

Nov. 16, 1971

M. P. NEAL ET AL

3,620,138

METHOD OF CARTON SEALING

Original Filed May 24, 1967

4 Sheets-Sheet 1

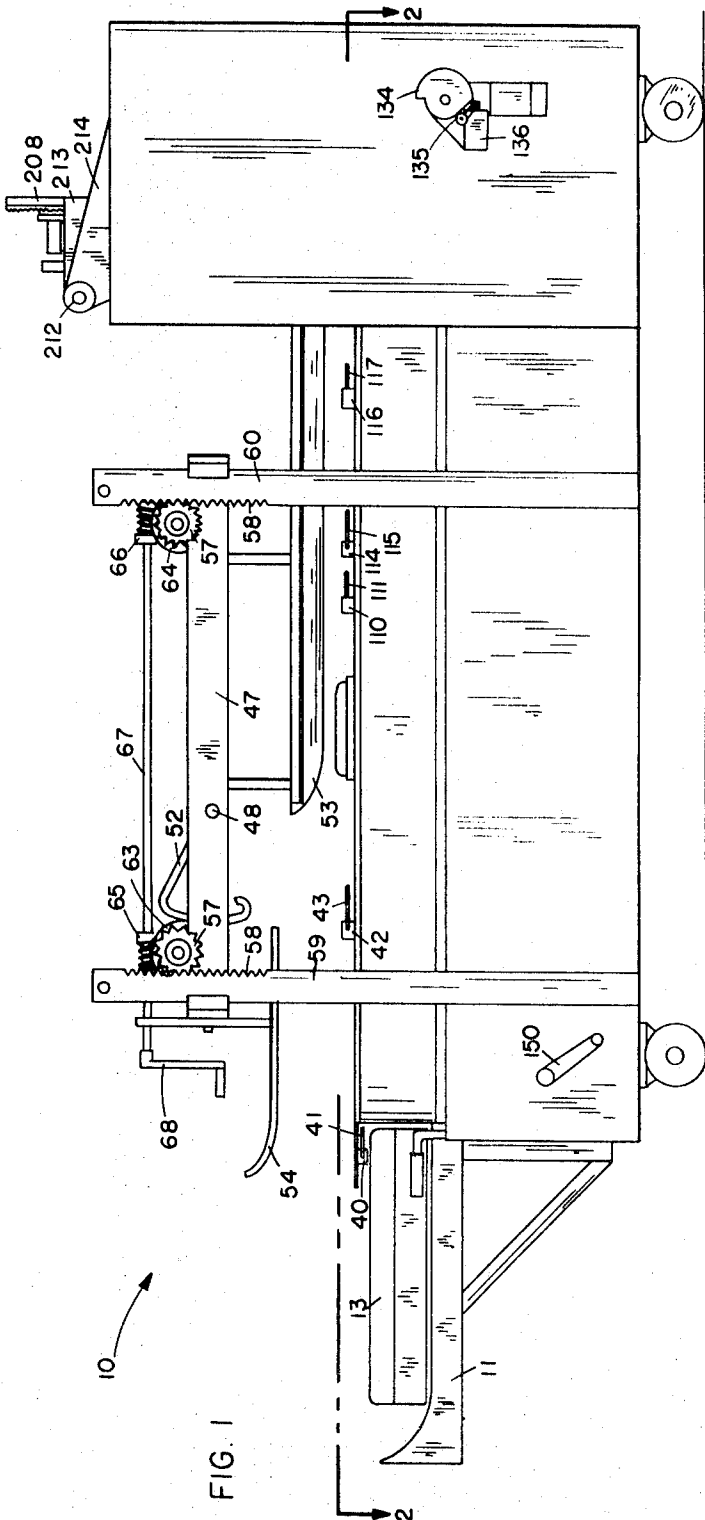


FIG. 1

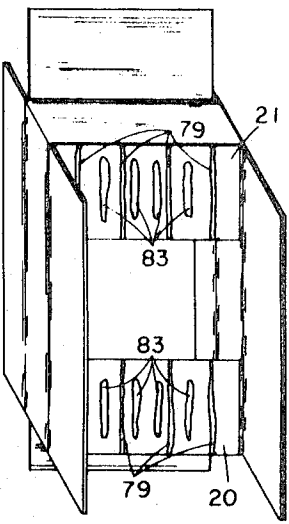


FIG. 4

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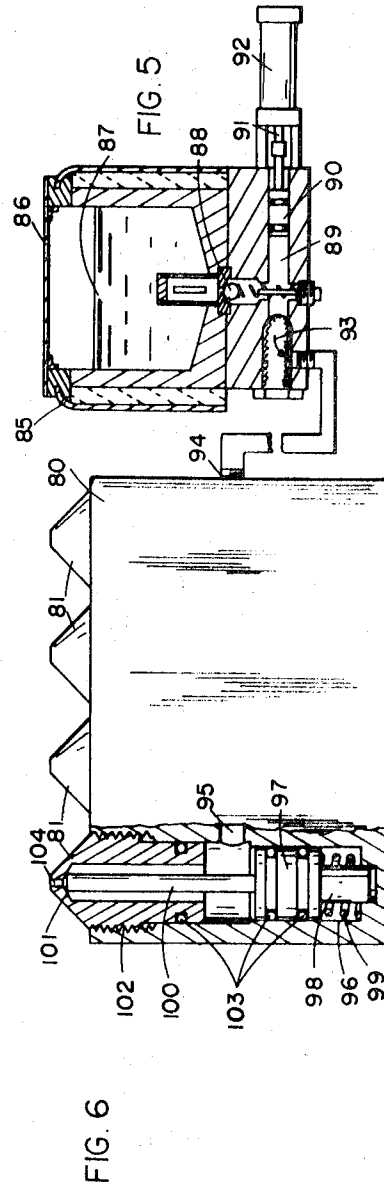
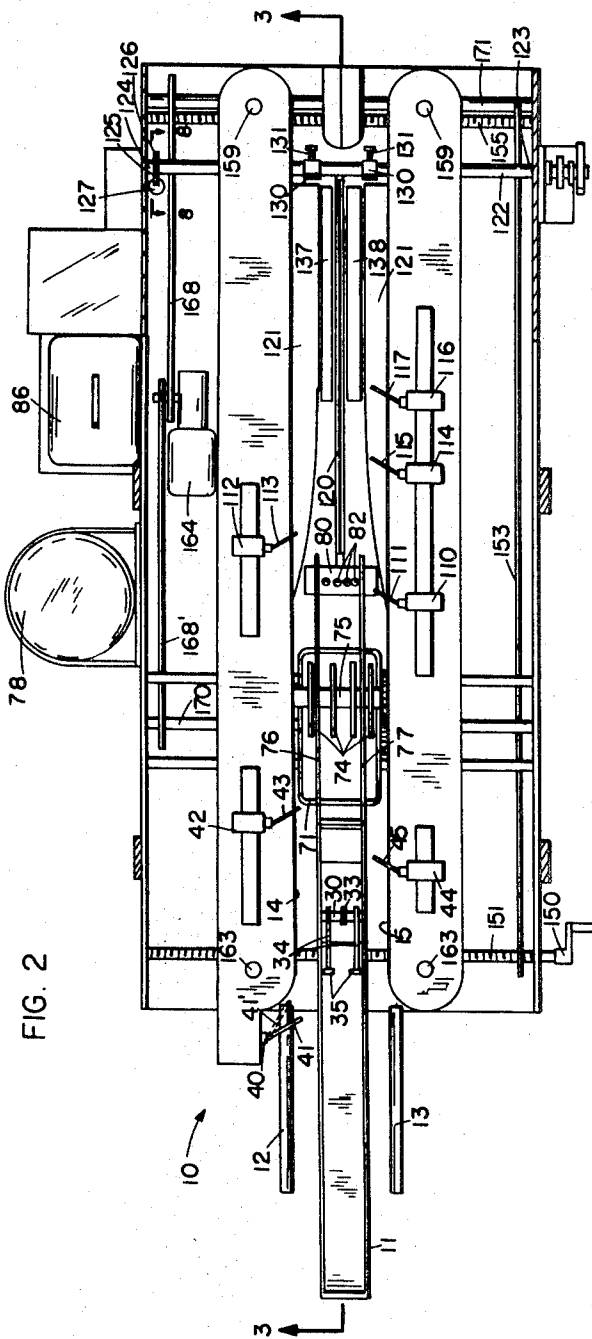
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3,620,138

METHOD OF CARTON SEALING

Original Filed May 24, 1967

4 Sheets-Sheet 2



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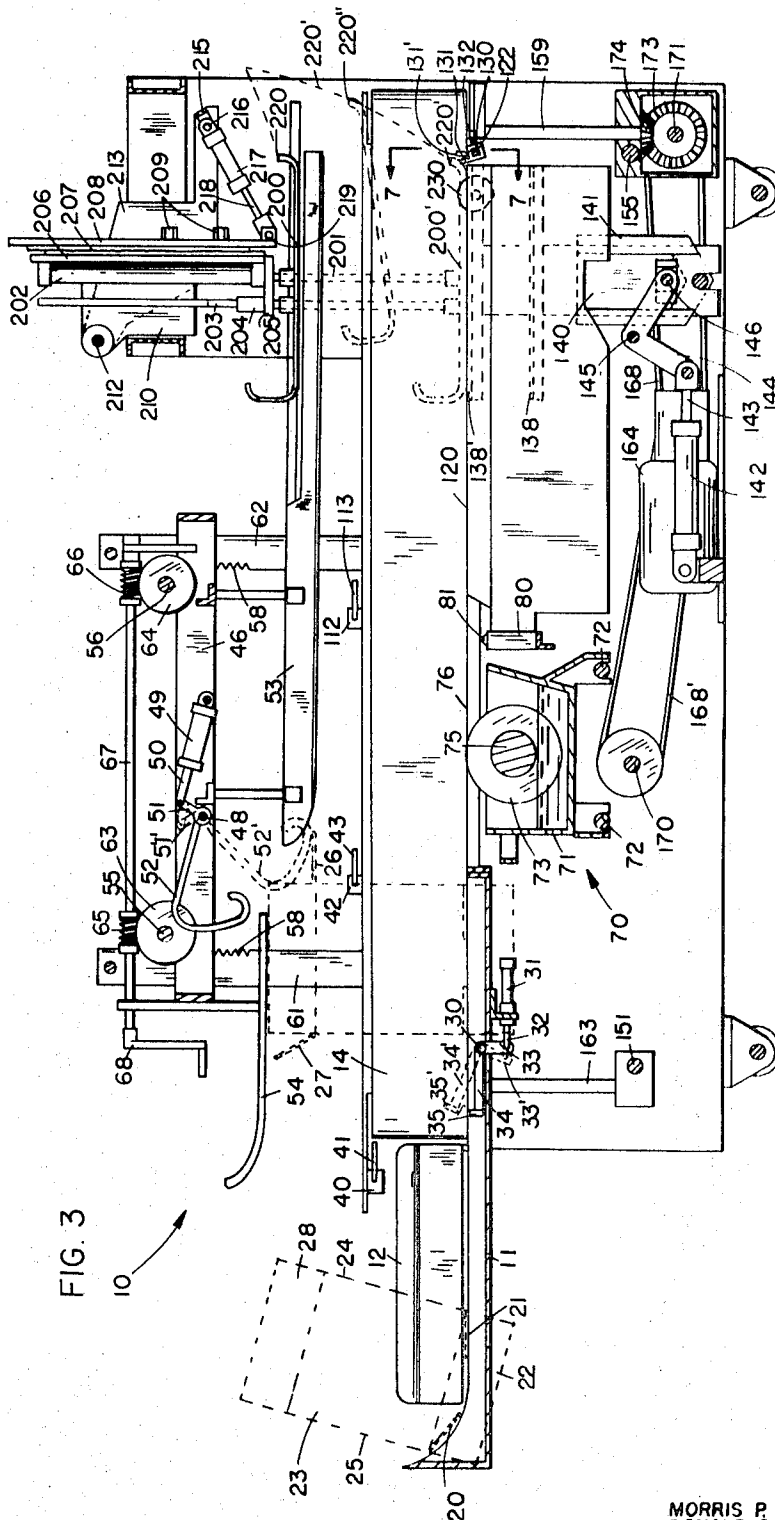
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3,620,138

METHOD OF CARTON SEALING

Original Filed May 24, 1967

4 Sheets—Sheet 3



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METHOD OF CARTON SEALING

Original Filed May 24, 1967

4 Sheets-Sheet 4

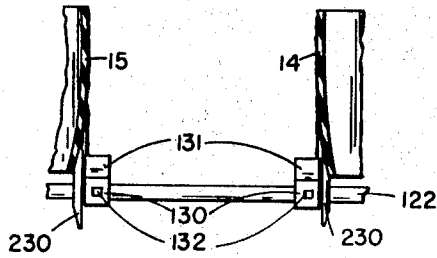


FIG. 7

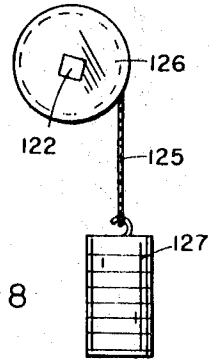


FIG. 8

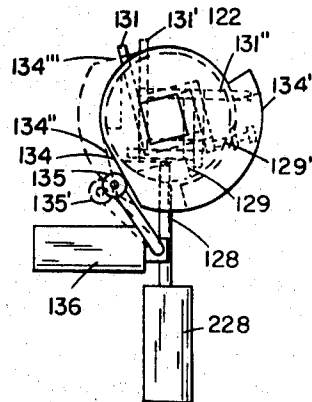


FIG. 9

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3,620,138

METHOD OF CARTON SEALING

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Original application May 24, 1967, Ser. No. 641,033, now Patent No. 3,482,489, dated Dec. 9, 1969. Divided and this application Nov. 3, 1969, Ser. No. 873,495

Int. Cl. B31b 1/26, 1/62, 49/02

U.S. Cl. 93—36.3

3 Claims

ABSTRACT OF THE DISCLOSURE

A machine is provided which seals the bottom flaps of empty cardboard cartons. It comprises means to receive partially set up cartons, means to first apply melted thermoplastic polymeric resinous adhesive (known normally as "hot melt" adhesive) to close forward and rear lower flaps, means to then apply water soluble adhesive to other areas of the same flaps, means to then close the side lower flaps against the flaps to which adhesive has been applied, means to square the carton prior to applying pressure, and means to apply pressure from above through the interior of the carton against the bottom of the carton comprising said flaps while at the same time supporting said flaps from the bottom to resist the pressure applied from above.

CROSS-REFERENCE

This application is a division of Ser. No. 641,033 filed May 24, 1967, now Pat. No. 3,482,489 issued Dec. 9, 1969, having the same entitlement.

BACKGROUND AND SUMMARY

This invention relates to a device for receiving partially set up empty cartons with the lower front and rear flaps closed, applying glue to these flaps and sealing the side lower flaps to these flaps while the carton is empty to provide a carton with square corners without maintaining pressure on the sealed flaps for a long period of time. The cartons are generally of corrugated paper board or the like.

The device may be considered an improvement on the sealing machine disclosed in U.S. Pat. 2,572,047 issued on an application filed by one of the inventors of the device described herein.

As described in that patent and as well known in the art, it has been known to provide sealing machines which include certain elements. These include means to accept a carton which is lifted from a pile by a human operator, then partially set up by the operator and then introduced to the machine by the operator in such fashion that two of the bottom flaps are closed, namely the front and rear bottom flaps, referring to the direction in which the carton travels through the machine. Such elements also include means to apply glue to the two bottom flaps which have been closed and to then close the side flaps against these flaps. Although not shown in the aforesaid patent, it is well known to then fill the carton with packages and to then close the top flap, whereupon pressure is applied to the bottom flaps in order to hold them closed until the glue has set by causing the carton to travel between an upper and a lower belt so that the bottom of the carton rests on the lower belt and pressure is applied to the top of the carton through the top flaps which are closed and thence through the contents of the package to the bottom flaps.

Such machine have depended entirely upon the provision of contents, that is, a plurality of packages such as

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cans, bottles or other small containers, either filled or empty, in the carton so that pressure can be applied to the top of the bottom flaps by applying pressure to the top of the carton which pressure is transferred therefrom to the bottom flaps by the contents of the carton.

Such machines obviously are inoperative with cartons which do not contain any contents, that is, empty cartons, because pressure applied in such a machine to the top of the carton is not transferred to the area of the bottom flaps in the manner necessary to hold the bottom flaps together. In such machines, pressure may be transmitted downward by the walls of the carton to the outer edges of the bottom flaps but such pressure is ineffective to hold the inner (upper) surfaces of the (inner or first closed) flaps downward so that the bottom surfaces of the inner flaps adequately contact the upper surfaces of the outer or side flaps in order to cause all of the flaps to be held firmly together until the glue sets.

It is necessary that the sealing of the flaps is accomplished primarily with water soluble glue of the type which requires that the surfaces at the glue joints be held firmly together for on the order of one minute or more for reasons of economy. Methods of fastening the bottom flaps together which call for the use of other materials in place of water soluble glue such as hot melt adhesives, rivets, staples or the like, are unsuitable because of the appreciably greater cost per carton introduced by the use of such substitutes.

OBJECTS

It is therefore an object of the invention to provide a device which provides for sealing together the bottom flaps of empty cartons with water soluble glue.

Other objects will become apparent from the drawings and from the following detailed description in which it is intended to illustrate the applicability of the invention without thereby limiting its scope to less than that of all equivalents which will be apparent to one skilled in the art.

DRAWINGS

In the drawings, like reference numerals refer to like parts and:

FIG. 1 is an elevation from one side with the head end of the machine at the left and the rear end of the machine at the right;

FIG. 2 is a cross-sectional plan view taken on lines 2—2 in FIG. 1;

FIG. 3 is a cross-sectional elevation taken on lines 3—3 in FIG. 1;

FIG. 4 is a perspective view from the bottom of a carton after both hot melt adhesive and water soluble glue have been applied;

FIG. 5 is a schematic, partially cross-sectional, partially cutaway view of the portion of the apparatus for applying hot melt adhesive which provides a reservoir for the adhesive;

FIG. 6 is a schematic, partially cross-sectional, partially cutaway view of the portion of the apparatus for applying hot melt adhesive which includes the nozzles from which the adhesive is dispensed onto the surface to be adhered; FIG. 6 is on a much larger scale than FIG. 5;

FIG. 7 is a fragmentary cross-sectional view taken on lines 7—7 in FIG. 3;

FIG. 8 is a fragmentary cross-sectional view taken on lines 8—8 in FIG. 2; and

FIG. 9 is an enlarged elevation which constitutes an enlargement of a portion of FIG. 1.

DESCRIPTION

Carton entrance portion

Referring now to FIGS. 1, 2 and 3, at the head end of the machine indicated generally as 10 there is provided

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a carton receiving member 11 which may correspond to the combination of members 14 and 15 shown in U.S. Pat. No. 2,572,047. Cartons (which are also referred to as cases throughout) which are partially set up by an operator are placed onto this member by an operator as shown in that patent. Side guide members 12 and 13 may be provided to align the carton with the machine so that as the carton is forced into the machine by the operator until it is grasped by belts 14 and 15 (which correspond to belt 16 shown in the aforementioned patent), it travels with its front and rear sides 24 and 25 disposed laterally with respect to the machine and with its left and right sides 23 substantially parallel with the direction of travel. As the case is placed in the machine, its front and rear lower flaps 20 and 21, respectively, are closed by contact with member 11 as shown in FIG. 3.

Carton jam preventer

Disposed below the path taken by flaps 20 and 21 through the machine, there is provided a shaft 30 extending laterally which may be rotated on its axis by the action of air cylinder 31 operating through its piston 32 on crank 33 rigidly attached to shaft 30. Extending toward the head end of the machine from shaft 30 and rigidly attached thereto are arms 34 which have pad or stop members 35 disposed at their ends and extending laterally. When air cylinder 31 is operated, members 35 are interposed in the path of the case through the machine. Parts 33, 34 and 35 are shown in dotted lines in this position and when so interposed the case, even though grasped by belts 14 and 15, is prevented from traveling through the machine; the belts merely slide along the left and right sides 23 of the carton. Near the head end of the machine there is provided switch 40 having switch actuating member 41 extending therefrom into the path of a carton through the machine. When a case is carried into contact with member 41, it is forced into the position shown in dotted lines at 41' in FIG. 2, whereupon switch 40 is actuated. A similar switch 42 is provided to ascertain the presence of the case further along in the machine by reason of switch actuating member 43 being moved by the case to actuate switch 42. Normally as the case passes through the machine, switch 40 is first actuated and subsequently switch 42 is actuated. However, if a case jams in a machine or more cases are present in the machine at one time than the machine is designed to accommodate, a case will be present opposite each of the switches 40 and 42 and both switches will be operated at the same time. When both switches are operated at the same time, means (not shown for simplicity) are provided to actuate cylinder 31 to cause members 35 to be interposed in the path of a case to prevent further cases from being introduced into the machine until the situation no longer obtains. Thus generally a case introduced in the machine is prevented in this manner from being carried by the machine into contact with the next previous case introduced into the machine.

Upper flap mechanism

Also near the head end of the machine there is provided switch 44 having actuator 45 to actuate switch 44 in response to the presence of a case opposite the switch. Extending transversely between frame members 46 and 47, located above the path occupied by a carton in traveling through the machine, there is provided shaft 48 rotatable on its axis. Attached to one or both frame members 46 and 47 there is provided air cylinder 49 disposed so that when operated its piston 50 acts on crank 51 which is rigidly attached to shaft 48, to rotate shaft 48. Also rigidly attached to shaft 48 there is provided tucking member 52. Means are provided (not shown for simplicity) to actuate cylinder 49 in response to actuation of switch 44 so that crank 51 and tucking member 52 are forced into the position shown in dotted lines at 51' and 52' to tuck the upper front flap 26 forward as shown

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in FIG. 3 as a case passes this portion of the machine. Thereafter it is held in the forwardly extending position by contact with guide members 53 against which it slides and when rear upper flap 27 is contacted by guide members 53 it is forced into the rearwardly extending position and held in this position as it passes through the machine.

Attached to the same frame there are provided guides 54 which serve to prevent upper left and right flaps 28 from being folded inwardly so that they are prevented from interfering with the action of tucker 52 or guide 53 in controlling the positions of the front and rear upper flaps 26 and 27. When the front upper flap contacts guide rails 54, it may be folded backward slightly. But guide rails 54 tend to pass in the slot between the front and rear flaps and the side flaps. In any event, guide 54 prevents the slide flaps from creating such interference until the positions of the front and rear flaps have been adequately controlled by members 52 and 53.

Provision for cases of different sizes

To provide for ready adjustability of the machine to accommodate cases which vary widely in height, width and length, within the design capability of any specific embodiment, several features are provided. Thus guide members 53, upper front flap tucking mechanism comprising elements 49, 50, 51 and 52 and guide members 54 are carried on the frame which comprises members 46 and 47 is supported from transverse shafts 55 and 56.

Attached at each end of shafts 55 and 56 there are provided pinions 57 which are engaged with racks 58 provided as portions of uprights 59, 60, 61 and 62. Also attached to each of shafts 55 and 56 is a larger pinion respectively 63 and 64 engaged respectively with worm gears 65 and 66 attached to longitudinally extending shaft 67. By operating crank 68 attached to shaft 67, the entire frame work comprising members 46 and 47 and controlling the height of guides 53, 54 and tucker 52 may be readily varied upwardly or downwardly to accommodate cases of greater or lesser height.

To accommodate varying widths of cartons, belts 14 and 15 are mounted and driven in the same manner as shown in Pat. No. 2,572,047. Thus crank 150 corresponds to crank 50 and is attached to shaft 151 which corresponds to shaft 51. Chain 153 corresponds to chain 53 to cause shaft 155 which corresponds to shaft 55 to be rotated the same amount as shaft 151. Shaft 163 corresponds to shaft 63 and carries pulleys around which the head ends of belts 14 and 15 are carried. Shafts 159 correspond to shafts 59 and carry pulleys around which the rear ends of belts 14 and 15 are trained. Shaft 171 corresponds to shaft 71 and is driven by motor 164 through chain 168 which corresponds to chain 68a. Bevel gears 173 correspond to bevel gears 73 and are slidable on splined shaft 171. Bevel gears 174 correspond to bevel gears 74 and are driven by bevel gears 173 to drive shafts 159 to which gears 173 are attached, to thereby drive the belts. The lateral spacing of the belts may be readily varied by simply operating crank 150 as described in the aforesaid patent.

Glue applicator

Glue applicator 70 corresponds to that shown in the aforesaid patent or may be a modification and comprises receptacle 71 which is received on transverse bars 72 but differs from the applicator described in said patent in that the rollers 73 which contacts the lower flaps comprises a plurality of discs 74 mounted on a common shaft 75. As described in the aforesaid patent, the applicator is driven by gears which engage with the gears carried by shaft 170 (which corresponds to shaft 70) which is driven through chain 168' (corresponding to chain 68) from motor 164. As the carton travels over applicator 70, it is carried on rails 76 and 77 which constitute extensions of member 11. Contact between discs 74 and bottom flaps 20 and 21

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causes glue to be disposed on these flaps in strips as indicated at 79 in FIG. 4.

Water soluble adhesive or glue 74 is supplied to receptacle 71 from reservoir 78 in the manner discussed in the above patent in conjunction with reservoir 38.

Means to apply hot melt adhesive

Disposed between applicator 70 and the rear end of the machine there is provided dispensing head 80 to dispense melted thermoplastic polymeric resinous adhesive known as "hot melt" adhesive through nozzles 81 as strips 83 on the lower flaps 20 and 21 (FIG. 4). Strips 83 are deposited on portions which are unoccupied by strips 79. Although four nozzles are shown so that two strips are applied on each side of the center, there may be provided only two nozzles so that only one strip is provided on each side of the center or there may be provided three or more nozzles on each side. Means for applying such hot melt adhesive is shown in more detail in FIG. 5. Adhesive which may be powdered, flake, granulated or pellet form is introduced into container 85 which is covered by lid 86. It is heated to molten state by means which for simplicity are not shown and maintained by suitable controlling means (which also for simplicity are not shown) at a temperature such as for example 325° F. The melted adhesive 87 may flow downward through check valve 88 into cylinder 89 in which piston 90 is adapted to move slidably, being driven by the piston 91 of air cylinder 92. When cylinder 92 is actuated, piston 90 is operated to drive a quantity of adhesive through a heated tube as indicated at arrow 93 to inlet 94 of the dispensing head 80. From inlet 94 the hot melt adhesive flows through passage 95 into each of valves 96. In each valve 96 there may be provided a stem having a sliding piston portion 97 to which there may be attached spring guide portion 98. Spring 99 may surround portion 98 and may act against the interior of the body of the dispensing head to bias portion 97 upwardly. Extending upwardly from piston portion 97 there may be provided sealing member 100 which seals at 101 against the interior of tip portion 81 which is threadedly received at 102 in the body of the dispensing head. Seals 103 are provided as shown.

In use, when the pressure of the hot melt adhesive in the dispensing head is increased by operation of piston 90, the pressure is transmitted through passage 95 to the upper side of piston member 97 thereby forcing the valve stem with its several parts downward against the action of spring 99 and unseating sealing member 100 from tip 81 at 101 to allow adhesive to flow out of the orifice 104 in tip 81. The force exerted upwardly on member 100 and therefore the pressure of the seal at 101 may be adjusted by screwing tip 81 into or out of the body to some extent. The dispensing head is heated and maintained at a suitable temperature by means which for simplicity are not shown. Such a temperature may be for some adhesives exemplified by a temperature of 350° F. or 375° F. Depending on suitable adjustment of the valves in the device, adhesive may be projected as much as 20 feet from the nozzle tips if desired. Generally speaking, the nozzles are located between 1/8 and 1/2 inch below the surface upon which adhesive is to be projected.

Switches 110, 112, 114 and 116 provided respectively with actuating arms 111, 113, 115 and 117 control actuation of cylinder 92 and thereby of piston 90 to control the length and longitudinal position of the start and end of each strip of adhesive. As a case contacts actuator 111 and switch 110 is thereby actuated, movement of piston 90 begins and deposition of strips 83 of adhesive as shown in FIG. 4 is begun. When the case contacts actuator 113 and actuates switch 112, actuation of cylinder 92 ceases and deposition of adhesive ceases. Then when a case contacts actuator 115 of switch 114, cylinder 92 is again actuated and deposition of adhesive is again initiated and when the case contacts actuator 117 to operate switch 116, deposition of adhesive is again caused to cease.

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Suitable thermoplastic polymeric resinous materials which may usefully serve as hot melt adhesives include, as examples, modified low molecular weight polyolefin resins and blends thereof with materials such as other resins, for example, chlorinated biphenyl, polyterpene, x-methyl styrene or the like or with microcrystalline wax. The particular adhesive to be used may depend upon the surface characteristics of the faying surfaces which are to be joined by the adhesives, the ambient temperature, the desired setting time and so forth.

Lower flap tacking station

Before a carton enters this station, its lower side flaps are closed against the inner flaps. At the station, pressure is applied to opposite sides of the lower flaps for a sufficient time, usually appreciably less than one second, for the hot melt adhesive to set enough to "tack" the lower flaps together. Then the carton is carried out of the machine and the hot melt adhesive, which has now set, holds the lower flaps "tacked" together until the water soluble adhesive has had time to set and to provide most of the strength of the joints.

After the case leaves rails 76 and 77 which terminate near the hot melt adhesive dispensing head, it is supported from below on the upper edge of vertical plate 120 and its two lower side flaps 22 are closed by closing members 121 which correspond to members 76 shown in the aforementioned patent. Near the rear end of the machine, extending transversely with respect thereto, there is provided square shaft 122, journaled at 123 and 124 to rotate on its axis and biased to rotate in a counter-clockwise direction as viewed in FIG. 3 or clockwise in FIG. 8, by the action of chain 125 which has weight 127 attached to its end and extends over sprocket 126 which is attached to the shaft. Further rotary movement in this direction is prevented by the action of pin 128 against cam 129 as shown in FIGS. 1 and 9. Members 130 are received slidably on shaft 122 and may be fixed in place on the shaft by the action of screws 132 and each comprises a tab 131 which may extend up into the path of a carton travelling through the machine. When a carton contacts tabs 131, the shaft is forced to rotate to the position in which tabs 131 have the position shown in dotted lines at 131' wherein the tabs extend vertically upward and if the case is at all skewed at the time it first contacts one or the other of these members, it is forced to become square by the action of both the belts in bringing each side forward until each lower front corner contacts one of said tabs. When the case has become squared so that the front side 24 or its lower corners contact both of members 131, then each of belts 14 and 15 slide by the case while the case is retained stationary. When the shaft 122 is rotated into the position indicated by tab 131', cam member 134 contacts switch actuator 135 as shown in FIG. 1 and switch 136 is operated.

Two lower pressure plates 138 are disposed respectively on each side of plate 120 below the position the case occupies when in contact with members 131. Each of plates 138 is supported respectively by a vertical sliding member 140 which slides in ways 141. Plates 138 are caused to occupy the position shown in dotted lines 138' and thereby bear against the lower surface of flaps 20 and 21 when cylinder 142 is actuated to actuate, through its piston 143, crank arm 144 pivoted at 145 and provided at 146 with a member slidably received in plate 140 to convert the circular motion at 146 of crank 144 into vertical reciprocatory motion of member 140. Above plates 138 there is provided a pressure-applying shoe 200. Shoe 200 is supported from the lower end of piston rod 201 extending from cylinder 202 in which rod 201 operates. Guide member 203 is provided extending upwardly through boss 204 which in turn is supported from plate 205 which extends from plate 206 to which cylinder 202 is attached. The rear of plate 206 is serrated or has the form of a modified type of rack as shown at 207 and also as

shown at 207, it engages a corresponding surface extending from plate 208. Plates 206 and 208 are held together by bolts 209. By loosening bolts 209, the vertical position of plate 206 with respect to that of 208 may be easily adjusted and a new and different vertical relationship between the two may be readily established by retightening the bolts whereupon the corresponding toothed or ribbed surfaces engage as shown at 207 and securely maintain the vertical relationship undisturbed. This means of adjusting makes it possible to adjust the height of shoe 200 to clear the uppermost part of a carton at the center, that is, to clear flaps 26 and 27 as the carton travels under the shoe when the shoe is in the raised position. Plate 208 is attached to brackets 210 and 211, only one of which is shown in FIG. 3, the other being on the other side of the machine. Brackets 210 and 211 are supported from shaft 212 to hingeably rotate around the axis thereof, shaft 212 being supported from frame members 213 and 214. Bar 215 is provided extending between the rear ends of frame members 213 and 214 and pivotally attached at 216 to a lug extending from said bar is air cylinder 217 having piston 218 which at its lower end is pivotally attached to the lower end of plate 208 as shown at 219.

When the movement of a case has been interrupted near the rear of the machine by the action of tabs 131 so that it is held stationary in the machine and the belts slide along the side of the case, shoe 200 is disposed to be introduced through the interior of the case into contact with the upper surfaces of lower front and rear flaps 20 and 21 to press these flaps down against flaps 22 to thereby hold the faying surfaces to which adhesive has been applied together by forcing the inner flaps against the outer flaps which are supported by plates 138.

For this purpose, shoe 200 is carried downward into the position indicated at 200' by piston 201 when cylinder 202 is actuated. The operation of guide member 203 and boss 204 serves to prevent the shoe from rotating in an undesirable manner in a horizontal plane around a vertical axis. As shoe 200 begins its upward travel, cylinder 217 may be actuated to withdraw piston 218 into the cylinder 217 so that the heel of shoe 200 indicated at 200 describes the path indicated by dotted lines 220' in returning to the position shown in full lines and thus at a point intermediate between that occupied at 200' and that occupied as shown in full lines, shoe 200 may occupy a position shown approximately by dotted lines 220''. This motion is desirable in order to make it possible for the movement of a case forward in the machine to be allowed to be initiated before shoe 200 has been entirely removed from therewithin.

Timing of this portion of the device is as follows: As a result of rotation of shaft 122 until tabs 131 extend in a vertical position, cam member 134' is rotated until its surface 134 occupies the position shown in dotted lines at 134'' and forces member 135 into the position shown in dotted lines at 135'. Member 135 is both a cam follower and the actuator for switch 136 (which is a combined limit switch and timer) and when it is moved to the position shown at 135', switch 136 is actuated. Actuation of switch 136 is set to operate cylinders 142 and 202. Normally pressure plates 138 reach the position shown at 138' before or at the same time shoe 200 reaches the position shown at 200'. After shoe 200 and plate 138 have been at the positions shown at 200' and 138' for a suitable time, the action of timer switch 136 causes actuation of cylinders 142 and 202 to cease whereupon members 200 and 138 are returned by springs (contained in the cylinders) to their positions shown in full lines. Timer switch 136 is set to provide a dwell of members 200 and 138 at 200' and 138' for any suitable time such as from $\frac{1}{10}$ to 3 seconds. When actuation of cylinders 142 and 202 ceases and shoe 200 starts to travel upwardly, cylinder 217 is actuated. The combined upward and forward motion of shoe 200 is thus initiated. At the same time cylinder 217 is actuated, solenoid 228 (FIGS. 1 and 6) is actuated to withdraw pin

128, which is connected to its core, from surface 129. Surface 128 is a portion of cam 129' which is attached to shaft 122. Thus, when pin 128 is withdrawn from the impingement on cam member 129, belts 14 and 15 then cease to slide by sides 22; they grip the sides and immediately start carrying the case out of the machine and square shaft 122 may rotate to allow tabs 131 to be forced by the case which bears against them being carried forward and over the tabs until they occupy the position shown in dotted lines at 132'' so that a case may pass freely thereover and out of the machine. At the same time, of course, cam 134' which is securely fixed to shaft 122, rotates until surface 134 occupies the position shown at 134''.

As soon as a case has passed out of the machine, the weight 127 acts to cause shaft 122 to be returned to the position indicated by tabs 131 and surface 134 in full lines, being prevented from further rotation by the action of stop member 225, which is connected to shaft 122, contacting stud 226.

Generally speaking, a water soluble glue or adhesive, usually of a proteinaceous or carbohydrate type, is usually utilized for sealing the flaps of cartons and especially cases comprising corrugated board and such glue generally requires from 15 seconds to 120 seconds to set, that is, reach a degree of tack sufficient that pressure on the joint may be released and the remainder of setting may be accomplished without continuing to maintain pressure on the joint. To maintain such pressure on the joints between the bottom closed flaps in an empty carton would entail either very complex, expensive and space-consuming machinery or would require a very low rate of production if each box were to be maintained at a station for the time required to accomplish such setting. The time of setting is normally dependent on such factors as ambient temperature and humidity, moisture in the surfaces, porosity of the surfaces, physical and chemical nature of the surfaces, viscosity of adhesive, concentration of solids in the adhesive, type of adhesive, and the like. The manner of adjustment of such factors or adjustment to such factors is well known in the industry and need not be elaborated here.

Hot melt adhesives on the other hand are relatively expensive and generally so expensive as to be prohibitive in being used for some closure purpose where water soluble glue may suitably be used. Nonetheless, such an adhesive may be provided to set in from $\frac{1}{10}$ second to 3 seconds depending upon such factors as the type of adhesive used, the temperature of application, chemical and physical nature of the surfaces to be adhered, ambient temperature and humidity and the like. Pressure must be maintained on a joint containing such an adhesive for a time sufficient to allow tack to be developed so that setting can be completed without continuing to maintain the pressure on the joint. This time may depend on the size of the package, the characteristics of the material of which the carton is made which determine the tendency of flaps to spring open, the amount of adhesive applied, the board surface finish, characteristics of the adhesive, room temperature, board temperature, adhesive temperature, and so forth. However, generally speaking, it is possible to adjust or balance these factors so that pressure need not be maintained on the joints for more than about .3 to .8 seconds in order to provide sufficient tack so that the joint may be maintained under pressure. By providing the device as described hereinabove, the desirable features of hot melt adhesives for the present application, namely their rapid setting rate, and the desirable features of water soluble adhesives, normally their low cost, are combined to provide a joint wherein most of the strength is provided by the relatively large volume of the relatively low cost water soluble glue whereas relatively extremely high rates of operation are provided by utilizing the rapid setting characteristics of small quantities of hot melt adhesive. Accordingly, the rate at which plates 138 and shoe

200 are cycled may be relatively great especially if operating under circumstances where pressure need be applied for only .2 or .3 of a second.

Since a high rate of operation is desirable, the pressure is normally applied for the minimum of time necessary to provide a sufficient degree of tack of the hot melt adhesive at the joints so that the hot melt adhesive will "tack" the lower flaps together sufficiently to hold them together after the carton has left the machine for a time sufficient to allow the water soluble glue to set and develop its strength whereupon the dried water soluble glue provides most of the strength of the joint.

As shown in FIG. 6, idlers 230 may be provided adjacent the inner lower surfaces of belts 14 and 15 respectively to push portions of the belts away from spaces which may be occupied by tabs 131 so that the tabs may be caused to bear against the lower outer corners of the case directly rather than merely against portions of the lower edge of the front side 24, in between the corners. Since the case is carried into contact with tabs 131 with a good deal of force by belts 14 and 15, it has been found desirable to cause the tabs 131 to contact the corners rather than a portion of the lower edge of side 24 between the corners. If tabs 131 are located inwardly from the corners so that they are not contacted by the corners but merely by portions of the lower front edge of side 24, they tend to become imbedded in the carton to a certain extent and since the extent of the imbedment is usually different for one than for the other, the case is not caused to be properly squared, this imbedment being a result of the fact that the belts bring the case into contact with the tabs with a considerable amount of force.

It may thus be seen that the invention is broad in scope and includes such modifications as will be apparent to those skilled in the art and is to be limited only by the claims.

Having thus described our invention, we claim:

1. The method of sealing side flaps of an empty carton to end flaps of an empty carton which comprises the combination of the steps of:

moving said carton along a path while maintaining said end flaps in closed position and said side flaps in an open position,

providing a plurality of small reservoirs of thermoplastic polymeric resinous adhesive which sets from liquid to solid in from $\frac{1}{10}$ second to 3 seconds, maintaining said adhesive in said reservoir at an elevated temperature to maintain it in a liquid form, projecting intermittent streams of said liquid adhesive

from said reservoirs against at least one pair of said flaps from means disposed out of contact with said flaps, as the carton moves along said path,

regulating the intermittency of said streams to provide strips of said adhesive on said flaps wherein said strips are characterized by terminating at points spaced inwardly on the flaps from the edges of the flaps,

providing at least one reservoir of liquid water soluble adhesive which sets in over 15 seconds,

providing roller discs which dip into said liquid water soluble adhesive and are positioned to contact said pair of flaps,

moving said carton along said path so that said pair of flaps contact said roller discs and strips of said liquid water soluble adhesive are provided on said flaps,

then closing the side flaps into contact with the end flaps and

applying pressure to the inner surfaces of the end flaps and

simultaneously applying pressure to the outer surfaces of the side flaps,

maintaining said pressure on said side and end flaps for at least 0.1 second until said thermoplastic polymeric resinous adhesive is sufficiently set to hold the flaps together until said water soluble adhesive sets.

2. The method of claim 1 wherein said adhesives are applied to said end flaps.

3. The method of claim 1 wherein said strips of water soluble adhesive are interposed between said strips of thermoplastic polymeric resinous adhesive.

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U.S. Cl. X.R.

53—383; 93—36 MM, 49 M, 56 PD