Dec. 24, 1963 P. A. VAN DE BILT 3,115,085

PACKAGING MACHINE

Filed Nov. 10, 1961 10 Sheets-Sheet 1

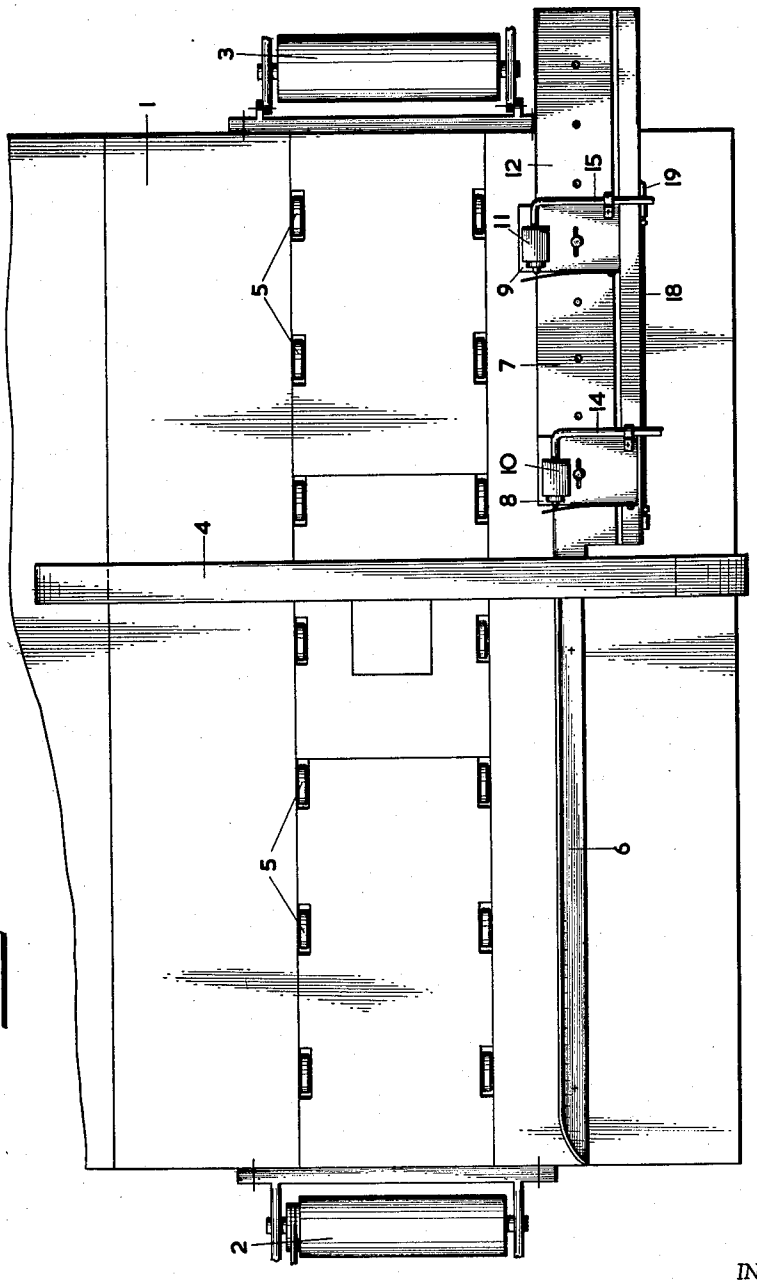


FIG. 1

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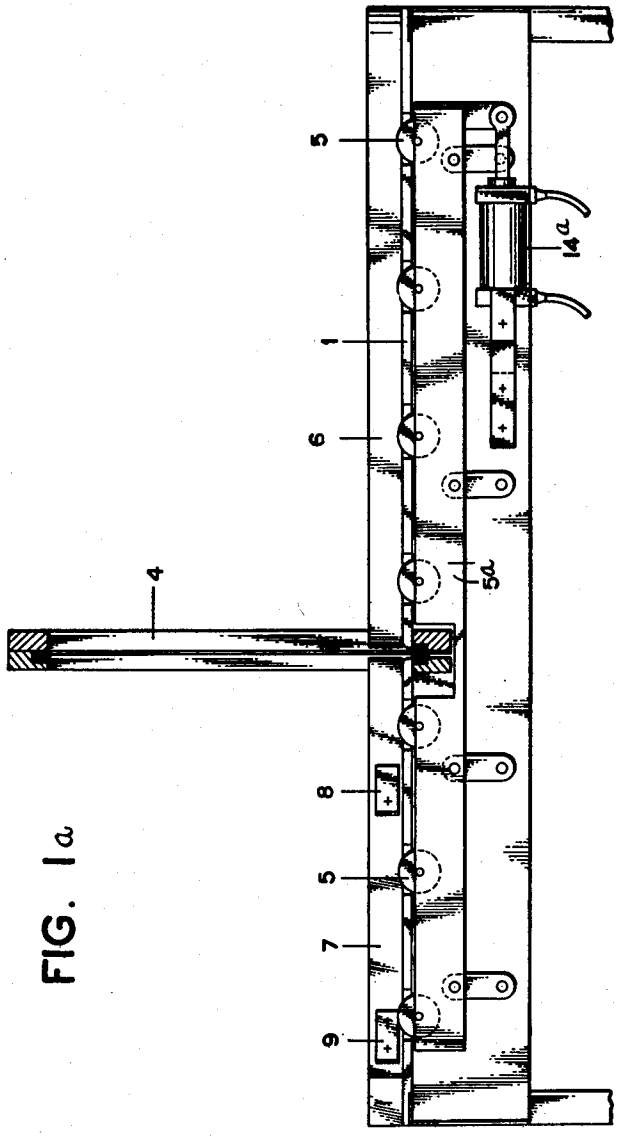


FIG. 1a

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FIG. 2

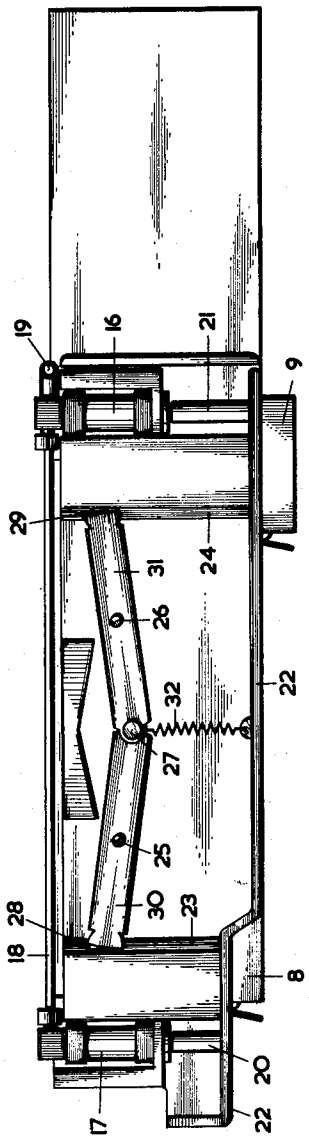
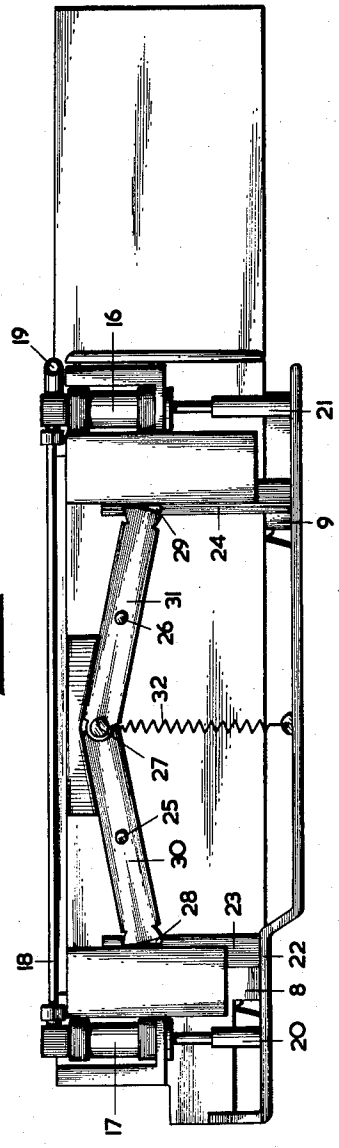


FIG. 3



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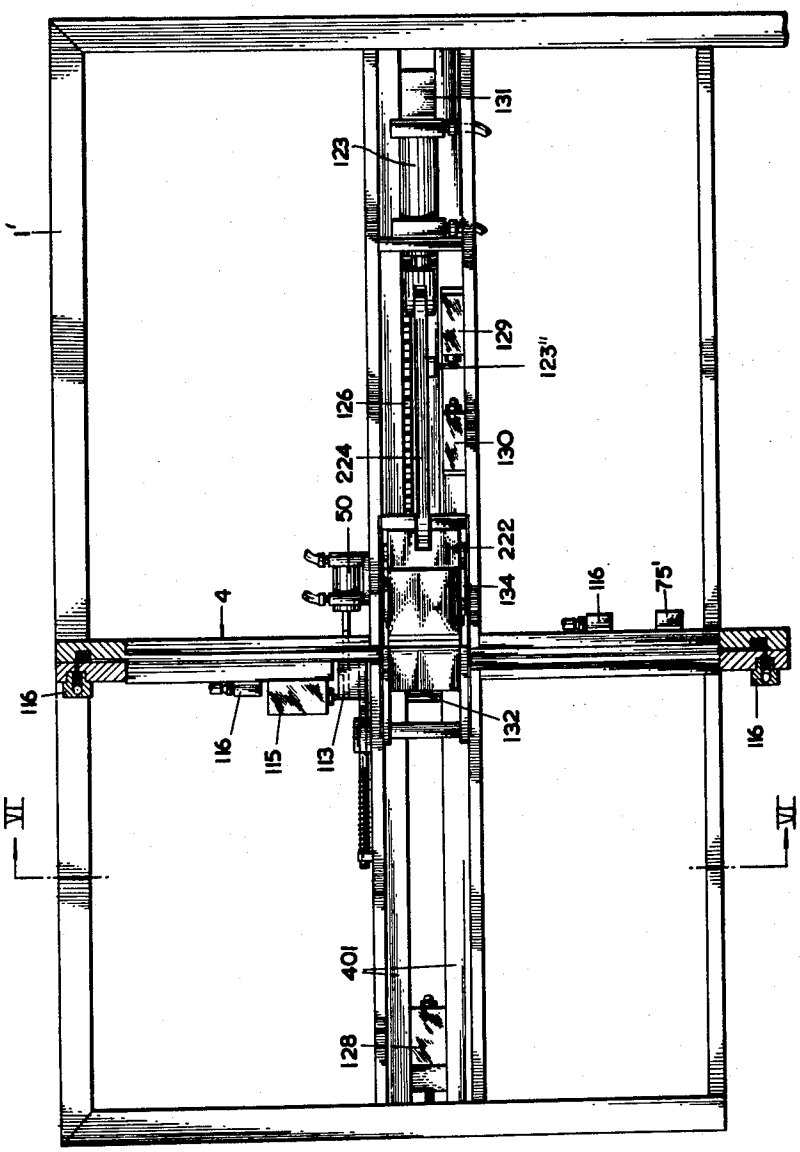
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FIG. 4



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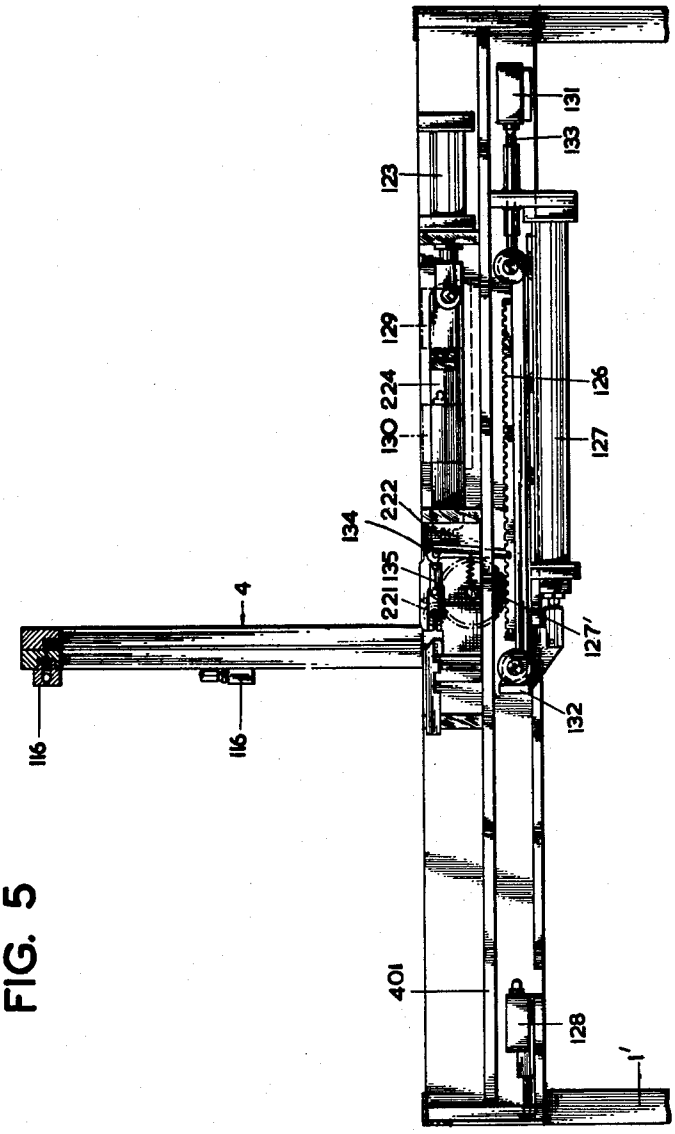


FIG. 5

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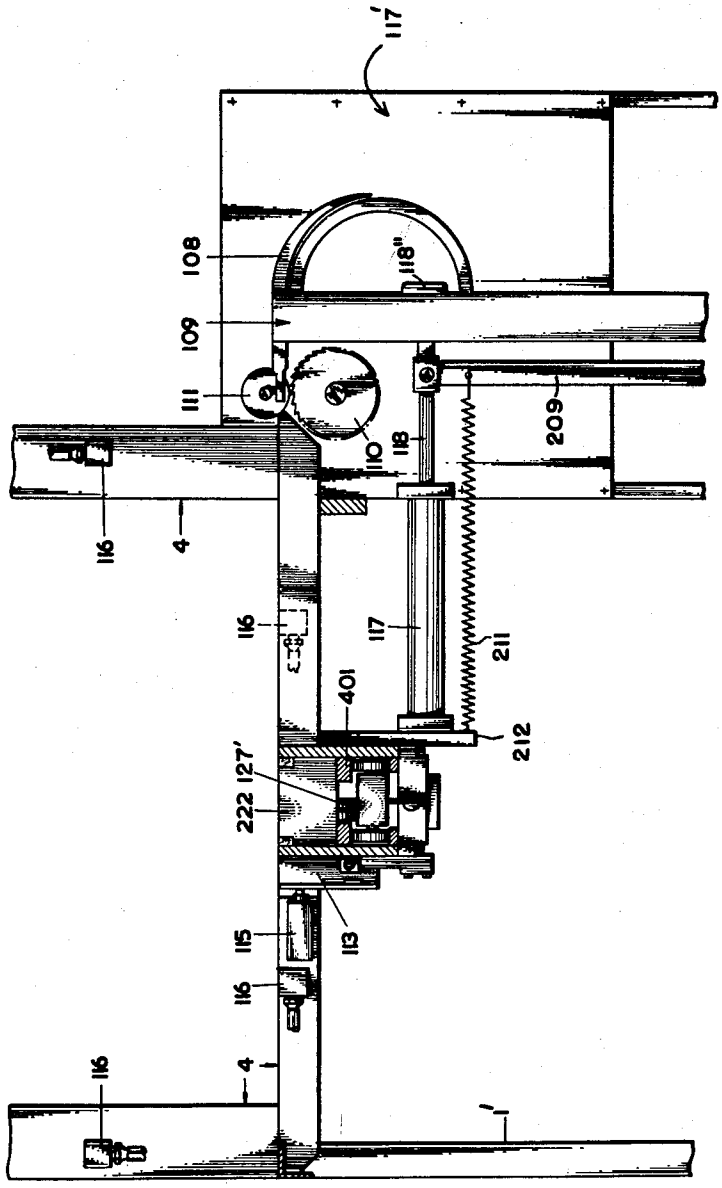


FIG. 6

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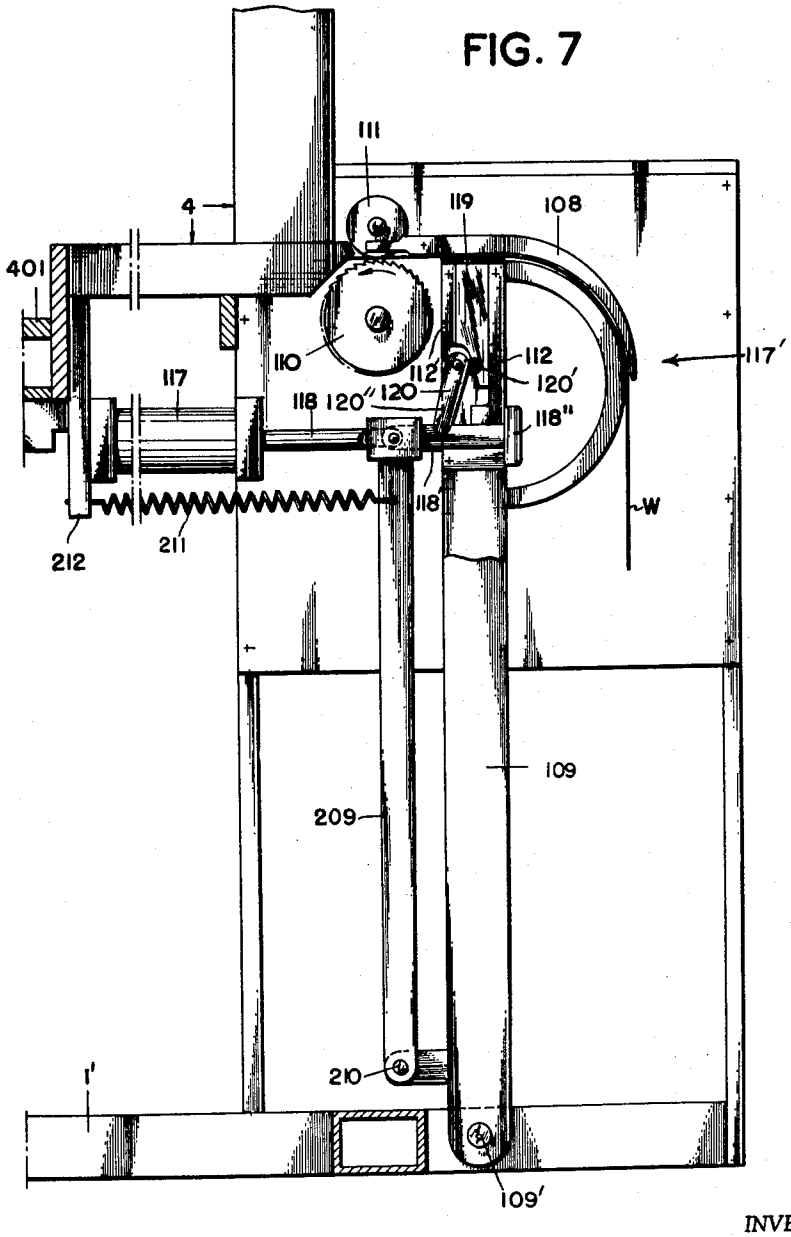
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FIG. 7



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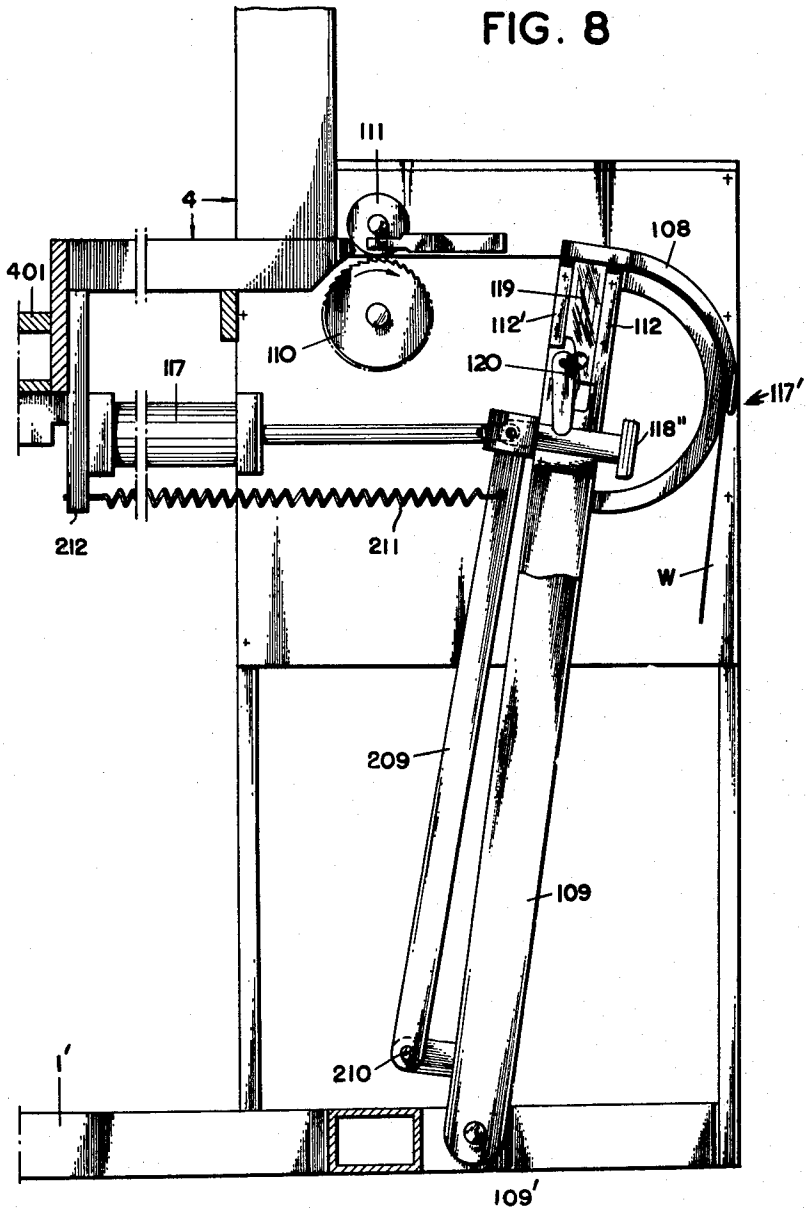
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FIG. 8



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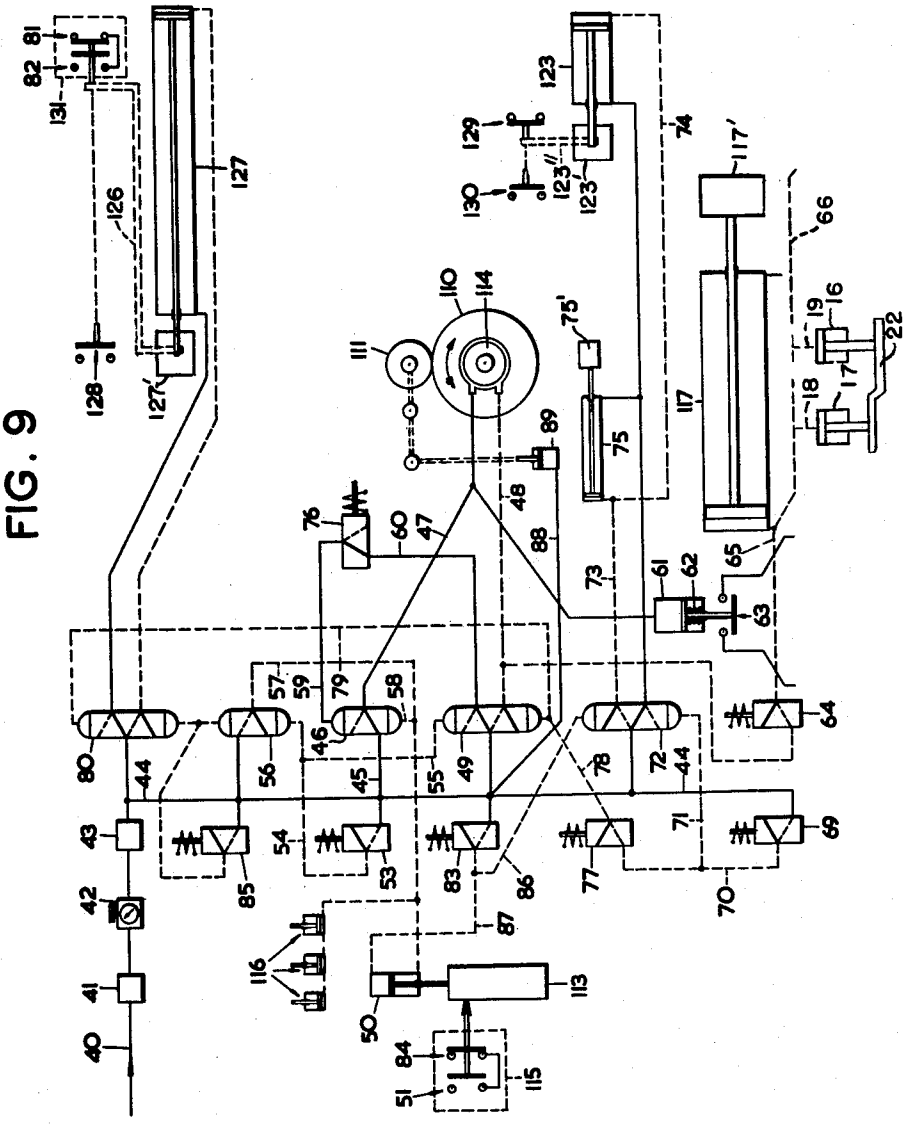
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PACKAGING MACHINE

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FIG. 9



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Dec. 24, 1963 P. A. VAN DE BILT 3,115,085

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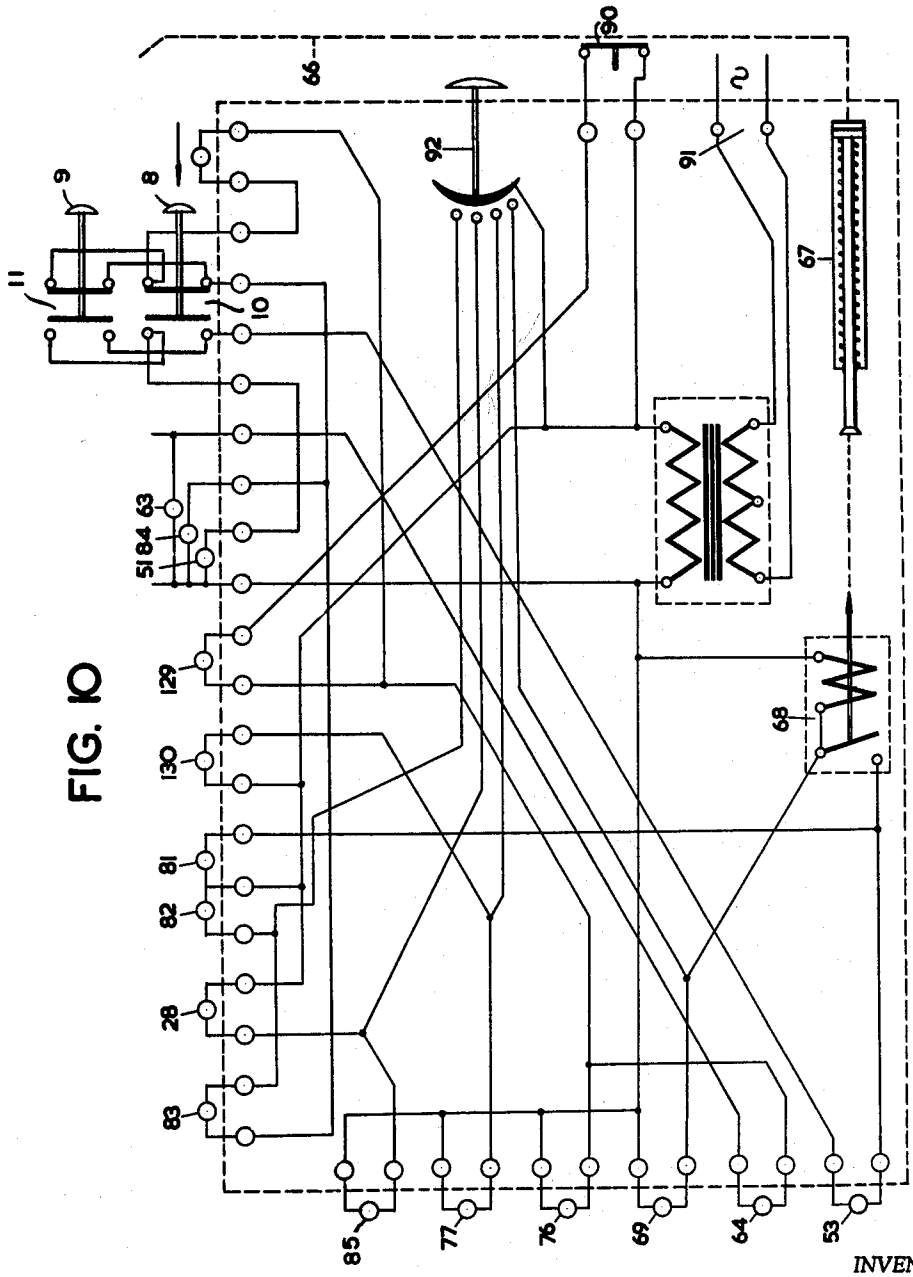


FIG. 10

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United States Patent Office 3,115,085 Patented Dec. 24, 1963

3,115,085
PACKAGING MACHINE

Pieter Arnoldus van de Bilt, Bos en Duin, Netherlands, assignor to N.V. Metaverpa, Maartensdijk, Netherlands, a corporation of Dutch law

Filed Nov. 10, 1961, Ser. No. 151,501
Claims priority, application Netherlands Nov. 15, 1960
4 Claims. (Cl. 100—4)

This application is a continuation-in-part of application Serial Numbers 69,491 (filed Nov. 15, 1960) and 111,073 (filed May 18, 1961).

The invention relates to a packaging machine by means of which wire or tape is applied around the package due to the fact that a wire passed around the package in a guide is applied around the package by retraction and tightening and the ends are subsequently joined, said machine comprising a worktable with a guide for the package and a stop mechanism with one or more stops, which project slightly inwards relative to the guide, said stop or stops performing a switching operation when a package abuts against it (them), in consequence of which the machine carries out a packaging cycle. A packaging machine of this kind has been described in my copending application Ser. No. 111,073 filed May 18, 1961, and in my Patents Nos. 3,060,839; 3,060,840 and 3,060,841. Further a package controlled mechanism has been proposed in my patent application No. 69,491, filed November 15, 1960. In this older proposal the worktable is fitted with conveyer rollers which extend slightly above the plane of the worktable and are placed somewhat obliquely relative to the feed direction, so that these rollers hold the package against the guide. As soon as the package encounters a stop, the machine is put into operation, and as the wire or tape is tightened around the package the latter is pulled away from the stop by the tightening operation, as a result of which this stop is disengaged again, while the machine completes its cycle, after which the further feeding of the package towards the next stop, if any, can take place. This older proposal sometimes involves certain drawbacks. Heavy cases do not always become sufficiently disengaged from the stop, with the result that the further feeding is hampered or the case during its further movement displaces the stop mechanism with its side, thus causing the machine to be switched on at an undesirable moment. When the packages are long, they are not always disengaged from a stop that is at a greater distance from the wire.

The object of the invention is to obviate these drawbacks and this object is attained according to the invention by the feature that near the stop mechanism the guide comprises a ledge adapted to be displaced parallel to itself, by means of which the package can be shifted so as to be disengaged from the operative stop. It is thus disengaged from the stop by force. The stops themselves are preferably provided with push-button contacts.

After the tightening of the wire or tape the ends of the latter are joined and the cutting operation takes place. The package thus has to be disengaged from the stop in any case after these treatments (but it may also at an earlier moment). When this has not yet taken place, it has to be brought about by the movable ledge, and the mechanism operating this ledge in that case can be simply included in the operating scheme of the machine in such a way that at the end of each cycle the ledge is displaced when the operative stop—and consequently the contact—is not yet disengaged.

It is, however, advantageous to have the ledge take part in the tightening operation.

In a packaging machine with pneumatic feed, retraction, and tightening of the wire or tape, as described in

the older proposal according to patent application Serial No. 111,073, according to the invention the mechanism operating the ledge may now come into operation as a circuit is closed by a contact responding to a pressure drop in the discharge pipe of the pneumatic retraction mechanism. This pressure drop invariably has the same value, irrespective of the pressure in the supply line, and the drop occurs as soon as the pneumatic mechanism bringing about the retraction is brought to rest at the end of said movement. The ledge thus comes into operation sooner, i.e. during the tightening of the wire the ledge forces the package in the direction of the tightening movement. The tightening is more uniform in this way, for the difference in tension between the two ends of the wire to be joined, caused by the sliding resistance of the package, now becomes smaller, which has a favourable influence on the twist. The mechanism operating the ledge preferably consists of one or more pneumatic cylinders, to which compressed air is supplied via a valve controlled by the contact responding to the pressure drop.

It is desirable for the ledge not to exert pressure on the package during the twisting and cutting operations. This can be ensured according to the invention by means of a contact in the circuit which controls the operating mechanism of the ledge, which contact is broken while the twisting and cutting mechanism is operating. This can be done, for instance, with the contact breaker 29 described in patent application Serial No. 111,073: This contact (and switch respectively) is thus connected in series with the contact controlled by the pressure drop in the discharge pipe of the retraction mechanism.

The ledge is thus able to move, and consequently so is the package, while the twisting and cutting mechanism is still at rest, and moves again as soon as this mechanism has returned to its initial position, which is useful if the package should not yet have become disengaged. In that case the ledge will no longer meet with resistance on the part of the wire and will thus be able to force the package further away.

At the end of each cycle the vacuum in the discharge pipe disappears because the latter becomes the supply pipe, in consequence of which the vacuum contact is broken and the ledge returns to its former position. The ledge itself is stepped, the number of steps being one less than the number of stops or contacts.

The invention will now be explained in greater detail with reference to the drawings.

FIGURE 1 is a top view of the worktable of the machine according to the invention.

FIGURE 1*a* is a vertical cross section of the worktable of the machine of FIGURE 1 with certain parts eliminated.

FIGURES 2 and 3 are bottom views of the stop mechanism with movable ledge to be placed on the worktable, in different positions of said ledge.

FIGURE 4 is a plan of the greater part of a packaging machine, the working surface carrying the packages being omitted and the vertical parts of the guide for the wire being shown in cross section.

FIGURE 5 is a side elevation, certain lateral lining elements being omitted in order to show clearly the interior of the machine.

FIGURE 6 is a cross section along the line VI—VI in FIGURE 4, in which the feeding and tightening mechanism, which due to lack of space is not shown in FIGURE 4, is also indicated.

FIGURES 7 and 8 are partially cut-away front elevations of the feeding and tightening mechanism of the machine, the tightening mechanism being shown in two different positions.

FIGURES 9 and 10 are diagrams of the pneumatic and electric circuits respectively of the invention.

The machine shown in FIGURE 1 has a worktable **1** with a feeding conveyer **2** and a discharge conveyer **3**. At **4** is mounted the wire-guiding frame, and accordingly it is in this place that the wire is applied around the package. In the plane of the worktable conveyer rollers **5** are present, over which the package is adapted to move and which are mounted in a frame **5***a* (FIG. 1*a*) which is retracted below the plane of the worktable with the aid of pneumatic cylinder **14***a* as a wire is applied as described in application Ser. No. 69,491. At **6** a guide is present and at **7** the stop mechanism, situated in line with the guide, with the stops **8** and **9**, where contacts **10** and **11** respectively are present. These stops with their contacts are movably mounted on a box-shaped body **12**; the contacts **10** and **11** are connected to the machine via the cables **14** and **15** with plugs not shown in the drawing.

FIGURES 2 and 3 show the lower side of the box **12**, so that the stops **8** and **9** are only partly visible. On the lower side of the box two pneumatic cylinders **16** and **17** are present, to which compressed air is supplied via the pipes **18** and **19**. These cylinders are adapted to press with the rods **20** and **21** against a ledge **22**, which has been placed in the box with inwardly directed arms **23** and **24**, said arms comprising recesses **28** and **29**, which are engaged by arms **30**, **31**, which are pivotally fastened to the box at **25**, **26** and are pivotally connected with each other at **27**, in which latter point is fitted a spring **32**, the other end of which is connected with the ledge **22**. The mechanism last described provides for accurate parallel guidance of the ledge **22**. As appears from FIGURES 2 and 3, the ledge is stepped. The package which abuts against the stop **8** and consequently operates the contact **10** puts the machine into operation for the application of a wire around the package. As the ledge is subsequently moved to the position shown in FIGURE 3 the package is disengaged from the stop **8**, and after the ledge has returned to its position of rest, the package is able to move past it until it abuts against the stop **9**. Here the same cycle is repeated.

The invention will now be explained more fully with reference to FIGURES 4–8 which show the essential parts of the machine when taken in conjunction with the diagrams of FIGURES 9 and 10 which show the pneumatic and the electric circuits. FIGURES 4–10 inclusive are taken from applicant's copending application Serial No. 111,073, filed May 18, 1961.

The diagram shown in FIGURE 9 comprises the pneumatic circuit with the electromagnetically operated valves and the pneumatically operated switch-over valves, and FIGURE 10 illustrates the electric circuit, so that electromagnetic valves and switches appearing in FIGURE 10 as well as FIGURE 9 are denoted by identical numbers. The main supply of compressed air takes place via the pipe **40**, filter **41**, reducing device **42**, and oil-spray lubricating device **43**. In the FIGURE 9 diagram, the unbroken lines denote those pipes in which the air is compressed and the broken lines those in which no pressure is present in the position of the diagram at the moment. The diagram has been drawn for the position in which the motor **114** feeds the wire W to wire frame **4** with the aid of the rollers **110** and **111** (also see FIGS. 6–8). The motor **114**, which is similar to that described in U.S. Patent No. 1,781,133, therefore receives air via the pipe **44**, the branch **45**, the valve **46**, and the pipe **47**. The discharge of air from the motor takes place via the pipe **48** and exhaust opening of the switch-over valve **49**.

When the wire W has been passed all around the frame **4**, the end of it is gripped by the clamp **113** (see also FIGS. 4 and 6), the operating cylinder **50** of which clamp is shown in the neutral position. This clamp is adapted to pivot in the direction of movement of the wire

W, so that the wire gripped by the clamp will tip over said clamp as shown and described in applicant's U.S. Patent No. 3,060,839, in consequence of which the contact **51** in the switch box **115** is closed. The machine is now in its initial position for performing the next complete cycle, and when the starting switch **10** is now closed, which is effected by a package being fed to the machine and engaging stop **8**, the supply of current to the electromagnetic valve **53** is brought about, in consequence of which this valves switches over and the pipe **54** receives compressed air. By this means the valve **49** is switched over via **55**, but so is the valve **56**, in consequence of which the pipe **57** receives compressed air from the main pipe **44**, which pipe leads to the cylinder **50** of the clamp **113**, in consequence of which said clamp is closed and holds the end of the wire, while at the same time from the pipe **57** a branch may lead to a number of cylinders **116** for opening the guide for the wire in the frame **4**.

The switch over of the valve **49** has resulted in that the exhaust pipe **48** has now received compressed air from the main pipe **44**, but the motor **114** is not yet at once able to reverse its direction of rotation, since compressed air is still present in the pipe **47**. The pressure produced in the pipe **57** by the switch over of the valve **56** now acts via the pipe **58** on the valve **46**, which, however, does not switch over until the pipes **59** and **60** have been sufficiently exhausted via valve **49**, when the pipe **47** begins to exhaust, so that the pressure in the pipe **48** begins to predominate, and the motor **114** reverses its direction of rotation, which reversal is used to draw the wire tighter about the package. At the end of this movement the pressure in the outlet pipe **47** will fall, and this fall of the pressure is measured by the plunger **61**, which is loaded by the spring **62** and which closes the contact **63** when the fall of the pressure is sufficient. This closing of the contact **63** causes the excitation of the electromagnetic valve **64**, in consequence of which the latter switches over and from the main pipe **44** compressed air is supplied to the pipe **65**, which leads to the cylinder **117** of the tightening mechanism **117'**.

Tightening mechanism **117'** as shown in FIGS. 6–8 includes a main lever **109** pivotally connected at **109'** to frame **1'**. Guide **108** is mounted on main lever **109** and, as can be seen, the wire W is passed through guide **108** to feeding rollers **110** and **111**. A slot is provided in main lever **109** in which clamp **119** is movably mounted between guide members **112**, **112'**. A double-armed lever **120** is pivotally mounted in the slot and includes one arm **120'** engaging a recess in clamp **119** while the other arm **120''** engages a recess in an extension **118'**. Guide member **112** and the inner end of the slot form a channel in which extension **118'** is reciprocably movable and an abutment against which arm **120''** abuts when extension **118'** is moved to the right in FIG. 7. Rod **118** and extension **118'** are pivotally connected to a secondary lever **209** which is pivotally connected to main lever **109** at **210**. A spring **211** is connected between secondary lever **210** and plate **212** on which cylinder **117** is mounted. Spring **211** maintains tightening mechanism **117'** in a normally inoperative position. Extension **118'** has a head element **118''** which abuts against lever **109** as shown in FIGS. 6 and 7 to maintain levers **109** and **209** in connection with each other when the tightening mechanism is in the inoperative position.

The wire is now tightened firmly about the package, while the pressure in the cylinder **117** rises, and this rise of the pressure is measured via the pipe **66** by the measuring device **67**, which is equipped with a plunger sliding against spring tension. Pipes **18** and **19** are branched off from pipe **66** to cylinders **17** and **16** of ledge **22** to operate same to move the package in the direction of tightening movement. When a given pressure has been reached, this measuring device closes the switch **68**, which is provided with a magnet coil which has been incorporated in

such a way in the electric circuit that through the mechanical closing of the switch **68** the latter is held in its closed position. The closing of the switch **68** results in the excitation of the electromagnetic valve **69**, in consequence of which compressed air is supplied from the main pipe **44** via the pipes **70** and **71** to the switch-over valve **72**. Thus the pipes **73** and **74** receive compressed air, with the result that the cylinder **75** for controlling the clamp **75'** which is located between feeding rollers **110**, **111** and the twisting mechanism **123'** (see FIG. 4) and which is to hold the tightened end of the wire is brought into operation, while further the cylinder **123** for moving the twisting mechanism **123'** is operated.

Twisting mechanism **123'** as shown in FIGS. 4 and 5 is formed by a twisting pinion **221**, which is located in a block **222** adapted to move on the guiding tracks **401**. Block **222** can be reciprocably moved by cylinder **123** which is coupled to block **222** by rod **224**. By a movement to the left of block **222** in FIGURE 5, the juxtaposed ends of the wire are fed to the twisting pinion **221** which is rotated by gear wheel **127'**. A toothed rack **126** is driven by pneumatic cylinder **127** which engages gear wheel **127'** to rotate same. Toothed rack **126** is equipped with an abutting surface **132** which operates switch **128** and an extension **133** which operates switch box **131**, while rod **224** has a cross arm **123''** which cooperates with switches **129** and **130**.

Owing to the displacement of the block **222** by the cylinder **123** and rod **224**, the contact **129** is broken and the contact **130** closed by arm **123''**. The breaking of the contact **129** involves at the same time the neutralization of the excitation of the electromagnetic valve **76** and of the electromagnetic valve **64**. The adjustment of the valve **76** breaks the connection between the switch-over valves **46** and **49**, which at this moment is still of no account. By the neutralization of the excitation of the valve **64**, the pipes **65**, **66** and the cylinder **117** can be exhausted, in consequence of which the tightening mechanism **117'** and ledge **22** return to their initial positions under the influence of springs **211** and **32** respectively.

Owing to the closing of the contact **130**, the electromagnetic valve **77** is excited, in consequence of which via the pipe **78** compressed air is supplied to the valve **49**, which switches over owing to this, while at the same time via the pipe **79** compressed air is supplied to the switchover valve **80**, owing to which the latter switches over and compressed air can now be supplied from the main pipe to the cylinder **127**, which serves to operate the twisting mechanism **123'** through gear **127'** by displacing the toothed rack **126**. This displacement of the toothed rack **126** results in the breaking of the contact **81** and the closing of the contact **82** in the switch box **131** by the disengagement of extension **133** therewith, and at the end of its movement in the closing of the contact **128** by abutting surface **132**. The breaking of the contact **81** results in the neutralization of the excitation of the switch **68**, in consequence of which the latter opens again, and this in turn results in reversal of the electromagnetic valve **69**, by which means the pipes leading to the valves **49** and **80** are exhausted. At first the closing of the contact **82** has no consequence at all. The closing of the contact **82** merely assures that a part of the circuit of the electromagnetic valve **83** is closed, which valve, however, cannot yet be excited, because the contact **84** in the switch box **115**, which is controlled by the clamp **113**, is still open.

At the end of the movement of the toothed rack **126**, the contact **128** is closed, and this energizes the electromagnetic valve **85**, in consequence of which the valve **80** is reversed by supply of compressed air from the main pipe and the drive of the toothed rack is reversed. During the return movement of the toothed rack **126**, the cutting mechanism **134**, **135** for the wires is operated, owing to which the clamp **113** is released and thus closes the contact **84**. This inturn results in the closing of the circuit of the electromagnetic valve **83**, owing to which the latter switches over and compressed air is supplied from the main pipe **44** to the pipes **86** and **87**. The pipe **87** leads to the pneumatic cylinder **50** for operating the clamp **113**, in consequence of which the latter opens and is forced away until the cut-off end of the wire can drop out. The pressure in the pipe **86** results in switch over of the valve **72**, owing to which the twisting mechanism returns to its initial position and the cylinder **75** also releases the clamp **75'** holding the wire. When the toothed rack and the twisting mechanism have returned to their initial position, the contacts **81** and **129** are closed again and the contact **82** is broken, while the valve **76** is re-excited, so that via the previously reversed valve **49** compressed air is supplied to the valve **46**, which reverses, so that via the main pipe compressed air is supplied again to the pipe **47**, which actuates the motor **114** for feeding wire again. As soon as the end of the latter reaches the clamp **113**, the contact **51** is closed again and the next cycle has become dependent on the operation of the starting switch **11** to repeat the same cycle.

The diagram finally includes the pipe **88**, by means of which compressed air is constantly supplied to the cylinder **89**, with which the pressure roller **111** is kept under pressure. Further, a switch **90** is present, which scans the feed of the wire and breaks the contact as soon as the wire has run out, so that the valve **76** after the return of the twisting mechanism cannot be excited, which prevents the air motor feeding an insufficient remnant of the wire supply into the machine. The current supply is controlled by the connection to the supply mains at **91**, while at **92** is shown a reversing switch, by means of which the machine can be returned to its initial position when in the middle of a cycle something has gone wrong and the machine has come to a standstill.

It is further observed that the clamp **113** is returned to the initial position by the opening of the contact **82** at the end of the path traversed by the toothed rack during its return movement. The electromagnetic valve **83** then returns to its initial position, in consequence of which the cylinder **50** is exhausted again and is able to return to its neutral position.

What I claim is:

1. A packaging machine having a worktable, a wire-guiding frame of loop formation extending vertically above said worktable dividing the worktable into a feed-in section and a feed-out section, means to feed wire through a guide channel of the guiding frame, a clamp to hold the leading end of the wire at the end of the guiding channel of the frame, means to withdraw the wire from the frame and around a package on the worktable, means to tie the ends of the wire, said work table having a guide along the length of the feed-in section for guiding the packages, a stop mechanism disposed adjacent said frame, said stop mechanism having at least one stop means which projects slightly inwards relative to the guide so as to be in the path of a package, switch means located adjacent said stop means and being adapted to be actuated by an incoming package, said switch means, when so actuated, being adapted to initiate operation of the wire-feed means and the means to withdraw the wire from the frame, ledge means located adjacent said stop means and being normally positioned to one side of the stop means so that a package first engages said stop means, means to reciprocate said ledge means, and means operatively connected to said withdrawing means when the wire is withdrawn from said frame to operate the ledge-reciprocating means to push the package laterally on said worktable away from said stop means so that the package can continue to move away from the frame on the feed-out section of the worktable.

2. A packaging machine according to claim 1 wherein said stop mechanism includes an additional stop means spaced from said first-mentioned stop means along said feed-out section of the worktable, and additional switch

means located adjacent said additional stop means and being adapted to be actuated by the package after moving away from said first-mentioned stop means so that the operation cycle effected by said first-mentioned switch means is repeated.

3. A packaging machine having a work-table, a wire-guiding frame of loop formation extending vertically above said worktable dividing the worktable into a feed-in section and a feed-out section, means to feed wire from a supply through a guide channel of the guiding frame, a clamp to hold the leading end of the wire at the end of the guiding channel of the frame, means to withdraw the wire from the frame and around a package on the worktable, means to tie the ends of the wire, a twisting and cutting mechanism to connect the ends of the wire and to sever the formed loop of wire from the supply, said worktable having a guide along the length of the feed-in section for guiding the packages, a stop mechanism disposed adjacent said frame, said stop mechanism having at least one stop means which projects slightly inwards relative to the guides so as to be in the path of a package, switch means located adjacent said stop means and being adapted to be actuated by an incoming package, said switch means, when so actuated, being adapted to initiate operation of the wire-feed means, the means to withdraw the wire from the frame and the twisting and cutting mechanism, ledge means located adjacent said stop means and being normally positioned to one side of the stop means so that a package first engages said stop means, means to reciprocate said ledge means, means operatively connected to said withdrawing means when the wire is withdrawn from said frame to operate the ledge-reciprocating means to push the package in the direction of tensioning of the wire away from said stop means, and means operatively connected between said twisting and cutting mechanism and said ledge-reciprocating means under the control of said twisting and cutting mechanism to prevent said ledge-reciprocating means from operating said ledge means while said twisting and cutting mechanism is operating.

4. A packaging machine having a worktable, a wire-guiding frame of loop formation extending vertically above said worktable dividing the worktable into a feed-in section and a feed-out section, means to feed wire through a guide channel of the guiding frame, a clamp to hold the leading end of the wire at the end of the guiding channel of the frame, pneumatic means to withdraw the wire from the frame and around a package on the worktable, means to tie the ends of the wire, said worktable having a guide along the length of the feed-in section of the worktable, a stop mechanism located on the feed-out section of the wire-guiding frame, said stop mechanism having a plurality of stop means which project slightly inwardly relative to said guide so as to be in the path of a package, switch means located adjacent each of said stop means and being adapted to be actuated by an incoming package, said switch means, when so actuated, being adapted to initiate operation of the wire-feed means and the pneumatic means to withdraw the wire from the frame, a retractable ledge located adjacent the stop means and being normally positioned to one side of the stop means so that a package first engages the stop means, means to reciprocate the ledge, and additional switch means operated by a pressure drop in said pneumatic means when the wire is withdrawn from said frame to operate the ledge-reciprocating means to push the package laterally on said worktable away from said stop means so that the package can continue to move away from the frame on the feed-out section of the worktable.

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