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Folk et al.

[11] **3,708,951**

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[54] SEALER FOR RANDOM SIZE SHIPPING CASES

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[73] Assignee: **Bemis Company, Inc.**, Minneapolis, Minn.

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[52] **U.S. Cl.**.....**53/75**, 53/374

[51] **Int. Cl.**.....**B65b 57/02**, B65b 7/20

[58] **Field of Search**.....53/75, 76

[56] **References Cited**

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3,045,402	7/1962	Keely et al.	53/75
3,085,376	4/1963	Ferguson et al.	53/75
3,183,639	5/1965	Rodman	53/75
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Primary Examiner—Travis S. McGehee

Attorney—Irving Powers and Peter S. Gilster

[57] **ABSTRACT**

Apparatus for sealing shipping cases including a sealing section adjustable upon the receipt of a signal from a case sensing means to accommodate successive cases of different dimensions and a compression section also adjustable to accommodate such cases, the adjustment of the compression section being controlled by the adjustment of the sealing section and being timed to occur following the entry of a case into the sealing section and the discharge of the previously sealed case from the compression section.

4 Claims, 7 Drawing Figures

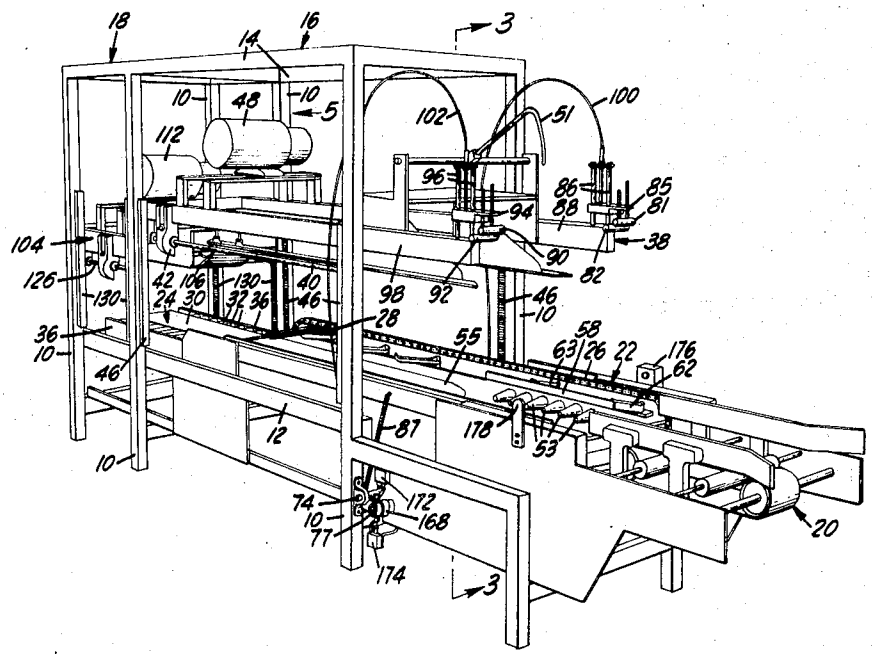


FIG. 1

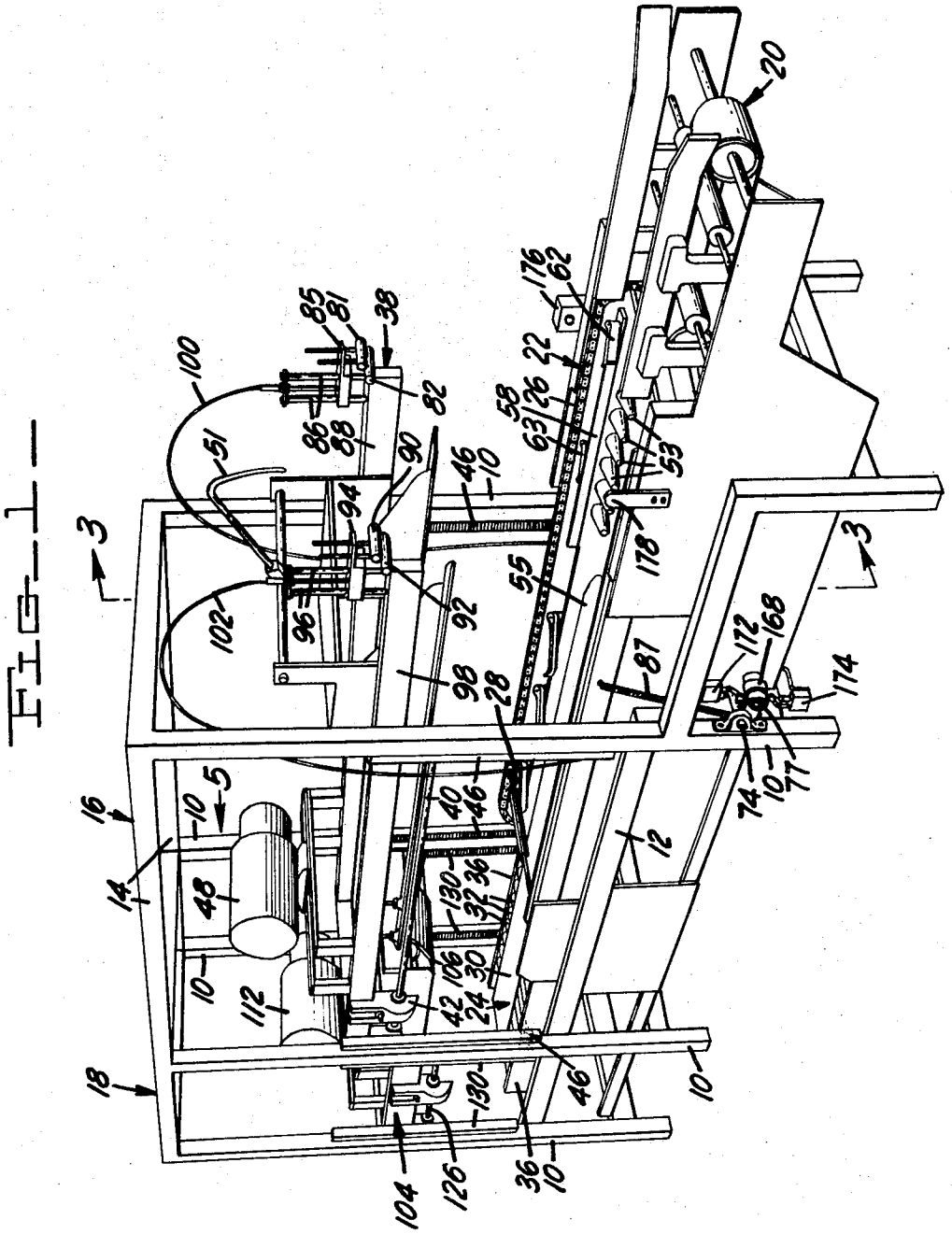

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FIG. 2

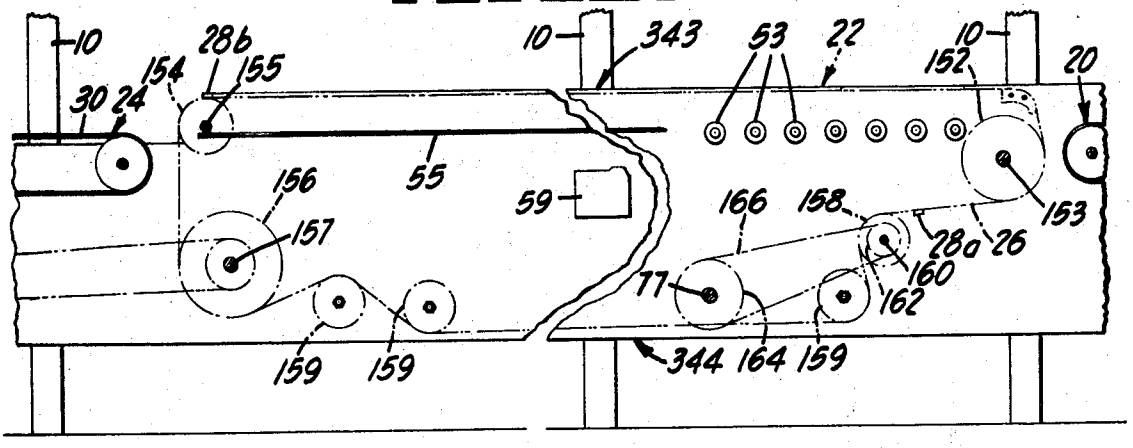


FIG. 3

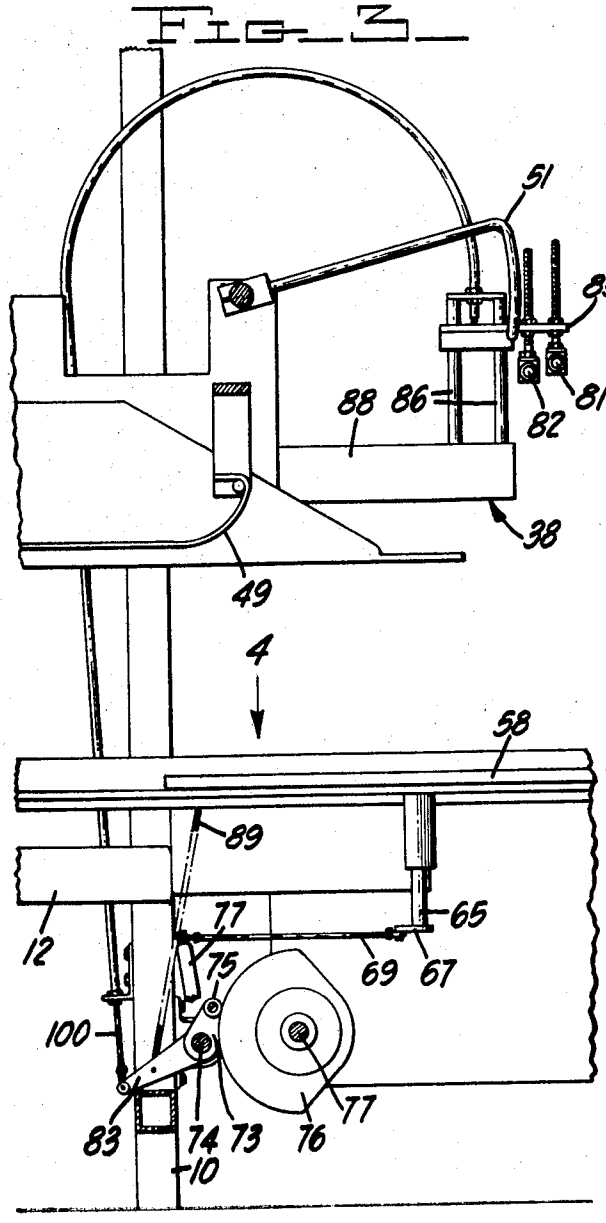


FIG. 4

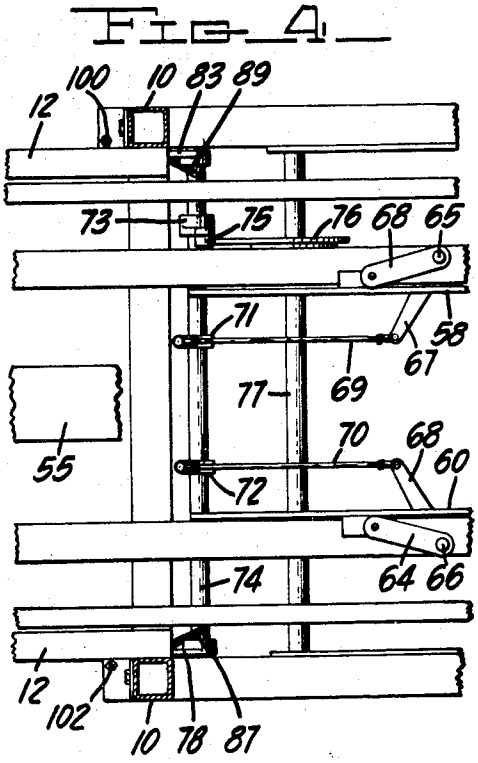


Fig. 5

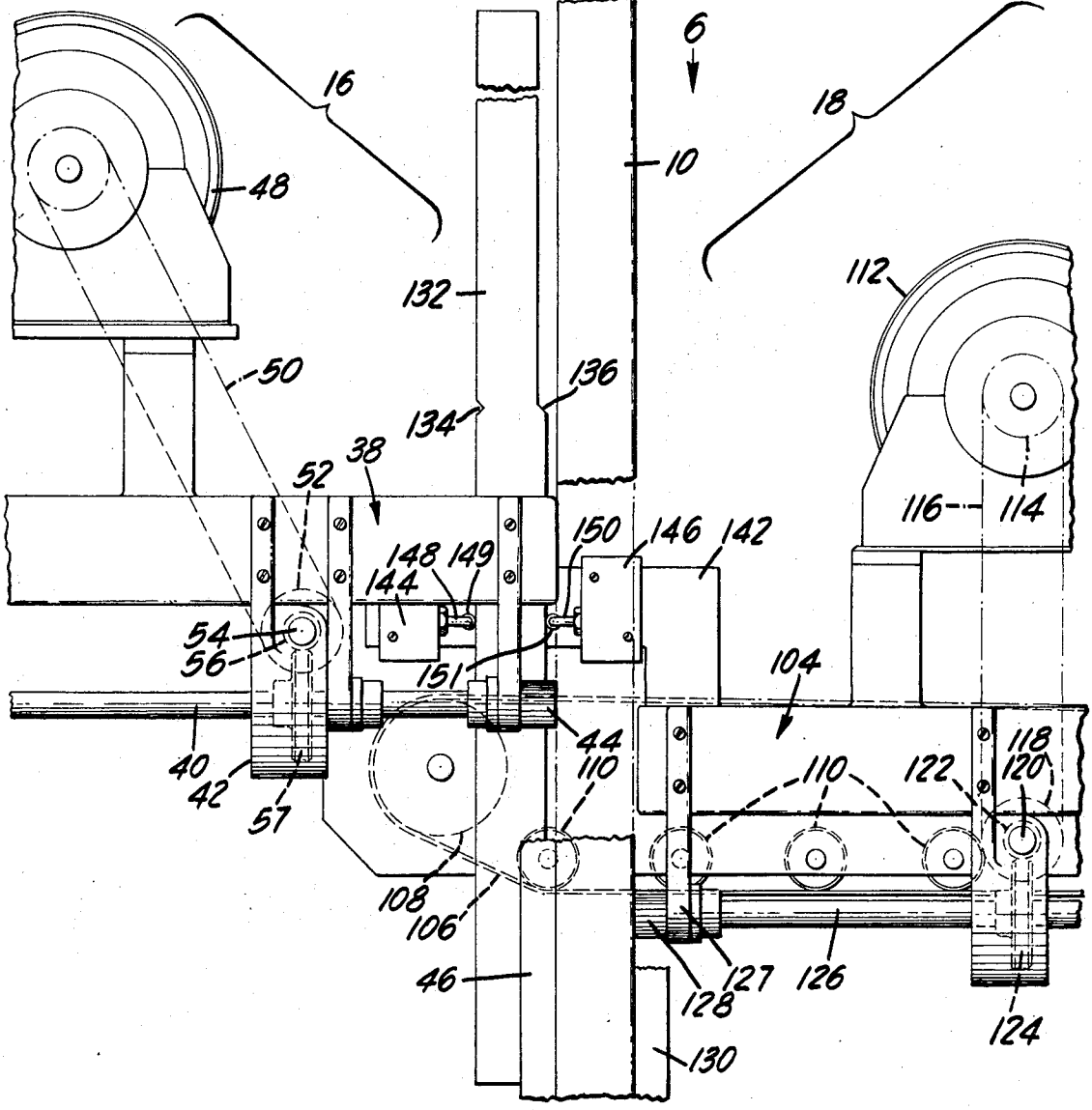

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Fig. 6

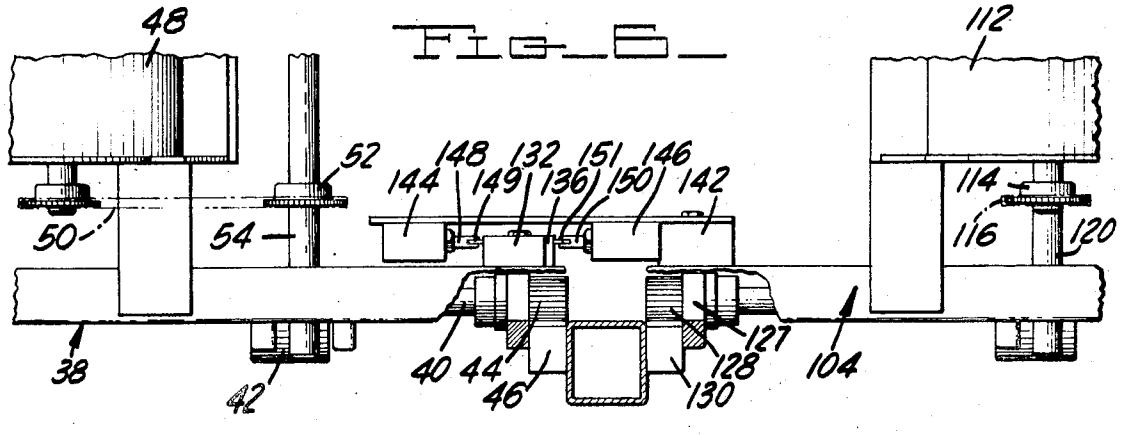
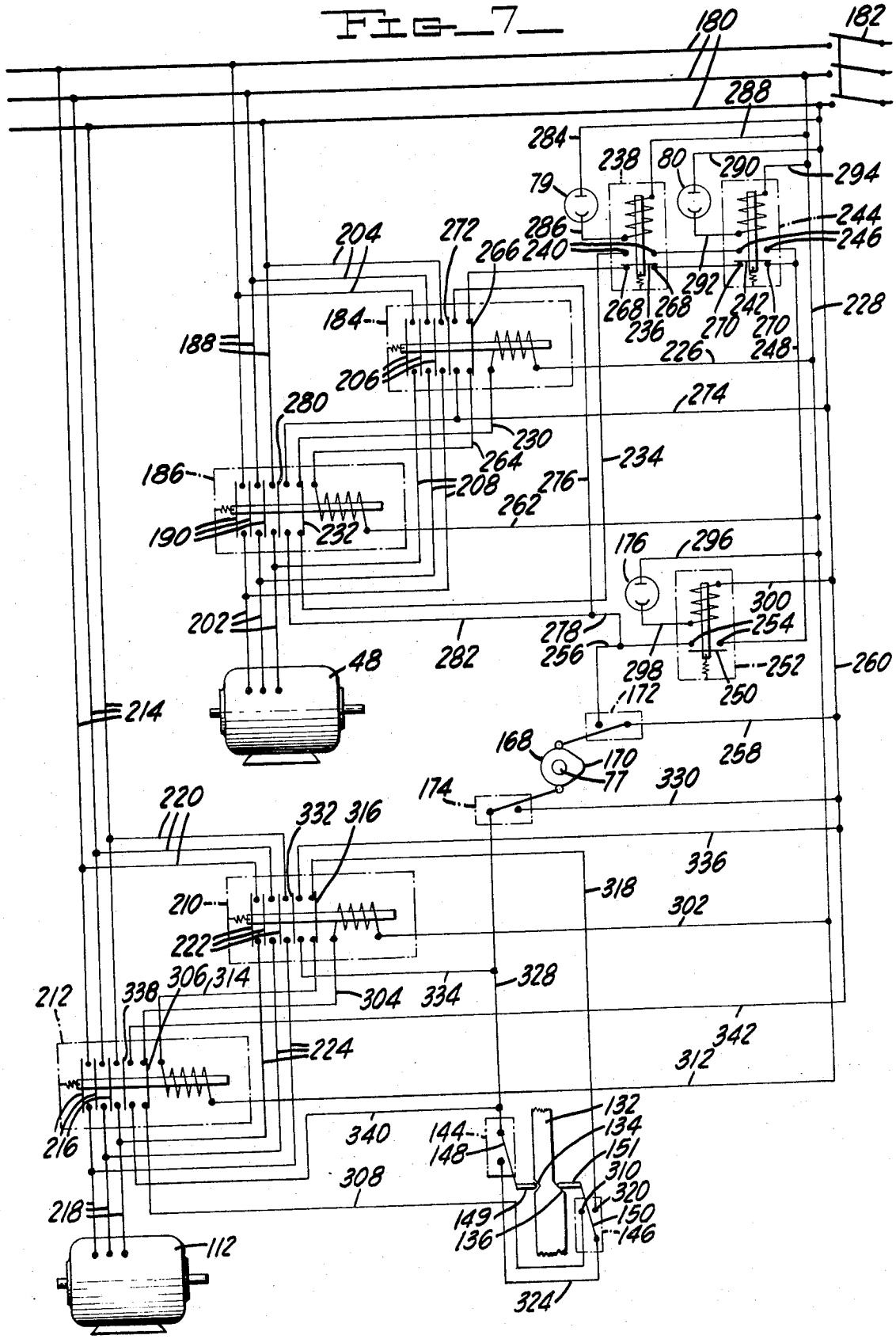

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Fig. 7


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SEALER FOR RANDOM SIZE SHIPPING CASES

BACKGROUND OF THE INVENTION

The present invention concerns machines or apparatus for closing and sealing fiberboard shipping cartons and cases, hereinafter referred to as "cases," and more particularly to such apparatus adapted to accommodate cases of different widths and heights successively delivered to the apparatus in random sequence. A conventional case sealing apparatus includes a sealing section through which the loaded case is conveyed and in which an adhesive is applied to certain of the case closure flaps and the flaps then brought into overlapping relationship. The conventional apparatus further includes a compression section to which the cases are delivered by the sealing unit and in which the closure flaps are maintained under pressure in their overlapped closed condition until the adhesive has taken a sufficient set that the flaps will not re-open when a case is discharged from the apparatus. In operation one case is carried through the compression section while a succeeding case is carried through the sealing section.

Where the apparatus is of the type to accommodate cases of different dimensions delivered in random sequence as in the present situation both the sealing and the compression units must be adjustable to position the mechanisms carried thereby and which operate on the cases, namely the glueheads, flap closers, etc. in the sealing section and the belt or other device for applying pressure to the closed flaps of a case in the compression section, in accordance with the dimensions of each case delivered to the apparatus. As will be recognized if one signaling and adjusting mechanism is employed for both the sealing and compression sections both sections must be emptied before the adjustment can take place thereby reducing the capacity of the apparatus.

One solution to the problem of securing the necessary adjustability in both the sealing and compression units without sacrificing capacity or efficiency has been to employ separate structures for the two units. In this apparatus the compression unit consists of a plurality of compartments each adjustable to accommodate cases of different sizes. The several compartments are adapted to be moved successively into positions to receive a case from the sealing unit, to hold the case under compression, to discharge the case and again return to the case receiving position. Each of the compartments includes means responsive to a signal received from the sealing unit, when the compartment is in the case receiving position, to cause it to adjust to accommodate the next case to be delivered to it by the sealing unit. Case sealing and compression units as described above are disclosed in patent to Ferguson et al. U.S. Pat. No. 3,085,376, issued Apr. 16, 1963 relating to the sealing unit and patent to Ferguson U.S. Pat. No. 3,125,842, issued Mar. 24, 1964, relating to the compression unit. As will be appreciated the units of these patents are relatively complicated and expensive and while they serve their functions in an efficient manner they fail to meet the needs of simplicity and low cost as required in many packaging operations.

SUMMARY OF THE INVENTION

The principal object of the instant invention is to provide an improved apparatus for sealing cases of different dimensions which are successively received in random sequence, the machine including a sealing section having means controlled by a case sensing means to adjust itself to accommodate any particular size of case within a given range and also including a compression section having adjustment means to permit it to accommodate the different cases handled by the sealing section, the extent and direction of the adjustment being dictated by the sealing section. Also the apparatus includes means for so timing the adjustment of the compression section with respect to the adjustment of the sealing section that, during the adjustment of the sealing section to accommodate a case and the treatment of such case therein, a case of different dimensions may be passing through the compression section.

The case sealing apparatus or machine attaining the foregoing effect includes a main frame structure supporting means for conveying a succession of cases of random dimensions through a sealing section and a compression section. A first sub-frame assembly or elevator is supported from the main frame in the sealing section for vertical adjustment toward and away from the conveying means. The sub-frame assembly carries the various mechanisms required for operating upon the flaps of a case to apply adhesive to selected flaps and to fold the flaps into adjacent overlapping relationship. The vertical adjustment of the first sub-frame assembly is made by a motive means under the control of a photo-electric sensing means such as shown for example in patent to Ferguson et al. U.S. Pat. No. 3,085,376 whereby under the direction of such sensing means the sub-frame assembly is moved by said motive means upwardly or downwardly to the proper height to accommodate a given case upon the admission of such case to the machine.

The compression unit of the apparatus comprises a second sub-frame assembly or elevator carried by the main frame structure and supporting means for applying pressure to the closed flaps of a case within the unit. The second sub-frame assembly is mounted for vertical adjustment by motive means individual to the compression unit. The operation of the motive means is effected by a control member carried by the first sub-frame assembly and which in cooperation with an electrical circuit serves, upon the adjustment of the first sub-frame assembly to accommodate a case, to signal the motive means for the second sub-frame assembly as to the direction and extent of the movement which the second sub-frame assembly is to take to accommodate said case. The timing of the operation of the second motive means is under the control of a cam operated switch included in the electrical circuit and is such that said motive means will be energized when the case in the sealing unit is approaching the compression unit and a previously sealed case has completed its travel through the compression unit.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a perspective view of a case sealing apparatus in accordance with the instant invention;

FIG. 2 is a diagrammatic sectional view with parts omitted of a portion of the machine of FIG. 1 and taken longitudinally of FIG. 1;

FIG. 3 is a diagrammatic sectional view with parts omitted taken in the direction of the arrows 3—3 of FIG. 1;

FIG. 4 is a top plan view of a portion of the apparatus looking in the direction of the arrow 4 of FIG. 3;

FIG. 5 is an elevational view of a portion of the apparatus looking in the direction of the arrow 5 of FIG. 1;

FIG. 6 is a top plan view, with parts in section, of a portion of the apparatus looking in the direction of the arrow 6 of FIG. 5; and

FIG. 7 is a wiring diagram illustrating the electrical control system of the instant invention.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring now to the drawings and particularly FIG. 1 there is disclosed an apparatus or machine for closing and sealing filled conventional fiberboard shipping cases within size ranges as determined by the size of the machine itself. Such cases have opposite side flaps of a width approximately equal to one-half the width of the case. The cases are fed to the machine in any desired order with the bottom end flaps folded in, the bottom side flaps folded thereunder and the top and end side flaps in substantially erect positions.

The machine has a main frame comprising vertical members 10 and horizontal members 12 and 14 providing a sealing section indicated generally at 16 and a compression section indicated generally at 18. The cases to be sealed are fed through the machine by suitable conveying means which includes an infeed conveyor 20, chain conveyor 22 and a belt conveyor 24. Chain conveyor 22 which extends through the sealing section comprises a pair of parallel chains 26 mounted on sprockets carried by suitable bearings supported by the frame structure, the chains lying on opposite sides of the apparatus. The chains carry transverse flight bars 28, two of such bars being employed. Belt conveyor 24 which extends through the compression unit and serves as a support for the cases while under compression as well as a conveying means comprises a belt 30 supported by a plurality of rollers 32 journaled in suitable bearings carried by frame members 36. Infeed belt 20, chain conveyor 22 and belt conveyor 24 are continuously driven by means of a motor or motors (not shown) in any suitable way.

The sealing section 16 of the machine, which suitably may be of the same type as the sealing unit disclosed in patent to Ferguson et al. U.S. Pat. No. 3,085,376 previously referred to although a somewhat simplified version is illustrated in the instant application, includes a sub-frame assembly or first elevator indicated generally at 38 overlying chain conveyor 22 and mounted for vertical movement toward and away from the conveyor. The mounting for the sub-frame assembly, which is similar to the mounting disclosed in FIG. 6 of said U.S. Pat. No. 3,085,376, comprises shafts 40 supported for rotation in suitable bearings on opposite sides of the assembly as by brackets 42. The shafts carry gears 44 (see FIG. 5) in intermeshing engagement with racks 46 supported by the vertical frame members 10 at the four corners of the sealing section. Shafts 40 are driven by a reversible motor 48 mounted on the sub-frame assembly through a chain 50, a sprocket 52 affixed to a shaft 54 extending transversely of the sealing section, and worm gears 56 secured to the shaft, each worm gear being in intermeshing engagement with a worm wheel 57 on one or the other of the longitudinal shafts 40. The timing of the energization of motor 48 and the determination of its direction of rotation are controlled by a control system hereinafter to be described.

Sub-frame assembly 38 supports conventional mechanism for applying adhesive to certain of the upper flaps and for the closing of the flaps of the case into overlapping sealing relationship. Such mechanism may take any suitable form such as that, for example, shown in U.S. Pat. No. 3,085,376, and hence is not illustrated in detail. However for present purposes the mechanism is assumed to include a hot melt gluehead of conventional type (not shown) adapted to apply stripes of glue or other adhesive to the upper end flaps of the case as the case moves through the sealing section with the end flaps infolded but with the upper side flaps remaining in their substantially erect positions. The infolding of the end flaps is automatically performed prior to the case reaching the gluehead by conventional flap tuckers, the tucker for the forward flap being indicated by the reference character 49 in FIG. 3 and the tucker for the rear flap being indicated by the reference character 51 in FIG. 1. As the case approaches the forward end of the sealing section the upper side flaps are infolded by conventional plows (not shown) into contact with the end flaps and the stripes of adhesive thereon. Means are also provided to allow the side flaps of the bottom of the case to open to permit the application of a hot melt adhesive to the infolded end flaps and to thereafter bring the side flaps into sealing underlying relationship with the end flaps before the case leaves the sealing section. These means, which involve only conventional structure, are not shown in detail, reference again being made to U.S. Pat. No. 3,085,376 for such detail, but as illustrated in FIG. 1 they comprise taper rolls 53 supported from the framework on opposite sides of the sealing section at its case receiving end whereby the bottom side flaps are permitted to open to some extent. The means also includes a package plate 55 (see FIG. 2) a tapered end of which enters between the side flaps and the closed end flaps as the case passes from the taper rolls onto the package plate. The package plate is suitably constructed and arranged to permit application of an adhesive in stripes to the end flaps, a hot melt gluehead 59 being illustrated for this purpose. Following the application of the glue, and as the case approaches the forward end of the sealing section, conventional flap folders (not shown) fold the side flaps into sealing relationship with the end flaps.

The sealing section of the machine includes mechanism for detecting the height and width of a case delivered thereto and for effecting the necessary adjustments of sub-frame assembly 38 to accommodate the case, such mechanism being of the type disclosed in said U.S. Pat. No. 3,085,376. The mechanism for determining the width of the case and which also serves to center the case is best illustrated in FIGS. 1, 3 and 4.

The mechanism comprises width bars **58** and **60** having their rear ends pivotally connected to one end of links **62**, only the link for the bar **58** being shown, the other end of each link being pivotally connected to a fixed frame member. The width bars **58** and **60** adjacent their forward ends are supported by links **63** and **64** respectively, link **63** being in parallelism with link **62** on the same side of the machine and of equal length therewith and link **64** similarly being in parallelism with and of equal length to the link **62** on its side of the machine. Links **63** and **64** are affixed to the upper ends of vertical shafts **65** and **66** respectively mounted for rotation in frame members of the machine as shown. The lower ends of the shafts **65** and **66** are affixed to lever arms **67** and **68** respectively which in turn are connected by links **69** and **70** respectively to the upper ends of lever arms **71** and **72** respectively carried by and affixed to a transversely extending shaft **74** supported for free rocking movement in bearings (not shown) in opposite side frame members of the machine. Shaft **74** (see FIGS. **3** and **4**) has affixed thereto a lever arm **73** carrying a follower roller **75** at its outer end for rolling contact with a cam **76** affixed to a shaft **77**. Lever arms **78** and **83** are also affixed to shaft **74** adjacent the opposite ends of the shaft, lever arms **78** and **83** being urged to rotate and to hence cause rotation of shaft **74** in a clockwise direction as viewed in FIG. **3** by tension springs **87** and **89** connected to the lever arms and to fixed frame members of the machine. Cam **76** is so positioned on shaft **77** and shaft **77** is so rotated in a counterclockwise direction as viewed in FIG. **3**, as will be explained more in detail hereinafter, that follower roller **75** is on the high portion of the cam during the travel of a case onto taper rollers **53**. As will be understood, when roller **75** is on the high portion of cam **76** shaft **74** has been rocked to in turn through the linkages described rotate links **63** and **64** to separate width bars **58** and **60** to their greatest extent. Upon continued rotation of shaft **77** and cam **76**, roller **75** will eventually ride off the high point of the cam and down the slope thereof. As the cam follower passes from the high point, springs **87** and **89** cause shaft **74** to rotate in a clockwise direction as viewed in FIG. **3** to, through the linkages described above, move width bars **58** and **60** inwardly, such movement continuing until the case has been centered in the machine and further inward movement is prevented by the contact of the bars with the opposite sides of the case. Upon continued rotation of cam **76**, follower roller **75** will be suspended out of contact with the cam, or, where a case of minimum width is involved, will ride on the low portion of the cam, until the cam is rotated sufficiently to bring the opposite slope thereof into contact with the follower. As will be apparent, further rotation of the cam will move the width bars apart until as the cam follower rides onto the high portion of the cam the width bars are again in the position shown in FIG. **4**.

The height sensing operation for the vertical adjustment of sub-frame assembly **38** is accomplished electrically. As previously noted the machine of the instant invention is adapted to seal regular fiberboard cases which have side flaps of a width approximately equal to one-half the width of the case. Inasmuch as the cases are delivered to the machine with the side flaps substantially upright the height sensing means is adapted to determine the position of the upper extremity of the side flaps and means are provided as will be hereinafter described for compensating for the flap height so that the height adjustment of the sub-frame assembly is actually made in accordance with the height of the case with the flaps closed.

For the height sensing operation two photo electric units **79** and **80** (see FIG. **7**) are employed similarly as in U.S. Pat. No. 3,085,376 each unit including a light source and a photo electric cell. The light source **81** (FIG. **1**) of unit **79** and the photo electric cell **82** of unit **80** are mounted in fixed positions on a bracket **85** which is slidably mounted for vertical movement on a pair of rods **86** secured in and projecting upwardly from a horizontal frame member **88** of the sub-frame assembly. Light source **81** is at a slightly elevated position relatively to photo electric cell **82**. Photo electric cell **91** of unit **79** and the light source **92** of unit **80** are similarly mounted on a bracket **94** slidably supported for vertical movement on a pair of rods **96** secured to and projecting upwardly from a frame member **98** on the opposite side of the sealing unit from frame member **88**. Photo electric cell **90** is directly opposite and in horizontal alignment with its light source **81** and similarly light source **92** is directly opposite to and in horizontal alignment with photo electric cell **82**.

The means previously referred to for compensating for the width or height of the side flaps of the case in the machine, such width or height being determined by the width of the case as noted above, includes the lever arms **78** and **83** secured for rocking movement with shaft **74** and adjacent the opposite ends thereof. The lever arms are connected by flexible cables or Bowden wires **100** and **102** and through suitable fittings to brackets **85** and **94** respectively. In operation and upon the rotation of shaft **74** following the riding of cam follower **75** off the high portion of cam **76** and the consequent rotation of lever arms **78** and **83**, Bowden wires **100** and **102** will move brackets **85** and **94** downwardly from upper rest positions the extent of such movement being determined by the degree of rotation of shaft **74** permitted by the movement of width bars **58** and **60** into their case centering and case width measuring positions.

Referring now particularly to FIGS. **1**, **5** and **6** the construction of the compression section of the machine will be described. The compression section includes a sub-frame assembly or second elevator indicated generally at **104** adapted for vertical movement and supporting upper compression belt **106** carried by end rollers, one being shown at **108** (FIG. **5**), the conveyor belt having a lower run traveling in the same direction and in parallelism with the upper run of conveyor belt **30**. The lower run of belt **106** is supported to enable it to exert a compressing force on a case passing therebeneath by a series of rollers **110** having their shafts mounted in bearings in side members of the sub-frame assembly. Belt **106** is adapted to be driven in any suitable way at the same speed as the lower belt **30** as, for example, the shaft of an end roller **108** of the upper conveyor may be connected by a suitable sprocket and chain with a sprocket carried by a shaft of one of the end rollers of the lower conveyor with the driving relationship being such that the lower and upper runs,

respectively, of two belts will travel at the same speed and in the same direction. However, as any equivalent conventional drive means may be employed, none has been shown.

The vertical movement of sub-frame assembly **104** is effected by means of a reversible motor **112** mounted thereon. A sprocket **114** carried by the drive shaft of motor **112** (FIG. **5**) is connected by a sprocket chain **116** with a sprocket **118** secured to a transversely extending shaft **120** mounted in suitable bearings (not shown) in the frame member of the sub-frame assembly. Shaft **120** carries worm gears located adjacent the opposite sides of the sub-frame assembly, one of said worm gears being shown at **122** in FIG. **5**. The worm gears mesh with worm wheels carried by shafts mounted for rotation in bearings on opposite sides of the sub-frame assembly one of the worm wheels, its supporting shaft and a bearing therefor being indicated at **124**, **126** and **127** respectively in FIG. **5**. Each of the shafts **126** carries gears **128** at its opposite ends, the gears meshing with racks **130** extending longitudinally of and supported by vertical frame members at the four corners of the compression section.

Referring again to FIGS. **5** and **6** a vertically extending control bar **132** is secured to the sub-frame assembly **38** of the sealing unit at the forward end thereof adjacent the compression section. One edge of the control bar, the edge to the left as viewed in FIG. **5**, is provided with a notch **134** approximately midway of its length. The other edge of bar **132**, from its upper end to a point opposite notch **134** is cut away as illustrated in FIG. **5**, the wider and narrower portions of the bar being connected by a slant **136** the midpoint of which lies horizontally opposite to the apex of the notch **134**. Thus, the bar **132** has at its right edge offset portions constituting upper and lower sections.

A bracket **142** projecting upwardly and then horizontally from a frame member of sub-frame assembly **104** carries a single action switch **144** and a double action switch **146** the switches having actuating members **148** and **150** respectively. These switches (as to which **146** may be termed a first control and **144** a second control) are so positioned and are of a type that rollers **149** and **151** carried by actuating members **148** and **150**, respectively, ride on the opposite edge faces of the control bar and follow the contours thereof. Switches **144** and **146** are included in an electrical circuit which will hereinafter be described.

As illustrated particularly in FIG. **2**, in which parts are shown diagrammatically, chains **26** of conveyor **22** as previously mentioned are carried by a series of sprockets including end sprockets **152** and **154** mounted for rotation with shafts **153** and **155** respectively supported in bearings (not shown) on the machine frame, drive sprockets **156** which are mounted for rotation with shaft **157** the shaft being driven by an electric motor or the like (not shown), suitably mounted adjustable slack take-up sprockets **159** and sprockets **158**. Sprockets **158** are affixed to a shaft **160** supported from the frame in bearings (not shown). Shaft **160** carries a sprocket **162** connected in driving relationship to a sprocket **164** by a chain **166**. Sprocket **164** is fixed to shaft **77** previously referred to. Shaft **77**, on which cam **76** is mounted, also carries a cam **168** (FIGS. **1** and **7**) having a riser **170** adapted to contact the actuators of switches **172** and **174** (FIG. **7**) and hence momentarily close the switches upon each rotation of the cam. As previously pointed out chains **26** carry two flight bars **28** the bars being individually identified in FIG. **2** as **28***a* and **28** *b* the spacing of the flight bars being equal to one-half the length of the chain. The relative diameters of sprockets **162** and **164** are such that shaft **77**, and hence the cams carried thereby, make one revolution during the movement of a flight bar half way around its circuit as for example from the position of the bar **28***a* to the position of the bar **28***b* of FIG. **2**. Also cam **168** is so correlated to the actuators of switches **172** and **174** that when the flight bars are in the positions shown in FIG. **2** switch **172** is closed.

Referring to FIGS. **1** and **7** a photoelectric cell **176** and a light source **178** are mounted on opposite sides of the unit in positions to have the light beam to the photoelectric cell broken upon the delivery of a case to the sealing section. The photoelectric cell **176** is included in the electrical circuit controlling the operation of motor **48** and functions to maintain the circuit open when there is no case in the entry portion of the sealing unit.

The electrical circuitry for the several motors and control elements previously referred to will now be described. Motors **48** and **112** are conventional three phase AC induction motors of the reversible type the direction of rotation of the motors being changed by reversing any two of the leads thereof. The motor circuit includes main leads **180** adapted to be connected by a master switch **182** to any suitable source of three phase electrical current. Electrical current is supplied to the motors from leads **180** through either one of two paths as determined by the energization of the coils of one or the other of relays **184** and **186**. As will be noted from FIG. **7**, upon the energization of relay **186** current will flow to the motor through leads **188** contactors **190**, when closed, and leads **202**. On the other hand, upon energization of the coil of relay **184** the current will flow through leads **204** which are connected into leads **188**, contactors **206**, when closed, leads **208** and leads **202**. As will be observed, the inner lead **188** will now be connected to the outer lead **202** and similarly the outer lead **188** will be connected to the inner lead **202** whereby the motor will rotate in a direction opposite to the direction of its rotation when the coil of relay **186** is energized. In the machine being described, energization of the coil of relay **184** will cause the motor to rotate in a direction to move sub-frame assembly **38** downwardly and energization of the coil of relay **186** will cause the motor to rotate in a direction to move the sub-frame assembly upwardly.

Motor **112** is similarly connected to the main leads through two different paths one including relay **210** and the other relay **212**. Upon energization of the coil of relay **212** leads **214**, which form a continuation of the main leads **180**, are connected to the motor through contactors **216**, when closed, and leads **218**. When the coil of relay **210** is energized power is supplied to the motor from the leads **214** through leads **220** contactors **222**, when closed, leads **224** and leads **218**. As will be noted the inner and outer leads, with respect to their connection to motor **112**, are reversed upon energization of the coil of relay **210** as compared

to their connection when the coil of relay **212** is energized. In the circuitry illustrated energization of the coil of relay **210** will cause rotation of the motor in a direction to lower sub-frame assembly **104** and conversely energization of the coil of relay **212** will cause upward movement of the sub-frame assembly.

The circuits controlling the energization of the coils of relays **184** and **186** will now be described. One terminal of the coil of relay **184** is connected by a lead **226** to a power lead **228** which in turn is connected to one of the main leads **180**. The other terminal of the coil is connected by a lead **230**, contactor **232** of relay **186**, when closed, lead **234**, contactor **236** of a relay **238**, when closed against contacts **240**, contactor **242** of a relay **244**, when closed against contacts **246**, a power lead **248**, the contactor **250** of a relay **252**, when closed, lead **256**, switch **172**, when closed, and lead **258** to a lead **260** which in turn is connected to a second of the main leads **180**. Similarly one terminal of the coil of relay **186** is connected by a lead **262** to lead **228** and the other terminal of the coil is connected by a lead **264**, contactor **266**, when closed, contactors **236** and **242** of relays **238** and **244**, when closed against contacts **268** and **270** respectively, to lead **248** which is connected to the power lead **260** as previously described.

Inasmuch as switch **172** is only momentarily closed by cam **168** holding circuits are provided for both relays. Thus with respect to relay **184**, upon energization of it by closing of switch **172**, contactor **272** is closed thereby connecting power lead **260** through lead **274** and leads **276** and **278** to lead **256**. Similarly upon energization of the coil of relay **186** contactor **280** thereof is closed connecting lead **274** through leads **282** and **278** to lead **256**.

One terminal of the photoelectric cell of unit **79** is connected by a lead **284** to power lead **260**. The other terminal of the photoelectric cell is connected by a lead **286** to one terminal of the coil of relay **238**. The other terminal of the coils is connected by a lead **288** to power lead **228**. The photoelectric cell of unit **80** has one terminal thereof connected by a lead **290** to power lead **260** and has its other terminal connected by a lead **292** to one terminal of the coil of relay **244** the other terminal of the coil being connected by a lead **294** to power lead **228**. The photoelectric cells of units **79** and **80** are of a known type which operate to close the circuits to the coils of their respective relays when the light beams are broken. Photoelectric cell **176** which similarly operates to close a circuit when the light beam is broken, has one terminal thereof connected by a lead **296** to power lead **228** and the other terminal connected by a lead **298** to one terminal of the coil of relay **252**. The other terminal of the coil of the relay is connected by a lead **300** to a power lead **260**.

Referring now to the lower portion of the wiring diagram of FIG. **7** the control of the energization of the coils of relays **210** and **212** will be described. One terminal of the coil of relay **210** is connected by a lead **302** to power lead **228**. The other terminal of the coil is connected by a lead **304**, contactors **306** of relay **212**, when closed, and lead **308** to a terminal **310** of double acting switch **146**. Similarly one terminal of the coil of relay **212** is connected by a lead **312** to power lead **228**. The other terminal of the coil is connected by a lead **314**, contactor **316** of relay **210**, when closed, and a lead **318** to a second terminal **320** of switch **146**. Contactor **150** of switch **146** is connected by a lead **324**, switch **144**, when closed, lead **328**, switch **174**, when closed, and a lead **330** to power lead **260**.

Holding circuits are provided for the coils of relays **210** and **212**. The holding circuit for relay **210** includes a contactor **332** which is closed upon energization of the relay, lead **334** connected to lead **328** and a lead **336** connected to power lead **260**, Similarly the holding circuit for the coil of relay **212** includes a contactor **338**, lead **340** connected to lead **328** and lead **342** connected to power lead **260**.

The operation of the machine of the instant invention will now be described. The machine is in operation with camshaft **77** rotating and the upper run of chain conveyor **26** and the upper and lower runs respectively of belt conveyors **30** and **106** traveling in a direction to carry cases in succession through the sealing and compression sections. It will be assumed that the chain conveyor has carried a case to a point just beyond the width bars **58** and **60** of the sealing section and that the belt conveyors have completed the travel of a previous case through the compression section. Under such circumstances one of the flight bars will be at the position indicated by the arrow **343** and the other will be in the position indicated by arrow **344**. Also follower roller **75** of lever **73** will be on the high portion of cam **76** and as a consequence width bars **58** and **60** will be in their outermost positions. As there is no case in the entry end of the sealing section the light beams to photoelectric cells **82** and **90** of units **79** and **80** respectively are unbroken and in consequence the coils of relays **238** and **244** are de-energized and contactors **236** and **242** are in the positions illustrated in FIG. **7** closing against contacts **268** and **270** respectively. Also the beam from the light source for photoelectric cell **176** is unbroken and hence the coil of relay **252** de-energized and contactor **250** separated from contacts **254**.

A case which may be of any dimensions within the adjustment capabilities of the machine is now delivered by infeed conveyor onto taper rollers **53**, the case having at least its upper side flaps substantially erect. As the case enters the sealing unit it will break the light beam to photoelectric cell **176** permitting the energization of the coil of relay **252** and the consequent closing of the contactor thereof against contacts **254** whereby the circuit is closed between leads **248** and **256**.

As the advancement of the chain conveyor and the rotation of camshaft **77** continues follower roller **75** will ride off the high point of cam **76** and width bars **58** and **60** will move into contact with and center the case. Also photoelectric cells units **79** and **80** will be lowered on rods **86** and **96** through the medium of the Bowden wires **100** and **102** to a position determined by the width of the side flaps of the case. These adjustments occur as one of the flight bars, such as bar **28a**, in FIG. **2** closely approaches the position shown in that figure. In the meantime depending upon the dimensions of the case, as compared to the dimensions of the last previous case which passed through the sealing section, the light beams of photoelectric cell units **79** and **80** will either be broken or remain undisturbed. In either situation motor **48** will remain de-energized due to open switch **172**. As the travel of the conveyor continues and

a flight bar reaches the position of the flight bar 28a of FIG. 2 the lobe or riser 170 of cam 168 will be moved into position opposite the actuating member of switch 172 to momentarily close the switch thus energizing the control circuit for motor 48.

In the event that the case is of such dimensions that the photoelectric cells of units 79 and 80 have their light beams interrupted, the coils of relays 238 and 244 will be energized to cause contactors 236 and 242 to close the circuit which causes motor 48 to rotate in a direction to elevate sub-frame assembly 38, the operation of the motor continuing until the circuit is broken by the upper of the two cells passing beyond the edge of the case flap. On the other hand if the light beams to the cells remain unbroken, the coils of the relays will not be energized and motor 48 will be driven in a direction to lower the sub-frame assembly until the light beam of the lower of the units is broken by the case flap and in consequence the coil of the relay controlled by that unit is energized. The adjustment of sub-frame assembly 38 to the proper height, as determined by the photoelectric cell units, causes similar adjustment of control bar 132 which moves upwardly and downwardly with the sub-frame assembly from its rest position as shown in FIG. 7. Movement of the control bar from its rest position causes actuator of switch 144 to close between leads 328 and 324 and, depending upon the direction of the movement of the bar, causes actuator 150 of switch 146 to close against one or the other of contacts 310 and 320. However as switch 174 remains open at this time the circuit to motor 112 is also open. In the meantime switch 172 has been permitted to open but due to the holding circuits the operation of motor 48 continues until the circuit to it is broken by the energization of the coil of one of the relays 238 or 244 as described above.

The above described operations take place during the movement of a flight bar from the position of the bar 28a of FIG. 2 to a position in which it is in contact with the case resting on taper rolls 53. The continued travel of the chain conveyor carries the case through the sealing section the several operations previously described being performed on the case. During the continued travel of the case camshaft 77 continues to rotate and as the leading edge of the case approaches the compression unit cam 168 is rotated to bring its nose 170 into position to close the actuator of switch 174 thereby closing the circuit controlling the operation of motor 112 the motor causing elevation or lowering of the sub-frame assembly 104 depending upon the circuit closed by the contactor of switch 146. The raising or lowering movement will continue until the contactor of switch 144 enters notch 134 and the contactor of switch 146 is on slant 136. At this point the sub-frame assembly 104 is prepared to receive the case from the sealing section.

Having thus described the invention in rather complete detail it will be understood that these details need not be strictly adhered to, and that various changes and modifications may be made all falling within the scope of the invention.

We claim:

1. In apparatus for sealing cases which have open upper flaps,

a sealing section wherein adhesive is applied to certain of the upper flaps after which the flaps are closed,

a compression section wherein pressure is applied to the closed flaps,

a continuously operable conveyor including pusher means adapted to come into engagement with a case in the sealing section and to push it through the sealing station and thence through the compression section,

a first elevator in said sealing section movable up and down relative to said conveying means to accommodate cases of different heights,

flap sealing means carried by and movable with said first elevator for applying adhesive to certain of the said upper flaps of a case in the sealing section and for closing said flaps,

means for moving said first elevator up and down to adjust it relative to said conveying means to position said flap sealing means for operation on cases of different heights before the pusher means engages a case in the sealing section,

a second elevator in said compression section movable up and down relative to said conveying means to accommodate cases of different heights with their upper flaps closed,

means carried by and movable with said second elevator for applying pressure on the closed flaps of a case travelling through the compression section after exiting from the sealing section,

reversible drive means for moving said second elevator up and down to adjust it relative to said conveying means to position said pressure-applying means for operation on cases of different heights,

a control member carried by one of said elevators extending vertically with respect to said one elevator,

a first control carried by the other of said elevators engageable with said control member for controlling the direction of operation of said drive means, said control member having an upper section and a lower section engageable by said first control, and said first control being operable when engaging one of control member sections to effect operation of the drive means in one direction for lowering the second elevator and operable when engaging the other of said control member sections to effect operation of the drive means in the opposite direction for raising the second elevator,

and a second control carried by said other elevator engageable with the control member for controlling the extent of movement of the second elevator, said control member having means at the level of the juncture of its said upper and lower sections engageable by said second control for stopping said drive means when said second elevator, in moving either up or down, reaches the level for applying pressure to the case exiting from the sealing section,

and means operable in timed relation with said conveyor for initiating operation of said drive means in one direction or the other as determined by the position of the first elevator as a case approaches the compression section during its passage through the sealing section.

2. In apparatus as set forth in claim 1, said control member being carried by said first elevator and said first and second controls being carried by said second elevator, said first control being operable when engaging said upper section to effect operation of the drive means in one direction for lowering the second elevator and operable when engaging said lower section to effect operation of the drive means in the opposite direction for raising the second elevator.

3. In apparatus as set forth in claim 2, said reversible drive means comprising a reversible electric motor, said first control comprising a first switch having an operating member engaging said control member, said first switch being connected in a circuit for operating the motor in said one direction when its said operating member is in engagement with said lower section and in said opposite direction when said operating member is in engagement with said upper section, and said second control comprising a second switch having an operating member engaging said control member, said second switch being connected in a circuit for energizing the motor when its operating member is above or below said stopping means and deenergizing the motor when its operating member is at said stopping means.

4. In apparatus as set forth in claim 3, said control member comprising a vertical bar having at one vertical edge offset portions constituting its said upper and lower sections, with said stopping means constituted by a notch in its opposite vertical edge.

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