Sept. 6, 1960 H. G. PODLESAK ET AL 2,951,325

SEALING AND SEVERING MECHANISM

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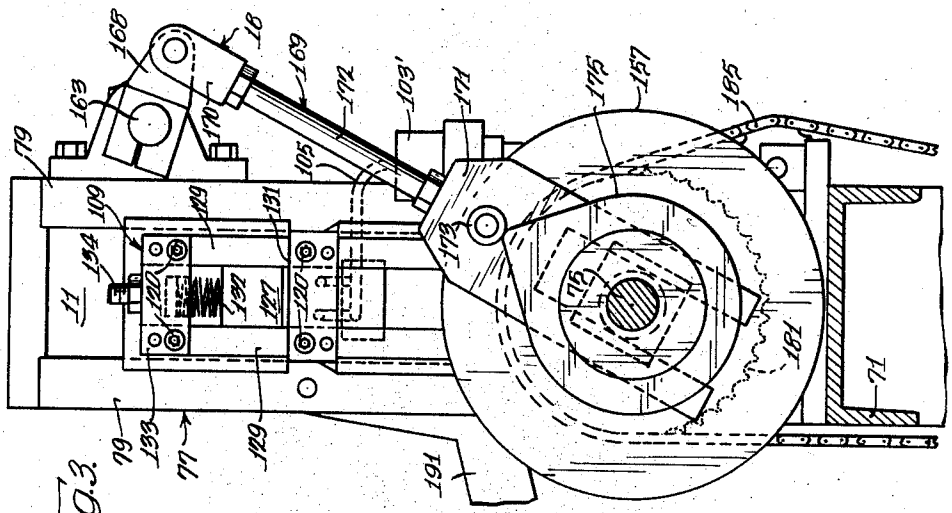


Fig. 3.

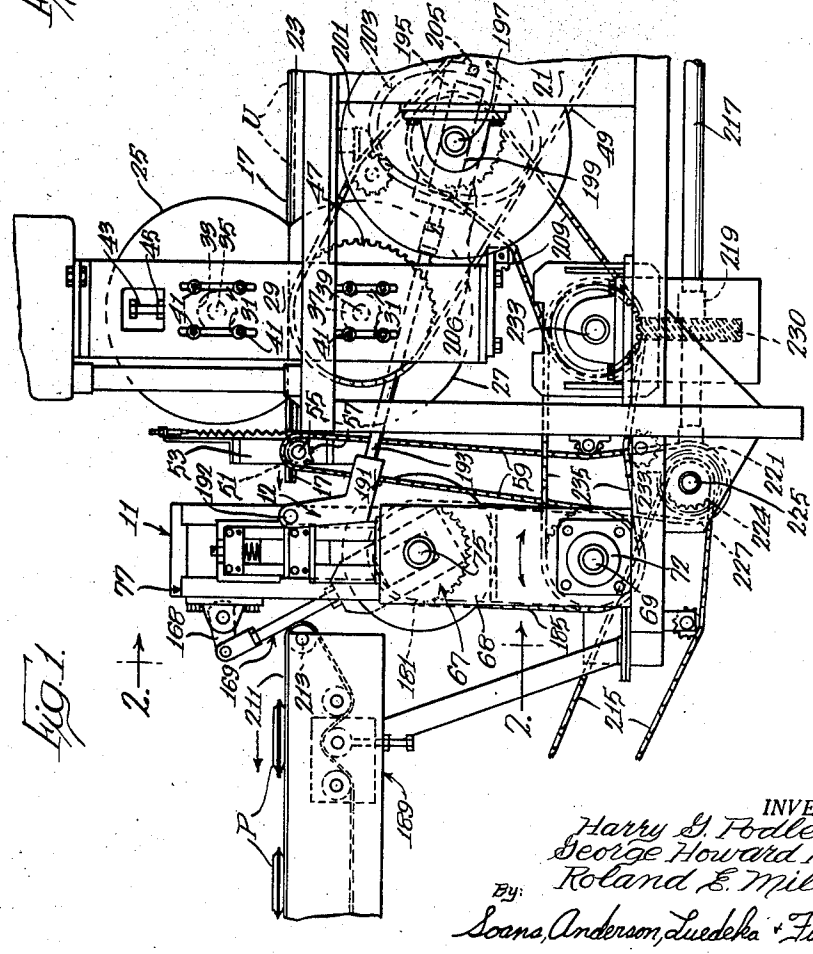


Fig. 1.

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4 Sheets-Sheet 2

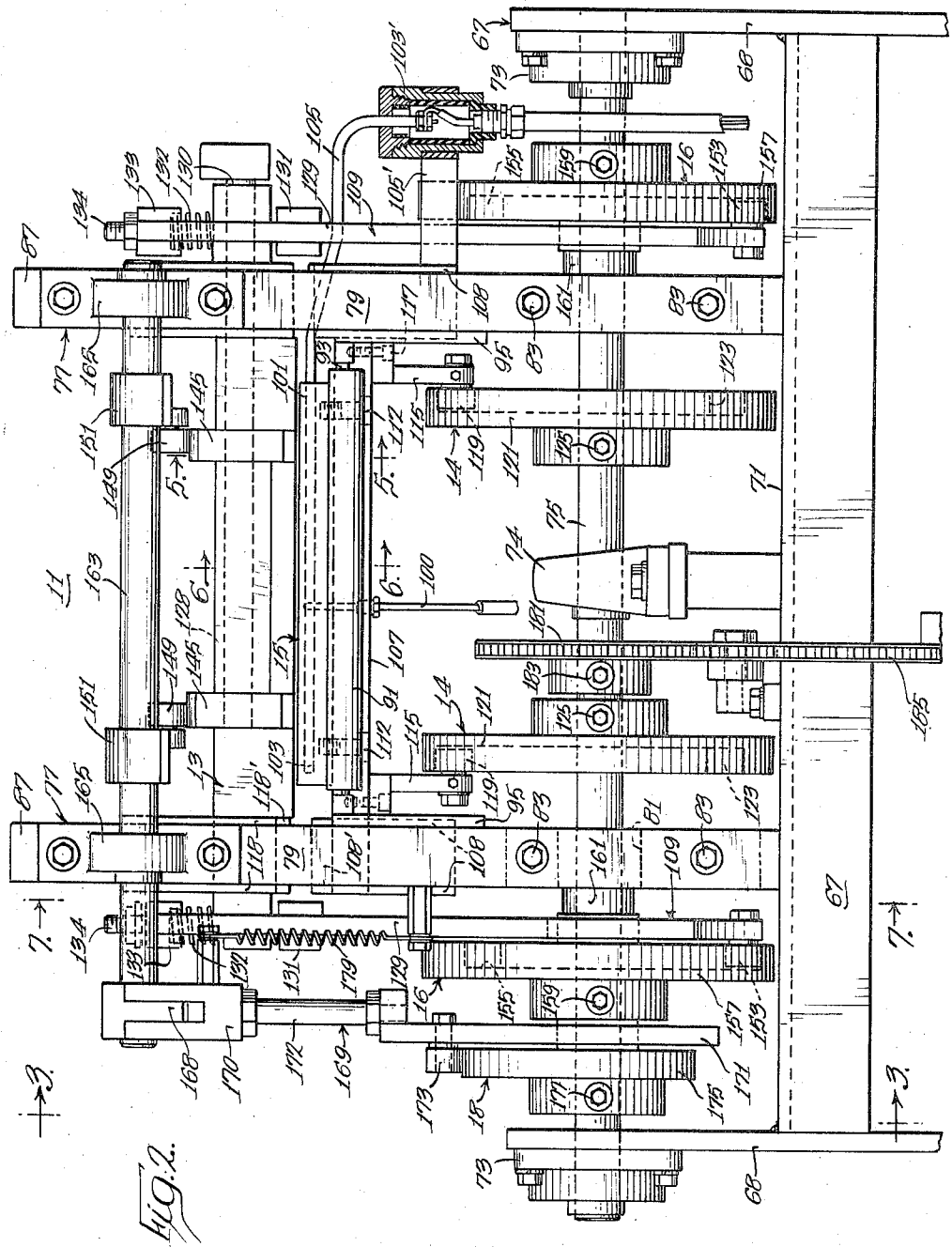


Fig. 2.

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SEALING AND SEVERING MECHANISM

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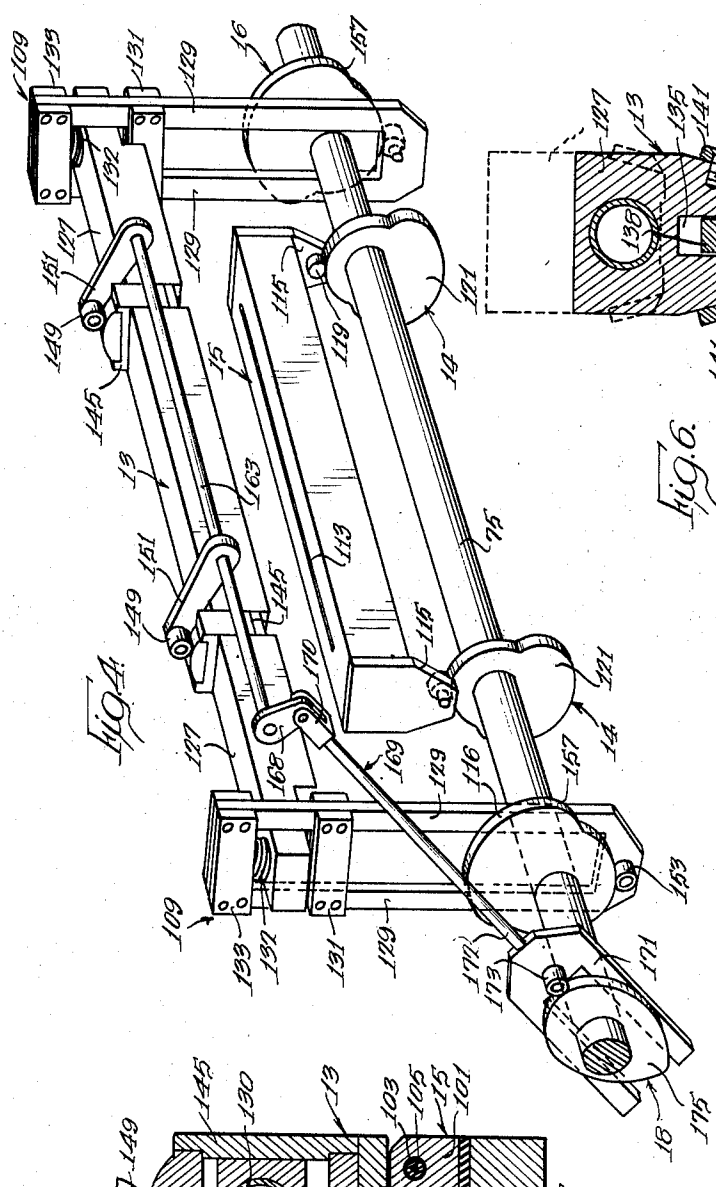


Fig. 4

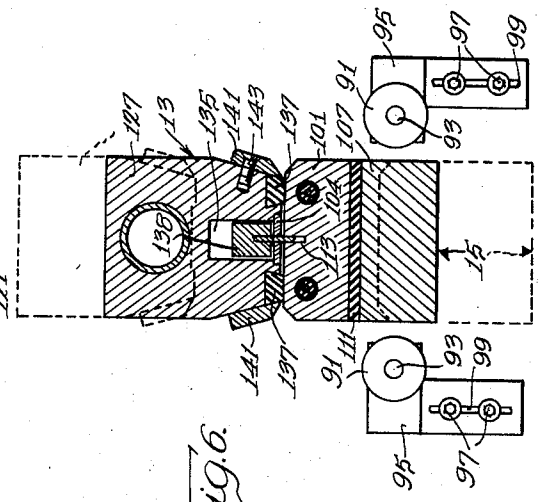


Fig. 6

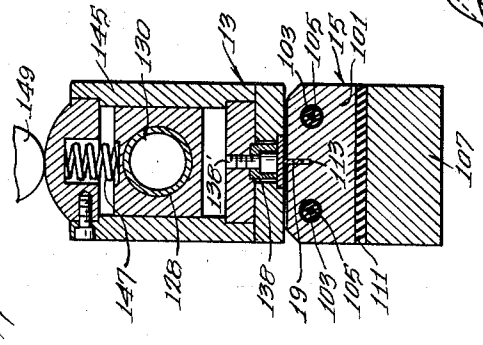


Fig. 5

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SEALING AND SEVERING MECHANISM

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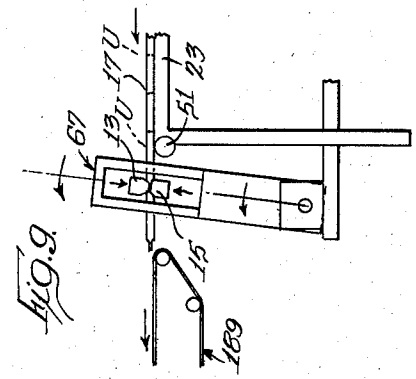


Fig. 9.

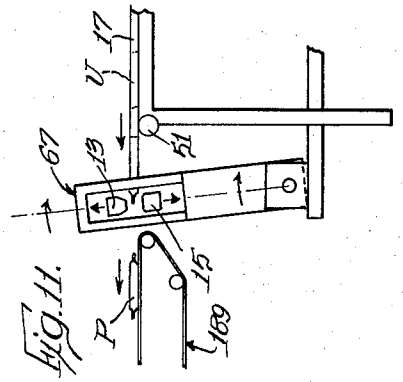


Fig. 11.

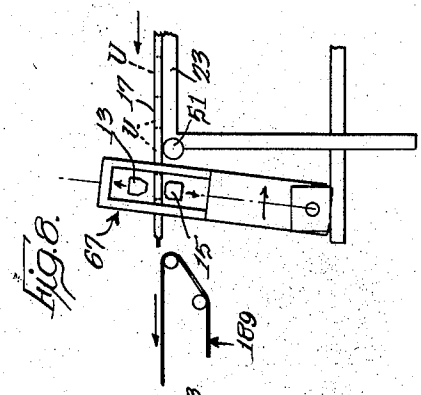


Fig. 8.

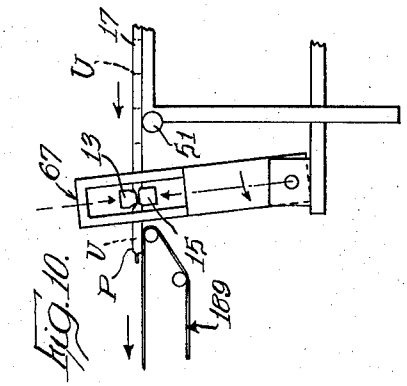


Fig. 10.

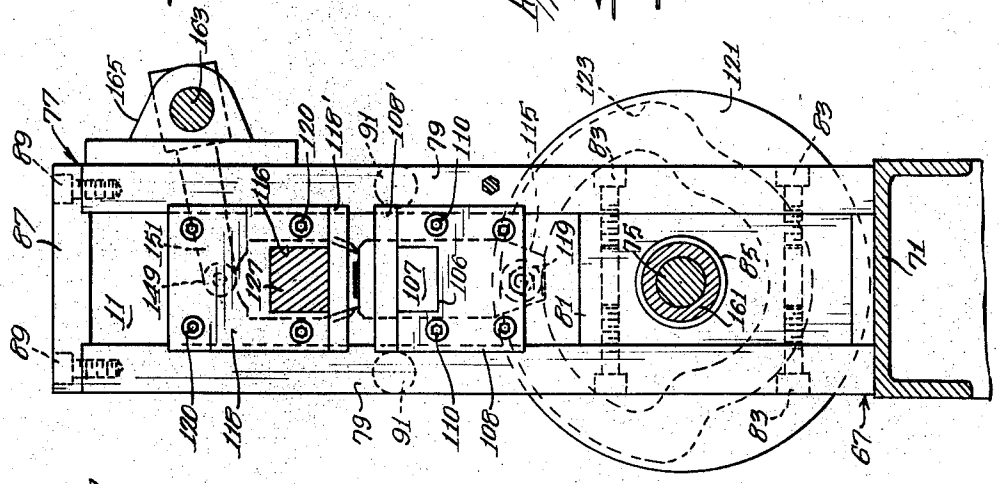


Fig. 7.

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2,951,325

SEALING AND SEVERING MECHANISM

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Filed Dec. 7, 1956, Ser. No. 626,987

1 Claim. (Cl. 53—182)

The present invention relates generally to improvements in the art of packaging and more particularly to an improved method and apparatus for sealing and severing a flexible tube at positions therealong intermediate spaced-apart articles which are enclosed in the tube.

In the packaging of many products, for example food products such as cheese, a series of the units to be packaged are placed in spaced-apart relationship in an open ended tube of substantially flexible, sealable sheet material, and the walls of the tube are sealed together between the packaged units, to divide the tube into separate sections. Each of the sections encloses at least one of the units. During or after the sealing operation, the sealed sections are cut apart to form individually packaged units. In the event a food product is to be packaged, the sheet material is desirably substantially gas and moisture impermeable and the seal is also desirably gas and moisture impermeable.

It is preferred, of course, that the packaging operation be performed in an automatic or semi-automatic manner. In such operations, the units to be packaged are placed in spaced-apart relationship in a tube of sheet wrapping material. The formation of the wrapper tube may be accomplished by placing the units to be packaged in spaced-apart relationship on a strip of the sheet material, and folding the strip into a tube having a single longitudinal seam which may be heat sealed or otherwise sealed together, or a second strip of packaging material may be placed over the units and sealed along its edges to the bottom strip to provide a two-piece tube.

The formed tube is then moved longitudinal of its axis as more units are placed on the succeeding strip of sheet material which is similarly folded to form additional sections of the tube. The tube is usually moved from the entubing section, longitudinally of its axis at a substantially constant speed, and it is preferred that the sealing of the tube between units and the severing of the tube to form individually packaged units do not interfere with the movement of the tube longitudinally of its axis.

The machines that were available, before this invention was made, for performing the sealing and severing, have been generally not entirely satisfactory for use in such packaging methods. These machines often made faulty seals, as a result of which the unit to be packaged, if perishable, would spoil. Also, these prior sealing and severing machines, in order to function properly, generally involved halting the longitudinal movement of the tube during the sealing and severing operation.

The present apparatus allows the tube to be moved longitudinally of its axis and, while the tube is in motion, the tube is sealed and severed.

The present application is a continuation-in-part of our prior application, Serial No. 517,218, now United States Patent 2,919,990 issued January 5, 1960. In this patent, there is disclosed a method and apparatus for semi-automatically or automatically wrapping units in flexible and sealable wrapping material. The apparatus encloses

units to be packaged in spaced-apart relationship in a tube of the wrapping material and subsequently the tube is sealed and severed between units. This apparatus has proven to be quite satisfactory for its intended purpose. However, on some types of wrappers and in the packaging of certain items, it is desirable to provide even a better and more extensive seal than is possible with the prior apparatus.

The principal object of this invention is, therefore, the provision of an improved method and apparatus for transversely sealing and severing an elongated tube of sealable, flexible sheet material between articles which are enclosed in the elongated tube in spaced-apart relationship. Another object is the provision of such an improved apparatus which is capable of sealing and severing the tube of sealable, flexible sheet material between articles contained therein, while the tube is moving.

Further objects and advantages of the present invention will be apparent from the following description and accompanying drawings which illustrate one form of the invention.

In the drawings:

Figure 1 is a side elevational view of a packaging apparatus embodying various features of invention.

Figure 2 is an enlarged view of the sealing and severing mechanism of the packaging apparatus, taken along line 2—2 of Figure 1.

Figure 3 is a view of the sealing and severing mechanism taken along line 3—3 of Figure 2.

Figure 4 is a diagrammatic illustration, in perspective, of a portion of the operating mechanisms shown in Figures 1 to 3.

Figure 5 is an enlarged cross-sectional view of the jaws of the sealing and severing mechanism, taken along line 5—5 of Figure 2.

Figure 6 is an enlarged cross-sectional view of the jaws of the sealing and severing mechanism taken along line 6—6 of Figure 2.

Figure 7 is a cross-sectional view taken along line 7—7 of Figure 2.

Figures 8 to 11 inclusive, are diagrammatic illustrations of some of the operating parts of the mechanism shown in Figure 1, in various operating positions.

As has been pointed out, the present invention provides an apparatus for transversely sealing and severing an elongated open-ended tube of sealable, flexible sheet material between articles which are enclosed in the tube in spaced-apart relationship. More particularly, the improved apparatus provides a sealing and severing mechanism **11** including an upper jaw **13** and a lower jaw **15**, which are movable into engagement with opposite sides of a wrapper tube **17** and which are further movable along with the tube through a pre-determined path. Generally, this novel co-action of the sealing and severing means with the wrapper tube affords a more prolonged sealing engagement with opposite surfaces of the tube and permits a more precise severing of the wrapper tube **17** transversely of the sealed portion by a knife **19**. Both of these features contribute to the improved seal achieved with the present invention and adapt the invention to use with a wide variety of wrapper materials.

Referring now more particularly to the drawings, especially Fig. 1, the specific wrapping machine illustrated, embodies various of the features of the invention, and, as has been pointed out, is particularly adapted to the packaging of cheese. The illustrated machine includes a generally rectangular main frame **21** of fabricated construction, which includes a horizontal platform **23** upon which the tube **17** is formed.

The tube **17** is formed about the units U by suitable tube forming apparatus. One type of tube forming ap-

paratus that may be used is described in the hereinbefore referred to United States Patent 2,919,990. However, other tube forming means may be employed and, since such means is not a part of the present invention a description thereof is believed to be unnecessary. The units U are in spaced-apart relationship in the tube 17. Various types of wrapping materials may be used to form the tube 17, such as, for example, cellophane coated with a waxlike material, such as the material sold under the trade name Parakote; rubber hydrochloride sheets, such as the materials sold under the trade name Pliofilm; vinylchloride-acetate sheets, such as the material sold under the trade name Vinylite; vinylidene-vinylchloride sheets, such as the material sold under the trade name Saran; and various other sealable, flexible sheets, as well as various laminated sheets embodying the foregoing or other materials.

The tube 17 of sheet material, containing the units U in spaced-apart relationship, moves longitudinally from the tube forming apparatus, and the tube 17 is collapsed and pressed about the units U by a pair of resilient rolls 25 and 27 which are arranged with their axis at right angles to the line of travel of the tube 17. The outer peripheries of the rolls 25 and 27 are in contact with each other to provide a nip through which the tube 17 can be passed to thereby press the tube into conformity with the enclosed, spaced-apart units U.

The rolls 25 and 27 are supported by a pair of vertical members 29 positioned on the sides of the frame 21, only one member 29 being shown, which members 29 are attached to and extend upwardly from the main frame 21. Each of the members 29 are provided with two pairs of parallel vertically disposed slots 31, each of which pairs is adapted to vertically adjustably receive a bearing mounting in fixed relation thereto. The upper bearing mountings 33 rotatably support opposite ends of the shaft 35 on which the upper roll 25 is mounted. The lower bearing mountings 37 rotatably support a shaft 39 upon which the lower roll 27 is mounted. Each of the bearing mountings is adjustably secured in vertical position in the slots 31 by bolts 41 which prevent rotational movement of the bearing mountings or brackets but permit vertical adjustment of the mountings in their associated slots. This allows adjustment of the rolls 25 and 27 toward and away from each other to permit a variation in the area over which the rolls 25 and 27 are in contact, and to permit a change in the location of the nip so that it is aligned to receive the tube 17.

In addition to the slots 31 and the bolts 41, positioning of the upper bearing mounting 33 and its associated upper roll 25 is facilitated by means of an adjusting screw 43 which is threadably engaged in an associated bracket 45 carried by frame member 29 and in the bearing mounting 33 and which is operable to effect adjustment of the upper roll 25.

The lower roll 27 has rotary motion imparted to it through a sprocket 47 which is keyed or otherwise secured to the shaft 39. The sprocket 47 is driven through an endless chain 49 which is suitably connected to a source of power (not shown).

After the tube 17 is pressed into intimate contact with the units U by the rolls 25 and 27, the tube 17 containing the units U in spaced-apart relationship is moved forward under the guidance of a driven roller 51. The driven roller 51 is rotated on a shaft 55 which is supported on the platform 23 by suitable brackets 53. The roller 51 is driven by a sprocket 57 which is keyed or otherwise secured to shaft 55. The sprocket 57 is driven through an endless chain 59 which is suitably connected to the source of power (not shown) through means including a sprocket 227 and chain 59 (Fig. 1).

As the tube 17 is moved forwardly under the action of rolls 25 and 27 and the driven roller 51, the tube 17 containing the units U in spaced-apart relationship is contacted by the sealing and severing means 11.

The sealing and severing means 11 is operable to seal the tube 17 between each of the enclosed units U and to cut the individually sealed units U apart to form separate packages P. The sealing and severing means 11 does not interfere or hinder the longitudinal motion of the tube 17 during the sealing and severing operations and, preferably, is arranged to move at the same speed as the tube as determined by the rolls 25 and 27.

The sealing and severing unit 11, as seen in Fig. 1, includes a support frame 67 which is rockably or hingedly mounted at its lower end on a cross shaft 69. The cross shaft 69 is journaled in a pair of spaced-apart bearings 72 which are mounted on a lower portion of the main frame 21. The support frame 67 includes a pair of spaced, vertical side plates 68 and a transverse horizontal channel member 71 (Fig. 2) which is secured to the side plates 68 by welding or other suitable means. The vertical side plates 68 extend above the channel member 71 and a pair of suitable bearings 73 for a cam drive shaft 75 are provided in these extensions. Preferably, a center bearing 74 (Fig. 2) is also provided for the drive shaft 75. As may be seen in the diagrammatic illustration of Fig. 4, the cam drive shaft 75 drives the means 14 for moving the lower jaw 15 up and down, the means 16 for moving the upper jaw 13 up and down, and the means 18 for actuating the knife 19, in a manner to be described hereinafter.

The horizontal channel member 71 also provides a support for a pair of upwardly extending vertical frames 77. Each of the upwardly extending frames 77 comprises a pair of spaced bars 79 (Fig. 7) and a spacer plate 81 fitted between the spacer bars. The spacer plate 81 is maintained in position by screws 83. The spacer plate 81 includes an opening or hole 85 through which the cam drive shaft 75 passes. A top spacer bar 87 connects the top portion of each of the upwardly extending spaced bars 79 and this top spacer bar 87 is attached to the vertical spaced bars 79 by screws 89 (Fig. 7).

The upwardly extending vertical frames 77 provide a support for various of the component members of the sealing and severing means 11. For guiding the tube 17 through the sealing and severing means 11 a pair of rollers 91 is provided between the vertical frames 77. These rollers 91 freely rotate on shafts 93. The shafts 93 have their axis perpendicular to the direction of travel of the tube 17 and are secured to suitable brackets 95 (Fig. 6), and each of the brackets is secured to the vertical frames 77 by a pair of screws 97. A slot 99 is provided in the bracket 95 to allow vertical adjustment of the bracket and the rollers which are mounted on the bracket. The vertical adjustment permits the rollers 91 to be positioned so that they afford a guide for the tube 17 as it is delivered between the jaws 13 and 15 and as it passes beyond such jaws.

The lower jaw 15 of the sealing and severing means 11 is constructed of several parts, as is seen in Figs. 5 and 6. It is preferred that the jaws 13 and 15 be heated since the preferred wrapping materials from which the tube 17 is made are usually heat sealable. In order to heat the lower jaw 15, the upper section 101 of the lower jaw has a pair of passages 103 therein and a pair of heating elements 105 are inserted within these passages. The heating elements are connected to a source of electrical power (not shown) by an insulated connector 103' which is mounted on the frame 77 by a bracket 105' (Fig. 2). A thermocouple 100 is inserted into the lower jaw to measure the temperature thereof.

The lower jaw 15 is adapted to be moved vertically; however, in order to prevent the lower jaw 15 from sliding horizontally from the frame 77, the lower section 107 of the lower jaw 15 is longer than the upper section 101 and each end of the lower section 107 extends through a slot 106 (Fig. 7) in a pair of lower guide plates 108 which slidably engage the outer sides of the vertical frame

members 77. The lower section 107 is maintained within the slots 106 by a cross plate 108' which is fastened by suitable means to the upper edge of the lower guide plates 108 and which includes recessed portions (not shown) along opposite sides to receive the inner edges of the bars 79. Screws 110 keep each pair of the lower guide plates 108 together and in slidable contact with the spaced bars 79 along which the guide plates slide. In order to keep the heat localized in the lower jaw 15, the upper end and lower sections, 101 and 107 are separated by a layer of heat insulating material 111 (Fig. 5) and are secured in position by a pair of screws 112 (Fig. 2). An elongated groove 113 is provided in the upper section 101, which groove is adapted to receive the knife 19.

To move the lower jaw 15 up to a position adjacent the upper jaw 13, so as to press the tube 17 between the lower jaw 15 and the upper jaw 13, a suitable lower jaw moving means 14 is provided. The means 14 includes a pair of brackets 115 (Figs. 2, 4 and 7) which are secured to the lower section 107 of the lower jaw by screws 117. A cam roller 119 is mounted on each of the brackets 115 and each of the cam rollers 119 engages a cam surface in one of a pair of generally circular plate structures 121. Each of the generally circular plate structures 121 has an irregular continuous groove 123 formed therein and this groove serves as a cam surface for the roller 119 mounted on the outer end of the bracket 115.

The circular plate structures 121 of the jaw actuating means 14 are each preferably formed in two complementary parts, to facilitate mounting and timing the cams, which are suitably clamped in position on shaft 75 by means including the screws 125. As the plate structures 121 rotate with the drive shaft, the rollers 119 follow the grooves 123 and the grooves are so designed that the lower jaw 15 is thereby moved up and down. The vertical movement of jaw 15 is, of course, guided by the bars 79 in the manner described above. The described co-action of the lower jaw 15, the cam rollers 119 and the cam surfaces in the plate structures 21 may be best noted in Fig. 4 wherein these parts are shown diagrammatically.

The upper jaw 13 of the sealing and severing mechanism 11 also is a generally elongated member and is constructed of several parts as seen in Figs. 5 and 6. It is preferred that the upper jaw 13 also be heated, and to provide for this a passage 128 in the upper jaw 13 extends for almost the entire length of an elongated main section 127 of the jaw, and a cartridge heater 130 is inserted in the passage 128 to heat the upper jaw. Each end of section 127 of the upper jaw 13 extends through a slot 116 in each of a pair of upper guide plates 118 and each end is secured within these slots 116 by a cross piece 118' on the lower edges of the guide plates. The cross piece 118' is suitably fastened to the upper guide plates 118, as by screws (not shown) or other suitable fastening means. The guide plates 118 serve a similar purpose as that previously described with respect to the guide plates 108 for the lower jaws and guide the upper jaw 13 which freely floats between the spaced bars 79 of the vertical frame 77 (Fig. 7). Four screws 120 keep each pair of the upper guide plates 118 together and in slidable contact with the spaced bars 79 along which the upper guide plates 118 slide.

The upper jaw 13 is also movable vertically so as to engage and release the tube 17. To provide for the moving of the upper jaw, each end of the main section 127 of the upper jaw 13 extends beyond the guide plates 118 and between a pair of substantially vertical guide rails 129 forming opposite sides of a vertical, cam-driven movable frame 109 (Figs. 2 and 3). The main section 127 of the upper jaw 13 is slidable up and down between these guide rails 129. The lower limit of travel of the upper jaw 13 is determined by lower cross bars 131 on each of the movable frames 109, and the upper limit of travel is determined by upper cross bars 133 on these frames. A pair of compression springs 132 disposed between the upper edge of jaw section 127 and the cross bars 133 urge the jaw section 127 downward and into contact with the lower cross bars 131. The compression springs 132 are provided to allow vertically yielding movement of the upper jaw 13, when the upper jaw 13 and lower jaw 15 are pressing the tube 17 therebetween. The compression springs 132 are maintained in place by guide screws 134 (Figs. 2 and 3) which are secured to the upper cross bar 133 and project downward between the guide bars 129.

The main section 127 of the upper jaw 13 has a longitudinal slot 135 (Fig. 6) in the lower part thereof in which a knife holder 138 and the knife blade 19 are slidably fitted. The slot 135 and knife 19 are proportioned so that the knife 19 may be entirely withdrawn into the slot 135. A knife guide 104 is fitted flush with the bottom of the upper jaw 13 and includes a slot therein which is aligned with the slot 113 in the lower jaw 15. In order to crimp the tube 17 and provide a better seal, the upper jaw 13 also has a pair of crimpers 137 (Fig. 6) on the lower edges thereof, which crimpers 137 are held in place by crimper holders 141 fastened to the jaw section 127 by screws 143.

Each end of the knife holder 138 is fastened by a recessed screw 138' (Fig. 5) to one of a pair of saddle-like members 145 (Fig. 2) which fit about the main section 127 of the upper jaw and are slidable up and down with respect to the main section 127 (Fig. 5). The saddle-like member 145 is spring biased by a spring 147 so as to move the saddle 145 to the topmost position with respect to the main section 127, thereby urging the knife holder 138 and knife 19 to retreat into the slot 135 so that the knife 19 does not protrude from the upper jaw. A pair of rollers 149 on lever arms 151, which are actuated as will hereinafter be described, periodically push down on the saddles 145 and move the knife 19 out of the slot 135 so that it protrudes from the upper jaw 13. With the knife 19 in the protruding position and the jaws 13 and 15 adjacent to each other, the knife 19 is able to sever the tube 17. The knife blade 19 when severing the tube 17, enters the slot 113 in the lower jaw 15.

The upper jaw 13 is moved up and down with the movable frame 109. Each of the vertical cam driven movable frames 109 has at the lower end thereof a cam follower or roller 153 (Fig. 2) which fits into an irregular continous cam groove 155 in a generally circular plate 157 fixed on the cam drive shaft 75 in the manner described with respect to cams 121, as by a clamp means including the screw 159. The cam plate 157 is spaced from the support frame 77 by a spacer 161 (Figs. 2 and 7). As may be seen from the diagrammatic illustration in Fig. 4, as the cam drive shaft 75 and the circular plates 157 rotate, the roller 153 follows the cam groove 155, and the irregular shape of the groove is designed such that it causes the vertical frames 109 to move up and down, which in turn moves the upper jaw 13 up and down.

The actuation of the knife 19 so that it cuts the tube 17 is controlled by a knife actuating means 18. As hereinbefore mentioned, it is the pressure of the roller 149 on the saddle member 145 which moves the saddle member and the knife 19 downward so that the knife protrudes from the slot 135 in the upper jaw. Each roller 149 is mounted at an end of a lever arm 151 (Figs. 2 and 7) and each lever arm 151 is secured to a shaft 163 which is rotatably mounted in brackets 165 carried by the support frame 67. One end of the shaft 163 has secured thereto an arm 168 which is pivotally connected at its free end to an actuating mechanism 169 comprising a yoke 170, a bifurcated guide member 171 slidably engaging the shaft 75, and a connecting rod 172 joining yoke 170 and the guide 171 in adjustably spaced relation to each other. The knife actuating means 169 is movable back and forth along its longitudinal axis, and this movement is effected by a roller 173, car-

ried by the guide 171, which engages the cam surface of a cam plate 175. The roller 173 is maintained in contact with the cam plate 175 by a tension spring 179 (Fig. 2) which is connected between a lower portion of the vertical frame 77 and the yoke 170 supporting the upper end of the connecting rod 169. The cam plate 175 is secured on cam drive shaft 75 by a set screw 177.

Therefore, as may be seen from the diagrammatic illustration in Fig. 4, as the cam drive shaft 75 and cam plate 175 rotate, the roller 173 follows the cam surface of the cam plate 175 to thereby provide axial movement of the actuating rod 169, which causes shaft 163 to be rotated through a predetermined arc. This rotation of the shaft 163 moves the levers 151 (Fig. 7) and the rollers 149 carried thereby to effect vertical movement of the saddles 145 and the knife blades 19 carried thereby. As the saddles 145 are moved downwardly, knife 19 protrudes from the slot 135 (Fig. 6) and the knife will extend into the longitudinal slot 113 in the lower jaw 15 when the jaws 13 and 15 are in the position as seen in Figs. 5 and 6.

The rotation of the cam drive shaft 75 is accomplished by a sprocket 181 which is fixed in position relative to the drive shaft 75 by a set screw 183 (Fig. 2). The sprocket is drivingly connected to a suitable source of power (not shown) by a continuous chain 185.

As hereinbefore mentioned, the support frame 67 which carries the sealing and severing mechanism 11, is hingedly mounted on a cross shaft 69 which is parallel to and spaced below the drive shaft 75. The support frame 67 is preferably rotatably mounted on the cross shaft 69, but instead the frame 67 may include a yoke or the like at its lower end which receives and rests on the shaft 69, thereby using the shaft as a pivot. The frame 67 is rocked about the axis of the shaft 69 by a suitable means 12, in order to enable the sealing and severing means 11 supported by frame 67 to engage the collapsed tube 17 as it leaves the driven roller 51 (Fig. 1) and to move forwardly, in the same direction as the tube, to the conveyor 189.

More particularly, the frame rocking means 12 includes a rocker arm 191 (Fig. 1) in the form of a bell crank having one end pivotally connected to an end portion of the frame 67, adjacent the upper part of member 77. The other end of arm 191 includes an internally threaded portion which receives a connecting rod 193. The other end of the connecting rod 193 is secured to a cross-head 195 having a longitudinal slot slidably engaging a cross shaft 197 which is suitably supported, as by journal bearings 199 on the frame 21. Reciprocal motion is imparted to the cross-head 195 by means of a cam plate 201 which includes an irregular continuous groove 203 on one face thereof in position for engagement by a roller 205 on the free end of the cross-head 195. A sprocket 206, keyed on the cross-shaft 197, affords a drive means for the shaft 197 in a manner to be described. Thus, it is seen that, as the shaft 197 is rotated, the cam groove 203 and roller 205 co-act to impart reciprocal motion to the cross-head 195. Further, this reciprocal motion is imparted through the rocker arm 191 to the frame 67 to rock the latter through a predetermined arc about the axis of the shaft 69.

The conveyor means 189 is of conventional design and comprises an endless conveyor belt 211 supported upon a pulley 213. The upper run of the belt 211 is essentially coplanar with the platform 23 and moves in the same direction as the tube 17. Conveyor 189 is adapted to receive and carry forward the packages P to a point where they may be removed from the conveyor by an operator or other means. The belt 211 is driven by a suitable means (not shown) including an endless driving chain 215.

All the operating parts of the machine are driven by a suitable source of power (not shown) which drives the main drive shaft 217 (Fig. 1). The source of power preferably includes a motor which is connected to a speed reducer. The main drive shaft 217 is suspended beneath the cross supports of the frame 21 and runs longitudinally of the machine. The drive shaft carries a helical gear 219 and a bevel gear 221. The bevel gear 221 meshes with bevel gear 223 which is keyed to a cross shaft 225 to provide a drive means for the latter. The cross shaft 225 includes a relatively fixed sprocket 224 engaging the chain 215 to thereby drive the conveyor 189. Shaft 225 also carries a sprocket 227 which drives the continuous chain 59 connected to the sprocket 57 which drives the driven roller 51.

The helical gear 219 on the main drive shaft 217 is connected with a suitably rotatably mounted worm shaft 230 having suitable driving connection with an overlying cross shaft 233, as by meshing bevel gears (not shown). The shaft 233 is drivingly connected by a chain and sprocket connection including a drive chain 235 to the cross shaft 69 at the lower end of the frame 67 supporting the sealing and severing means. The driven cross shaft 69 in turn is drivingly connected through chain 185 to the drive shaft 75 which operates the various mechanisms of the sealing and severing means 11. The cross shaft 233 is also connected by drive chain 209 to the sprocket 206 fixed on the cross shaft 197 to afford rotation of the cam plate 201.

The operation and timing of the sealing and severing mechanism 11 may be more easily understood by referring to Figs. 8 to 11. Although a preferred timing of the mechanism is shown, other timings which accomplish substantially the same results may be used. Figs. 8 to 11 are diagrammatic illustrations of some of the operating parts of the mechanism shown in Fig. 1, in various operating positions. Fig. 8 illustrates the beginning of the sealing and severing operation, with the support frame 67 disposed in position adjacent the driven roll 51 at the forward end of platform 23 and with the upper jaw 13 and the lower jaw 15 of the sealing means apart. The jaws are positioned above and below the tube 17 and between the individual units U in the tube. As illustrated in Fig. 9, the sealing and severing unit frame 67 is rocked forwardly as the upper jaw 13 is moved downwardly and the lower jaw 15 is moved upwardly, thereby pressing the tube 17 between the jaws. The support frame 67, with the jaws closed and the tube 17 therebetween, continues to move to the left at essentially the same rate of speed as that of the tube 17, to a position adjacent the rearward end of the conveyor 189, as seen in Fig. 10. It is seen, therefore, that the jaws 13 and 15 engage the tube 17 over a substantial period and length of travel of the tube, while effecting a sealing of a transverse section of the tube through heat, pressure, or a combination thereof.

At the forward position of the frame 67 (Fig. 10), the jaws have completed sealing the tube 17 at a position between the units U which are within the tube 17. Further, as the frame 67 approaches its forwardmost position (to the left) the knife 19 is actuated to sever the tube at approximately midway of the sealed portion of the tube. The resulting sealed package P is then delivered to the conveyor 189. The package P then proceeds along conveyor means 189, and the frame 67 is rocked rearwardly toward the roll 51 (Fig. 11), while the jaws of the sealing and severing mechanism 11 are being separated and the knife blade 19 retracted, to thereby condition the sealing and severing unit to engage the succeeding section of the tube 17 between the next two units U to be packaged.

The machine should be timed, of course, so that the jaws 13 and 15 clamp the tube 17 between units U which are in spaced-apart relationship in the tube. The sealing and severing means 11 therefore should be rocked back and forth by the actuating means 12 in timed relationship to the linear motion of the tube 17. Moreover, timing of the operation of the knife 19, which severs the tube 17, should be such that the knife 19 is actuated

while the jaws **13** and **15** are adjacent to each other and, preferably, toward the end of the sealing operation.

Although shown and described with respect to particular apparatus and material, it will be apparent to those skilled in the art that various modifications might be made without departing from the principles of the disclosed invention.

We claim:

In a packaging machine, means for independently continuously moving along a predetermined path an elongated tube of flexible, sealable wrapping material having enclosed therein a series of spaced apart units being packaged, a frame located adjacent said path in advance of said tube moving means and being movable forwardly from a given point along said path in tube-advancing direction at substantially the same rate of travel as that of the tube, and then being movable rearwardly to said given point, a pair of opposed jaws carried by said frame in straddling relation to the continuously advancing tube, said jaws each incorporating a heating element and being movable between an open position affording passage of the continuously advancing tube therebetween during rearward frame movement and a closed position during frame advancing movement wherein the opposed walls of the continuously advancing tube are collapsed between adjacent units and sealed together transversely of the tube incident to the application of heat from said jaws, means on said frame for guiding the continuously advancing tube for movement between said open jaws during rearward frame movement, a knife blade carried by one of said jaws, said blade being movable just prior to opening movement of said jaws from a retracted position within said one jaw to a position wherein said knife blade is extended in the direction of the other jaw to transversely sever the tube in the sealed area, and means for causing said movement of said frame, movement of said jaws and said knife blade in the described sequence.

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