

[54] CONTAINER SEALING APPARATUS

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[51] Int. Cl. B65b 7/20

[58] Field of Search 53/374, 375, 75, 76, 387

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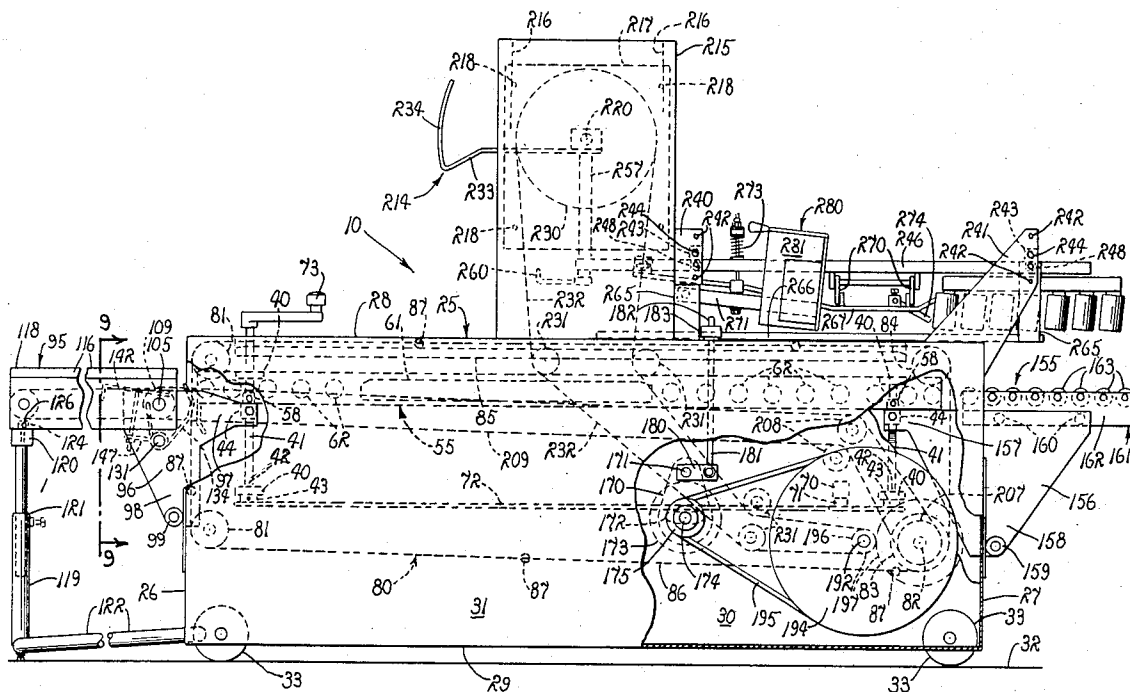
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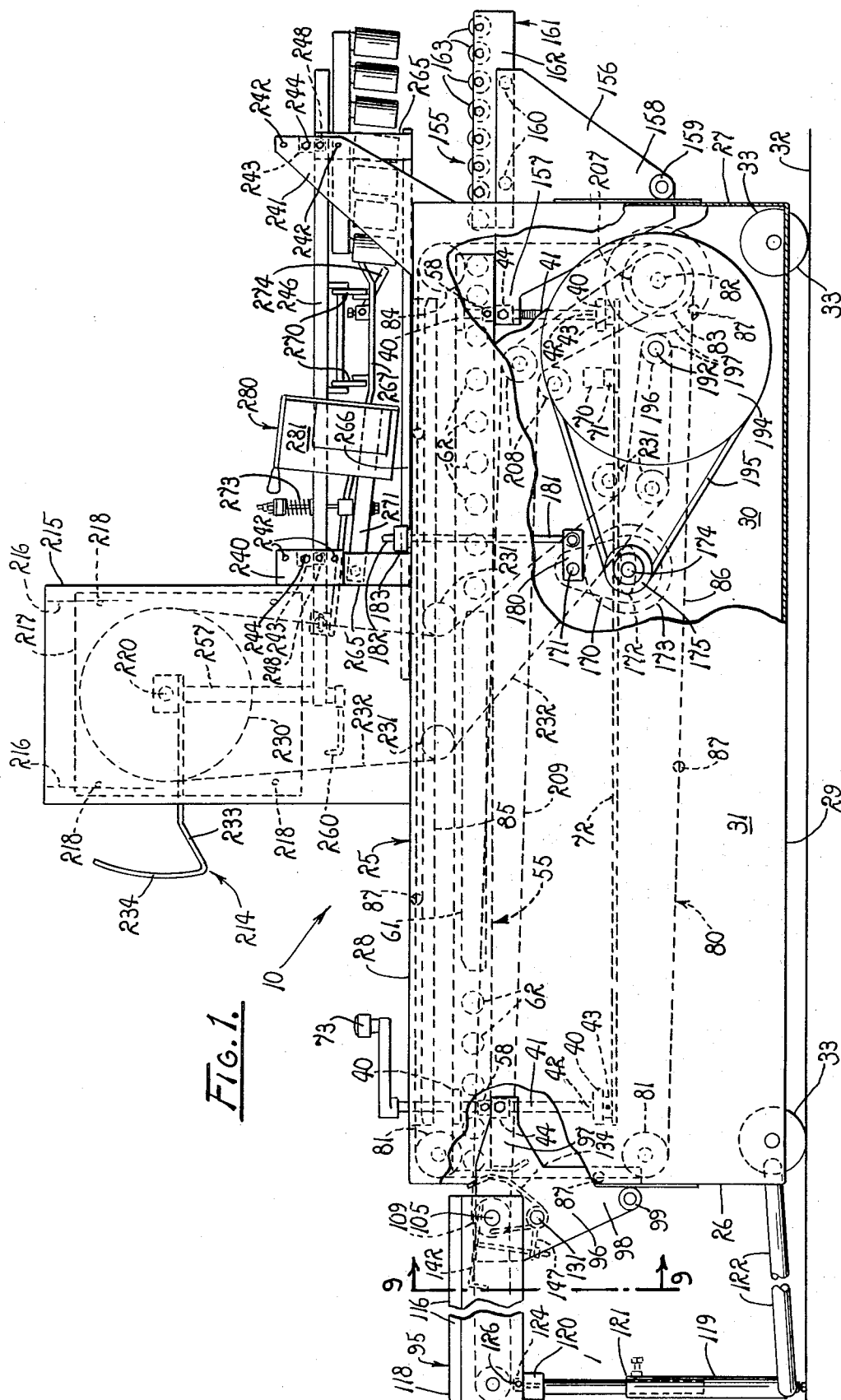
Primary Examiner—Travis S. McGehee
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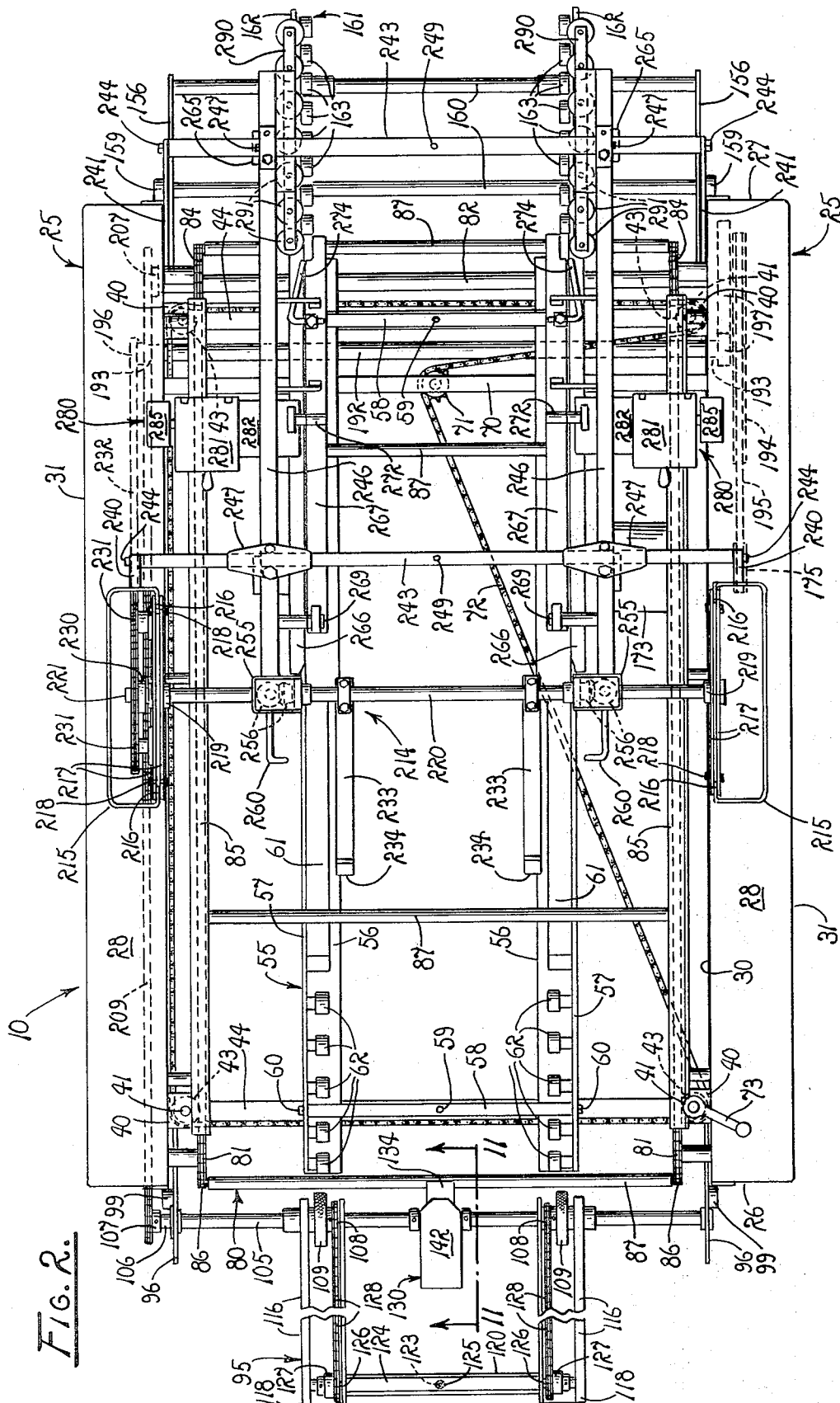
[57] ABSTRACT

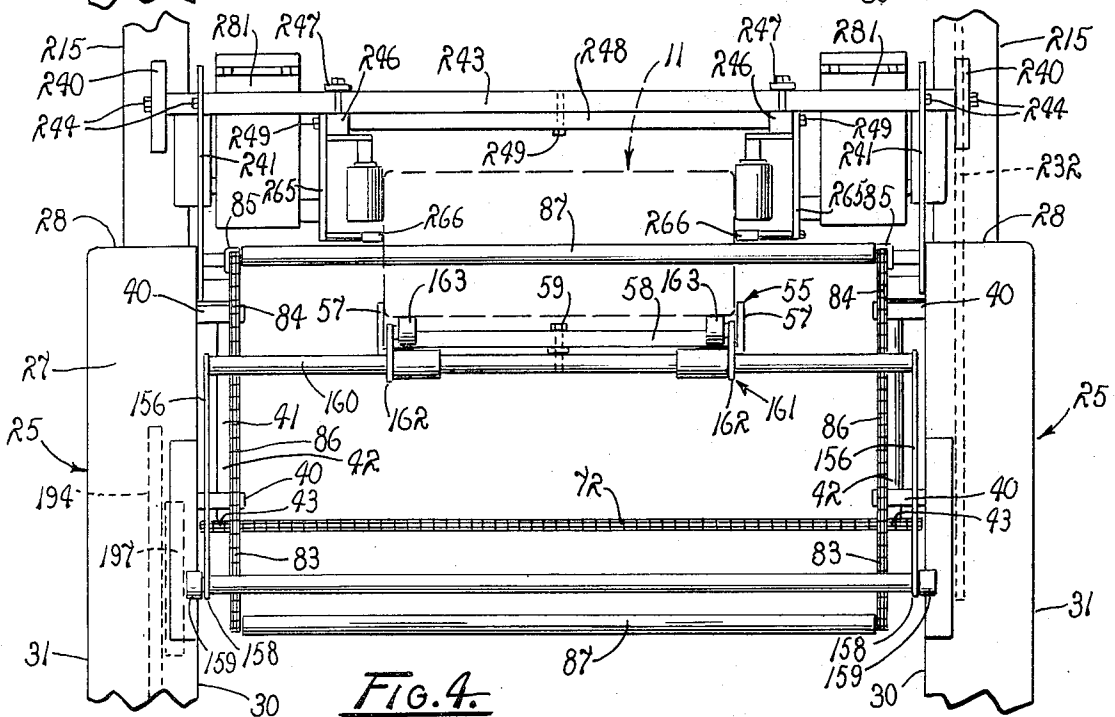
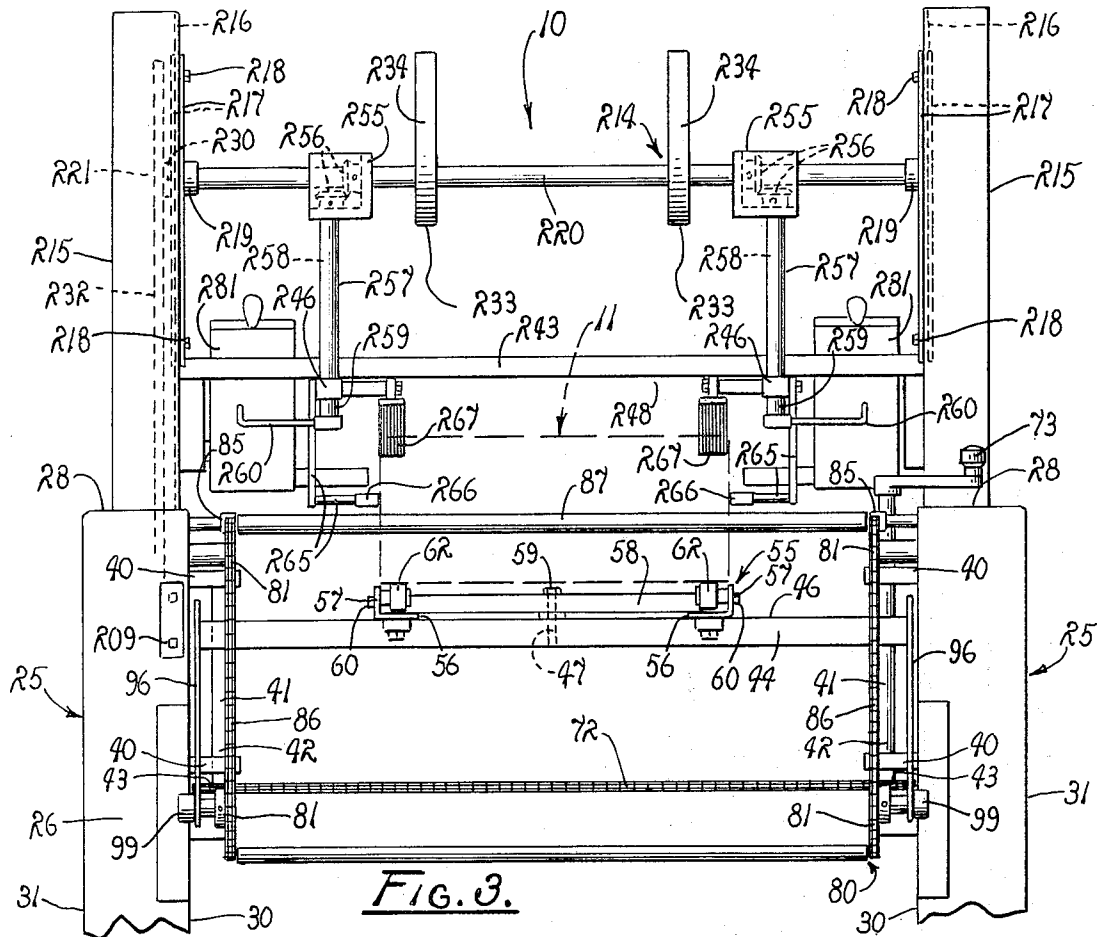
An apparatus for sealing containers having upstanding longitudinal and transverse flap portions, the apparatus having a conveyor for the motivation of containers therealong in spaced intervals; a folding mechanism, having tucking fingers and folding arms, mounted in spaced relation to the conveyor and synchronous therewith, the fingers being adapted to tuck the transverse flap portions and the arms to fold the longitudinal flap portions to overlay their respective containers during passage along the conveyor; an adhesive applicator mounted adjacent to the folding mechanism for the application of adhesive to selected areas of the flap portions; and pressure rollers mounted adjacent to the applicator to fold the selected areas of the flap portions into contact with the container and to maintain such contact during passage of the container along the conveyor until the adhesive sets.

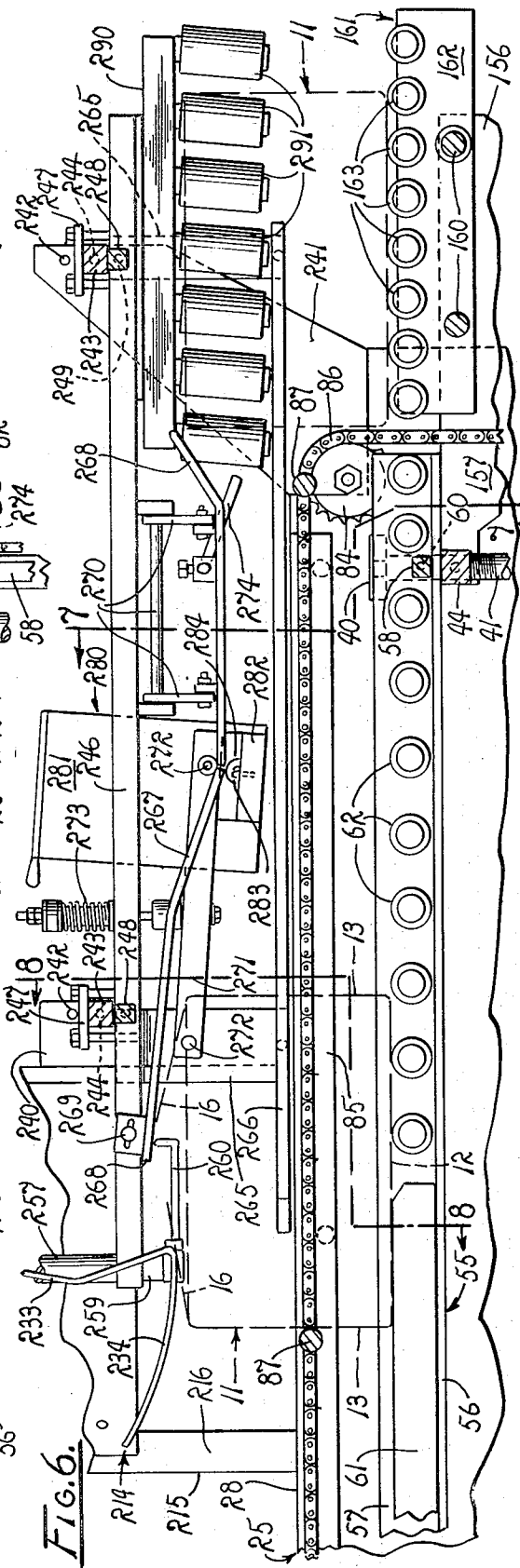
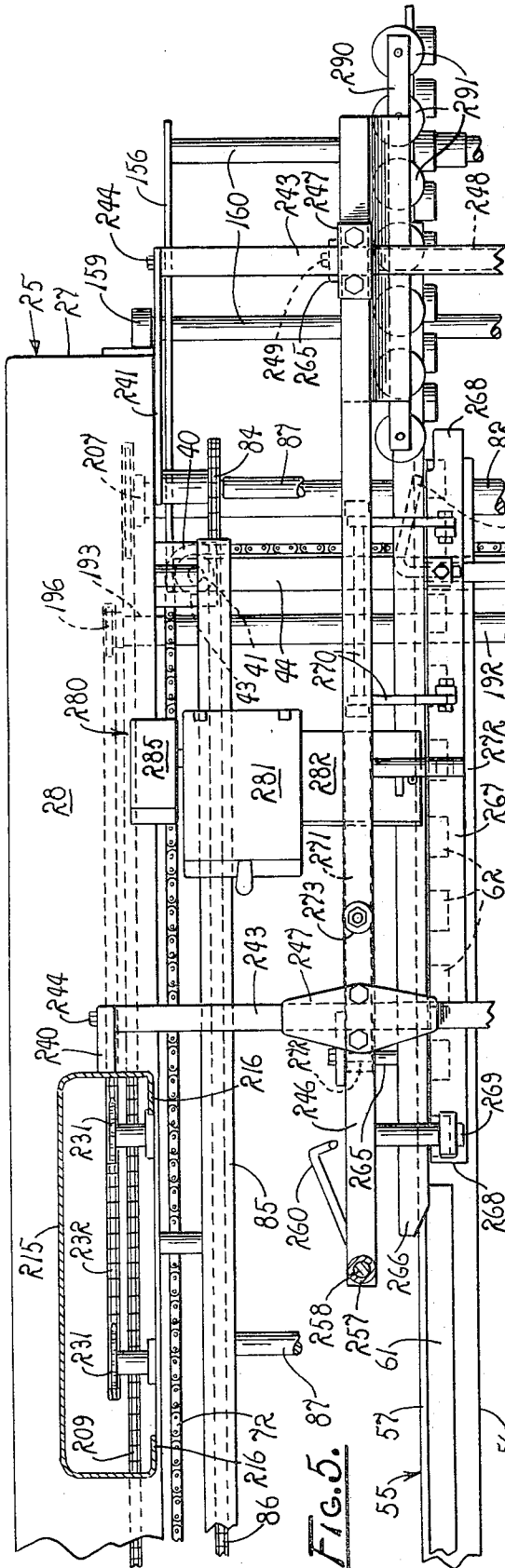
22 Claims, 11 Drawing Figures











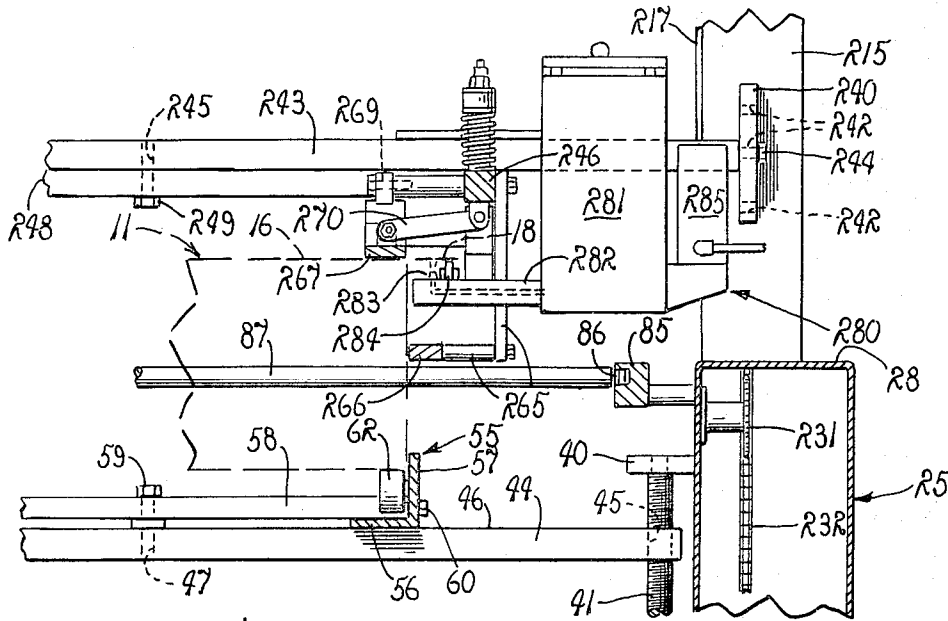


FIG. 7.

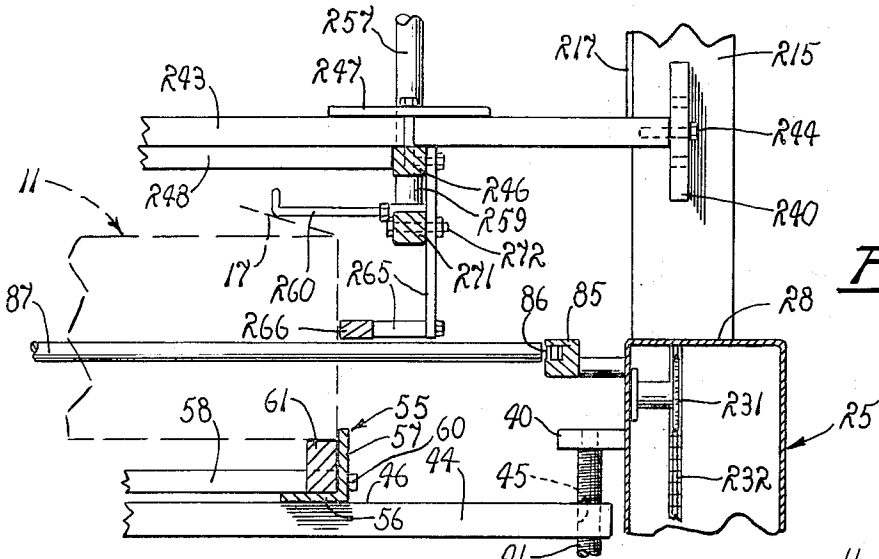


FIG. 8.

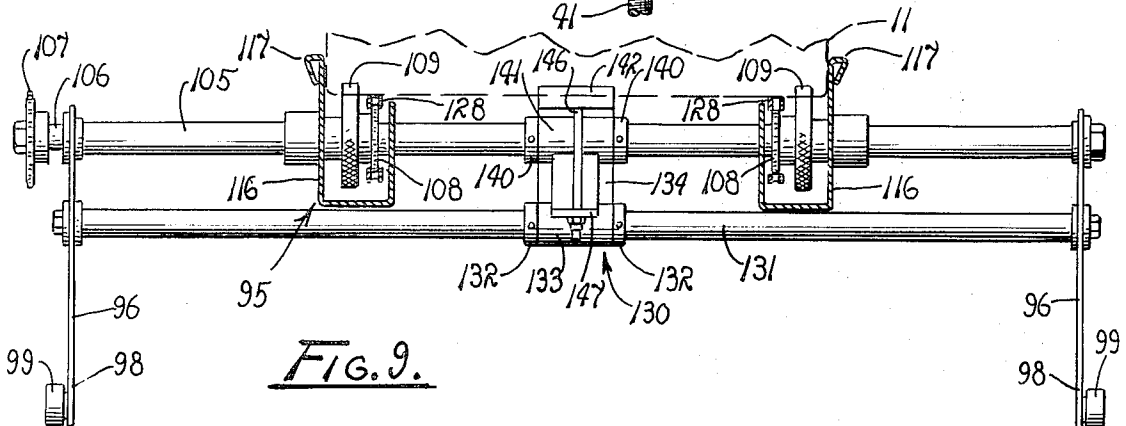
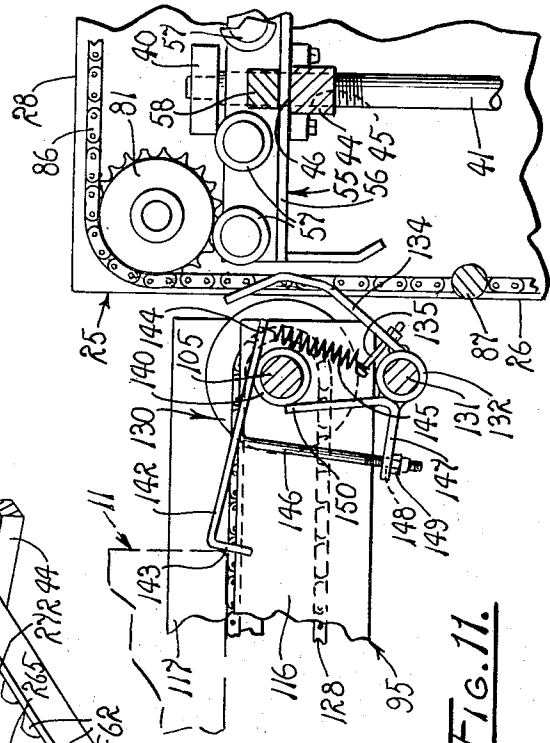
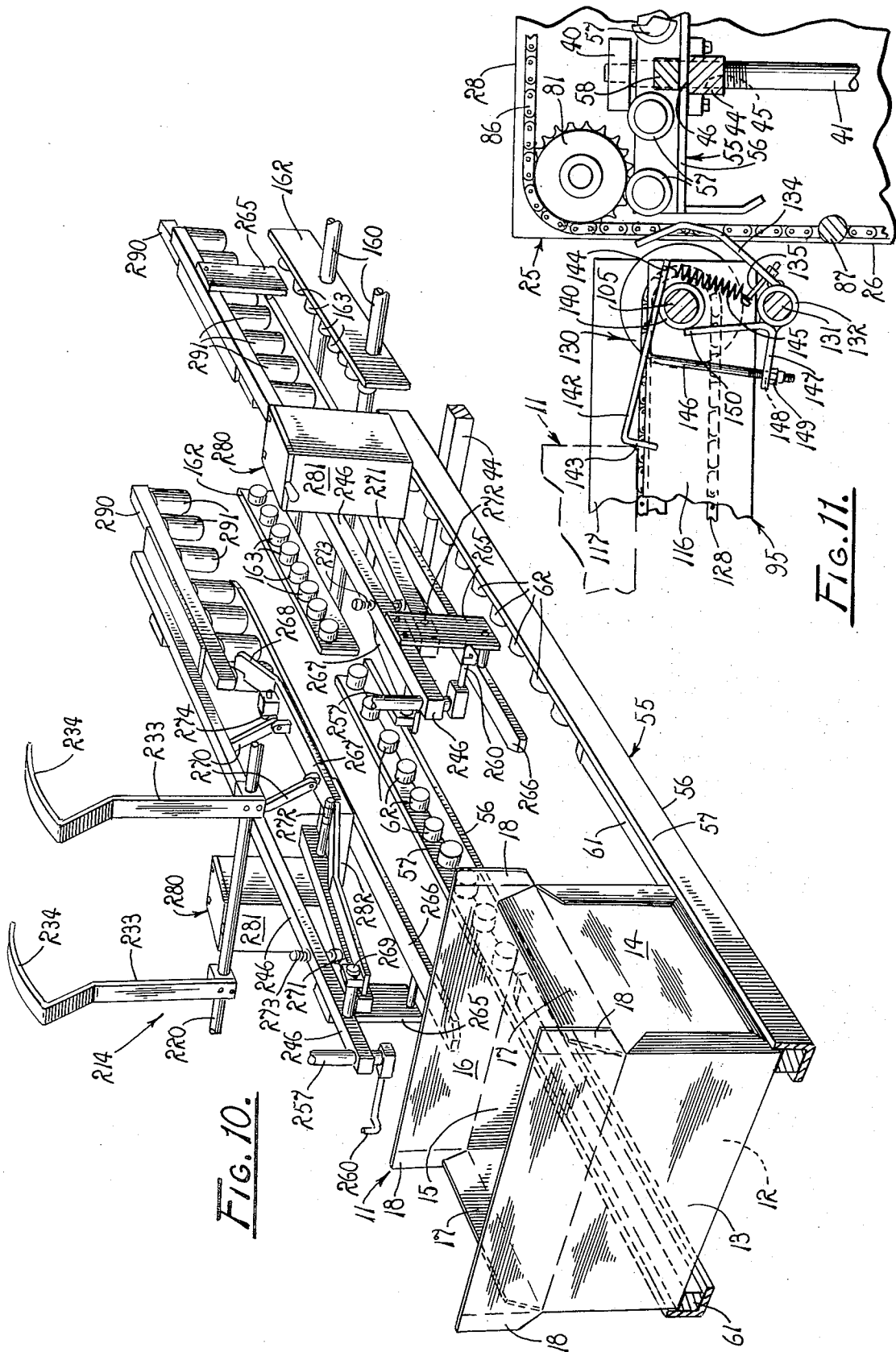


FIG. 9.



CONTAINER SEALING APPARATUS

BACKGROUND OF THE INVENTION

The present invention relates to a sealing apparatus and more particularly to such a sealing apparatus which is adaptable to fold and adhesively seal containers having upstanding longitudinal and transverse flap portions and to do so with a maximum of dependability and a minimum of power and which is adjustable with a minimum of effort for the selected handling of containers of varying configurations.

A wide variety of types of container folding and sealing machines are currently in use in industry. Such conventional machines are deficient in several important respects. Many containers have upstanding flap portions which must be folded in a preselected configuration relation to each other normally with corresponding opposite flap portions folded toward each other and the other flap portions subsequently folded so as to overlay the first flap portions. This operation is conventionally done in two stages often requiring each container to be individually manipulated and reoriented as it passes along the assembly line thus slowing production. Such machines are expensive to maintain, susceptible to breakdown and wasteful of energy.

Conventional machines are essentially designed to handle containers of a single predefined configuration. While modification to handle other types of containers is possible, such modification often amounts to a major rebuilding of the machine involving considerable time and expense. This shutdown time may mean that an entire assembly line must also be shut down. Particularly in the packaging of seasonal food products, it is frequently necessary to modify the machinery to handle containers for packaging different varieties of food products. Where such seasonal production is the practice, this substantial shutdown time for modification is costly and results in inefficiency.

Furthermore, the adjustment of such machines to handle containers of different sizes and configurations often requires several readjustments in order to attain dependable operation without malfunction. Such readjustment in itself is of considerable expense and containers which are improperly folded and sealed can damage or cause other handling equipment to malfunction.

Still another deficiency existent in conventional container folding and sealing machines is the inefficient use of power to accomplish the work to be performed. Where several types of work are performed in such a machine, it is frequently the practice to utilize a different source of power for each of the types of work performed. Thus, a different motor may be employed to operate each of the conveyors used and frequently hydraulic or pneumatic manipulating systems are used for folding or gluing operations. While such a plurality of power sources may accomplish the work objectives, it is extremely inefficient and makes the apparatus susceptible to breakdown at a plurality of different points thereby multiplying the chances that shutdown will occur. Furthermore, where such a plurality of power sources is employed, the relative adjustment of the power sources for synchronous operation of the machine is often difficult and thus expensive.

Therefore, it has long been recognized as desirable to have a sealing apparatus capable of sealing containers

having upstanding flap portions which is easily and dependably adjustable to handle containers of a variety of configurations on an assembly line basis and which utilizes a single power source for synchronously driving the related work performing systems of the apparatus so as to minimize the opportunity for breakdown.

SUMMARY OF THE INVENTION

In view of the foregoing, it is an object of the present invention to provide an improved container sealing apparatus.

Another object is to provide such an apparatus which is adjustable for the sealing of containers of a variety of configurations and sizes.

Another object is to provide such an apparatus which is capable of performing both folding and tucking actions with respect to containers having upstanding flap portions in one synchronous operation as the containers are motivated in spaced intervals through the apparatus.

Another object is to provide such an apparatus which utilizes a single major source of power for the operation of the various related systems of the apparatus so as to minimize malfunction and breakdown.

Another object is to provide such an apparatus which utilizes a single major source of power so as to maximize the efficiency with which work is performed as containers are motivated along the apparatus.

Another object is to provide such an apparatus which has a staging mechanism for precisely positioning containers in spaced intervals during transportation through the apparatus for the synchronous performance of work with respect thereto.

Another object is to provide such an apparatus which is capable of performing all of its work during passage of the containers through the apparatus without the necessity of removing the containers or otherwise reorienting the containers with respect to the apparatus for the performance of the work to be done.

Another object is to provide such an apparatus which automatically applies adhesive to selected areas of the flap portions of the container and subsequently folds the areas into contact with the container maintaining pressure thereagainst during passage along the apparatus sufficient for the adhesive to set.

Another object is to provide such an apparatus which has several conveyors which may be simultaneously conditioned for the handling of containers of different sizes and shapes by means of a simple adjustment.

Another object is to provide such an apparatus which minimizes the frequency with which readjustment of the apparatus is required once initially adjusted to handle containers of different configurations and sizes.

A further object is to provide such an apparatus which is of relatively simplified construction so as to facilitate repair and adjustment of the apparatus.

A still further object is to provide such an apparatus which is of durable and dependable construction so as to maximize operating efficiency.

Other objects and advantages of the present invention will subsequently become more clearly apparent upon reference to the following description.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a side elevation of the sealing apparatus of the present invention.

FIG. 2 is a top plan view of the sealing apparatus.

FIG. 3 is a fragmentary front elevation of the apparatus with a portion thereof removed for illustrative convenience.

FIG. 4 is a fragmentary rear elevation of the apparatus.

FIG. 5 is a somewhat enlarged fragmentary top plan view of the apparatus.

FIG. 6 is a fragmentary longitudinal vertical section of the apparatus.

FIG. 7 is a fragmentary transverse vertical section taken from a position indicated by line 7—7 in FIG. 6.

FIG. 8 is a fragmentary transverse vertical section taken from a position indicated by line 8—8 in FIG. 6.

FIG. 9 is a fragmentary transverse vertical section taken on line 9—9 in FIG. 1.

FIG. 10 is a fragmentary perspective view of the apparatus showing a container having upstanding longitudinal and transverse flap portions received for movement therealong.

FIG. 11 is a somewhat enlarged fragmentary longitudinal vertical section taken on line 11—11 in FIG. 2.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring more particularly to the drawings, the sealing apparatus of the present invention is generally indicated by the numeral 10 in FIG. 1. The apparatus is adapted to handle containers or boxes 11 such as that shown in FIG. 10. The box shown and herein described is known in the trade as a Bliss-type cardboard box which is characterized by having one pre-cut integral blank which is scored and folded in such a manner as to provide the bottom and at least two sides for the box. However, it will become apparent that the apparatus is capable of handling a variety of types and configurations of boxes.

Each of the boxes 11 has a rectangular bottom wall 12 having a pair of upstanding opposite side walls 13 continuous therewith. A pair of opposite end walls 14 is secured on the bottom wall and interconnects the side walls in spaced relation so as to form a receptacle 15 for the receipt of the material to be packaged therein. As shown in FIG. 10, the side walls individually afford upstanding longitudinal flap portions 16. The end walls individually mount coextensive upstanding transverse flap portions 17. Each of the longitudinal flap portions provides a pair of oppositely extending tab portions 18. It will be appreciated that the apparatus is most frequently employed to receive boxes configured as described and shown in FIG. 10 with the receptacle thereof already filled with the material to be packaged.

The sealing apparatus 10 has a pair of spaced, substantially parallel upright frames or frame housings 25 defining an entrance end 26 on the left and an exit end 27 on the right, as viewed in FIG. 1, with work stations situated therebetween as will subsequently be more fully described. Each of the housings has an upper surface 28 and an opposite lower edge 29. The housings each provide spaced parallel interior and exterior walls 30 and 31 respectively. Each of the housings is adapted for support on any suitable surface 32 by a pair of wheels 33 individually rotationally mounted on the housing adjacent the entrance and exit ends thereof, the peripheries of which extend below the lower edge

of their respective housing for engagement with the surface.

Two pair of mounting brackets 40 are affixed on the interior wall 30 of each frame housing 25 individually adjacent to the entrance end 26 and the exit end 27 thereof. As shown best in FIG. 8, the brackets extend inwardly of the apparatus 10 in substantially horizontal relation and in vertical alignment. The corresponding brackets of each pair of brackets on both frame housings are disposed in a pair of parallel common planes. A screw threaded adjustment shaft 41 is threadably received in each pair of brackets extending in substantially vertical relation therebetween. Each shaft has a remote end 42 which extends a short distance below the lower bracket of each pair of brackets. A sprocket 43 is mounted on the remote end of each shaft for rotational movement with the shaft. A pair of conveyor support rods 44, having opposite internally threaded ends 45 defining axes normal to the rods and upper surfaces 46, are screw threadably received on the corresponding adjustment shafts of each housing adjacent to the entrance end and exit end thereof. The support rods extend transversely of the apparatus 10 and are disposed in a common substantially horizontal plane. It will be seen that the support rods are vertically, screw threadably adjustable by the simultaneous rotation of the adjustment shafts. Each support rod has a central threaded bore 47 extending into its upper surface.

A sealing section or stationary conveyor is generally indicated by the numeral 55 in FIG. 1 extending substantially horizontally from the entrance end 26 to the exit end 27 of the frame housings 25 extending through the work stations. The conveyor consists of a pair of right-angled conveyor bars 56 rested in spaced parallel relation on the conveyor support rods 44 facing inwardly, as best shown in FIG. 2. Each of the conveyor bars has a back portion 57. The conveyor bars are secured on the support rods 44 by means of width adjustment bars 58 of selected length. The width adjustment bars are fastened between the conveyor bars and above each of the support rods with bolts 59 screw threadably extended through the width adjustment bars and into the central threaded bore 47 of each support bar. A pair of bolts 60 are individually received through the back portions of the conveyor bars and inwardly into the ends of the width adjustment bars so as firmly to secure the right-angled conveyor bars in the precise desired position on the support rods 44. It will be seen that through the use of width adjustment bars of the length desired the stationary conveyor 55 will always be mounted precisely centrally of the apparatus and be of the precise desired width so as to minimize the possibility for human error.

A slide bar 61 is mounted on each of the right-angled conveyor bars in a predetermined position spaced from the entrance end 26 of the frame housings 25 and extending longitudinally thereof a predetermined distance. A plurality of idle wheel rollers 62 are rotationally secured on the back portions 57 of each of the conveyor bars in alignment throughout the entire length thereof with the exception of the area in which the slide bar is mounted.

A brace 70 is mounted on the interior walls 30 of the frame housings 25 extending transversely therebetween inwardly spaced from the exit end 27 of the housings. A tension sprocket 71 is rotationally mounted on the brace extending therebelow midway between the inter-

ior walls of the housings and defining a common plane with the sprockets 43. An adjustment chain 72 is operably extended about the sprockets 43 and inwardly about the tension sprocket 71, as best shown in FIG. 2. An adjustment handle 73 is extended upwardly from the screw threaded adjustment shaft 41 adjacent to the entrance end 26 of the housings 25. It will be seen that by rotation of the handle, the sprockets 43 are simultaneously caused to be rotated by the adjustment chain 72 to in turn correspondingly rotate all four adjustment shafts 41 so as vertically to adjust the stationary conveyor 55 on the support rods 44.

A driven conveyor, indexing mechanism, or conveying mechanism is generally indicated by the numeral 80 in FIG. 1 extending longitudinally about the stationary conveyor 55. The mechanism affords two pairs of sprockets 81 individually secured on the interior walls 30 of each frame housing 25 adjacent to the entrance end 26 thereof in spaced vertically aligned relation. A drive shaft 82 is rotationally mounted on the interior walls 30 so as to interconnect the frame housings 25 and extends transversely of the apparatus 10 adjacent to the exit end 27 thereof spaced from the upper surface 28 of the housings. A pair of enlarged drive sprockets 83 are mounted for rotation with the drive shaft in spaced relation thereon so as individually to define common vertical planes with the corresponding pairs of sprockets 81 of each frame housing. An upper sprocket 84 is mounted on the interior wall of each frame housing in horizontal alignment with the upper sprocket of each pair of sprockets 81 and in vertically spaced relation to their respective drive sprockets 83, as best shown in FIG. 1. A chain guide 85 is mounted on the interior wall of each frame housing extending horizontally between the top of the upper sprocket of each pair of sprockets 81 and the top of the upper sprocket 84 of that frame housing. As shown in FIG. 1, a conveyor chain 86 is operably extended about the pair of sprockets 81, the upper sprocket 84 and the drive sprocket 83 of each frame housing. A plurality of flight bars 87 are mounted on the chains so as to interconnect the chains and extend transversely of the apparatus 10 in precise, predetermined spaced relation as will subsequently be more clearly described.

A delivery section or staging conveyor is generally indicated by the numeral 95 in FIG. 1 operably mounted on the frame housings 25 at the entrance end 26 thereof and defining a passage between it and the stationary conveyor 55. A pair of mounting plates 96, each having a mounting arm 97 and a lower end 98, are mounted in spaced parallel relation on the stationary conveyor 55. The mounting arms are attached to respective opposite ends of the conveyor support rods 44. A roller 99 is mounted on the lower end of each mounting plate and extends outwardly therefrom so as to contact the entrance end 26 of the adjacent frame housing 25. Thus, it can be seen that the staging conveyor is vertically adjustable with the stationary conveyor 55 through rotation of the adjustment handle 73 as previously described.

A staging conveyor drive shaft 105 is rotationally mounted in the mounting plates 96 extending transversely therebetween immediately adjacent to the entrance end 26 of the frame housings 25. The shaft has a drive end 106 extending through the mounting plate outwardly thereof to the extreme left, as viewed in FIG. 9. A drive sprocket 107 is mounted on the drive end of

the shaft for rotational movement therewith. A pair of conveyor sprockets 108 is mounted in spaced relation on the drive shaft for rotational movement therewith. A friction wheel 109 of somewhat larger diameter than sprockets is mounted outwardly of each of the sprockets for rotational movement with the drive shaft.

A pair of guides 116 having upwardly extending portions 117 are connected to the drive shaft 105 in nonrotational spaced relation. Each guide is inwardly bent opposite to its upwardly extending portion and then upwardly bent parallel to the upwardly extending portion so as to enclose its respective conveyor sprocket 108 and friction wheel 109, as best shown in FIG. 9. The guides extend in parallel relation to the left, as viewed in FIG. 1, away from the entrance end 26 of the frame housings 25 and have remote ends 118.

A vertically adjustable support assembly 119, having a horizontal cross bar 120, downwardly extending adjustable legs 121, and connecting arms 122 is mounted on the entrance end 26 of the housings 25 with the cross bar in supporting relation to the remote ends 118 of the guides 116. The assembly is connected to the housings by the arms. The legs are engageable with the surface 32. The cross bar affords a screw threaded bore 123 centrally thereof. A width adjustment bar 124 of the precise desired length is mounted on the cross bar with a bolt 125 threadably extending through the adjustment bar and into the central bore of the cross bar. As with adjustment bar 58, a pair of bolts 126 is individually screw threadably received through the guides into the opposite ends of the adjustment bar to mount the guides in the precise desired spaced relation. A pair of sprockets 127 is individually rotationally mounted in the remote ends of the guides. A pair of endless conveyor chains 128 are individually extended about corresponding conveyor sprockets 108 and 127, as best shown in FIG. 2. The guides and associated sprockets, friction wheels, and conveyor chains are adjustable to and from each other after removal and replacement of the width adjustment bar, as previously described, with respect to adjustment bar 58 and by loosening of the attachment of the sprockets 108 and friction wheels so as to permit slidable movement on the drive shaft 105.

A staging mechanism is generally indicated by the numeral 130 in FIG. 1. The mechanism includes a lever shaft 131 mounted in fixed relation on the mounting plates 96 extending therebetween parallel to the drive shaft 105. A pair of lock rings 132 is affixed in spaced relation on the lever shaft centrally thereof. A sleeve 133 is rotationally received about the lever shaft between the lock rings. An angularly bent lever arm 134 is secured on the sleeve so as normally to extend upwardly therefrom spaced from the drive shaft 105, as best shown in FIG. 11 and as will subsequently be more fully described. The remote upwardly extending end of the lever arm is of such a length so as not to extend above the friction wheels 109 of the drive shaft 105. An adjustable bolt 135 is fastened on the lever arm so as to extend therefrom substantially tangential to the sleeve 133.

A pair of lock rings 140 is secured in fixed, spaced relation on the drive shaft 105 in precise alignment with the lock rings 132. A sleeve 141 is rotationally mounted on the drive shaft between the lock rings. A stop or control plate 142, having a downwardly bent abutment end 143 and an attachment end 144, is af-

fixed on the sleeve 141 for rotation therewith. A tension spring 145 interconnects the remote end of the adjustable bolt 135 and the attachment end of the control plate. A rod 146 is mounted on and extends downwardly from the control plate intermediate the sleeve and the abutment end of the control plate. An angled flange 147 is affixed on the sleeve 133 and has a borehole 148 at the remote end thereof. The rod is extended through the borehole and a nut 149 is threadably secured on the remote end of the rod so as to maintain the staging mechanism 130 in the relationship shown in FIG. 11. The angled flange has an opposite end 150 remote from the borehole which contacts the sleeve 141 of the drive shaft to restrain the lever arm 134 against further clockwise rotation as viewed in FIG. 11.

A compression section or discharge conveyor is generally indicated by the numeral 155 in FIG. 1 mounted on the frame housings 25 at the exit end 27 thereof defining a passage between it and the stationary conveyor 55. The discharge conveyor has a pair of parallel mounting plates 156, having mounting arms 157 and lower ends 158. The mounting plates are secured at the remote ends of their mounting arms on the opposite ends of the conveyor support rod 44 adjacent to the exit end 27 of the frame housings 25. A pair of rollers 159 is individually fastened on the lower ends of the plates so as to engage the exit ends of the frame housings. A pair of parallel shafts 160 is affixed on the mounting plates so as to extend transversely of the discharge conveyor at the uppermost portions of the mounting plates. An idle roller conveyor 161 is secured on the pair of shafts intermediate the mounting plates in substantial alignment with the stationary conveyor 55. The conveyor consists of a pair of bars 162 which is individually mounted on the shafts so as to be positionally to and from each other. Each of the bars has a plurality of idle rollers 163 rotatably mounted thereon with their upper peripheries extending above their respective bar. Since the discharge conveyor is mounted on the conveyor support rods 44, as with the staging conveyor 95 and as previously described, use of the adjustment handle 73 simultaneously vertically adjusted the stationary conveyor 55, the staging conveyor, and the discharge conveyor.

A motor mounting plate 170, having a pivot shaft 171 extending in fixed, right angular relation therefrom, is mounted on the interior wall 30 of the frame housing 25 on the right in FIG. 3 with the pivot shaft extending through the inner wall into the interior of the housing. An arcuate passage 172 is provided in the interior wall spaced below the pivot shaft and substantially concentric thereto. A power source or electric motor 173, having a drive shaft 174, is mounted on the mounting plate 170 with the drive shaft extending through the mounting plate and the arcuate passage of the interior wall. A split V-pulley 175 composed of two halves is affixed on the drive shaft of the electric motor within the interior of the frame housing. The split V-pulley is spring loaded in the conventional fashion so that an increase in tension of a V-belt extended thereabout causes the halves of the pulley to separate against compression of the spring so as to reduce the operable diameter of the pulley and thereby increase the numbers of revolutions per minute supplied by the pulley to the V-belt.

A lever arm 180 is secured on the pivot shaft 171 of the mounting plate 170 inwardly of the interior wall 30 and has a control rod 181 pivotally connected to the remote end thereof, as best shown in FIG. 1. The rod has a threaded upper end 182 which is extended through the upper surface 28 of the frame housing 25. An internally threaded control nut 183 is rotationally mounted on the upper surface of the frame housing in screw threaded engagement with the threaded upper end of the control rod. Thus, adjustment of the control nut on the control rod causes the electric motor 173 to be pivoted and therefore drive shaft 174 to be pivoted in the arcuate passage 172 thereby permitting adjustment of the tension on the split V-pulley 175.

A second drive shaft 192 is rotationally mounted in the interior walls 30 of the frame housings 25 extending transversely therebetween parallel to the first drive shaft 82, as best shown in FIG. 1. The second drive shaft has opposite ends 193 which extend into the interior of each of the frame housings. A pulley 194 is secured on the opposite end of the second drive shaft within the frame housing mounting the electric motor 173. A V-belt 195 is operably extended about the pulley and the split V-pulley 175 in driving relation. A sprocket 196 is fastened on the other opposite end of the second drive shaft within the other frame housing for rotation with the shaft. A pair of engaged drive gears 197 is individually mounted in driving engagement on the second drive shaft 192 and the first drive shaft 82 so as to supply power to the first drive shaft. Thus, power is supplied from the electric motor to operate the conveying mechanism 80 which is driven off the first drive shaft by way of the pair of drive sprockets 83.

A drive sprocket 207 is affixed on the first drive shaft 82 within the frame housing 25 opposite that having the electric motor 173 mounted thereon. A pair of tension sprockets 208 is mounted in closely spaced relation on the interior wall 30 within the same frame housing. A drive chain 209 is operably extended about the drive sprocket 107 of the staging conveyor 95, over the tension sprockets 208 and about the drive sprocket 207, as best shown in FIG. 1. Thus the staging conveyor 95 is driven from the electric motor 173 through the drive shaft 82.

A folding mechanism is generally indicated by the numeral 214 in FIG. 1 mounted in one of the work stations. The folding mechanism has a pair of support housings 215 individually mounted on the upper surface 28 of the frame housings 25 in upstanding relation approximately midway between the entrance end 26 and the exit end 27 thereof. As shown in FIG. 5, each of the support housings is inwardly bent to define a pair of parallel mounting flanges 216 extending upwardly in vertical relation from the upper surface of the frame housing. Mounting plates 217 are mounted in facing engagement on each support housing with the mounting flanges disposed therebetween. The plates are held securely in position by bolt assemblies 218 extending through the plates so as to bind the flanges therebetween. The mounting plates of each support housing provide a bearing 219 mounted centrally thereof so that both bearings of the support housings have a substantially horizontal axis extending transversely of the sealing apparatus 10. A drive shaft 200 is rotationally received in the bearings so as to extend between the support housings. The drive shaft has a drive end 221

extending into the interior of the support housing on the left as viewed in FIG. 3.

A drive sprocket 230 of relatively great diameter is mounted on the drive end 221 for rotation with the drive shaft 220. Two pairs of tension sprockets 231 are mounted on the interior wall 30 of the frame housing 25 on the left as viewed in FIG. 3 in spaced relation. As viewed in FIG. 1, a drive chain 232 is operably extended about the sprocket 196 of the first drive shaft 82, both pairs of tension sprockets 231, and about the drive sprocket 230. Thus the drive shaft 200 is operated by the electric motor 173 through the first drive shaft 82 and the drive chain 232. A pair of folding arms 233 is secured on the drive shaft 220 in spaced relation extending substantially normal thereto. Each of the arms has a remote cam or arcuate folding portion 234 providing an arc substantially concentric to the drive shaft.

A mounting bracket 240 is affixed on each of the support housings 215 in vertical relation extending toward the exit end 27 of the frame housings 25. A mounting arm 241 is secured on the exit end of each frame housing extending upwardly therefrom, as best shown in FIG. 1. Both the mounting bracket and arm of each frame housing has a plurality of vertically aligned adjustment holes 242 therein. Each hole is in horizontal alignment with the corresponding hole of the other brackets and arms. A pair of slide supports or support bars 243 are individually mounted extending between corresponding adjustment holes 242 of the mounting brackets and corresponding holes of the mounting arms. The support bars are secured in their respective positions by bolts 244 extending through the holes of their respective mounting arms and brackets endwise of the support bars. So mounted the support bars extend transversely of the sealing apparatus 10, as best shown in FIG. 2. Each support bar has a central threaded bore 245.

A pair of sub frames or mounting bars 246 is mounted on the support bars 243 in predetermined spaced parallel relation extending longitudinally of the sealing apparatus 10, also as best shown in FIG. 2. The mounting bars are secured on the support bars by means of adjustable bracket assemblies 247. Precise spacing of the mounting bars is accomplished by the use of a pair of width adjustment bars 248 which, like the width adjustment bars 58 are of the precise length desired to separate the mounting bars. The adjustment bars are individually secured transversely between the mounting bars on their respective support bars and maintained in position by bolts 249. One of the bolts of each bar is screw threadably received in the central threaded bore 245 of that support bar. The other bolts individually extend through their respective mounting bars and into the ends of the adjustment bars.

As best shown in FIG. 3, a pair of gear boxes 255, having engaged bevel gears 256 operably mounted therein in connection with the drive shaft 220, is mounted on the drive shaft in nonrotational relation spaced outwardly from the folding arms 233. A sleeve 257 interconnects each of the gear boxes and the end of the adjacent mounting bar 246 nearest the entrance end 26 of the frame housings 25. Each of the sleeves extends in nonrotational vertical relation therebetween. A drive shaft 258 is rotationally received in the sleeve in driven engagement with the bevel gears 256 at one end thereof and having a lower end 259 ex-

tended downwardly through the end of the mounting bar. A tucking mechanism or finger 260 is mounted in fixed relation on the lower end of each of the drive shafts extending normal thereto for rotation in a substantially horizontal plane. The tucking fingers 260 and the folding arms 233 are mounted in cooperative rotational relation as will subsequently be more fully explained.

A pair of guide brackets 265 are affixed on and extend below each of the mounting bars 246 in spaced relation. A guide bar 266 is mounted on the downwardly extending ends of the guide brackets extending in horizontal relation in alignment with the right angled conveyor bars 56 of the stationary conveyor 55 and immediately above the conveying mechanism 80, as best shown in FIG. 6. A guide or compression arm 267, having opposite ends 268, is fastened on each of the mounting bars 246 extending therebelow. The arms are angled downwardly as shown in FIG. 6 and are individually connected to their respective mounting bars at the end thereof nearest the entrance end 26 of the frame housings 25 by slotted pivotal connection 269 and adjacent to the other end thereof by a floating linkage 270. Linking arms 271 are individually mounted on the guide brackets 265 adjacent to the entrance end of the frame housings and at the other of their ends to the compression arms 267 intermediate their opposite ends by pivotal connections 272. A pair of compression spring assemblies 273 interconnect the mounting bars 246 and their respective linking arms 271 and are adapted to reduce upward pressure against the compression arm. A guide finger 274 is fastened on each compression arm in a position adjacent to the floating linkage and extends a short distance inwardly of the apparatus from the compression arm.

An adhesive dispensing mechanism is generally indicated by the numeral 280 in FIG. 7 mounted in one of the work stations. The mechanism consists of a pair of adhesive containers 281, each having an extension 282 extending inwardly between the guide bar 266 and compression arm 267. Each of the containers is mounted intermediate the compression spring assembly 273 and floating linkage 270 of the compression arm 267, as shown in FIG. 6 by connection of the extension to its respective linking arm 271. Thus, each adhesive container is adapted for vertical floating movement with its respective linking arm. A nozzle 283, adapted to dispense adhesive is affixed on the upper surface of the extension remote from the container. A metering wheel 284 is operably mounted in the extension adjacent to the nozzle and adapted to contact the tab portion 18 of a box 11 being transported along the stationary conveyor 55 and to dispense adhesive through the nozzle during such contact. A heating unit 285 is fastened on the adhesive container and connected to a source of power, not shown, adapted to heat adhesive received within the container to a selected optimum temperature.

A compression roller assembly 290 is mounted on each of the mounting bars 246 above the discharge conveyor 155. Each of the roller assemblies mounts a plurality of pressure rollers 291 extending downwardly therefrom in parallel relation in approximate individual vertical alignment with the adjacent bar 162 of the idle roller conveyor 161 and slightly oblique to the intended direction of movement of the containers 11 along the

stationary and discharge conveyors 55 and 155 respectively.

OPERATION

The operation of the described embodiment of the subject invention is believed to be clearly apparent and is briefly summarized at this point. The sealing apparatus 10 is most advantageously employed in an assembly line for successively sealing successive boxes 11 transported along the assembly line subsequent to being packed. The boxes are delivered to the sealing apparatus in the configuration shown in FIG. 10 having upstanding longitudinal and transverse flap portions 16 and 17 respectively. The boxes are delivered to the sealing apparatus oriented so that the longitudinal flap portions of the boxes are extending transversely of the apparatus as shown in FIG. 10. The sealing apparatus is oriented with respect to the assembly line so that the staging conveyor 95 is in box receiving relation to the immediately preceding conveyor.

As previously described, the electric motor 173 is operated to drive the second drive shaft 192 and the first drive shaft 82 by way of the V-belt 195. The staging conveyor 95 is operated through the drive chain 209 to rotate the pair of conveyor chains 128 in a clockwise direction, as viewed in FIG. 1. Simultaneously the folding mechanism 214 is operated through the drive chain 232 to rotate the folding arms 233 in a counterclockwise direction as viewed in FIG. 1. The tucking fingers 260 are rotated through the drive shafts 258 and gear boxes 255. The tucking finger in the lower portion of FIG. 2 is rotated in a clockwise direction while the tucking finger in the upper portion of FIG. 2 is rotated in a cooperative counterclockwise direction. Simultaneously the conveying mechanism 80 is driven from the first drive shaft 82 to rotate the conveyor chains 86 and interconnecting flight bars 87 in a clockwise direction, as viewed in FIG. 1.

As the boxes 11 are delivered to the staging conveyor 95, the conveyor chains 128 motivate the boxes therealong until the lead box contacts the abutment end 143 of the control plate 142. Timing of the passage of the boxes through the apparatus 10 is controlled by the positioning of the flight bars 87 of the rotating conveying mechanism 80. As can best be seen in FIG. 11, a passing flight bar contacts the lever arm 134 and pivots the arm in a counterclockwise direction. This causes the angled flange 147 to rotate with the sleeve 133 pulling the control plate to a horizontal position allowing the box to pass over the control plate carried by the conveying mechanism 80. After passage of the flight bar the lever arm is pivotally returned to the position shown in FIG. 11 by spring 145 with the opposite end 150 of the angled flange 147 contacting the sleeve 141 to limit pivotal movement of the lever arm. While a box is passing over the control plate, the weight of the box prevents the control plate from returning to the position shown in FIG. 11. Movement of the rod within the borehole 148 permits relative movement between the control plate and the lever arm so as to permit the lever arm to return to its normal position before the control plate has done so. However, when the box has passed over the control plate the tension spring 145 again rotates the control plate to the position shown in FIG. 11 until the passage of another flight bar again operates the staging mechanism 130.

As each box 11 reached the end of the staging conveyor 95 the friction wheels 109 lift the box over the staging mechanism 130 and introduce it into the entrance end 26 of the frame housings 25 on the stationary conveyor 55. Momentum carries the box a short distance on the conveyor, but contact with the next successive flight bar 87 carries the box through the sealing apparatus 10, as shown in FIG. 6. Contact with the slide bars 61 prevents the box from being carried farther through the apparatus until the next flight bar contacts the box.

As a flight bar 87 contacts the box 11 and initiates movement over the slide bar 61, operation of the folding mechanism 214 comes into play. The tucking fingers 260 are simultaneously rotated to contact the transverse flap portions 17 of the box to tuck them inwardly in partial covering relation to the receptacle 15 of the box. Cooperatively, the forwardmost longitudinal flap portion 16 of the box contacts the compression arm 267 as the box is carried along by the flight bar. As shown in FIG. 6, the gradual downward slope of the compression arm causes the forwardmost longitudinal flap portion to be folded downwardly in covering relation to the receptacle. Simultaneously, the folding arms 233, rotating in a counterclockwise direction, as viewed in FIG. 6, contact the rearwardmost longitudinal flap portion of the box folding it forwardly in covering relation to the receptacle. Thus, the longitudinal flap portions overlay both the receptacle and the transverse flap portions of the box.

As movement of the box 11 is continued through the sealing apparatus 10, the slope of the compression arms 267 insures that the longitudinal and transverse flap portions 16 and 17 respectively of the box are folded flat in covering relation to the receptacle 15 and securely maintained in this position. The slotted pivotal connections 269, the floating linkages 270 and the pivotal connections 272 permit the compression arms to float upwardly and downwardly on the boxes passing therebeneath to accommodate limited variation in box height.

With the longitudinal flap portions 16 folded flat over the box 11, the tab portions 18 extend outwardly from the box as shown in dashed lines in FIG. 7. The downward slope of the compression arms 267 at this point causes the tab portions of the box to be brought in contact with the metering wheel 284 of the adhesive dispensing mechanism 280. Such contact causes the metering wheel to be rotated and to pump heated adhesive through the nozzle 283 from the adhesive container 281 so as to apply the adhesive to the underside of the tab portions of the box during such passage.

The guide fingers 274 contact the tab portions 18 of the box 11 after the box leaves the adhesive dispensing mechanism 280 folding them downwardly against the opposite end walls 14 of the box as passage of the box continues through the apparatus 10. At this point the box 11 passes out the exit end 27 of the frame housings 25 and onto the idle roller conveyor 161 of the discharge conveyor 155. The compression roller assemblies 290 press the tab portions inwardly against the opposite end walls 14 of the box after having been introduced thereto by the fingers 274. The box continues to rest on the idle roller conveyor until the next sealed container is discharged from the exit end of the frame housings and is forced against the previous box by its flight bar thereby driving the previous box farther along

the discharge conveyor. Assuming that the sealing apparatus 10 is part of an assembly line operation, another conveying mechanism, not shown, will carry the boxes successively from the discharge conveyor for subsequent handling. In any event, the time interval between application of the adhesive and discharge from the discharge conveyor is sufficient to insure that the adhesive has congealed adhesively to retain the tab portions in their folded configuration.

As noted, adjustment of the sealing apparatus 10 to handle boxes 11 of different sizes and configurations is readily accomplished. Rotation of the adjustment handle 73 causes simultaneous vertical adjustment of the stationary conveyor 55, staging conveyor 95, and discharge conveyor 155. Adjustment of the support assembly 19 accommodates vertical repositioning of the staging conveyor so as adequately to support the remote ends 118 of the guides 116. Vertical adjustment of the folding mechanism 214 is accomplished by loosening the bolt assemblies 218 to loosen facing engagement of the mounting plates 217 thereby permitting vertical repositioning of the plates and associated drive shaft 220 on the mounting flanges 216. Vertical adjustment of all of the elements supported on the support bars 243 including the compression arms 267, adhesive dispensing mechanism 280 and compression roller assembly 290 is accomplished by removing the bolts 244 therefrom and repositioning the support bars on the mounting brackets 240 and mounting arms 241 in the desired corresponding adjustment holes 242.

Adjustment of the width of the stationary conveyor 55 is accomplished by removal of the bolts 59 and 60 in the width adjustment bars 58 and replacement of the bars with other adjustment bars to delimit the precise desired width. Subsequently, reinsertion of the bolts 59 and 60 insures precise spacing of the right angled conveyor bars 56. Similarly, adjustment of the spacing of the guides 116 and conveyor chains 128 of the staging conveyor 95 is accomplished by removal of the bolts 125 and 126 and replacement of the width adjustment bar 124 with a bar of the precise length desired for spacing of the guides. Since the peripheries of the rollers 163 of the discharge conveyor 155 extend above the upper edges of the bars 162 on which they are mounted, spacing of the bars need not be performed although it can be readily accomplished by simply sliding the bars on the shafts 160. The positioning of the central threaded bore 47 on the upper surface 46 of the conveyor support rods 44 and of the threaded bore 123 of the cross bar 120 insures that the stationary conveyor and staging conveyor respectively will be positioned precisely centrally of the apparatus 10.

Similarly spacing of the compression arms 267, adhesive dispensing mechanism 280 and compression roller assembly 290 supported on the mounting bars 246 is accomplished by removal of the bolts 249 from the width adjustment bars 248 and replacement of the bars with adjustment bars of the precise desired length. The bracket assemblies 247 are then loosened to allow repositioning of the mounting bars with the adjustment bars 248 disposed therebetween. The bolts 249 are then reinserted so as to mount the adjustment bars in position insuring that the mounting bars are the precise desired distance apart and are mounted centrally extending longitudinally between the frame housings 25. The bracket assemblies 247 are then again tightened.

Therefore, the container sealing apparatus of the present invention efficiently and dependably folds and seals containers having upstanding flap portions as they are motivated along an assembly line, is quickly adjustable to permit the folding and sealing of containers of different configurations and sizes while minimizing the danger of improper adjustment, and utilizes a single source of power and simplified work systems so as to minimize malfunction and breakdown.

Although the invention has been herein shown and described in what is conceived to be the most practical and preferred embodiment, it is recognized that departures may be made therefrom within the scope of the invention, which is not to be limited to the illustrative details disclosed.

Having described my invention, what I claim as new and desire to secure by Letters Patent is:

1. An apparatus for sealing containers having upstanding flap portions, the apparatus comprising a substantially horizontal stationary conveyor adapted to permit containers to be motivated therealong; means mounted in spaced relation to the conveyor for successively folding said flap portions of each container in overlapping, sealing relation to the container; a drive mechanism mounted on the apparatus synchronizing the movement of containers along the conveyor at pre-defined intervals cooperative with the folding means to permit the folding means to contact and fold the flap portions of each container during the interval said container passes between the folding means and the conveyor, said drive mechanism including a driven conveyor mounted on the apparatus extending longitudinally of the stationary conveyor, said driven conveyor mounting bars transversely thereof predetermined distances apart adapted to motivate the containers over the stationary conveyor between the stationary conveyor and the folding means; said stationary conveyor being mounted on the apparatus on adjustment shafts for vertical adjustment with respect to the driven conveyor and the folding means to permit adjustment of the apparatus for the folding and sealing of containers of a different selected size; said folding means including a guide and a folding arm individually cooperatively mounted on the apparatus above the driven conveyor for folding the forward and rearward upstanding flap portions of each container, as defined by the direction of travel, toward each other so as to overlay the container during movement thereof along the stationary conveyor by the drive mechanism; and tucking fingers borne by the apparatus for cooperative movement with the guide and folding arm synchronous with the passage of each container along the stationary conveyor for folding the remaining flap portions inwardly in sealing relation to the container.

2. The apparatus of claim 1 in which an adhesive applying mechanism is secured on the guide adapted to contact and deposit adhesive on preselected areas of the flap portions for adhesively securing the flap portions in the folded configuration.

3. The apparatus of claim 2 in which a support assembly is mounted on the apparatus in supporting relation to the guide, folding arm and tucking fingers, the support assembly being adjustable for the individual vertical and horizontal repositioning of the guide, arm and fingers so as to permit the handling of containers of different sizes.

4. An apparatus for sealing preformed containers having upstanding longitudinal and transverse flap portions, the longitudinal flap portions having laterally extending tab portions, the apparatus comprising a frame; a stationary conveyor mounted on the frame for vertical adjustment, having entrance and exit ends and adapted to permit the transport therealong of the containers oriented so that their longitudinal flap portions extend transversely of the apparatus; an endless driven conveyor mounted on the frame for movement longitudinally about the stationary conveyor and having flight bars extending transversely thereof at predetermined intervals; a folding arm mounted on the frame above the stationary conveyor adapted for the completion of a downward sweep toward the stationary conveyor corresponding with the passage therebelow of each flight bar so as to contact and fold the rearwardmost longitudinal flap portion so as to overlay its respective container; a pair of guides secured on the frame in transversely spaced relation between the folding arm and the exit end of the conveyor adapted to contact and fold the forwardmost longitudinal flap portion so as to overlay its respective container; a pair of tucking fingers mounted in transversely spaced relation in the frame for cooperative rotational movement with the folding arm adapted to fold the transverse flap portions of each container inwardly under the longitudinal flap portions during passage along the conveyor; a dispensing mechanism fastened on each guide adjacent to the exit end of the conveyor adapted to contact and apply adhesive to the laterally extending tab portions of each container and to fold them inwardly adhesively to retain the longitudinal and transverse flap portions in the folded configuration overlaying the container; and power means mounted on the frame in driving engagement with the driven conveyor, folding arm, and tucking fingers for the synchronous operation thereof.

5. The apparatus of claim 4 in which a staging conveyor is mounted on the entrance end of the stationary conveyor for vertical adjustment therewith and in driven connection with the power means.

6. The apparatus of claim 5 in which a staging mechanism operated by contact with each passing flight bar at the entrance end of the stationary conveyor is secured on the staging conveyor adapted selectively to admit containers to the entrance end of the stationary conveyor at intervals defined by the passing flight bars.

7. The apparatus of claim 6 in which a discharge conveyor is mounted on the exit end of the stationary conveyor for vertical adjustment therewith having downwardly convergent pressure rollers for maintaining the tab portions of each container in folded relation until the adhesive congeals sufficiently to hold the tab portions in the folded configuration.

8. A container sealing apparatus adjustable to accommodate containers of different sizes and configurations comprising a frame, an elongated conveyor mounted substantially horizontally in the frame for adjustable elevational movement in positions of parallelism, slide supports mounted in the frame substantially horizontally transversely of the conveyor, sub frames mounted on the slide supports on opposite sides of the conveyor for adjustable spacing, and container closing and sealing means individual to the sub frames adjustably spaced by adjustable spacing of the sub frames to accommodate containers of different widths and the

conveyor being adjustable to accommodate containers of different thickness.

9. A container sealing apparatus adjustable to accommodate containers of different sizes and configurations comprising a frame, an elongated conveyor mounted substantially horizontally in the frame for adjustable elevational movement in positions of parallelism, slide supports mounted in the frame substantially horizontally transversely of the conveyor, sub frames mounted on the slide supports on opposite sides of the conveyor for adjustable spacing, container closing and sealing means individual to the sub frames adjustably spaced by adjustable spacing of the sub frames to accommodate containers of different widths and the conveyor being adjustable to accommodate containers of different thickness, a supply conveyor aligned with said elongated conveyor, means connecting an end of the supply conveyor to said elongated conveyor for elevational movement therewith, a compression conveyor aligned with said elongated conveyor, and means connecting an end of the compression conveyor to said elongated conveyor for elevational movement therewith.

10. The apparatus of claim 9 in which at least one finger is affixed to the container closing and sealing means adjacent to the compression conveyor adapted to introduce containers to the compression conveyor in closed and sealed relation.

11. A container sealing apparatus adjustable to accommodate containers of different sizes and configurations comprising a frame, an elongated conveyor mounted substantially horizontally in the frame, slide supports mounted in the frame substantially horizontally transversely of the conveyor, sub frames mounted on the slide supports on opposite sides of the conveyor for adjustable spacing, and container closing and sealing means individual to the sub frames adjustably spaced by adjustable spacing of the sub frames to accommodate containers of different widths.

12. The apparatus of claim 11 in which the container closing and sealing means includes top flap closing guides individual to the sub frames mounted for individual floating movement on said sub frames automatically to accommodate containers of mixed thickness.

13. The apparatus of claim 12 including a dispensing mechanism mounted on at least one of the top flap closing guides for floating elevational movement therewith adapted to apply adhesive to containers of mixed thickness accommodated by the guides.

14. The apparatus of claim 13 having means mounting the conveyor in the frame for adjustable elevational movement in positions of parallelism to accommodate containers of different thickness.

15. The apparatus of claim 14 including a supply conveyor aligned with said elongated conveyor, means connecting an end of the supply conveyor to said elongated conveyor for elevational movement therewith, a compression conveyor aligned with said elongated conveyor, and means connecting an end of the compression conveyor to said elongated conveyor for elevational movement therewith.

16. The apparatus of claim 15 in which a finger is affixed to the container closing and sealing means adjacent to the compression conveyor adapted to engage closed and sealed containers on said elongated conveyor and convey them to the compression conveyor.

17. An apparatus for sealing preformed containers having upstanding longitudinal and transverse flap portions, the longitudinal flap portions having laterally extending tab portions, the apparatus comprising a frame; an elongated substantially horizontal conveyor mounted on the frame having entrance and exit ends and adapted for the transport therealong of the containers oriented so that their longitudinal flap portions extend transversely of the apparatus; a folding arm mounted on the frame above the conveyor for reciprocal movement between an upwardly retracted position and a lower flap closing position operated synchronously with the passage therebelow of each container so as to contact and fold the rearwardmost longitudinal flap portion of each container so as to overlay its respective container; a pair of guides secured on the frame in spaced relation transversely of the conveyor between the folding arm and the exit end of said conveyor adapted to contact and fold the forwardmost longitudinal flap portion of each container so as to overlay its respective container; and a pair of tucking fingers mounted in the frame in spaced relation transversely of the conveyor for synchronous movement with the folding arm adapted to fold the transverse flap portions of each container inwardly under the longitudinal flap portions during passage along the conveyor.

18. An apparatus for sealing preformed containers having upstanding longitudinal and transverse flap portions, the longitudinal flap portions having laterally extending tab portions, the apparatus comprising a frame; an elongated substantially horizontal conveyor mounted on the frame having entrance and exit ends and adapted for the transport therealong of the containers oriented so that their longitudinal flap portions extend transversely of the apparatus; a folding arm mounted on the frame above the conveyor for reciprocal movement between an upwardly retracted position and a lower flap closing position operated synchronously with the passage therebelow of each container so as to contact and fold the rearwardmost longitudinal flap portion of each container so as to overlay its respective container; a pair of guides secured on the frame in spaced relation transversely of the conveyor between the folding arm and the exit end of said conveyor adapted to contact and fold the forwardmost longitudinal flap portion of each container so as to overlay its respective container; a pair of tucking fingers mounted in the frame in spaced relation transversely of

the conveyor for synchronous movement with the folding arm adapted to fold the transverse flap portions of each container inwardly under the longitudinal flap portions during passage along the conveyor; a dispensing mechanism fastened on each guide adjacent to the exit end of the conveyor adapted to contact and apply adhesive to the laterally extending tab portions of each container and to fold them inwardly adhesively to retain the longitudinal and transverse flap portions in the folded configuration overlaying the container; and power means mounted on the frame in driving engagement with the conveyor, folding arm, and tucking fingers for the synchronous operation thereof.

19. The apparatus of claim 18 in which said conveyor has an elongated upper run, a lower return run and means engageable with containers while traversing the upper run to urge the containers toward the exit end; and including a substantially horizontal stationary conveyor mounted between the upper and lower runs of the driven conveyor for adjustable elevational movement; and a staging conveyor mounted on the entrance end of the stationary conveyor for elevational adjustment therewith and in driven connection with the power means.

20. The apparatus of claim 19 in which a staging mechanism operated by contact with each passing container engaging means of the driven conveyor at the entrance end of the stationary conveyor is secured on the staging conveyor and is adapted selectively to admit containers to the entrance end of the stationary conveyor at intervals defined by the passing container engaging means.

21. The apparatus of claim 19 in which a discharge conveyor is mounted on the exit end of the stationary conveyor for elevational adjustment therewith having downwardly convergent pressure rollers for maintaining the tab portions of each container in folded relation until the adhesive congeals sufficiently to hold the tab portions in the folded configuration.

22. The apparatus of claim 18 in which a support assembly is mounted on the apparatus in supporting relation to the guide, folding arm and tucking fingers, the support assembly being adjustable for the individual vertical and horizontal repositioning of the guide, arm and fingers so as to permit the handling of containers of different sizes.

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UNITED STATES PATENT OFFICE
CERTIFICATE OF CORRECTION

Patent No. 3,821,875 Dated July 2, 1974

Inventor(s) Gerald C. Paxton

It is certified that error appears in the above-identified patent and that said Letters Patent are hereby corrected as shown below:

In the Specification:

Col. 7, lines 44 and 45, after "vertically" and before "the" delete "adjusted" and insert ---adjusts---.

Col. 9, line 11, after "shaft" and before "is" delete "200" and insert ---220---.

Col. 13, lines 15 and 16, after "assembly" and before "accommodates" delete "19" and insert ---119---.

Signed and sealed this 15th day of October 1974.

(SEAL)
Attest:

McCOY M. GIBSON JR.
Attesting Officer

C. MARSHALL DANN
Commissioner of Patents