 18—22, disposing the web in proper draped position.

Articles such as loaves of bread L, are delivered to the wrapping machine by a suitable, intermittently moving, endless conveyor formed of a pair of endless conveyor chains 28 and 30 on which are mounted a plurality of suitably spaced conveyor flights 32, adapted to successively engage loaves of bread L and move them intermittently over a runway 34 into a delivery position aligned with lifter table 24. Conveyor chains 28 and 30 and runway 34 are suitably mounted on a support 36, carried by rods 38 and 40 mounted in the main machine frame F. The loaf infeed conveyor and its drive mechanism may be similar in construction and operation to the mechanism shown and described in Arelt Patent 2,385,675. The spacing of the infeed conveyor flights may be adjusted in accordance with the mechanisms disclosed in Bell Patent 2,736,421 and Panuline Patent 2,844,242. Since these mechanisms form no specific part of the present invention, further description thereof is omitted in the interest of brevity.

Loaves L forwarded by flights 32 over runway 34 engage guide or cam face 19 of web support plate 18, which urges any improperly positioned loaves into proper aligned position on the loaf infeed conveyor. When a loaf L is positioned between loaf heel guides 21 and 23 formed on web support plates 18 and 22 extending above runway 34 (see FIGURE 5), the drive mechanism of conveyor chains 28 and 30 is interrupted, the loaf being properly positioned for delivery onto lifter table 24.

Web support plates 18, 20 and 22 are mounted in common on a transverse shaft 42, threaded at each end with an unthreaded portion adjacent the middle thereof. Shaft 42 is rotatably supported at each end between spaced supports 43 and 44 in collars 46 and 48. Shaft 42 passes through collar 46 and is provided at its end with a drive sprocket 49 on which is mounted a suitable drive chain 50. Web support plate 20 is mounted on a lug 52 secured in between supports 43 and 44 adjacent the middle shaft 42 at the unthreaded portion thereof.

To accommodate loaves L of different lengths, web support plates 18 and 22 which are provided with heel guides 21 and 23 respectively, are mounted on lugs 54 and 56, threaded on each end of shaft 42 between supports 43 and 44. Upon actuation of chain 50 by a suitable power source (not shown), but which, may be the power source for adjusting the spacing of flights 32 of the infeed conveyor, shaft 42 is rotated, moving the threaded lugs 54 and 56 inwardly toward each other or outwardly away from each other, adjusting the space between heel guide plates 21 and 23 to accommodate loaves L of various lengths. It will be understood that since web support plate 20 is centered relative to lifter table 24 (see FIGURE 4) and has no portion extending above runway 34, its position on shaft 42 remains fixed.

Each loaf, positioned on the loaf infeed conveyor between heel guides 21 and 23, is pushed by a pusher plate 58 across runway 34 between heel guides 21 and 23 and onto lifter table 24. Pusher plate 58 is attached to a reciprocating plunger 60 slidably supported in guide lugs 62 formed on brackets 12 below web support plate 10. Plunger 60 is connected by links 64 to actuating arm 68 swingably supported on a shaft 69 suitably supported in the side frames F. Formed on the hub of arm 68 is a lug 70 having connected thereto one end of a rod 72. Rod 72 is suitably driven by drive mechanism (not shown), but which may include a cam and follower, to rotate arm 68 about shaft 69 in timed relationship with the infeed conveyor mechanism to reciprocate plunger 60 back and forth in guide lugs 62 to deliver loaves L from the infeed conveyor onto lifter table 24. Pusher plate 58 and its drive mechanism may be similar in operation and construction to that disclosed in Bell Patent 2,860,469. Further disclosure thereof is omitted in the interest of brevity.

At the beginning of the wrapping cycle, the leading edge of the wrapper web material W is draped or extends downwardly from guide roller 16 and hangs between lifter table 24 and against web support plates 18, 20 and 22. As an article, such as a loaf of bread L, is pushed by pusher plate 58 from between adjacent conveyor flights 32 through heel guides 21 and 23 onto lifter table 24, the leading edge of the draped wrapper web material W is pressed against back tension plate 25, by the loaf L as it is pushed onto lifter table 24. As

the result of the forward movement of pusher plate 58 in delivering a loaf L onto lifter table 24, back tension plate 25 is moved rearwardly thereon with the leading end of wrapper web W firmly held between back tension plate 25 and loaf L.

At the same time, loaf L now partially enveloped by the wrapper, is pushed into the path of an opposed pair of folder or tucking plates 27 on each side of lifter table 24, which tuck the web over the edges of the loaf to form what is generally designated as the first fold against the ends of loaf L. When loaf L is properly positioned on lifter table 24 with the first fold against each end thereof, pusher plate 58 is retracted and lifter table 24 is moved upwardly into alignment with the foldway section of the wrapping machine thus disposing wrapper web W over the top and two sides of loaf L.

After completion of the upward movement of lifter table 24, lap roller 74 carried in control arm 76 is moved downwardly by arms 76, effecting the feed of additional wrapping material W from the source of supply. As a partially wrapped loaf L is moved upwardly on lifter table 24, it is brought between a pair of second folder plates 78 mounted adjacent one end of the sealing foldway or table T to form what is generally designated as the second fold by downwardly folding the upper portion of the wrapper web W against the loaf end, overlapping the first fold.

The second fold being completed, loaf L is engaged by a set of driven flights 80. Flights 80 are appropriately spaced from each other laterally and longitudinally to accommodate the particular size of loaves L and sets of flights 80 thereafter push their engaged loaf L along the sealing foldaway or table T. Flights 80 and their drive mechanisms may be similar in construction and operation to that disclosed in Waite Patent 2,887,212. Further disclosure thereof is therefore omitted in the interest of brevity.

Flights 80 move their engaged loaf horizontally on table T beneath a longitudinal loaf hold-down bar 85 and between an opposed pair of third folder plates 82 and fourth folder plates 84 where in succession the third folds are made by folding inwardly the wrapper flaps extending from the leading face of the loaf and then folding upwardly from the bottom the fourth flap by means of the fourth folder plates and the inclined slot 83 formed between the substantially parallel inclined edges of folder plate 84. Folders 78, 82 and 84 at each side of loaf L are suitably supported by a bar 77 hingedly mounted at one end in a bracket 79 downwardly depending from a support member 81 carried by a part of the main machine frame F. Loaf hold-down bar 85 is adjustably supported at each end by generally vertical arms 87 carried by longitudinal support bar 89 suitably supported above table T midway between folder plates 78, 82 and 84 and extending therebeyond (see FIGURE 6). The folder plates 27, 78, 82, 84 and bar 85 and their associated mechanisms may be similar in construction and operation to those disclosed in Jensen Patent 2,883,819 and further disclosure is therefore omitted.

As a loaf L is engaged by flights 80 for movement along table T, a suitable cutter knife 86 supported on pivoted arms 88 and operated by rod 90, driven by means of suitable cams (not shown) is actuated to cut the wrapper web W.

While web W is being cut, the wrapping material resting on support plate 10 is pressed thereagainst by a paper brake 92 pivotally mounted on a shaft 94. Shaft 94 is provided with a lever 96 which is pivotally attached to one end of a link rod 98, the other end of which is connected by a lever 100 to rod 90. Thus, rod 90 operates to pull paper brake 92 into contact with the web material W on support plate 10, clamping the paper thereagainst as knife 86 is moved by rod 90 into cutting position.

Lap roller 74, knife 86, paper brake 92 and their associated mechanism may be similar in construction and operation to that disclosed and described in the above-mentioned Schmitt patent and further disclosure thereof is deemed unnecessary.

The trailing end of the cut length of wrapping material surrounding the loaf L on lifter table 24 is guided by means of a roller 29 mounted on lifter table 24 and a roller 31 into overlapping position beneath loaf L as it is pushed by flights 80 from lifter table 24 over a ribbed bridge plate 102 and a ribbed gap closer plate 104 along table T. The web guiding mechanism including roller 31 may be substantially the same in construction and operation as that shown in the above referred to Schmitt patent.

Adjacent the end of gap closer plate 104 and while the fourth fold is being made as described hereinabove, loaf L is moved by flights 80 onto the upper lap of a bar conveyor designated generally 106. Conveyor 106 includes a plurality of spaced bars 108 secured at each end by brackets 107 to a pair of chain conveyors 110. Each chain 110 passes over a drive sprocket 112 mounted in common on a shaft 114 extending between sprocket 112 adjacent gap closer plate 104. Shaft 114 is mounted transversely of table T in side frames 116 which, in turn, are attached by bolts 118 to the main machine frame F. One end of drive shaft 114 passes through frame F and supports a sprocket 115 which is driven by any suitable power source (not shown) to rotate shaft 114. Preferably sprocket 115 is driven from the main machine drive, in timed relationship with the various loaf conveying mechanisms of the machine, especially flights 80. The other end of each chain 110 passes over an idler sprocket 120 mounted on a shaft 122 suitably supported in brackets 121, which are, in turn, slidably supported in side frames 116. The upper and lower stretch of each chain 110 between sprockets 112 and 120 is ported in side frames 124. Each lower bar 124 is fixed by a bracket 126 to side frames 116. Upper bars 124 are fixed in turn by brackets 128 to a plurality of central support members 130 secured to side frames 116 and extending between the upper and lower laps of conveyor 106.

Bar conveyor 106 is provided with a plurality of heater bars 109 spaced between bars 108. Bars 109 are removably secured, as by sscrews 113 to their associated brackets 107 and are mounted on chains 110 in spaced relationship with the front face of pusher flight 80. Bars 109 are operative to form the bottom seal in the wrapper web W encircling loaf L. It will be understood that the distance "*d*" between the front face of pusher flight 80 and the centerline of a heater bar 109 of bar conveyor 106 is determined by the width of loaf L and the desired position of the bottom seal. In the preferred embodiment of the invention illustrated in FIGURE 3, every 13th bar of bar conveyor 106 is a heated bar. However, if desired, other spacing; such as every 12th bar, could be a heated bar depending upon the desired spacing thereof relative to flights 80 and the wrapping speed of the associated machine.

In the event that it is desired that the distance "*d*" be increased or decreased, each sprocket 112 is provided with three elongated openings 117, each accommodating a set screw 119. By loosening the set screws 119 and moving sprockets 112 appropriately in slots 117, distance "*d*" between heater bar 109 and its associated set of pusher flights 80 may be increased or decreased as desired. It will be underestood, however, that if more change in distance "*d*" is desired than can be accomplished by slots 117, set screws 119 can be loosened and sprockets 112 moved ahead or back on chain 110 a full tooth or more. Thus, the zone or point of application of heat to the bottom overlapped fold can be selectively controlled.

Referring to FIGURES 9–13 inclusive, there is disclosed details for conveyor 106 and heater bars 109. To transmit the required current to energize heater bars

109, conveyor 106 is provided with a central longitudinal commutator rail 132 secured at spaced intervals to support members 130. Commutator rail 132 is provided with a pair of electrical current-carrying elements 134 on each side thereof housed in suitable insulation 136, and electrically connected at terminals 133 by lead-in wires 131 to a suitable source of electrical energy.

The underside of each heater bar 109 is provided at each side thereof with a suitable bracket 138 to which is attached a brush housing 140 by a coupling 139. Brush housing 140 includes a brush element 142 secured in a sleeve 144 carried in an insulating insert 146 which extends into the body of housing 140. A suitable spring 148 is positioned in sleeve 144 with one end secured to brush element 142. The other end of spring 144 is secured to one end of a current-carrying rod 150. Each rod 150, with suitable insulation 151 thereabout, extends from its brush housing 140 through coupling 139 to a connector 149. A current-carrying lead-in wire 155 is associated with each end of heater bars 109 and coupled to rod 150 at connector 149. Lead-in wires 155 are connected at each end of heater bar 109 to an electrical heater element 111 which preferably is an electrical resistance heating unit and is formed as an integral part of heater 109. To provide heater bar 109 with proper release characteristics preventing adherence thereto of certain wrapper web materials, such as, polyethylene, each heater bar is preferably crowned and provided with an outer plastic coating 152. It has been found that a suitable plastic material for coating 152 is tetrafluoroethylene resin, known generally as "Teflon" and commercially available from the E. I. du Pont de Nemours Company, Wilmington, Delaware. It has likewise been found that the crowning of bars 109 eliminates pressure at the edges of the bottom wrapper overlap of an article resting thereon, minimizing the possibility of damaged wrappers.

Referring to FIGURE 9 it will be understood that heater element 111, rods 150 and current-carriers 134 form a complete circuit for the transmission of electrical energy, springs 144 ensuring that each of their associated brushes 142 remain in contact with current carriers 134 during the travel of heater bars 109. It will be further understood that commutator rail 132 and its associated mechanism form a closed path of travel between the laps of conveyor 116 for brushes 142, ensuring that the temperature of heater elements 111 remains substantially constant.

In view of the limited temperature range between the melting and sealing temperatures of some of the wrapper web materials such as polyethylene, a regulator may be included, if desired, for the circuit between the current carriers 134 and the source of electrical energy for precisely controlling the temperature of the heater bars 109. A suitable form of regulator is known as a "Variac" Auto Transformer and is commercially available from the General Radio Company, 275 Massachusetts Avenue, Cambridge, Massachusetts.

Each side of commutator rail 132 adjacent shafts 114 and 122 is provided with a cap 153 removably secured by screws 154 in position at the ends of commutator rail 132. To facilitate removal of one of the heater bars 109, caps 153 adjacent shaft 114 are each provided with a suitable notch 156. To remove a particular heater bar, its associated screws 113 are removed from their brackets 107 when the particular heater bar is adjacent caps 152 at shaft 114. Brush 142 is then urged from between insulating material 136 against the action of spring 148. The free end of brush 142 is removed from the commutator rail 132 through notches 156, thus accomplishing the removal of the particular heater bar 109 for maintenance or other necessary repair.

After the fourth fold in wrapper web W has been made as described hereinabove, and while loaf L is in position on bar conveyor 106, in the process of having the bottom seal formed in the wrapper thereabout, loaf L is conveyed by flights 80 and bar conveyor 106 between a pair of spaced, vertical, travelling belts 158 at each side of table T. Each belt 158 is mounted for travel about a pair of vertical pulleys 160 and 162 mounted on shafts 164, and 166, respectively, spaced above bar conveyor 106.

Each shaft 164 is rotatably supported in an arm 168 depending downwardly from each support 81 at each side of conveyor 106. Shafts 166 are rotatably supported in bearing blocks 167 mounted on transverse shaft 170. Shafts 166 and shaft 170 are provided with meshing bevel gears 169 and 171 respectively, mounted in a housing 172 about each shaft 166. Shaft 170 is mounted transversely of conveyor 106 and rotatably supported at each end in frames F. To drive shaft 170, there is provided transversely of conveyor 106, midway between shafts 114 and 122 thereof, a third shaft 174, rotatably supported in side frames 116 between the upper and lower laps of conveyor 106 (see FIGURE 8). Adjacent one end of shaft 174 there is provided a sprocket 176 which drives a suitable chain and sprocket arrangement (not shown) to rotate shaft 170. The other end of shaft 174 is provided with a sprocket 175 about which is mounted a suitable chain 178 driven from a sprocket 177, mounted on shaft 114. Thus, shaft 114 drives conveyor 106 and spaced side belts 158 in synchronism, to move loaves L along table T.

To maintain suitable tension on belts 158 each is provided with a tension roller 180 mounted on a shaft 181 rotatably carried in one end of belt crank lever 182. The other end of belt crank lever 182 supports one end of a spring 184 which is fixed at its other end to a stud 186 downwardly depending from member 81. Adjacent its midpoint, belt crank lever 182 is rotatably mounted on a shaft 188 supported in member 81. Thus, spring 184 is operative to urge belt crank lever 182 and its associated roller 180 against its associated belt 158, assuring proper tension therein.

Between each lap of the vertical side belts 158, there is mounted a suitable heater plate 190 supported by brackets 192 depending from support members 81. Each heater plate 190 is connected by lead-in wires 191 to a suitable source of electrical energy and if desired, to a regulator. Loaves L conducted between belts 158, with their end folds completed, are subjected to heat at each side through each belt 158 from its associated heater plate 190. The heat delivered thereto is operative to form the end seals to complete the sealing and wrapping operations on loaf L as it is conducted therealong by flights 80 and bar conveyor 106.

Belts 158 may be of any suitable material such as, canvas, wire mesh, plastic, silicone rubber or combinations thereof. It has been found that "Teflon" coated wire mesh produces the best results.

At the end of the side belts 158, loaf L is released by flights 80 which are returned toward the delivery end of table T. However, loaves L on bar conveyor 116 are conveyed thereby from between the heated side belts 158 into position between a pair of vertical, travelling, side delivery belts 194. Side belts 194 are mounted above conveyor 106 for travel about a pair of vertical pulleys 195 and 196, mounted on shafts 197 and 198 respectively.

Each shaft 197 is supported in an arm 200 downwardly depending from the end of an extension 199 of support 81 at each side of conveyor 106. Shafts 198 are likewise rotatably supported above conveyor 106 in blocks 167 and are provided with a sprocket 202 about which is mounted a chain 204. Chain 204 is driven from a suitable sprocket 205 mounted on each shaft 166, belts 152 and 194 being driven continuously together to move loaves L therebetween toward the discharge end of table T. Further, to maintain proper tension on belt 194, each

is provided with a suitable tension roller 207, similar in construction and operation to tension roller 180.

To maintain positive pressure on the top of loaf L as it is moved between belts 194, there is provided an overhead travelling belt 206, the bottom lap of which contacts the top of loaf L. Belt 206 is mounted for travel about a pair of horizontal pulleys 208 and 210 mounted on shafts 212 and 214 respectively. Shafts 212 and 214 are carried by a pair of spaced support plates 216 on each side of belt 206. Plates 216 are provided at the top thereof with a pair of generally I-shaped link arms 218. The lower cross arm 220 of each link arm 218 is rotatably supported at each end in spaced plates 216. The upper cross arm 222 of each link arm 218 is rotatably supported at each end in a pair of support frames 224 fixed by cross bars 226 to a portion of the main machine frame. Positioned beneath the lower lap of belt 206 which contacts the top of loaf L, is a back-up plate 228 carried by brackets 230 supported in side plates 216.

Referring to FIGURE 7, it will be noted that link arms 216 are mounted in generally parallel inclined relationship. To accommodate loaves of various heights, belt 216 is provided with means for adjusting the vertical height thereof relative to bar conveyor 106. To accomplish this, side plates 216 are provided with a cross bracket 232 rotatably supporting the lower end of a generally vertical threaded shaft 234. Cross frames 224 are likewise provided with a cross bracket 236 threaded about shaft 234. The free end of shaft 234 is provided with a hand wheel 238. Upon actuation of hand wheel 238, which rotates shaft 234, cross bracket 236 is travelled along shaft 234 moving plates 216 carried by links 218 upwardly or downwardly on shaft 234, the inclined parallel relationship of arms 218 ensuring vertical movement of plates 216 and associated mechanism.

To drive belt 206, shaft 212 is provided with a sprocket 240 about which is mounted a chain 242. Chain 242 in turn passes over a second sprocket 244 mounted on shaft 170 and a third sprocket 246 carried by a link arm 248 pivotally connected to a bearing block 245 carrying one end of the hold down bar support 89 adjacent the middle of shaft 170. Thus shaft 170, continuously rotated in the main machine frame as described hereinabove, drives belts 158, 194 and 206, travelling a loaf L toward the discharge end of table T.

A loaf L positioned between belts 138 and 206 is travelled therebetween from bar conveyor 106 onto rollers 250 for discharge from the wrapping machine or, preferably, delivery to wrapper cooling units. As will be noted best in FIGURE 7, belts 194 and 206 extend beyond the end of conveyor 106, thus ensuring that all loaves L are moved out of contact with conveyor 106 and away from the range of operation of any of the heater bars 109, preventing any scorching or other damage to a finished wrapper about a loaf L.

Referring to FIGURE 8, in the event that it is desired to take up any slack which develops in chains 110 after continued operation thereof, each side frame 116 is provided with a bracket 252 which rotatably supports one end of a bolt 254. The free end of bolt 254 is threaded into a nut 256 secured to a bracket 258 supported in side brackets 121. By suitably rotating bolt 254, nut 256 and bracket 258 are travelled therealong, moving its associated side bracket 121 appropriately relative to side frames 116, taking up any slack in its associated chain 110.

To prevent the accumulation of wax or other foreign material on web cutter knife 86, there is provided a heater element 260 positioned beneath bridge plate 102 adjacent knife 86. Heater 260 is connected to suitable source of electrical energy and is operative to maintain knife 86 at a temperature sufficiently high to prevent the accumulation thereon of wax or other foreign material on knife 86 during the severing operation thereof. However, it will be understood that the temperature of knife 86 is kept below the melting or scorch point of the particular web material used.

Further, to prevent any foreign substance; such as, crumbs or molten wax from falling from conveyor 106 onto the paper infeed section of the machine, there is provided a catcher tray 262 supported at each end on a bracket 264, secured to side frames 116 below the bottom lap of conveyor 106. Catcher tray 262 is operative to catch any foreign substance dropping from conveyor 106 as it travels loaves L along table T.

Likewise, if desired, foldway table T and its associated folder plates 78, 82 and 84 and side belts 158 and 188 may be mounted for lateral adjustment relative to each other as described in the above mentioned Waite Patent 2,887,212.

Referring to FIGURE 1 it will be noted that folders 78 and 82, 84 on each side of table T are provided with electrical lead-in wires 91 and 93 respectively. Wires 91 and 93 are suitably connected to heater elements (not shown) contained in folders 78 and 82, 83, and are electrically connected in parallel with the lead-in wires 191 of the side belt heater 194 on its respective side of table T, in the event that it is desirable to heat either folder 78 and 82, 84 or the side heaters 194 or both, depending on the wrapper material used to form the end seals about loaf L. To accomplish this, any conventional selector mechanism such as a conventional three-way switch can be suitably connected into the circuit from the source of electrical energy to the folders 78, 82, 84 and heaters 194, the switch being utilized to selectively control which elements accomplish the end sealing of the wrapper about loaf L.

It has been found that, with moisture-proof cellophane and wax-coated paper, heating plates 78 and 82, 84 alone or with side heaters 194 produces the best results while, with polyethylene, heating only side heaters 194 is best. In addition, if preheating of the wrapper web is desired, plates 78, and 82, 84 may be energized with any wrapper material used. In such an arrangement, however, the temperatures thereof are kept below the sealing temperature of the wrapper material.

Referring to FIGURES 14 and 15, there is disclosed a modified form of the present invention wherein bridge plate 102 and gap closer plate 104 have been eliminated, and conveyor 106 has been extended to a position adjacent guide roller 31. There is provided, in this embodiment, a bottom conveyor 1106 having a plurality of spaced support bars 1108 and a plurality of heater bars 1109 spaced between bars 1108. Bars 1108 and 1109 are mounted at each end on a pair of chains 1110. Each chain 1110 passes over a drive sprocket 1112 and a suitable idler sprocket (not shown) but which is suitably supported adjacent the discharge end (not shown) of conveyor 1106. Drive sprockets 1112 provided with position adjusting slots 1117 and set screws 1119 are mounted in common on a shaft 1114 extending transversely of foldway table T between sprockets 1112. Shaft 1114 is suitably supported in side frames 116 and driven in any suitable manner adjacent guide roller 31 to travel the terminal portion of conveyor 1106 close to roller 31. Thus, any loaves L on lifter table 24 and engaged by flights 80 are moved directly onto the upper lap of conveyor 1106, substantially eliminating any and all frictional drag acting on the bottom overlapped portion of wrapper W about a loaf as it is moved from the lifter table 24 along the foldway table T.

It will be understood that while conveyor 106 is shown associated with a wrapping machine which forms what are known generally as "end fold packages;" namely, packages in which the wrapper is folded against the ends of the article wrapped, conveyor 106 could operate with equal efficiency and effectiveness with a wrapping machine adapted to form what are generally known as "bottom-fold" packages; namely, packages in which the wrap-

per is folded against each side of the bottom article wrapped. Further, it will be evident that with a "bottom-fold" wrapping machine, conveyor 106 and its associated heater bars 109 are operative to seal the side bottom folds, as well as any longitudinal bottom seam, securing the wrapper about the article to form a finished package. Likewise, conveyor 106 and its associated heater bars 109 could be incorporated, without adverse results, into any wrapping machine adapted to form a variation of the "end-fold" or "bottom-fold" packages to secure a wrapper folded about an article to be packaged.

What is claimed is:

1. In a wrapping machine, the combination of an article infeed conveyor, an article transfer, a guide surface for a wrapper, said wrapper having heat-sealable characteristics, means for holding a wrapper on said surface with the leading edge thereof draped in the path of travel of an article onto said transfer, means for draping the leading end of said wrapper in said path of travel of said article, means for maintaining the leading edge of said wrapper in the path of travel of an article from said article infeed conveyor to said article transfer, said means including spaced support elements for the leading edge of said wrapper, said support elements having raised sections for engaging the leading edge of said wrapper and maintaining it thereagainst in the path of travel of said article from said infeed conveyor to said article transfer, means for moving an article from said infeed conveyor against said draped end of said wrapper and onto said transfer with said wrapper partially encircling said article with portions of said wrapper extending unfolded beyond the ends of said article, means on said article transfer for folding a portion of said unfolded wrapper against the ends of its associated article, an article foldway positioned above said infeed conveyor, means mounting said article transfer for movement from said article infeed conveyor to said foldway to deliver partially-wrapped articles thereto from said article infeed conveyor, opposed pairs of plates supported in vertical relationship on each side of said foldway for completing the folding of the end flaps of said wrapper as an article is moved along said foldway between said plates, pusher flights adapted to engage and move articles along said table with the wrappers thereof disposed in overlapped relationship forming the bottom seam of said wrapper, an endless travelling surface for supporting and travelling articles engaged by said flights along said foldway, means mounting said conveyor for movement along the bottom of said foldway, means for sealing the end flaps of said wrapper, a plurality of spaced heating elements forming part of said conveyor, said heating elements being supported in spaced relationship with said flights with the bottom seam of the wrapper of an article engaged by said flights being disposed adjacent said heating element, means for driving said conveyor to travel articles thereon through said foldway and means for energizing said heating elements for securing said wrapper about the girth of its associated article and sealing said bottom seam during the movement of said article therewith along said foldway.

2. The invention as defined in claim 1 including means for adjusting the position of said heating elements on said conveyor relative to said flights whereby said bottom seam is found at a selected location in said overlapped portion of said wrapper.

3. The invention as defined in claim 1 wherein said opposed pairs of folder plates include heater elements and means for energizing said heater elements for forming said end flap seals in said wrapper as its associated article is moved therepast.

4. The invention as defined in claim 1 wherein said energizing means is operative to maintain each of said heating elements at a selected substantially constant temperature below the melting point of said wrapper material so that said heating elements are operative to apply substantially constant heat to their associated wrappers during the travel therewith, said constant heat preventing damage to said wrappers and insuring proper sealing thereof.

5. The invention as defined in claim 4 including a substantially continuous electrical current carrying device operatively connected to transfer electrical energy to said heating elements.

6. The invention as defined in claim 1 wherein said means for sealing the end flaps of said wrapper include endless conveyors, means mounting said endless conveyors in vertical relationship on each side of said foldway, heaters, means mounting said heaters between the laps of each of said side conveyors, means for energizing said heating elements for forming said end flaps and means for driving said side conveyors for engaging the sides of an article on said bottom conveyor, maintaining said end flaps thereagainst as said article is moved past said side heaters to form said end flap seals.

7. The invention as defined in claim 6 wherein said opposed pairs of folder plates include heater elements and including means for selectively energizing said folder plate heater elements and/or said side conveyor heaters in accordance with the selected type of wrapper material.

8. In an article wrapping machine wherein said article is moved against the leading edge of the wrapper web draped in the path of travel of said article as it moves from an article infeed station to an article delivery station, a web support comprising web support plates, means mounting said plates in spaced relationship adjacent said article infeed station, said plates provided with protuberances for engaging the leading edge of said wrapper and maintaining it thereagainst, disposing said wrapper in the path of travel of said article from said article infeed station to said article delivery station.

9. The invention as defined in claim 8 wherein said plates adjacent the ends of said article are provided with guide elements for maintaining said article in proper orientation during transfer from said article infeed station to said article delivery station.

10. The method of folding and sealing a length of heat-sealable wrapper about an article comprising folding said wrapper about the girth of said article with the portion of said wrapper adjacent the bottom of said article disposed in overlapped relationship and with portions of said wrapper extending beyond the ends of said article, moving said article on a travelling support surface from an article delivery station to an article discharge station, maintaining said article disengaged from any object movable thereto after said article leaves said delivery station and as it moves into said discharge station folding the extending portions of said wrapper against the ends of said article on said support surface, applying heat to the ends of said article on said support surface for forming the end seals of said wrapper, applying a zone of heat to said overlapped portion of said wrapper during the travel of said article on said support surface and maintaining said zone of heat at substantially constant temperature and substantially stationary relative to said overlapped portion for sealing said overlapped portions, securing said wrapper about the girth of said article.

11. The method of folding and sealing a length of heat-sealable wrapper about an article comprising folding said wrapper about the girth of said article with the portion of said wrapper adjacent the bottom of said article disposed in overlapped relationship and with portions of said wrapper extending beyond the ends of said article, moving said article on a travelling support surface from an article delivery station to an article discharge station, folding the extending portions of said wrapper against the ends of said article on said support surface, applying heat to the ends of said article on said support surface for forming the end seals of said wrapper and applying a zone of heat to a selected section only of said overlapped portion of said wrapper during the travel of said article on said support surface and concomitantly with the formation of said end seals.

12. Heat sealing mechanism for use with a wrapping machine for sealing end flaps and overlapped bottom seam in a package formed by wrapping an article in a wrapping material having heat sealable characteristics comprising a single endless conveyor for supporting and moving a succession of wrapped articles along a predetermined, substantially horizontal path of travel into a discharge station where fully wrapped and sealed articles are received, a plurality of individual longitudinally spaced heat sealing elements forming a part of said conveyor and carried thereby in positions to support at least a portion of one side of a package, pusher means for positively delivering each package to be heat sealed onto said conveyor with the overlapped bottom seam of said wrapping material thereof resting on one of said heat sealing elements for travel therewith along said path of travel, a continuous driven belt engageable with the tops of each of said wrapped articles for holding the articles in engagement with said heat sealing elements, said belt being driven at the same speed as said article, traveling end flap heat sealing elements engaging said end flaps as said conveyor moves said package along said path of travel, and means for energizing said heat sealing elements and said end flap heat sealing elements for sealing said bottom seam of said package as each package with its bottom seam resting on said heat sealing element and the end flaps thereof is moved by said conveyor along said path of travel to a point of discharge.

13. The invention defined in claim 12 wherein said heat sealing elements of said conveyor and said traveling end flap heat sealing elements are provided with a surface covering which prevents adherence of the wrapping material of said packages thereto whereby at the point of discharge of said packages from said heat sealing elements each package is released freely from engagement therewith.

14. In a heat sealing apparatus for heat sealing overlapped flaps of a package including an article about which is completely folded a wrapper of a material having heat sealable characteristics, an endless conveyor adapted to support and carry packages so wrapped along a predetermined path of travel for sealing said flaps, said conveyor comprising longitudinally spaced electrically heated sealing members on said conveyor positioned for constant engagement with said flaps during the travel of said packages along said path of travel, said sealing members being crowned and extending above the plane of travel of said conveyor, and means for maintaining each package in a predetermined sealing position relative to its respective heat sealing member during its travel by said conveyor along said path of travel.

15. The invention defined in claim 14 wherein said heat sealing members comprise heating resistance units, a source of supply of electric current to each of said units, means connecting said source of supply to said units during the travel of said conveyor, and means for effecting the delivery of packages to be sealed onto said conveyor in predetermined, time relationship whereby said flaps to be sealed are disposed in engagement with said heat sealing members.

16. In a wrapping machine of the type having means for folding a polyethylene wrapper about a loaf of bread to provide a seam extending longitudinally along the bottom of said loaf of bread, and a delivery station to which fully sealed and wrapped loaves are delivered, a heat sealing mechanism for sealing said seam comprising a substantially horizontal conveyor for supporting and moving a loaf substantially completely enwrapped in a polyethylene wrapper into said delivery station, said conveyor including a plurality of spaced heating bars for sealing said longitudinal seam as said loaf of bread is carried by said conveyor to said delivery station, and means for delivering said loaf and its wrapper onto said conveyor with said seam resting on one of said bars.

17. In a wrapping machine of the type having means for folding wrappers about loaves of bread so that the wrapper on each loaf has a bottom seam and a plurality of overlapped end flaps, said machine further having a discharge station for receiving fully wrapped and sealed loaves, said wrapper having heat sealing characteristics similar to that of sheet material of polyethylene, the combination of a sealway extending to said discharge station and having a driven conveyor for supporting and moving said loaves through said sealway, said conveyor including a plurality of spaced crowned heater bars each engageable with a different loaf for sealing the bottom seam as said loaf is moved through said sealway, said sealway further having a plurality of heaters operatively disposed for sealing the end flaps of each loaf as it is moved through said sealway in engagement with one of said heater bars.

18. A combination in accordance with claim 17 wherein each of said heater bars is provided with a tetrafluoroethylene coating to prevent said wrapper from sticking thereto.

19. A combination in accordance with claim 18 and including a pair of traveling belts engageable with said end flaps, each of said plurality of heaters being operatively disposed adjacent one of said belts.

20. In a wrapping machine adapted to wrap a length of wrapper material about an article, said wrapper being heat-sealable, said machine being provided with an article foldway having folders for forming the end folds of said wrapper upon the ends of said article, a conveyor for travelling a succession of articles to be wrapped through said foldway comprising a plurality of article-supporting bars, endless elongated travelling elements mounting said bars at each side of said foldway for movement along the bottom thereof, a plurality of heating bars forming part of said conveyor and supported in spaced relationship on said elongated travelling elements, each of said heating bars including an internal heating element and an external plastic coat, means for positioning each article on said conveyor on one of said heating bars for travel therewith through said foldway, means for driving said elongated elements to travel articles on said bars through said foldway, and means for energizing said heating bars for securing said wrapper about the girth of its associated article as said article is travelled therewith, said energizing means comprising an endless electrically energizable current carrying device, brushes mounted on each of said heater bars on said plastic coat and operatively associated with said current carrying device, and means connecting said brushes to said heating bar heating elements for energization thereof to effect the heat sealing of said wrapper, said plastic coat insuring release of said wrapper from its respective heating bar at the discharge end of said foldway.

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