

June 27, 1967

H. M. FORMAN
WRAPPING MACHINE

3,327,451

Filed March 1, 1965

8 Sheets-Sheet 1

FIG. 1a.

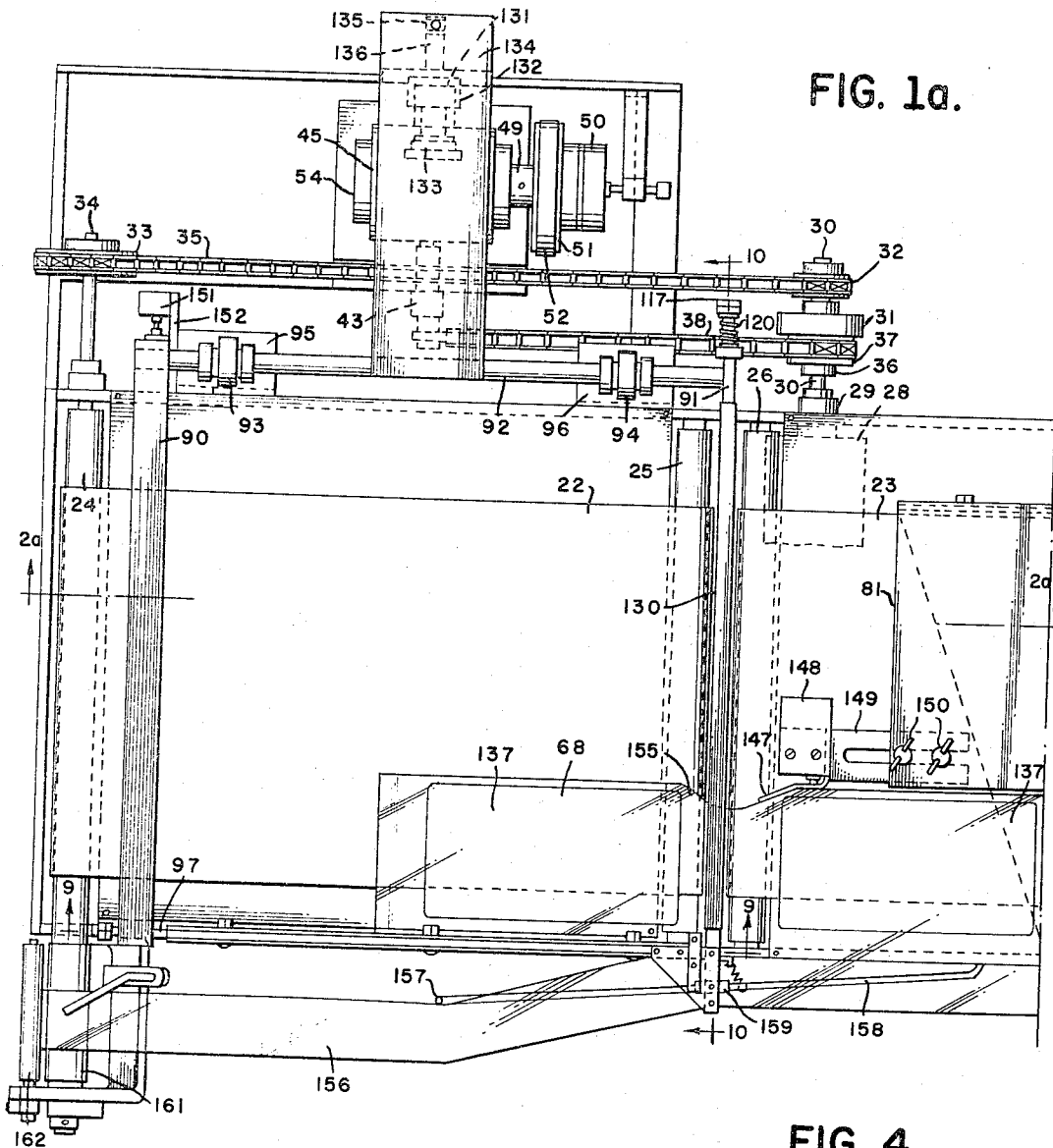
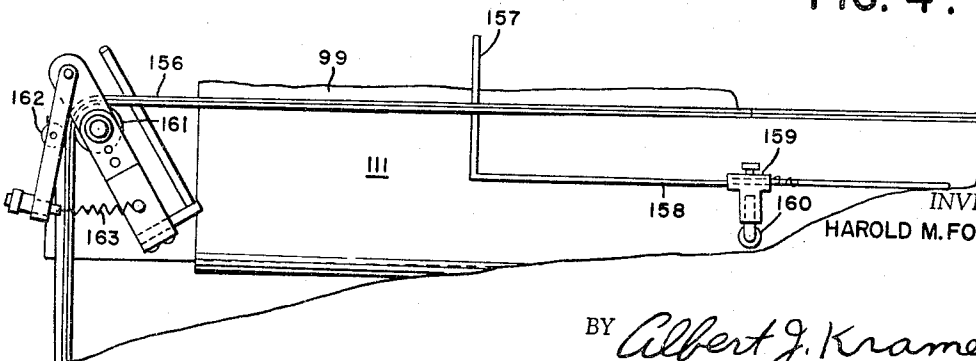


FIG. 4.



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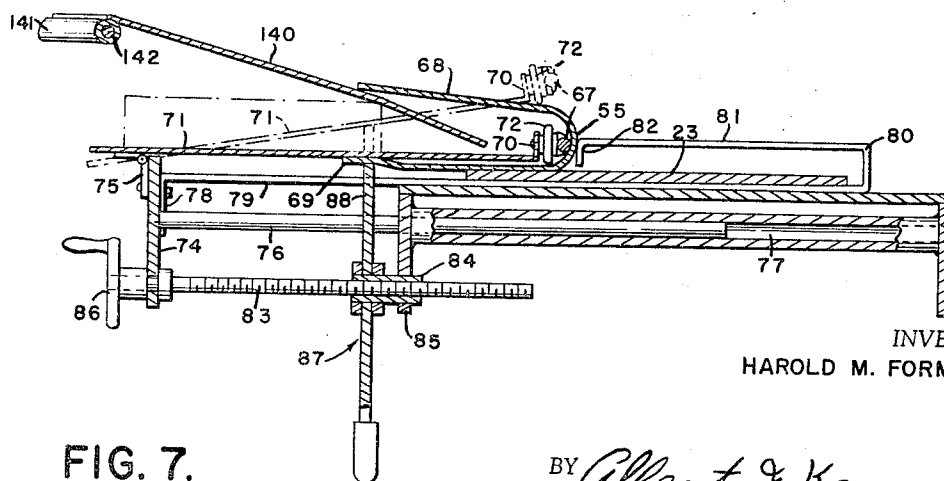
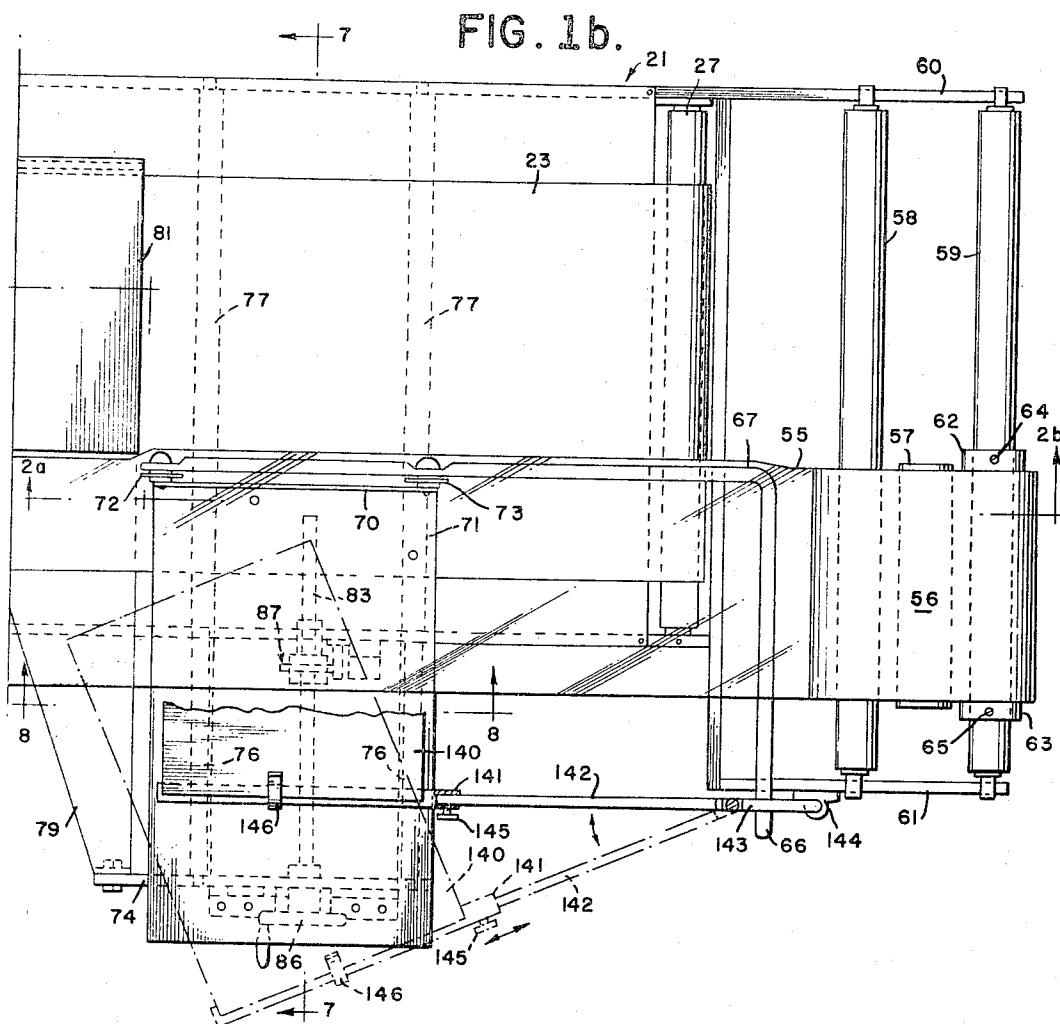
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FIG. 7.

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FIG. 2a.

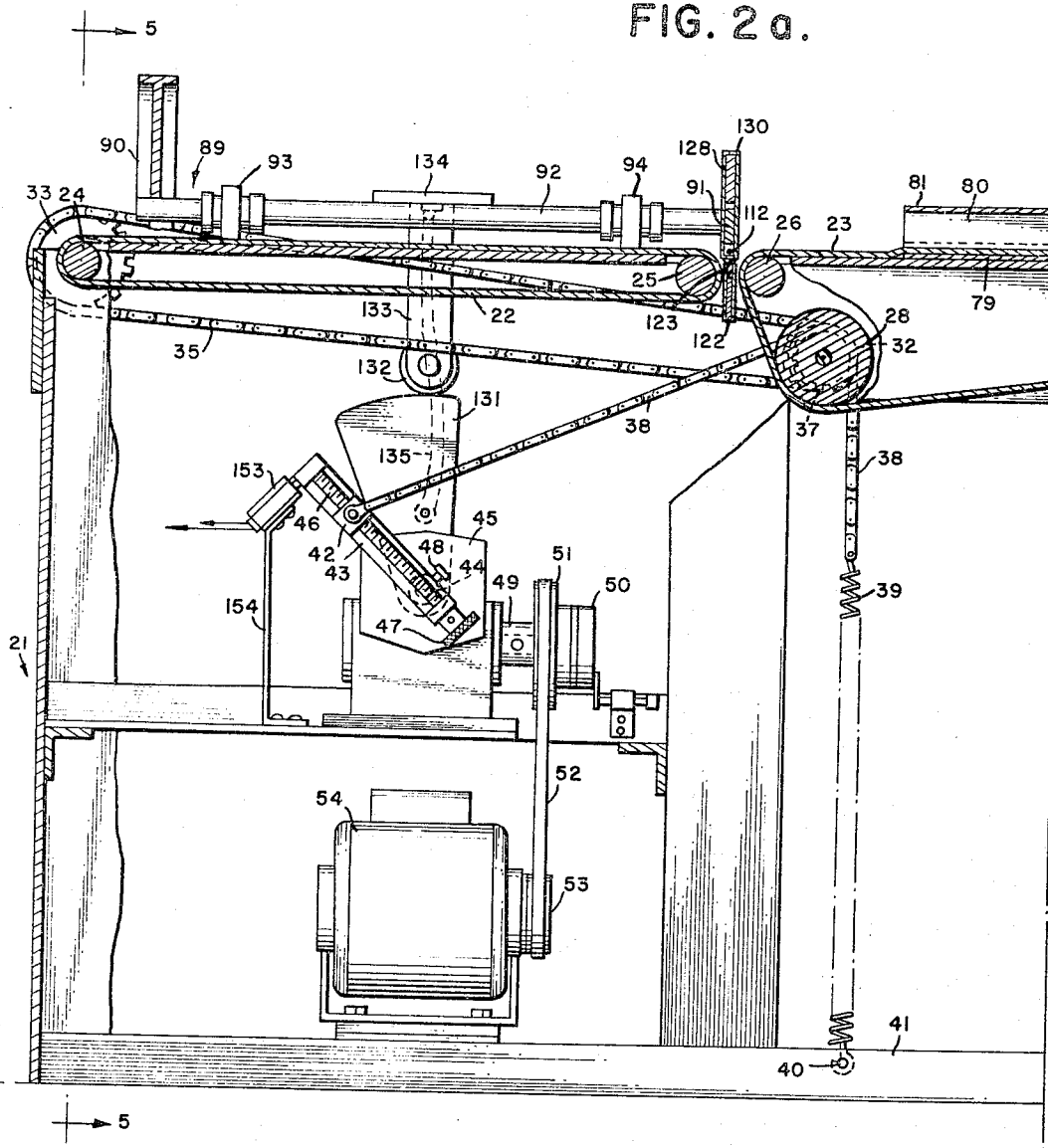
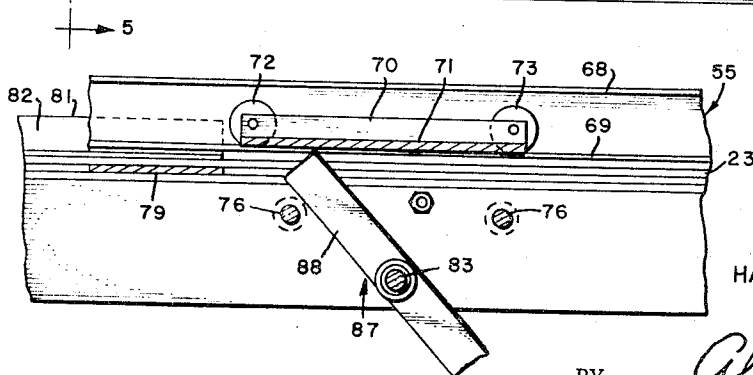


FIG. 8.



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FIG. 2b.

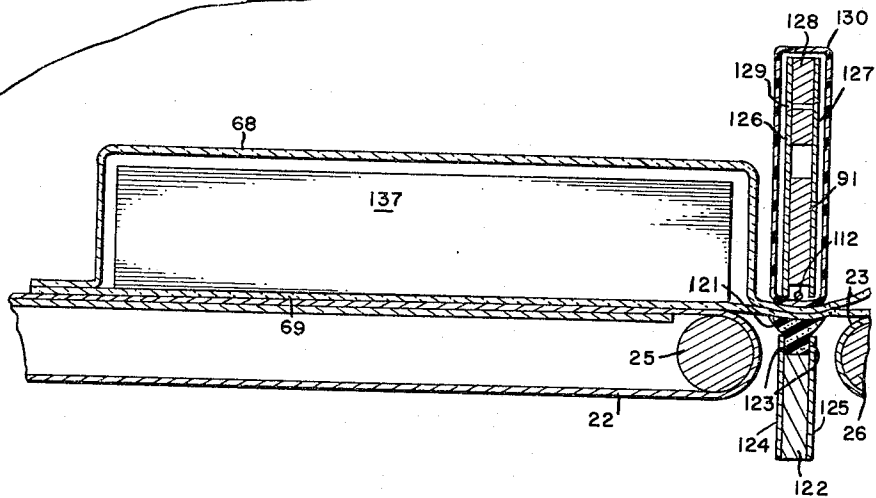
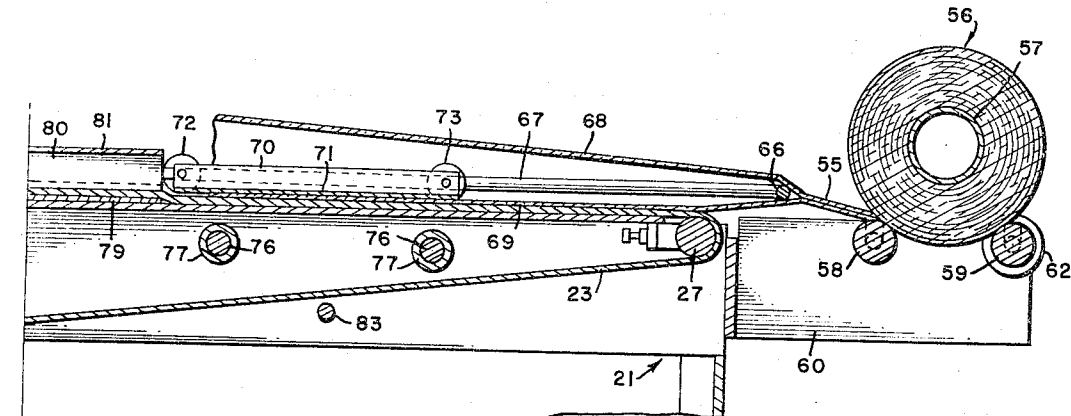


FIG. 12.

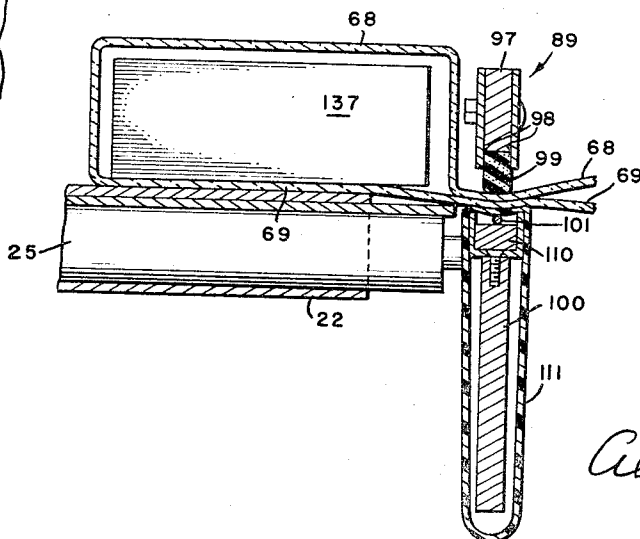


FIG. 11.

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FIG. 3.

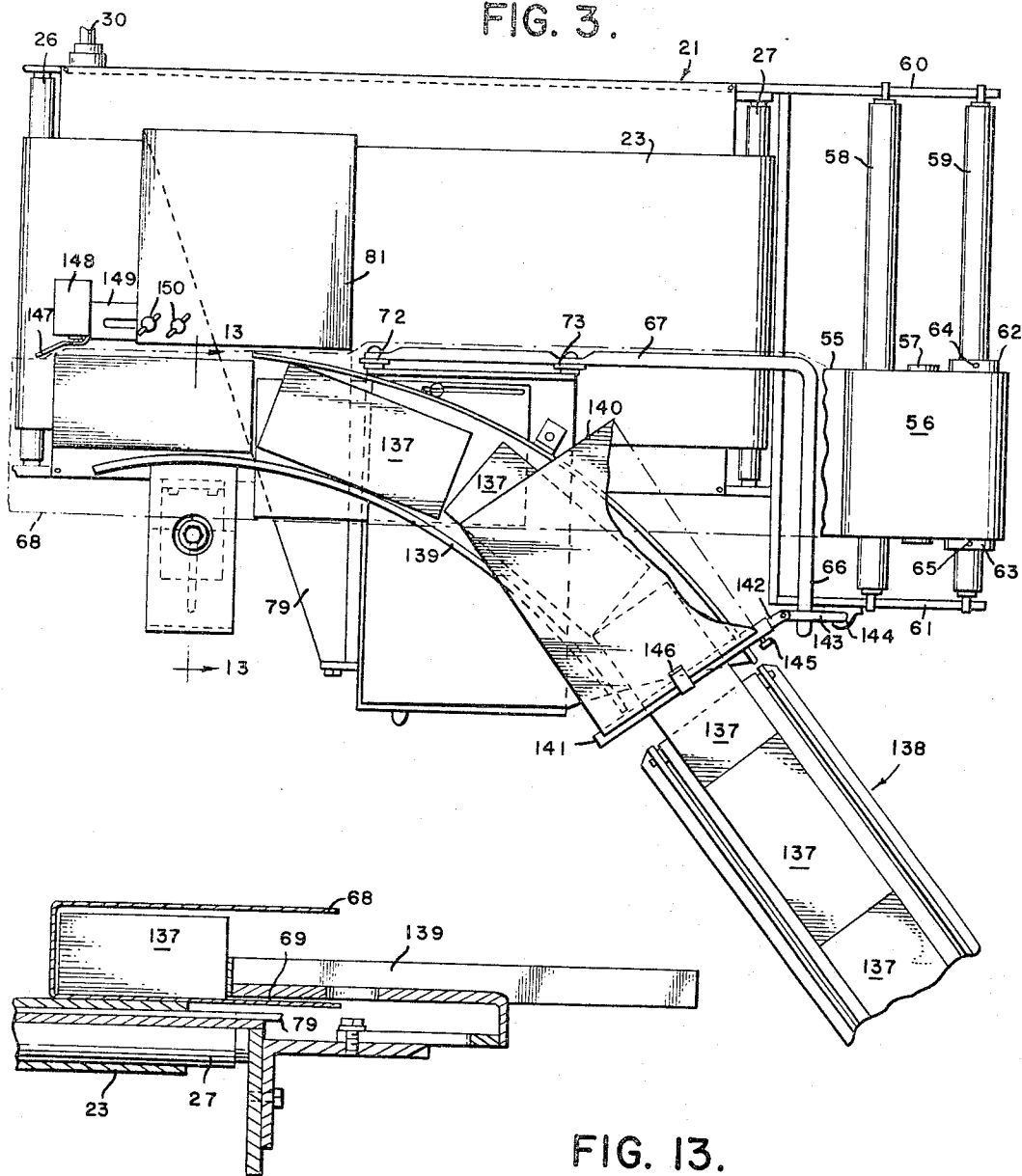


FIG. 13.

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FIG. 5.

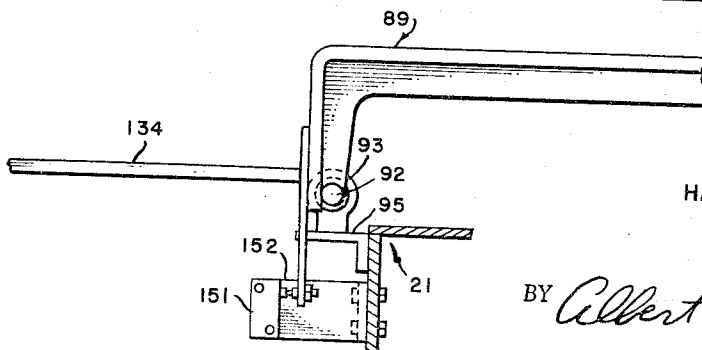
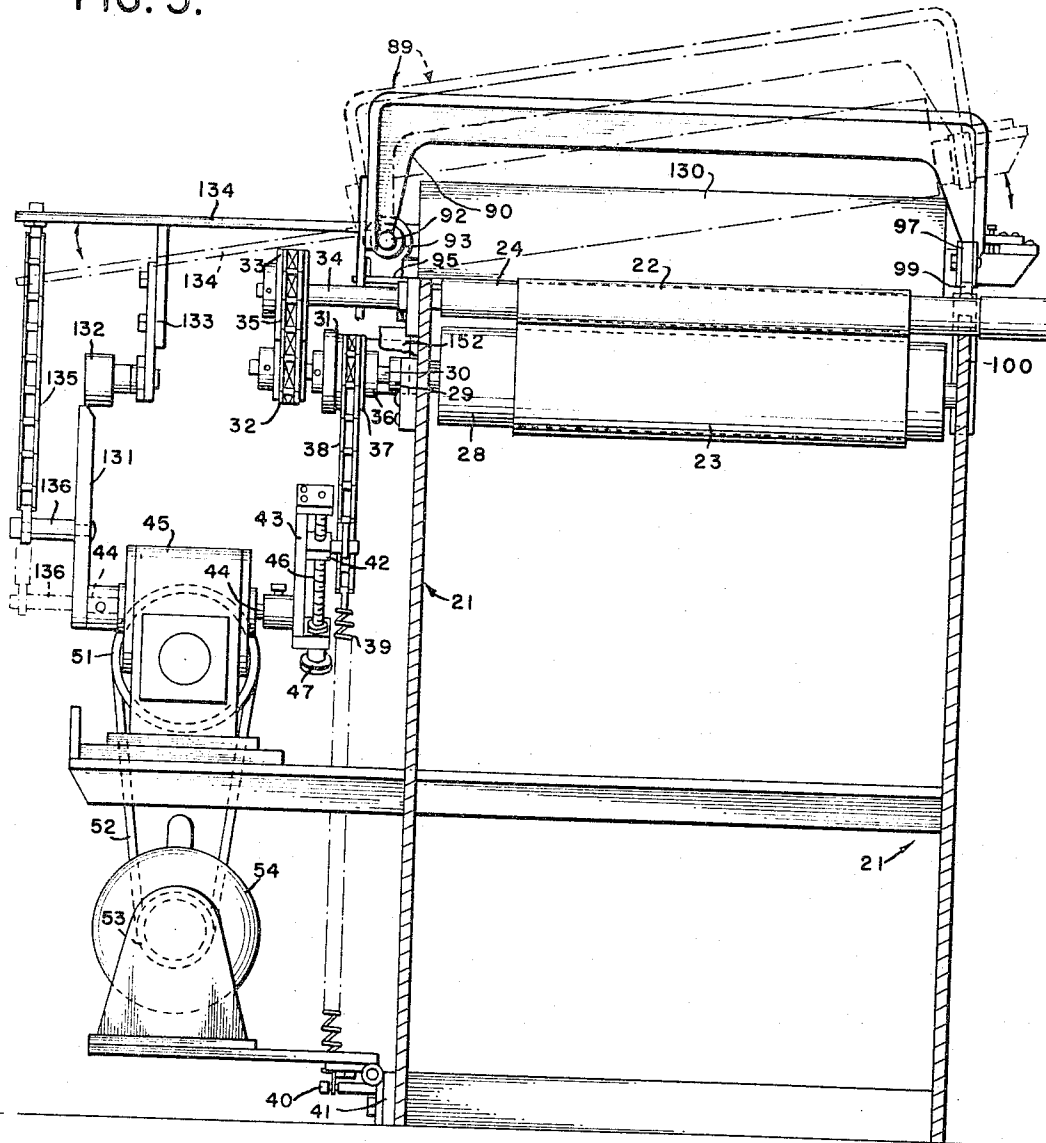


FIG. 6.

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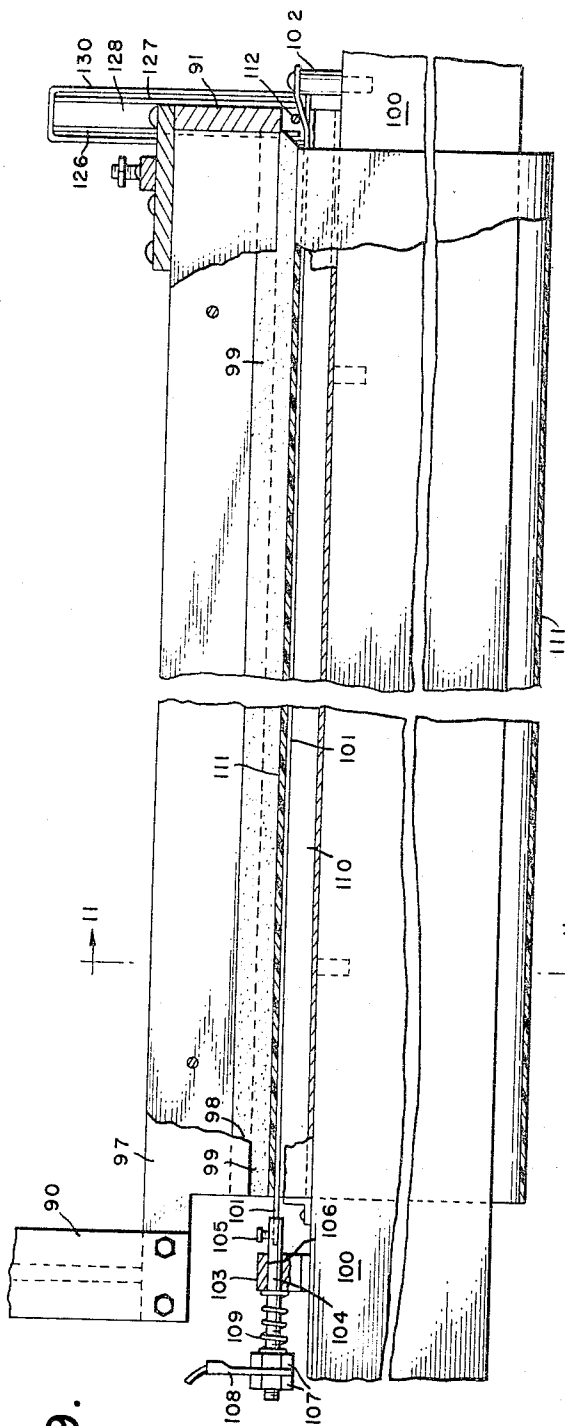
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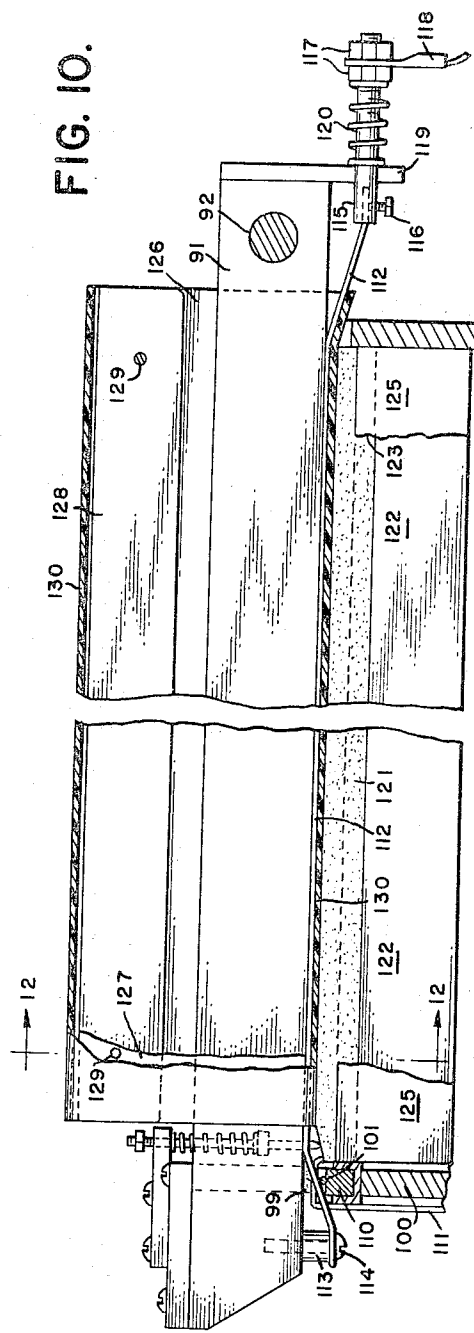
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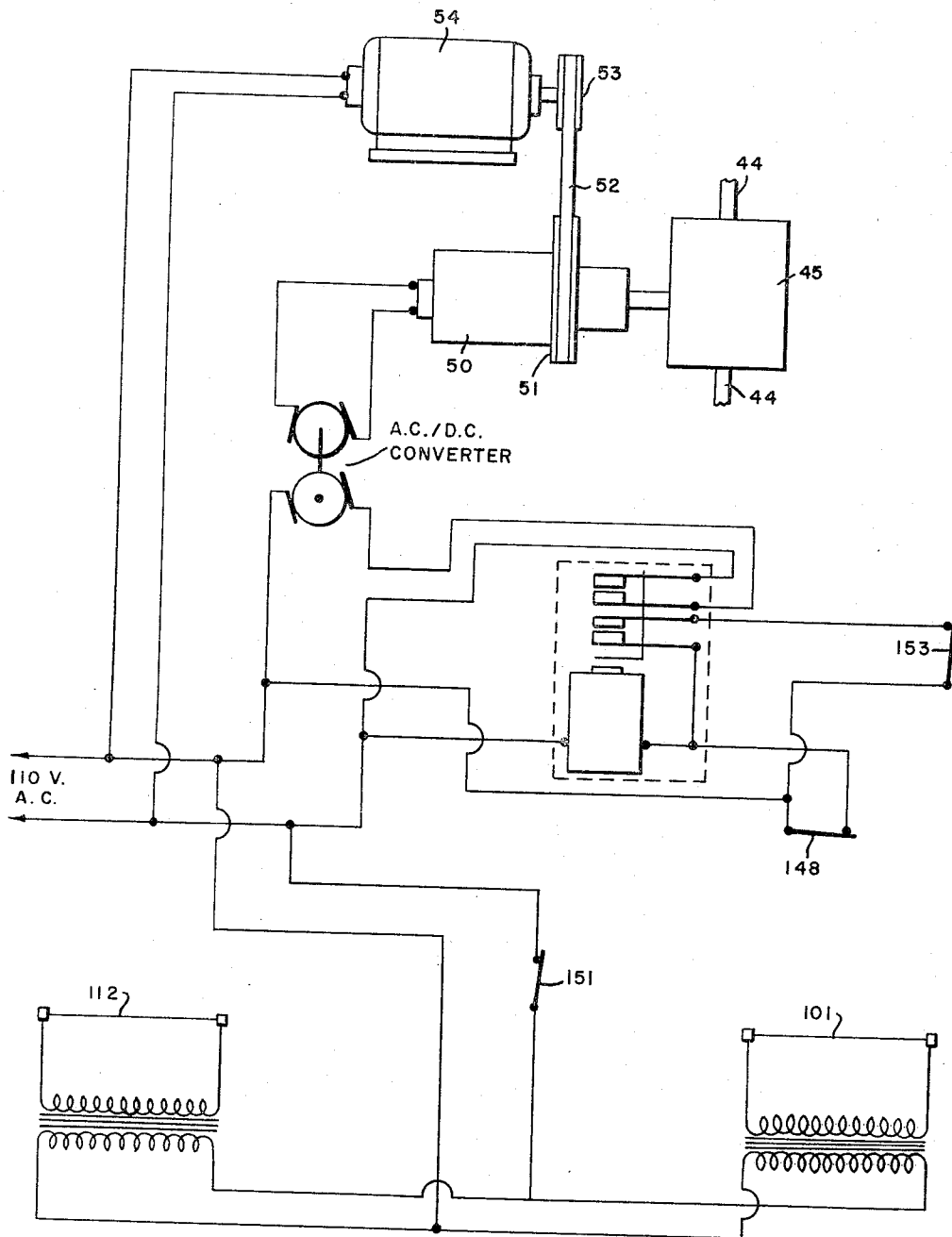
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FIG. 14.

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WRAPPING MACHINE

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Filed Mar. 1, 1965, Ser. No. 436,394

24 Claims. (Cl. 53-182)

This invention relates to packaging machines and it is more particularly concerned with machines for wrapping articles in sheets of heat bondable material such as the conventional polystyrene, and polyvinyl chloride film sheets.

An object of the invention is the provision of a packaging machine of the type mentioned which feeds a double layered strip of wrapping sheet longitudinally to an article loading station where the article to be wrapped is disposed between the two layers after which the layers are sealed together along lines forming an enclosure or pocket for the article.

Another object of the invention is the provision of such a machine which can be adjusted for use with wrapping sheets of different widths and articles of different sizes.

A further object is the provision of a machine of the type mentioned which is adaptable to different operating conditions, which is reliable, efficient and relatively easy to operate in comparison with prior types of wrapping machines.

A still further object is the provision of improvements in an article wrapping machine that facilitates its overall functioning.

These objects and still further objects, advantages, and features of the invention will be explained hereinafter or will be apparent from the description which follows in conjunction with the accompanying drawing.

In the drawing:

FIGS. 1a and 1b together comprise a top plan view of an embodiment of the invention.

FIG. 2a is a longitudinal sectional view along the line 2a-2a of FIG. 1a.

FIG. 2b is a longitudinal sectional view along the line 2b-2b of FIG. 1b.

FIG. 3 is a plan view of a portion of the embodiment adapted to the automatic feeding of articles to be wrapped.

FIG. 4 is a front elevational view of a fragmentary portion of the embodiment illustrating a specific feature of the invention.

FIG. 5 is a sectional view along the line 5-5 of FIG. 2a.

FIG. 6 is a sectional view of a fragmentary portion of the embodiment.

FIG. 7 is a cross-sectional view along the line 7-7 of FIG. 1b.

FIG. 8 is a cross-sectional view along the line 8-8 of FIG. 1b.

FIG. 9 is a cross-sectional view along the line 9-9 of FIG. 1a.

FIG. 10 is a cross-sectional view along the line 10-10 of FIG. 1a.

FIG. 11 is a cross-sectional view along the line 11-11 of FIG. 9.

FIG. 12 is a cross-sectional view along the line 12-12 of FIG. 10.

FIG. 13 is a cross-sectional view along the line 13-13 of FIG. 3.

FIG. 14 is an electrical diagram of the essential electrical elements of the embodiment.

Referring to the drawing with more particularity, the embodiment illustrated comprises a suitable frame structure 21 supporting a pair of tandem belt conveyor sec-

tions 22 and 23. The front section 22 is supported on rollers 24 and 25, and the rear section 23 is supported on rollers 26 and 27.

The rollers are each rotatably supported on the frame structure 21 by conventional bearings.

The rear conveyor section 23 engages a driving roller 28 which has a shaft extension 29 connected to the output shaft 30 of a conventional one-way clutch unit 31. The output shaft 30 is also connected to a sprocket 32 which is geared to a sprocket 33 on an extension shaft 34 of the roller 24 by means of an endless sprocket chain 35.

The input shaft 36 of the clutch unit 31 is secured to sprocket 37 which is oscillated by means of a length of sprocket chain 38 meshed therewith.

One end of the chain 38 is connected to one end of a coil spring 39, and the other end of the spring being anchored to a stationary point 40 on the frame member 41. The other end of the sprocket chain 38 is attached to a slide 42 on an arm 43. The arm 43 is connected for rotation to a horizontal output shaft 44 of a conventional reduction gear unit 45.

The slide 42 is adjustable along the length of the arm 43 in relation to the shaft 44 by a lead screw 46 with which it is engaged, the lead screw being provided with a knurled knob 47 to facilitate manual rotation. A set screw 48 is also provided to hold the lead screw 46 in different positions of adjustment. The input shaft 49 of the gear unit 45 is connected to the output of a conventional electromagnetic clutch 50. The input of the clutch 50 is in the form of a pulley 51 which is driven by a belt 52 connected to the output pulley 53 of an electric motor 54.

By these means the conveyor is intermittently driven by the motor 54 through the clutch 50 and the reduction gear unit 45 to rotate the arm 43. On each rotation of the arm 43 the sprocket chain 38 is pulled against the tension of the spring 39, and then released, whereby the chain is returned to its initial position under the tension of the spring.

The distance through which the chain is pulled and released by the arm 43 is controlled by adjusting the position of the slide 42 on the arm with the lead screw knob 47.

Rotation of the sprocket 37 under the force of the chain 38 is effective to rotate the driving roller 28 and sprocket 32 in one direction only (counter clockwise as viewed in FIG. 2a).

The sprocket 32 is smaller than the sprocket 33 in order that the forward conveyor section 22 move slower than the rear conveyor section 23, the purpose of which will be explained hereinafter.

The sheets to be used for wrapping the article may be any of the conventional types, including the so called heat fusible transparent polyvinyl chloride film 55 which is shown in the drawing by way of illustration only and not by way of limitation.

These sheets are provided in roll form 56 in which the sheet is folded in half lengthwise before being wound on core 57.

A pair of supporting parallel rollers 58 and 59 are transversely disposed on a pair of bracket arms 60 and 61, secured to the rear end of the frame structure 21 and projecting rearwardly cantileverwise. The supporting rollers 58 and 59 are spaced apart a distance just short of the diameter of the core 57 so as to prevent it from falling through between these rollers when the sheet material is used up. The roll 56 is placed on the rollers 58 and 59 between a pair of abutment rings 62 and 63 slidably mounted on the rear roller 59, the fold edge of the sheet 55 being adjacent to the inner abutment ring 62. These rings are set close to the sides of

the roll 56 and clamped in place by set screws 64 and 65, thereby preventing the roll from drifting laterally as it is unwound.

The free end of the sheet 55 extends outwardly from the roll 56 over the roller 58 to a transverse bar 66 at the rear end of a longitudinal arm 67 with the folded edge of the sheet adjacent to the arm. The top layer 68 of the sheet 55 passes over the bar 66 and arm 67 while the bottom layer 69 passes under the rear bar 66 and arm 67.

The forward end of the arm 67 is connected to the vertical flange 70 of a horizontal plate 71. The flange 70 also carries pressure wheels 72 and 73 of rubber or other suitable material, which overlie the rear conveyor section 23 and thereby apply pressure to force the bottom layer 69 of the wrapping sheet into positive engagement with this conveyor. (See FIGURE 7.)

The plate 71 is hingedly mounted on a longitudinal vertical beam 74 by means of a spring hinge 75 at the outer end, which biases the inner end that carries the wheels 72 and 73 downward against the conveyor section 23.

The beam 74 is supported on the outer ends of transverse rods 76, the inner ends being slidably disposed in tubular frame members 77.

To the inner side of the beam 74 there is secured the outer flanged end 78 of a platen 79 which platen extends inwardly from the beam 74 beneath the conveyor section 23 to the opposite side of the conveyor where it is bent upwardly to form a vertical side member 80 and thence forwardly to form an overhanging cantilever deck 81. The inner end of the deck 81 has a downwardly extending flange 82 near and alongside the arm 67 which acts as a shoulder for gauging and positioning the inner folded edge of the sheet 55. (See FIG. 7.)

The beam 74 and parts carried thereby are adjustable relative to the conveyor section 23 by repositioning the rods 76 in the tubular members 77. This is facilitated by a lead screw 83 pivotally mounted on the beam 74 engaging a threaded collar 84 secured to a suitable frame member 85. The lead screw is provided with a hand wheel 86.

On the exterior of the collar 84 there is pivotally mounted a lever 87, the upper arm 88 of which is adapted to contact the bottom of the plate 71 to elevate and hold it in the position shown in dotted lines in FIG. 7, against the spring action of the hinge 75, thereby holding the wheels 72 and 73 in an inoperative position. Disengagement of the lever arm 87 from the bottom of the plate 71 results in the wheels 72 and 73 returning to their normal operative position under the force of the spring hinge 75.

In the inoperative, elevated position of the rollers 72 and 73, the weight of the sheet alone on the conveyor section 23 is slight and insufficient to permit it to be drawn by the conveyor, hence all functions tied in with the sheet motion is thus arrested.

Overlying the front conveyor section 22 is a hinged member 89 comprising a forward arm 90 and a rearward arm 91 secured to the ends of a rocker shaft 92 rotatably mounted in stationary bearings 93 and 94. These bearings are secured to mounting plates 95 and 96 of the frame structure on one side of the conveyor section 22. On the opposite side, a bar 97 extends between and is carried by the arms 90 and 91. The bar 97 has a longitudinal recess 98 along its bottom adapted to receive and frictionally hold a strip 99 of heat resistant sponge rubber which functions as an anvil as explained hereinafter.

On a stationary member 100 of the device underlying the strip 99 when the member 89 is in its horizontal position, is an electrothermal wire 101 tensioned between an electrical terminal post 102 and a bracket 103. One end of the wire is connected to the terminal post 102 and the other end is releasably secured in a tubular holder

104 by a set screw 105. The holder 104 is slidably disposed in an aperture 106 of the bracket 103. The outer end of the terminal 104 is provided with a pair of nuts 107 for attachment to an electrical conductor 108 and a coil spring 109 is disposed between the innermost nut and the bracket 103 to apply tension to the wire 101.

In its normally tensioned position, the wire 101 lies in spaced relation just above a longitudinal metal abutment bar 110 secured to the frame member 100. The bar 110 also functions as a heat sink to cool the wire 101 when it is pressed down by the rubber anvil strip 99.

A sleeve 111 of Teflon, is placed around and it encircles the wire 101, the abutment bar 110 and the frame member 100. See FIG. 11. This arrangement prevents adherence of the wrapping sheet to the encircled parts as well as the accumulation of charred particles. The position of the sleeve can be shifted at will to fresh areas thereof adjacent the wire 101 when undue wear becomes evident.

The rearward arm 91 carries along the bottom thereof another electro-thermal wire 112, one end being secured to a post 113 by a screw 114 and the other end to a tubular holder 115 by a set screw 116. A part of the holder 115 is threaded and it carries a pair of electrical terminal nuts 117 for attachment to an electrical conductor 118. The holder 115 is slidably disposed in a lateral extension 119 of the arm 91 and a coil spring 120 is disposed between the extension 119 and the innermost nut 117 to apply tension to the wire 112.

Below the arm 91 when it is in its horizontal position, a rubber strip 121 is mounted on a frame member 122 in a channel 123 formed by spaced side members 124 and 125.

The arm 91 is straddled by a pair of plate members 126 and 127 which are slidable thereon, the upper ends of the plate members being secured to the sides of a pressure bar 128 by rivets 129. In the normal inoperative position, the bar 128 rests on the arm 91 and the lower ends of the plate members 126 and 127 extend below the wire 112 on either side thereof.

A sleeve 130 of Teflon encircles the arm 91, the wire 112, and the plate members 126 and 127 and it serves the same purpose as the sleeve 111 described above.

When the arm 91 is lowered toward the strip 121, pressure against the bottom of the plates 126 and 127 causes them to become elevated relative to the arm 91 to bring the wire 112 against the sleeve 130. Continued pressure causes the wire 112 to contact the arm 91 which acts as a heat sink to cool the wire.

A rotating arm 131 in the general form of a wheel segment is secured to the shaft 44 for rotation therewith. A roller 132 is mounted on the outer end of a cross arm 133 extending from a lever 134 secured to the rocker shaft 92. The arm 131 is adapted to engage the roller 132 when the arm 133 is in a near vertical position by movement of the member 89 to its closed horizontal position. This has the effect of pressing the frame downwardly for a short period during each revolution of the shaft 44 to press the hot wires and wrapping sheets together to effect heat seals. (The wire 112 may for chain type wrapping, be operated at a lower temperature sufficient to effect sealing, but not sufficient to effect severing.) In all other positions of the member 89, the roller is not contactable by the arm 131. This provides a safety measure to prevent injury to an operator should his hand or clothing be accidentally caught under the member 89.

The member 89 is oscillated by a flexible member, such as the chain 135, one end of which is secured to the outer end of the lever 134 and the other end to a post 136 secured on the arm 131 in an eccentric position.

Articles 137 to be packaged are placed between the upper and lower layers of the wrapping sheet over the conveyor section 23. This may be done either manually or automatically by means of a belt conveyor 138 on which the articles are placed and fed thereby to the outer

end of a channel track 139, the inner end being disposed between the layers of the wrapping sheet. To facilitate insertion of the articles between these layers, a guide in the form of a plastic sheet 140 is provided at the outer end of the channel track. This sheet has one end secured to a tubular roller 141 which roller is rotatably mounted on a bar 142, the bar being supported cantileverwise on a bracket 143 attached to a suitable frame member 144. The roller 141 can be set in any given angular position by a set screw 145 and the sheet can be unfurled to different degrees by rotating the roller on the bar 142. A spring clip 146 may be provided to hold any rolled portions of the sheet on the roller in selected positions.

When an article to be wrapped is disposed between the layers of the wrapping sheet on the conveyor section 23, motion of the conveyor advances it toward the other section 22. Along this line of travel, there is interposed the actuating finger 147 of an electrical switch 148. This switch is carried by a bracket 149 which is adjustably mounted on the deck 81 by thumb screws 150. This adjustment permits varying the cycle of operation for different size packages. Actuation of the switch energizes the electromagnetic clutch 50, thereby causing power to be delivered from the motor 54 to the output shaft 44 of the reduction gear unit 45, which causes the arm 131 to rotate, thereby oscillating the lever 134 which causes the member 89 to oscillate between the upper and lower positions. This action of the member 89 is synchronized with the cyclic operation of the belt conveyor through the chain 135 and slip clutch 50 so that the conveyor is at rest when the member 89 is lowered and member 89 is in its elevated position.

On lowering of the member 89, a switch 151 mounted on a stationary bracket 152 breaks the electrical circuit containing electro-thermal wires 101 and 112, as the wires are brought into contact with the bar 110 and arm 91 under the pressure exerted by the arm 131 against the roller 132 thereby causing cooling of the wires after sealing and severing of the wrapping sheet has taken place. The arm 43 on reaching a cut-off switch 153 mounted on a stationary bracket 154, actuates it to open the electrical circuit containing the clutch 50, thereby completing the cycle. The cycle is repeated when the switch finger 147 is again tripped by pressure of an article thereagainst moving on the conveyor.

Following elevation of the member 89, the conveyor is actuated by the intermittent action of the clutch 50 connected to the driving chain 38 whereupon the wrapped article is carried to the discharge end of the conveyor section 22, as another portion of the wrapping sheet to be sealed is delivered from the section 23 to the section 22, whereupon the cycle of operation is repeated. The discharged wrapped article may be delivered directly to a conventional shrink oven (not shown) for shrinking the wrapper tightly about the article, where shrink film is used as the wrapping material, or otherwise processed as desired.

It is preferred in actual practice that the conveyor section 23 be operated somewhat faster than the section 22 in order to maintain a web portion 155 of the wrapping sheet between consecutive articles in a slack condition during the heat sealing operation and thereby to facilitate the operation and insure a good seal. A ratio of about 8 to 10 has been found satisfactory for this purpose in many operations and this ratio or any other ratio may be achieved by selecting proper relative sizes for the sprockets 32 and 33.

The width of the wrapping sheet is selected so that a continuous waste band 156 is formed as the operation proceeds. This band is laterally diverted from the main part of the wrapping sheet from which it is severed by a finger 157 at the end of a rod 158 adjustably mounted on a swivel bracket 159 on a stationary part 160 of the machine. The band is maintained taut by an extension 161 of the roller 24 and is held thereagainst by an idler 162 which

is biased toward the extension 161 by a spring 163. By maintaining the band taut, a positive force is applied to draw the sheet material from the sheet roll to supplement the action of the pressure wheels 72 and 73 against the conveyor section 23.

I claim:

1. A wrapping machine comprising a conveyor, means cooperating with the conveyor for feeding a longitudinally folded heat sealable strip of wrapping material lengthwise over said conveyor, the folds of said strip being adapted to contain a series of articles to be wrapped, heat means for sealing portions of the folds to form separate article pockets and for severing the sheet along lines forming a separate continuous waste band longitudinally of the strip, and means for holding the band taut as it is formed.

2. A wrapping machine as defined by claim 1 in which the strip of material is folded lengthwise and the folds are sealed along lines forming a right angle, one side of the angle being parallel to the fold line of the sheet and the other side of the angle extending transversely to the fold line of the sheet.

3. A wrapping machine as defined by claim 1 and means for discharging the band continuously from the machine as it is formed.

4. A wrapping machine as defined by claim 1 in which the heat means comprises a movable member and a stationary member, and means for moving the wrapping material between said members, each of said members having a thermal electrical wire attached thereto, said wires being disposed at right angles to each other, each member also having an anvil attached thereto opposite the wire of the other member, and means for cyclicly moving the movable member to positions of engagement and disengagement with the stationary member.

5. A wrapping machine comprising a conveyor, means cooperating with the conveyor for feeding a longitudinally folded heat sealable strip of wrapping material lengthwise over said conveyor, the folds of the strip being adapted to contain a series of articles to be wrapped, heat means for sealing portions of the folds to form separate article pockets, said heat means comprising a movable member and a stationary member, means for moving the wrapping material between said members, each of said members having a thermal electric wire attached thereto, said wires being disposed at right angles to each other, each member also having an anvil attached thereto opposite the wire of the other member, means for cyclicly moving the movable member to positions of engagement and disengagement with the stationary member, means for electrically connecting said thermal electrical wires to a source of electric current while the members are in a position of mutual disengagement and for disconnecting said wires from said source when the members are in a position of mutual engagement.

6. A wrapping machine as defined by claim 4 in which the anvils are of a heat resistant spongy material.

7. A wrapping machine as defined by claim 5 in which the thermal electrical wires are disposed on their respective members so as to cross each other when the said members are in positions of mutual engagement.

8. A wrapping machine as defined by claim 7 in which the thermal electrical wires are each mounted on their respective members by supports at their outer ends, at least one support for each wire having resilient means to tension the wire longitudinally in suspension between its supports.

9. A wrapping machine as defined by claim 8 and a metallic bar effective as a heat sink carried by each member in spaced relation to the wire, adapted to be contacted by the wire when the members are mutually engaged and pressed together.

10. A wrapping machine as defined by claim 4 and a tube of Teflon encircling each thermal electrical wire.

11. A wrapping machine as defined by claim 6 in which the movable member comprises a longitudinal sup-

port bar, the thermal electrical wire thereof being attached to the bottom of said bar, and a press bar overlying said support bar, said press bar having side plates secured thereto and slidably extending downwardly along the sides of the support bar, the lower ends of the plates being normally below the wire when the press bar is in its lowermost position.

12. A wrapping machine as defined by claim 1 and means overlying the conveyor for supporting and laterally positioning the sheet material relative to the conveyor.

13. A wrapping machine as defined by claim 14 in which the overlying means comprises a platform and an offset section below the conveyor supporting the platform above the conveyor.

14. A wrapping machine as defined by claim 13 and means hingedly connecting the platform to the section, means resiliently biasing the platform to a hinged position parallel to the conveyor, and means for hingedly moving the platform to and holding it in an upwardly inoperative position against the force of said resilient means.

15. A wrapping machine as defined by claim 13 and means for adjusting the position of the platform laterally relative to the conveyor.

16. A wrapping machine as defined by claim 13 in which the platform comprises a vertical abutment to slidably engage the inner edge of the wrapping sheet as it moves over the conveyor.

17. A wrapping machine as defined by claim 4 in which the conveyor comprises a forward section and a rearward section, said movable member overlying said forward section.

18. A wrapping machine as defined by claim 17 and means for driving each conveyor section at different relative speeds.

19. A wrapping machine as defined by claim 17 and means for driving the rearward section at a speed less than that of the rearward section.

20. A wrapping machine as defined by claim 18 in which the means for driving the conveyor sections comprises a one-way clutch having an input shaft and an

output shaft, means for oscillating the input shaft, and means connected to said output shaft for driving each of said sections.

21. A wrapping machine as defined by claim 20 in which the means for oscillating the input shaft of the one-way clutch comprises a sprocket secured to the input shaft for rotation therewith, a sprocket chain in meshed relation with the sprocket, a rotatable arm, means for rotating the arm, one end of the chain being attached to an eccentric point of the arm, the other end of the chain being connected to a resiliently yieldable member.

22. A wrapping machine as defined by claim 21 in which the eccentric point on the arm is adjustable along the length of the arm in relation to the axis of rotation of the arm.

23. A wrapping machine as defined by claim 4, an offset arm secured to the movable member, a roller carried by the arm, and a rotatable arm adapted to engage the roller when the movable member is in engagement with the stationary member to press the movable member against the stationary member.

24. A wrapping machine as defined by claim 14 and friction wheels carried by the platform adapted to lie on and press against the conveyor under tension of the spring hinge in the path of the wrapping sheet as it moves over the conveyor.

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