Dec. 9, 1969 M. P. NEAL ET AL 3,482,489

CARTON SEALING MACHINE

Filed May 24, 1967 4 Sheets-Sheet 1

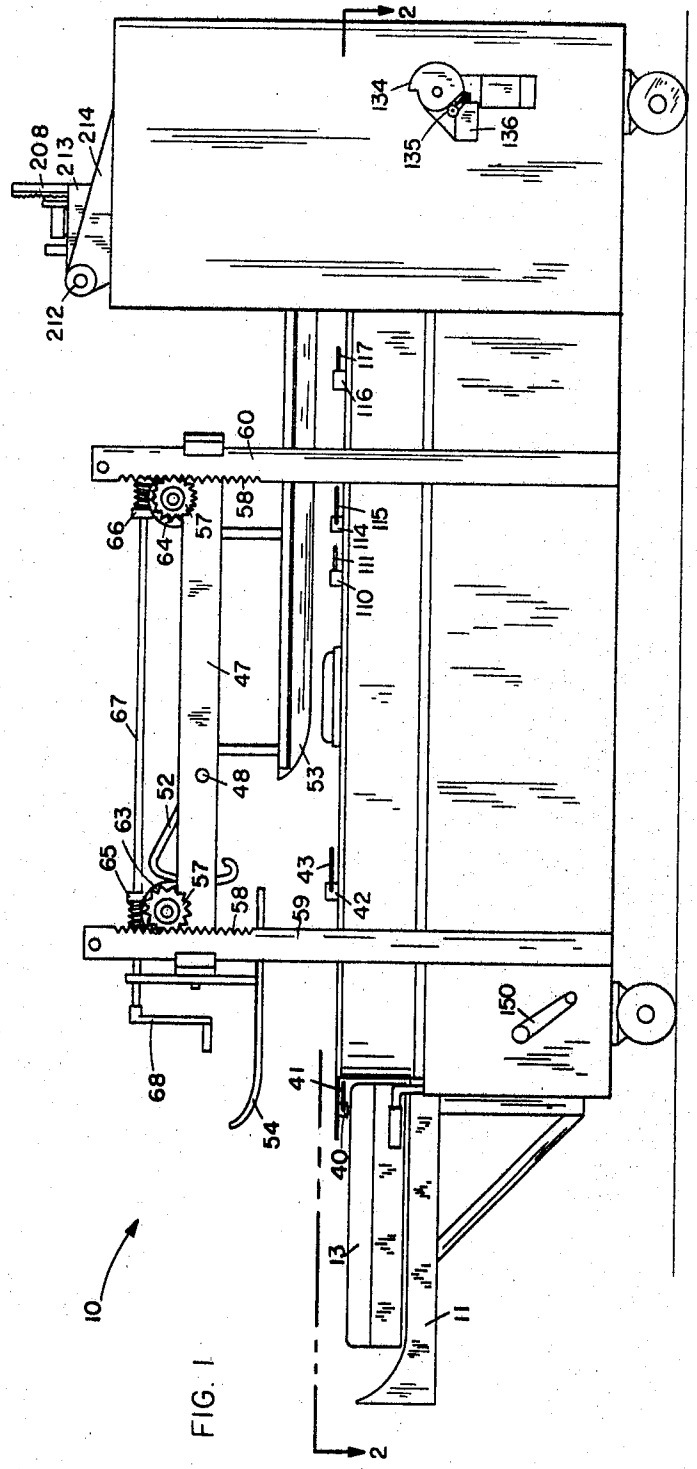

FIG. 1

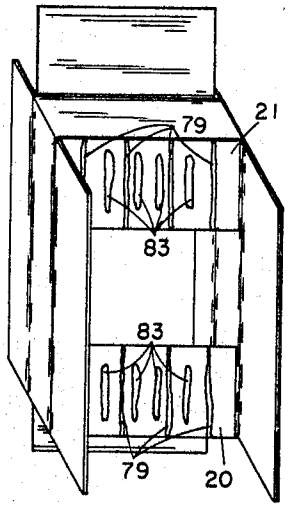

FIG. 4

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CARTON SEALING MACHINE

Filed May 24, 1967 4 Sheets-Sheet 2

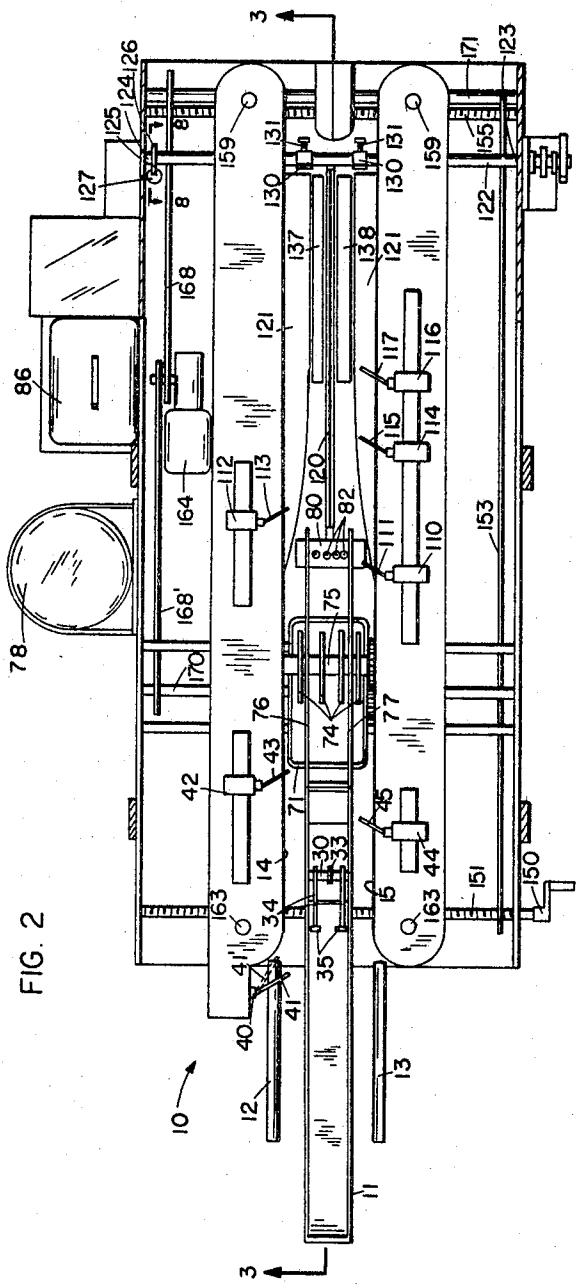

FIG. 2

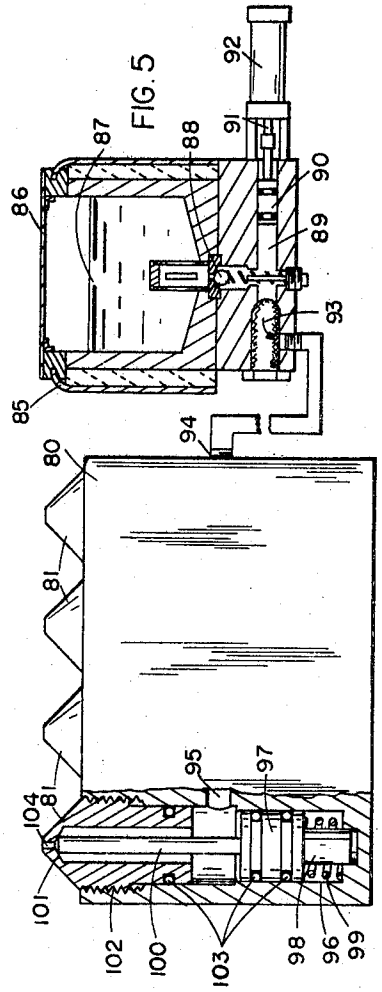

FIG. 5

FIG. 6

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CARTON SEALING MACHINE

Filed May 24, 1967 4 Sheets-Sheet 3

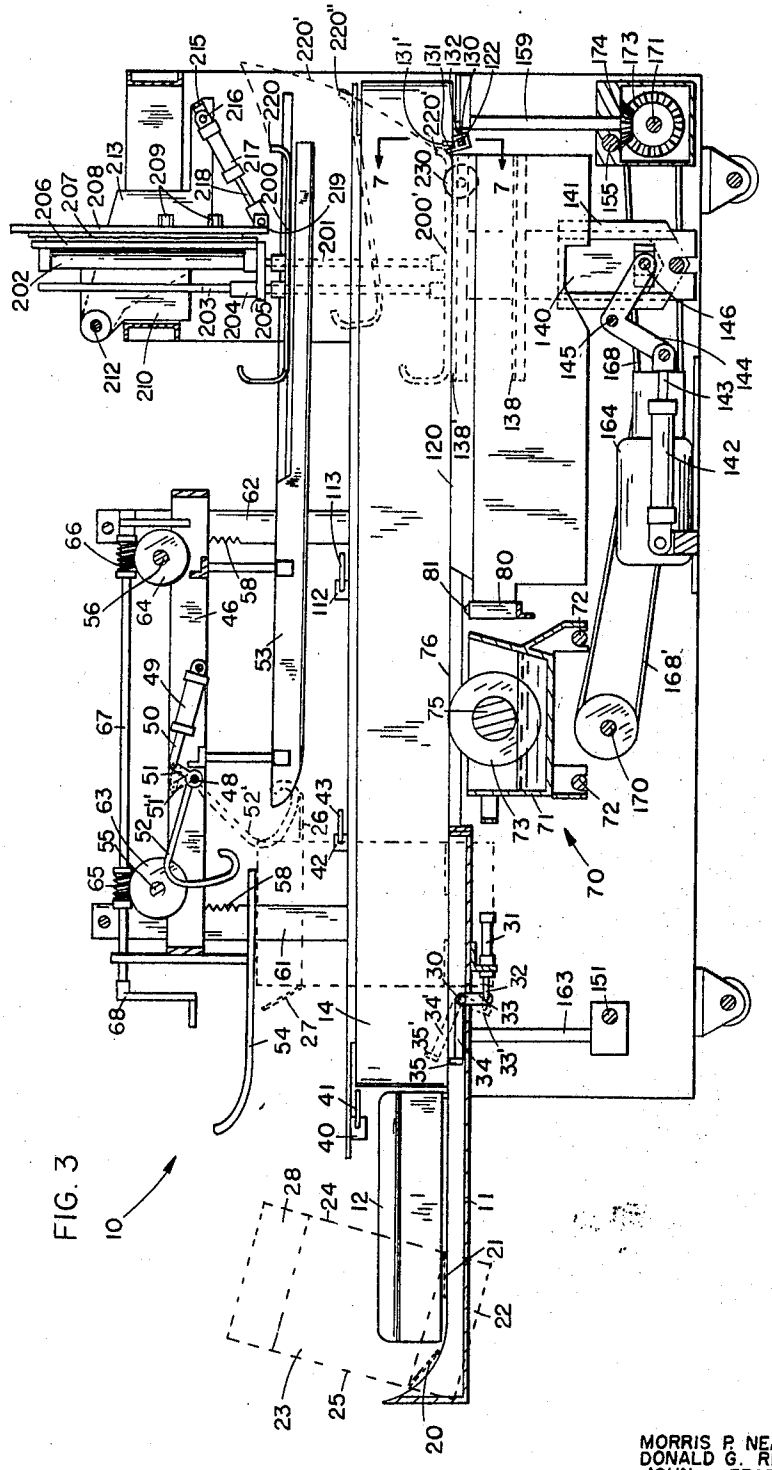

FIG. 3

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CARTON SEALING MACHINE

Filed May 24, 1967 4 Sheets-Sheet 4

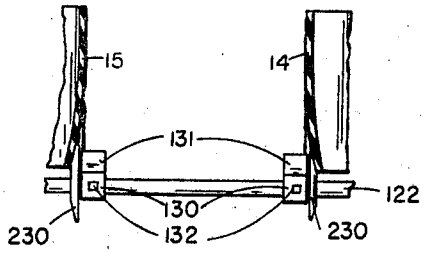

FIG. 7

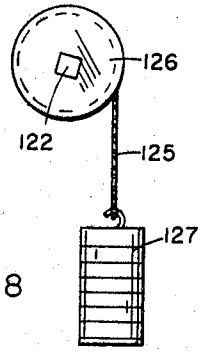

FIG. 8

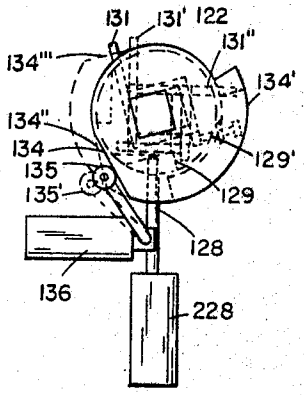

FIG. 9

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United States Patent Office

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3,482,489

CARTON SEALING MACHINE

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Filed May 24, 1967, Ser. No. 641,033
Int. Cl. B31b 1/62, 1/64
U.S. Cl. 93—36.3 8 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.

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.

There are no related applications.

The device may be considered an improvement on the sealing machine disclosed in U.S. Patent No. 2,572,047 issued on an application field by one of the inventors of the device described herein.

As described in the 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 machines have depended entirely upon the provision of contents, that is, a plurality of packages such as 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. In the drawings, like reference numerals refer to like parts and:

DRAWINGS

FIGURE 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;

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

FIGURE 3 is a cross-sectional elevational taken on lines 3—3 in FIGURE 1;

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

FIGURE 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;

FIGURE 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; FIGURE 6 is on a much larger scale than FIGURE 5;

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

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

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

DESCRIPTION

Carton entrance portion

Referring now to FIGURES 1, 2 and 3, at the head end of the machine indicated generally as **10** there is provided a carton receiving member **11** which may correspond to the combination of members **14** and **15** shown in U.S. Patent 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 FIGURE 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 FIGURE 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 in FIGURE 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 Patent 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 **68***a*. 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 roller **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** causes glue to be disposed on these flaps in strips as indicated at **79** in FIGURE 4.

Water soluble adhesive or glue **74** is supplied to receptable **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** (FIGURE 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 FIGURE 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 ⅛ and ½ 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 FIGURE 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.

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**, journalled at **123** and **124** to rotate on its axis and biased to rotate in a counter-clockwise direction as viewed in FIGURE 3 or clockwise in FIGURE 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 FIGURES 1 and 9. Members **130** are received slidingly 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 members **134** contacts switch actuator **135** as shown in FIGURE 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 FIGURE 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 beings 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 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 (FIGURES 1 and 8) is actuated to withdraw pin 128, which is connected to its core, from surface 129. Surface 129 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 protemacious 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 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 second 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 FIGURE 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 embedment 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. In a machine for sealing the bottom flaps of empty cartons which comprises means to receive partially set up empty cartons and to facilitate closing the front and rear lower flaps thereof and belt means to grip the left and right sides of each carton to carry it through the machine and roller means to apply strips of water soluble glue to the lower surfaces of said closed flaps:

means to prevent one case from being carried into contact with the next as it is fed to the machine,

means to apply strips of hot melt adhesive to the lower surfaces of said closed front and rear lower flaps prior to application thereto of said water soluble glue,

means to close the left and right or outer lower flaps against the lower surfaces of said previously closed front and rear or inner lower flaps,

means combined with said belts to square the cases,

upward and downward reciprocating means to support said closed flaps to resist pressure applied thereto from above,

a pressure-applying shoe and means to operate said shoe downward into the carton and against the upper surfaces of said lower inner flaps to apply pressure thereto and to then lift the shoe out of the carton, and

means to prevent obstructing movement of the carton by the shoe as the shoe is lifted out of the carton.

2. The device of claim **1** wherein said means to prevent one case from being carried into contact with the next comprises a first switch near the head end of the machine which is actuated by contact with a case alongside said switch, a second such switch disposed further along the machine to contact the case after it is out of contact with said first switch, a member interposable in the path of said carton to prevent its movement through the machine, and means to interpose said member in the path of a case during those times when both of said switches are actuated.

3. The device of claim **1** further provided with means to fold the front upper flap outward prior to application of said pressure-applying shoe.

4. The device of claim **1** wherein said means to support said closed flaps to resist pressure applied thereto from above comprises two plates disposed to reciprocate upwardly and downwardly respectively substantially under each of said two closed outer lower flaps and means to drive said plates into conjunction with said flaps during application of said pressure-applying shoe and to remove said plates from conjunction with said flaps at other times.

5. The device of claim **1** wherein said pressure-applying shoe is supported from means which slidingly reciprocate in ways, said ways being hingeably mounted to hingeably move upon a horizontal axis and wherein said means to prevent obstructing movement of the carton by the shoe as the shoe is lifted out of the carton comprises means to cause said ways to be moved hingeably to move said shoe in the direction of carton movement in the machine as the carton is carried out of the machine and the shoe is lifted out of the carton.

6. The device of claim **5** wherein said means to prevent one case from being carried into contact with the next comprises a first switch near the head end of the machine which is actuated by contact with a case alongside said switch, a second such switch disposed further along the machine to contact the case after it is out of contact with said first switch, a member interposable in the path of said carton to prevent its movement through the machine, and means to interpose said member in the path of a case during those times when both of said switches are actuated.

7. The device of claim **5** further provided with means to fold the front upper flap outward prior to application of said pressure-applying shoe.

8. The device of claim **5** wherein said means to support said closed flaps to resist pressure applied thereto from above comprises two plates disposed to reciprocate upwardly and downwardly respectively substantially under each of said two closed outer lower flaps and means to drive said plates into conjunction with said flaps during application of said pressure-applying shoe and to remove said plates from conjunction with said flaps at other times.

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