(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) EP 1 091 875 B1

(12) **EUROPEAN PATENT SPECIFICATION**

(45) Date of publication and mention of the grant of the patent:
24.08.2005 Bulletin 2005/34

(21) Application number: **99955251.6**

(22) Date of filing: **01.06.1999**

(51) Int Cl.[7]: **B65B 51/00**, B65B 61/18

(86) International application number:
PCT/US1999/012110

(87) International publication number:
WO 1999/062768 (09.12.1999 Gazette 1999/49)

(54) **TAMPER RESISTANT CLOSURE**

ORIGINALITÄTSVERSCHLUSS

FERMETURE INVIOLABLE

(84) Designated Contracting States:
DE DK ES FI FR GB IE IT NL SE

(30) Priority: **01.06.1998 US 87517 P**

(43) Date of publication of application:
18.04.2001 Bulletin 2001/16

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(56) References cited:
WO-A-99/03731
US-A- 3 576 694
US-A- 4 682 976
US-A- 5 708 339
CA-A- 2 064 270
US-A- 3 990 216
US-A- 5 600 938
US-A- 5 816 019

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Description

TECHNICAL FIELD

[0001] The invention relates to a tamper resistant closure attachment accessory to a machine for wrapping a ribbon around the gathered neck of a bag and twisting the ribbon for closing and sealing the neck of the flexible bag.

BACKGROUND OF INVENTION

[0002] U. S. Patent No. 3,138,904 entitled "METHOD AND APPARATUS FOR TYING PACKAGES AND WRAPPING MATERIALS;" U. S. Patent No. 3,059,670 entitled "WIRE TWISTING TOOL;" U. S. Patent No. 3,919,829 entitled "APPARATUS FOR TYING PACKAGES AND WRAPPING MATERIALS;" U. S. Patent No. 4,856,258 entitled "WIRE TYING DEVICE;" and U. S. Patent No. 5,483,134 entitled "RIBBON SENSING DEVICE FOR BAG TYER" disclose apparatus used for closing a plastic bag by attaching and twisting a wire-like ribbon about the neck of the bag.

[0003] Bag tying devices of the type disclosed in the aforementioned patents are commercially available from Burford Corporation of Maysville, Oklahoma. The tying devices are generally constructed to receive packages such as loaves of bread at speeds of for example over one hundred (100) packages per minute at speeds of about 108 feet per minute.

[0004] Plastic bags containing bakery products, paper plates and ice are easily opened by removing the twisted ribbon from about the neck of the bag so that the contents of the bag are accessible. The bag can be resealed by manually replacing and twisting the ribbon about the neck of the bag.

[0005] Canadian Patent application 2,064,270 discloses a method of handling a preformed, open-mouthed bag having a filled and an unfilled bag portion. The method comprises continuously conveying the bag through a plurality of automatic bag handling stations where the unfilled bag portion is gripped to produce a flattening of the unfilled bag portion with the bag mouth in an essentially unstressed condition. The bag mouth is then sealed and a reusable bag closure is applied to the unfilled portion of the bag.

[0006] U.S. Patent No. 3,576,694 discloses a method of forming a linear seal between two layers of a thermoplastic material. The method comprises gripping the layers and progressing the gripped layers. The path of the progress is successively intercepted by directing a plurality of jets of hot air from both sides of the layers.

[0007] U.S. Patent No. 5,816,019 discloses a hot air heat-sealing machine for heat-sealing pieces of heat-sealable material. The machine includes a heat source for delivering hot air; presser means for pressing the pieces of material against each other, the heat source being located upstream of the presser means; and drive means and guide means for driving and guiding the pieces along a guide axis towards the heat source, so that they face each other and are spaced apart from each other, such that when they pass the heat source it lies between the two facing pieces to be heat sealed.

[0008] U.S. Patent No. 5,600,938 discloses apparatus for sealing a plurality of spaced spots across the flattened open end of a filled plastic bag. The bag is moved along a conveyor past a sealing mechanism where a plurality of spaced spots are welded or fused across the open end of the bag. In one embodiment a sealing mechanism includes a plurality of heated pins which penetrate the two layers of the open end of the bag while the end of the bag is substantially flat. These pins then move along with the bag in synchronism with the conveyor while the fusing occurs. In another embodiment, the sealing is accomplished by using a wheel having heated pins around its periphery and the wheel is rotated so that its tangential speed is in synchronism with the conveyor to successively make spaced fused spots across the generally flat open end of the bag. The apparatus seals a plurality of spaced spots to only delicately seal the bag to show evidence of tampering by breaking the seal but allow the bag to be opened without tearing or destroying the bag.

[0009] U. S. Patent No. 5,741,075 describes a package comprising a flexible plastic bag and a label, the bag having a closed end, the closed end being openable to provide an opening for access to the contents of the package, wherein, the closed end of the package is initially sealed at a sealing area and, wherein, the sealing area is provided with a line of perforations to define the opening and reclosable by means of the label. The label is disclosed as having on one face two areas of adhesive separated by a non-adhesive area extending across substantially the whole width of the label, the adhesive areas being adapted to adhere to the package, one to each side of the line of perforations. A satisfactory method and apparatus for forming the seal and the line of perforations to provide an initial tamper-evident tear-off strip is not disclosed.

[0010] Heretofore, no system has been devised for forming a reclosable tamper-proof seal which can be economically applied for safe-guarding the contents of the bag prior to its being opened by the ultimate consumer.

SUMMARY OF INVENTION

[0011] The present invention provides a method and apparatus for forming a tamper resistant seal on a plastic bag as recited in the appended claims.

[0012] The apparatus for forming the tamper resistant seal is preferably mounted on a bag tyer, for example of the type disclosed in U. S. Patent No. 5,483,134. Gathering belts are mounted on pulleys synchronized with the gathering belts in the bag neck tying device.

[0013] The bag neck is flattened adjacent the gather-

ing belts and the flattened bag neck moves adjacent a roller which has projections for forming a row of perforations in the neck of the bag. The bag moves between a pair of manifolds through which heated air flows to impinge against upper and lower surfaces of the bag neck for sealing the bag. The manifolds do not contact the surface of the bag such that the bag neck can be sealed even though printing ink on the surface of the bag may not have dried or cured or if the heat softens the ink.

[0014] Once the seal and row of perforations have been formed on the bag, the neck of the bag moves through the tying device where the neck of the bag is gathered, tied and ejected from the tying device in conventional manner.

[0015] It should be readily appreciated that in lieu of a twisted wire tie around the gathered neck, other closure means such as plastic wireless twist ties, plastic clips having a slot or adhesive tape may be attached to the gathered neck of the bag. The closure seals the bag between the row of perforations and the contents to prevent contamination and for maintaining freshness of the contents of the bag.

DESCRIPTION OF THE DRAWINGS

[0016] Drawings of a preferred embodiment of the invention are annexed hereto, so that the invention may be better and more fully understood, in which:

Figure 1 is a perspective view illustrating the front of a bag neck tying device having apparatus for forming a tamper resistant seal mounted thereon;
Figure 2 is an elevational view of the rear of the bag tying device and the apparatus for forming a tamper resistant seal;
Figure 3 is a fragmentary enlarged perspective view showing bag neck gathering belts and toothed rollers for forming perforations;
Figure 4 is an enlarged fragmentary view illustrating rollers for perforating the bag;
Figure 5 is a perspective view illustrating the rear and side of the apparatus for forming a tamper resistant seal;
Figure 6 is a perspective view of the apparatus for forming a tamper resistant seal, the cover being removed to more clearly illustrate details of construction;
Figure 7 is an enlarged elevational view showing the relationship of heaters, air manifolds and perforating rollers for forming a tamper resistant seal;
Figure 8 is an exploded perspective view illustrating parts of the apparatus for forming a tamper resistant seal;
Figure 9 is a fragmentary diagrammatic view of a sealed strip and a row of perforations formed on the neck of a bag;
Figure 10 is a perspective view of a bag showing the relationship of the seal strip, row of perforations and removable closure;
Figure 11 is a table showing examples of relationships of conveyor speed, bag thickness and temperature; and
Figure 12 is a perspective view of the belt assembly in an operative position;
Figure 13 is a view similar to Figure 12 with the lower drive belt chassis in a lowered position;
Figure 14 is a diagrammatic view with the belts in the position illustrated in Figure 12;
Figure 15 is a diagrammatic view with the belt assemblies in the position illustrated in Figure 13;
Figure 16 is a diagrammatic view of the heater and manifold assemblies with the belt assemblies in the position of Figure 12 and 14;
Figure 17 is a diagrammatic view similar to Figure 16 with the belt assemblies in the position of Figures 13 and 15;
Figure 18 is a diagrammatic side elevational view; and
Figure 19 is a diagrammatic view taken substantially along lines 19-19 of Figure 18.

[0017] Numeral references are employed to designate like parts throughout the various figures of the drawing.

DESCRIPTION OF A PREFERRED EMBODIMENT

[0018] The wire tying device, generally designated by the numeral 10 in Figures 1 and 2 of the drawing is mounted adjacent a side of conveyor 300 of the type disclosed in Burford U.S. Patent No. 3,138,904 and Burford U.S. Patent No. 3,919,829, the disclosures of which are incorporated herein by reference in their entireties for all purposes. Conveyer 300 carries, for example, loaves 125a, 125b and 125c of bread to, through and out of wire tying device 10 in rapid succession. Conveyor 300 is well known to a person skilled in the art and further description is not deemed necessary except in conjunction with the drive mechanism as will be hereinafter more fully explained. It should be appreciated that other and further structures may form the conveyor.

[0019] Loaf 125c of bread is moving toward bag tying device 10 and the neck of the bag is positioned adjacent apparatus 100 for forming a tamper resistant closure on the neck of the bag. Bag 125b has been moved by conveyor 300 and the gathering belts to a position where a wire-like ribbon is wrapped around the gathered neck of the bag and twisted. Loaf 125a of bread has moved through tying device 10 and has moved out of the tying device. Referring to Figures 9 and 10 of the drawing, apparatus 100 welds the sides 125x and 125y of bag 125 together to form a tamper resistant seal strip 130. A row 132 of perforations is formed in the neck of the bag 125 adjacent seal strip 130 to facilitate removing seal strip 130 from the bag to render the contents of the bag accessible.

[0020] Twisted wire-like ribbon 115 closes the bag between perforated strip 132 and the contents of bag 125a.

[0021] As best illustrated in Figures 9 and 10 of the drawing, opposite sides 12x and 12y of the bag are welded together along seal strip 130 and a row 132 of perforations is formed adjacent seal strip 130. After the tamper resistant seal 130, 132 has been formed on the neck 125 of the bag, any conventional removable closure such as a twisted wire-like tie 115, a plastic clip having a slot that grips the neck of the bag or an adhesive tape may be attached to the neck of the bag for maintaining freshness and to prevent contamination of the contents of the bag. Seal strip 130 can be easily removed by tearing the bag along the row 132 of perforations.

[0022] It should be readily apparent that seal strip 130 forms a tamper evident closure for bag 125a and that the contents of the bag are not accessible until seal strip 130 is removed by tearing the bag along row 132 of perforations. Twist tie 115 can then be removed for opening the bag and reattached for resealing the bag.

[0023] The apparatus 100 for forming a tamper resistant closure includes a pair of rollers for engaging opposite sides of the neck of the bag for forming row 132 of perforations and a pair of manifolds for directing a heated gas, such as air, to impinge against surfaces of the bag neck adjacent the row 132 of perforations for welding panels of the bag neck together to form the seal strip 130.

[0024] Referring to Figures 3, 4 and 8 of the drawing, the numeral 140p generally refers to a roller having teeth 142p formed by the periphery thereof while a roller 150p has a groove 152p formed therein for receiving teeth 142p on roller 140p. As the neck of a bag moves between rollers 140p and 150p the teeth 142p on roller 140p perforate the neck of the bag and form row 132 of perforations in the neck of the bag.

[0025] As best illustrated in Figures 2 and 8 of the drawing, a pair of gathering belts 41 and 43 extend around driven rollers 140 and 144 and around a drive roller 145 mounted on shaft 146. Shaft 146 has a pulley 147 mounted on the opposite end thereof and is driven by a belt 25a extending around pulleys 147 and 148. Pulley 148 is mounted on a shaft 25 which drives the upper gathering belt 22 routed around driven pulley 24 and idler pulleys 26, 27 and 28 of the bag neck tying apparatus 10.

[0026] Roller 150p has a groove 152p formed in the surface thereof and is driven by a pair of gathering belts 51 and 53 extending around rollers 150, 154 and 155, as illustrated in Figure 8. Drive roller 155 is mounted on shaft 156 which has a pulley 157 mounted on the end thereof. A drive belt 35a extends around pulley 158 mounted on the end of shaft 35 which drives the lower gathering belt 32 of tyer 10 which extends around driven pulley 34 and pulleys 36, 37 and 38 of the bag tying apparatus 10.

[0027] It should be noted that upper gathering belts 41 and 43 and lower gathering belts 51 and 53 grippingly engage the neck of the bag adjacent opposite sides of the segment of the bag that is to be sealed to form sealed strip 130. Teeth 142p on roller 140p are preferably spaced from but adjacent the segment of the neck of the bag between the gathering belts 41 and 43.

[0028] It should be readily apparent that roller 140p having teeth formed thereon is driven in synchronized relation with gathering belt 22 through the belt 25a extending around pulleys 147 and 148 and that roller 150p having a groove 152p formed therein is driven in synchronized relation to the lower gathering belt by the drive belt 35a extending around pulleys 157 and 158.

[0029] Rollers 140, 144 and 145 are mounted on a mounting plate 149 and rollers 150, 154 and 155 are mounted on a mounting plate 159. The opposite ends of shafts 146 and 156 are supported by mounting plates 149a and 159a.

[0030] A top plate 149b has opposite ends secured by screws between mounting plates 149 and 149a and a side plate 149c extends vertically between mounting plates 149 and 149a and generally perpendicular to top plate 149b.

[0031] An upper heater 160 is secured by U-bolts 162 and 164 to top plate 149b, as best illustrated in Figures 6 and 7 of the drawings. The rear end of the upper heater 160 extends through passage 160a formed in mounting plate 149a.

[0032] A lower heater 170 extends through openings formed in mounting plates 159 and 159a and is secured by U-bolts 172 and 174 to a bottom mounting plate 159b adjacent a vertically extending mounting plate 159c.

[0033] Heated air is delivered from heater 160 into an upper manifold 165 and heated air is delivered from heater 170 into a lower manifold 175.

[0034] Manifolds 165 and 175 preferably have elongated orifices formed therein which form a row of jets of air which are projected to impinge against the surface of the neck of a bag moving between manifolds 165 and 175. The temperature and volume of air is selected to deliver sufficient heat for fusing panels of the bag together to form seal strip 130.

[0035] It should be appreciated that the projection of jets of heated air to impinge against the surface of the bag allows panels of the bag to be fused without physically contacting surfaces of the bag with heated sealing elements. Thus, even though the neck of the bag may carry wet ink which has not cured, or ink softened by the heat, seal strip 130 can be formed thereon. Wet or softened ink will not offset onto manifolds 165 and 175 because the manifolds do not physically engage surfaces of the neck of the bag.

[0036] Air manifolds 165 and 175 preferably have for example twenty orifices about 0.040 inches arranged to form outlet openings which project air streams to impinge against panels 125x and 125y above and below the neck 125 of each bag for heating panels 125x and 125y to a temperature sufficient for fusing panels 125x

and 125y together to form the seal strip 130.

[0037] Heaters 160 and 170 preferably electrically heat air flowing therethrough delivered from an air supply line 180 through a pressure regulator 182, filter 184 and feed line 185, as illustrated in Figure 2 of the drawing. Air feed line 185 preferably passes through a control valve 186 for controlling the pressure and volume of air delivered through line 187 to heaters 160 and 170. The heater mount for the lower 170 is substantially a mirror image of the heater mount for heater 160 and heaters 160 and 170 are mounted on a frame to permit separation of rollers 140 and 150 in the event that a heel on a loaf of bread in bag 125 falls down into the nip between rollers 140 and 150. Roller 140 is spring urged downwardly toward roller 150 but can pivot upwardly if necessary to allow a heel or other obstruction to pass through the nip between rollers 140 and 150.

[0038] Each heater 160 and 170 is preferably provided with an electric heating element connected through a thermostat which is adjustable for controlling the temperature of air delivered from heaters 160 and 170 to manifolds 165 and 175. Further, thermocouples are mounted in manifolds 165 and 175 to indicate the temperature of air supplied by heaters 160 and 170 for assuring that the temperature is maintained in a predetermined range.

[0039] As shown in the table of Figure 11, the air temperature required for forming seal strip 130 varies depending upon the thickness and composition of the material used for forming bag 125 and the speed of conveyor 300 moving the neck of the bag between manifolds 165 and 175. As the thickness of the bag increases the temperature of air delivered through air manifolds 165 and 175 generally increases. As the speed of the conveyor increases the temperature of the air is increased to deliver a controlled volume of air and heat through manifolds 165 and 175 for forming seal strip 130.

[0040] Air supplied through pressure regulator 182 is preferably about 25psi and heaters 160 and 170 are preferably selected to heat the volume of air flowing through manifolds 165 and 175 to a maximum temperature of for example 600° Fahrenheit. The thermocouples provide a read out of temperature of air flowing through manifolds 165 and 175 and the temperature of air delivered through the heaters 160 and 170 is adjustable to provide the desired quantity of heat for forming seal strip 130.

[0041] The wire tying device, generally designated by the numeral 10 in Figures 1 and 2 of the drawing, forms no part of the invention claimed herein except in combination with the apparatus for forming a tamper resistant closure. The wire tying device generally comprises upper and lower gathering belts 22 and 32, the upper gathering belt 22 being driven by a pulley on a shaft 25 and the lower gathering belt 32 being driven by a pulley on a shaft 35, as described in U. S. Patent No. 5,483,134. As noted above, movement of rollers in the apparatus for forming a tamper resistant closure are synchronized with the rotation of shafts 25 and 35 through belts 25a and 35a.

[0042] The upper and lower gathering belts 22 and 32 move bags 125 along a path to a position adjacent a needle assembly, a twister hook assembly and a holder-shear assembly (not shown) for wrapping a wire-like tie around a gathered neck of the bag 120.

[0043] Terms such as "horizontal," "vertical," "up," and "down" when used in reference to the drawings, generally refer to the orientation of the parts in the illustrated embodiment and not necessarily in the described orientation during use.

SECOND EMBODIMENT

[0044] A second embodiment of the apparatus for forming a tamper resistant closure on the neck of a bag is illustrated in Figures 12 through 19. The parts of the apparatus are substantially the same as that of the first embodiment except that certain parts and operations have been rearranged.

[0045] Referring to Figures 16 and 18, a heater housing 200 has partition walls 202 and 204 mounted between end walls for forming a hot zone 201, and intermediate zone 203 and a cool zone 205 in the heater housing 200. An air filter is mounted in the intermediate zone 203 for cleaning air drawn through the intermediate zone by a blower 230 in the cool zone 205 for delivering air to heaters 260 and 270. Exhaust fans 208 are mounted in the hot zone 201 for exhausting spent air from heater housing 200, as will be hereinafter more fully explained.

[0046] Referring to Figures 12 and 18 of the drawing, outboard upper gathering belt 241 and inboard upper gathering belt 243 are mounted on an upper chassis 222 and outboard lower gathering belt 251 and inboard lower gathering belt 253 are mounted on a lower chassis 225.

[0047] The lower chassis 225, carrying belts 251 and 253 is movable from the position illustrated in Figure 12 to the position illustrated in Figure 13, if capacitive sensor 215, best illustrated in Figure 14, detects a heel or other obstruction has fallen into the neck of the bag. After the heel or other obstruction has been removed, the system is reset and the lower chassis 225 moves back to the position illustrated in Figure 12.

[0048] The outboard upper gathering belt 241 extends around outer timing belt pulleys 240, 244, 245 and 246. The inboard upper gathering belt 243 extends around pulleys 240a, 244a, 245a and 246a. Pulleys 240and 240a are mounted on a shaft 240b, pulleys 244 and 244a are mounted on a shaft 244b, pulleys 245 and 245a are mounted on a shaft 245b and pulleys 246 and 246a are mounted on a shaft 246b.

[0049] As best illustrated in Figure 18, the upper chassis 222 is formed by spaced plates 221 and 223 bolted or otherwise secured between end walls. In the illustrat-

ed embodiment the upper chassis is not movable and shafts 240b-246b are supported in bearings 227 mounted in the spaced plates 221 and 223.

[0050] The outboard lower gathering belt 251 extends around outer pulleys 250, 254, 255 and 256. The inboard lower gathering belt 253 extends around pulleys 250a, 254a, 255a and 256a. Pulleys 250 and 250a are mounted on a shaft 250b, pulleys 254 and 254a are mounted on a shaft 254b, pulleys 255 and 255a are mounted on a shaft 255b and pulleys 256 and 256a are mounted on a shaft 256b. The lower chassis 225 is formed by spaced plates 224 and 226 bolted or otherwise secured between slide plates which move vertically relative to the end walls. In the illustrated embodiment the lower chassis is movable and shafts 250b-256b are supported in bearings 228 mounted in the spaced plates 224 and 226. As will be hereinafter more fully explained, the bearings 227 and 228 are spaced inwardly from the timing pulleys 240 - 256b and manifolds 265 and 275 a distance sufficient to prevent excessive heating of the bearings 227 and 228 by spent air drawn vertically through the hot zone 201 in heater housing 200 by exhaust fans 208.

[0051] The perforator wheel 220 is driven by a belt 240x which extends around a hub on the perforator wheel and is driven by a pulley (not shown) on shaft 255b.

[0052] An air nozzle 209, illustrated in Figure 14, is connected to a flexible tube 209a through which air is delivered from an air compressor (not shown) or other suitable source of compressed air to form a jet which flattens the neck of the bag and positions it to enter the nip between a first pair of brushes 210 and 214 positioned above the edge of the conveyor and a second pair of brushes 212 and 216 positioned below the edge of the conveyor. The air jet pushes side 12x of bag 12a toward side 12y of bag 125a.

[0053] A capacitive sensor 215 is positioned between the air nozzle 209 and brushes 210-216 for sensing when a heel of a loaf of bread has fallen down into the neck of the bag. If a heel or other obstruction has fallen down into the neck of the bag, the sensor sends a signal to stop the conveyor and actuate the sealing apparatus to the non-operable position, as shown in Figures 13, 15 and 17. The sensor 215 is a capacitor type sensor which senses a change in mass adjacent the sensor out of a predetermined range.

[0054] If the bag neck is unobstructed, the neck of the bag moves between upper and lower pairs of brushes. First upper and lower brushes 210 and 212, best illustrated in Figure 14, have stiff bristles and rotate in opposite directions such that the lower surface of the upper brush 210 and the upper surface of the lower brush 212 move in the same direction and engage the neck of the bag to draw the bag laterally across the conveyor until the contents of the bag engage guide bars which limit lateral movement of the bag when the contents of the bag move to engage the guide bars. The sweeping action of the first upper and lower brushes 210 and 212 draws the bag taut around the contents of the bag.

[0055] The second upper and lower brushes 214 and 216 have spaced rows of angular bristles which are slightly longer than the bristles of the first upper and lower brushes 210 and 212 for moving the leading edge of the neck of the bag away from the trailing edge to flatten the neck of the bag and to evacuate air from the bag before it is sealed. The angularly disposed bristles are preferably about 1/8 inch larger in diameter than the bristles on the first upper and lower brushes 210 and 212.

[0056] It should be readily apparent that the first pair of upper and lower brushes 210 and 212 draw the bag around the product while the second pair of upper and lower brushes 214 and 216 flatten the bag neck, evacuate air from the inside of the bag and position the leading edge of the bag neck between upper belts 241 and 243 and lower belts 251 and 253. The first set of brushes 210 and 212 which move the neck of the bag laterally across the conveyor tend to resiliently hold and resist movement of the neck of the bag longitudinally of the conveyor by the second pair of upper and lower brushes 214 and 216 and the gathering belts. Thus the leading edge of the neck of the bag is gripped by the gathering belts and the trailing edge is pulled from between the brushes so that the neck of the bag is smoothed as it is drawn between the gathering belts and the portion of the neck of the bag that bridges the space between horizontally spaced belts 241 and 243 is substantially planar.

[0057] As illustrated in Figure 14 and 15, the perforating assembly is formed by a perforator wheel 220 having teeth 221 spaced around its periphery positioned below the neck of the bag and an anvil 218 having a slot 217 formed therein above the neck of the bag. The neck of the bag is held taut between lower surfaces of belts 241 and 243 and upper surfaces of belts 251 and 253.

[0058] Each tooth 221 on the perforator wheel 220 is shaped to make a defined cut or elongated slot in the portion of the bag neck bridging between the belts. An area 221a of defined length is formed between adjacent teeth 221 on the perforator wheel 220 to leave spaced areas on the neck of the bag which are not cut. The perforator wheel 220 is driven by a pair of belts in synchronized relation with the belts moving the bag so that every bag moving adjacent the perforator wheel is substantially identical.

[0059] The perforator wheel 220 is mounted on a stub shaft secured in a bearing to the lower belt chassis 225. Teeth on the perforator wheel extend into the slot on the lower surface of the anvil carried by the upper chassis 222 such that the bag is supported by flat surfaces adjacent opposite sides of the perforator wheel.

[0060] Referring to Figure 12 of the drawing, upper gathering belts 241 and 243 are mounted on an upper chassis 222 and lower gathering belts 251 and 253 are mounted on a lower chassis 225, as herein before de-

scribed. The lower chassis 225, carrying belts 251 and 253 is movable from the position illustrated in Figure 12 to the position illustrated in Figure 13, if capacitive sensor 215 detects a heel which has fallen into the neck of the bag. After the heel or other obstruction has been removed the system is reset and the bottom chassis moves back to the position illustrated in Figure 12. The perforator wheel 220 is driven by a belt 240x which extends around a hub on the perforator wheel and is driven by a pulley (not shown) on shaft 255b.

[0061] Referring to Figures 18 and 19 of the drawing, shaft 240b which carries pulleys 240 and 240a and shaft 255b having pulleys 255 and 255a mounted thereon, are driven by a belt 320 routed around pulleys as illustrated in Figure 19 of the drawing. The upper pulley 302 is mounted on the end of shaft 246b. Shaft 245b is an idler shaft and does not have a pulley mounted on the rear end thereof.

[0062] A pulley 304 is mounted on shaft 255b for driving timing belt pulleys 254 and 254a. Pulley 305 is mounted on shaft 256b for driving timing belt pulleys 350 and 350a. Idler pulley 306 is mounted on a stub shaft carried by the lower chassis 225.

[0063] A direct current driven motor 315 is electrically connected to a suitable driver, such as the output from the tyer or a decoder module on the conveyor for driving belts 241, 243, 251 and 253 at a speed equal to the surface speed of the conveyor 300. Motor 315 has a drive pulley 310 mounted on the drive shaft for driving belt 320 which extends around an idler pulley 309, pulley 302 for driving upper belts 341 and 343, around drive pulley 304, idler pulley 305 and drive pulley 306 for driving shafts 246b and 256b, and around pulley 308.

[0064] The upper chassis 222 carrying the upper belts 241 and 243 is stationary. The lower chassis 225, carrying belts 251 and 253 can be moved vertically, as illustrated in Figure 19, for moving the lower chassis 225 to an off position for separating the upper and lower pairs of belts. Referring to Figure 19, it should be readily apparent that when chassis 225 moves downwardly, the length of drive belt 320 is unchanged since pulleys 304, 305 and 306 rotate and advance along belt 320 as chassis 225 moves vertically. Thus, the belt tension is not changed.

[0065] Referring to Figure 16 of the drawing, a three-stage blower 230 delivers a high volume of pressurized air to electric heaters 260 and 270. Heaters 260 and 270 are preferably configured to circulate the air over heating elements for heating the air to a controlled temperature and delivering the air through diverter valves 262 and 272, respectively, to upper manifold 265 and lower manifold 275. Each manifold 265 and 275 has an elongated slot through which heated air is delivered to impinge against the flattened surface of the neck of the bag bridging space between outboard belts 241 and 251 and inboard belts 243 and 253. It should be appreciated that the perforator wheel 220 has already formed row 132 of perforations in the neck of the bag before the neck of the bag moves between upper and lower manifolds 265 and 275. This assures that the bag is perforated while it is cool and before it is heated to the point at which it might tend to stretch and deform when teeth 221 on the perforator wheel 220 engage the neck of the bag. The heated air, flowing at a high velocity, impinges against upper and lower surfaces of the neck of the bag for welding the upper and lower surfaces together. It should be appreciated that air impinges against the portion of the bag bridged between the belts such that the molten plastic or any ink which may be softened by the hot air is not offset onto the belts or any other mechanism before the neck of the bag is cooled.

[0066] Upper and lower diverter valves 262 and 272 are provided with spring-loaded paddles which are rotated by air cylinders from the position illustrated in Figure 16 to the position illustrated in Figure 17 when the lower chassis 225 is actuated to an inoperable position. This causes the heated air to be diverted away through exhaust ports from the neck of any bag which might be positioned adjacent the manifolds 265 and 275 when the lower chassis 225 is actuated downwardly. Diverting the air, as illustrated in Figure 17 also directs the air away from the vicinity of the belts to assure that the belts are not overheated.

[0067] As best illustrated in Figure 16, the three stage blower 230 has an intake line 230a extending through partition wall 204 for drawing air from the intermediate zone 203 through air filter 206. Air is discharged by blower 230 through lines 260a and 270a into heaters 260 and 270. Air preferably is delivered along a plurality of paths through heaters 260 and 270 to diverter valves 262 and 272. When the spring-loaded paddles are in the position illustrated in Figure 16, air is delivered through manifolds 265 and 275 to impinge against the upper and lower surfaces of the neck of the bag bridging between the inboard and outboard belts. When levers 262a and 272a are rotated, the spring-loaded paddles are moved from the position illustrated in Figure 16 to the position illustrated in Figure 17 for delivering air through exhaust ports 262e and 272e into the hot zone 201 and the air is evacuated from the hot zone 201 by exhaust fans 208 mounted at upper and lower ends of the hot zone 201.

[0068] Diverter valves 262 and 272 positioned immediately adjacent manifolds 265 and 275 allows the air to be diverted quickly from the manifolds to the exhaust ports and back to the manifolds. Since heated air flows continuously through diverter valves 265 and 275, the mechanism does not deviate in temperature and does not require warm-up periods when the paddle is moved from one position to the other.

[0069] The provision of an intermediate zone 203 between the hot zone 201 and the cool zone 205 effectively isolates the hot zone 201 from the cool zone 205 where the electrical controls and blower 230 are located. Further, drawing air through filter 206 adjacent partition wall 202 pre-heats air drawn into blower 230.

[0070] The three stage blower 230 is configured to de-

liver a high volume of relatively high pressure air through the heaters and manifolds 265 and 275. The continuous regulated supply of air through heaters 260 and 270 over heating elements assures that the air temperature and volume is maintained within parameters to assure that bag necks will be sealed as they move between manifolds 265 and 275 while assuring that excessive heat is not delivered. Heating elements in heaters 260 and 270 are thermostatically controlled to accommodate bags constructed of different materials and made of plastic of different thicknesses.

[0071] It is important to note that brushes 210, 212, 214 and 216 are configured for flattening the neck of the bag and evacuating excess air from the inside of the bag so that the row 132 of perforation and seal strip 130 can be formed consistently on bag necks.

[0072] The belts are preferably timing belts which have teeth 241t undercut or shortened to permit edges of the belt to extend beyond flanges on the timing belt pulleys 240 - 256a carrying the belts. This assures that the neck of the bag will not wrap around and be pinched between the belt and the flanges on the timing belt pulleys. A layer of soft pliable material 241x is vulcanized onto the outer surface of each belt body 241y to provide a relatively hard durable surface which is in engagement with the timing belt pulleys and to provide a relatively soft pliable surface on each belt which engages the neck of the bag. This causes the belts to grip the bag to minimize slippage as the neck of the bag is moved adjacent the perforator wheel 220 and between upper and lower manifolds 265 and 275 where seal strip 130 is formed.

[0073] Teflon reinforced slider plates 300s are secured to mounting plates 301 bolted or otherwise secured to the upper and lower chassis 222 and 225. Belts spanning space between pulleys 344 and 345 and between pulleys 354 and 355 engage slider plates 300s which prevent deflection of the belts to assure that the belts firmly grip spaced portions of the bag neck adjacent opposite sides of upper and lower manifolds 265 and 275.

[0074] As best illustrated in Figure 12 of the drawing, diverter valves 262 and 272 have levers 262a and 272a extending outwardly therefrom which are engaged by a turnbuckle on the rod of a cylinder for actuating spring loaded paddles in the diverter valves from the position illustrated in Figure 16 to the position illustrated in Figure 17.

Claims

1. A method of forming a tamper resistant seal on a plastic bag containing a loaf of bread comprising the steps of:

   flattening a portion of the neck of the bag adjacent the open end of the bag; and

   characterised by:

   positioning a segment of the flattened portion to bridge between a pair of upper belts (41, 43) and a pair of lower belts (51, 53), said upper and lower belts being horizontally spaced apart such that one of said upper belts and one of said lower belts engage opposite sides of a portion of the neck of the bag and one of said upper belts and one of said lower belts engage a second portion of said bag neck such that a portion of the bag neck bridges space between the upper pair of belts and the lower pair of belts;
   moving the neck (125) of the bag such that streams of heated air impinge on the surface of the bag spanning between the belts for fusing panels (125x, 125y) on the bag together to form a sealed strip (130) such that the product (125a) in the bag is not accessible;
   gathering the flattened portion of the bag between the sealed segment and the product; and
   attaching a reusable closure (115) to said neck.

2. A method according to Claim 1 with the addition of the step of perforating (142p, 150p) the bag between the secured segment and the product in the bag for forming a strip of perforations.

3. The method of Claim 1 further comprising the step of:

   delivering air heated to a temperature in a range between about 315 and 600 Fahrenheit in a stream to impinge against the surface of the bag; and
   gripping portions of the bag adjacent opposite sides of the segment of the bag against which the stream of air impinges.

4. A method for forming a tamper resistant closure on a plastic bag containing a product comprising the steps of:

   forming a row (132) of perforations in the bag; and **characterised by**:

   gripping the bag at spaced positions adjacent the row of perforations between a pair of upper belts (41, 43) and a pair of lower belts (51, 53), said upper and lower belts being horizontally spaced apart such that one of said upper belts and one of said lower belts engage opposite sides of a portion of the neck of the bag and one of said upper belts and one of said lower belts engage a second portion of said bag neck such that a portion of the bag neck bridges space between the upper pair of belts and the lower

pair of belts; and
directing temperature controlled air to impinge against the bag between the gripped positions for forming a sealed strip (130) adjacent the row (132) of perforations.

5. Apparatus for forming a tamper resistant closure on a plastic bag containing a product comprising:

means (140p, 150p) for forming a row of perforations in the bag adjacent gripped portions of the bag; and **characterised by**:

a pair of upper belts (41, 43) and a pair of lower belts (51, 53), said upper and lower belts being horizontally spaced apart such that one of said upper belts (41) and one of said lower belts (51) engage opposite sides of a portion of the neck of the bag and one (43) of said upper belts and one (53) of said lower belts engage a second portion of said bag neck such that a portion of the bag neck bridges space between the upper pair of belts and the lower pair of belts; and means (160, 170) for delivering temperature controlled gas to impinge against the surfaces of the bag between the gripped portions for fusing portions of the bag between the gripped portions for forming a sealed strip, said perforations being positioned to permit removal of the sealed strip.

6. Apparatus for forming a tamper resistant closure on a plastic bag according to Claim 5, said means for forming a row of perforations in the bag adjacent the gripped portions comprising an anvil (150P) having a slot (152P) formed therein adjacent one side of the neck of the bag and a perforator wheel (140P) having cutter teeth (142P) positioned adjacent the other side of the bag neck such that said teeth perforate the bag and extend into the slot formed in the anvil when a bag neck moves between the anvil and the perforator wheel.

7. Apparatus for forming a tamper resistant closure on a plastic bag according to Claim 5, said means for delivering temperature controlled gas to impinge against the surface of the bag comprising an upper manifold (165) positioned above the neck of the bag and a lower manifold (175) positioned below the neck of the bag; and means (160, 170) for delivering air through said upper and lower manifolds (165, 175) for impinging against the neck of the bag, said air being heated to a temperature sufficient for melting the bag neck for forming a sealed strip extending generally parallel to said row of perforations.

8. Apparatus for forming a tamper resistant closure on a plastic bag according to Claim 7 with the addition of a diverter valve (262, 272) adjacent each of said upper and lower manifolds (165, 175), said diverter valve being actuatable to divert air flow from said upper and lower manifolds and to exhaust air, without interruption of the flow of air into the diverter valves.

9. Apparatus for forming a tamper resistant closure on a plastic bag containing a product according to claim 5, comprising:

a conveyor (300) for moving a plastic bag containing a product along a path, said bag having an open end forming a neck (125) extending beyond the product in the bag;
an air nozzle (209) for flattening the open neck as the bag is moved by said conveyor;
a pair of upper brushes (210, 214) and a pair of lower brushes (212, 216), a first of said pair of upper and lower brushes having bristles arranged to engage the flattened neck of the bag and draw the bag transversely across said conveyor, second upper and lower brushes (214, 216) having angularly inclined bristles for moving the leading edge of the bag neck longitudinally of the conveyor while the trailing edge of the bag neck is engaged by the first upper and lower brushes.

Patentansprüche

1. Verfahren zur Bildung eines manipulationssicheren Verschlusses an einem Plastikbeutel, der einen Brotlaib beinhaltet, bestehend aus den Schritten:

Abflachen eines Teils des Beutelhalses in der Nähe des offenen Endes des Beutels; und **dadurch gekennzeichnet, dass**:

Anordnung eines Abschnitts des abgeflachten Teils, um zwischen einem Paar oberer Gurte (41, 43) und einem Paar unterer Gurte (51, 53) zu überbrücken, wobei die oberen und unteren Gurte voneinander horizontal beabstandet sind, so dass einer der oberen Gurte und einer der unteren Gurte gegenüberliegende Seiten des Abschnitts des Beutelhalses erfassen und einer der oberen Gurte und einer der unteren Gurte einen zweiten Teil des Beutelhalses erfassen, so dass ein Teil des Beutelhalses den Abstand zwischen den oberem Gurtpaar und dem unteren Gurtpaar überbrückt;

Bewegen des Beutelhalses (125), so dass

eine Strömung erhitzter Luft auf die Oberfläche des Beutels trifft, die sich zwischen den Gurten spannt, um Flächen (125x, 125y) auf dem Beutel zu verschmelzen, um einen versiegelten Streifen (130) zu bilden, so dass das Produkt (125a) im Beutel nicht zugänglich ist;

Zusammenfassen des abgeflachten Beutelbereichs zwischen dem versiegelten Abschnitt und dem Produkt; und

Anbringen eines wieder verwendbaren Verschlusses (115) an dem Hals.

2. Verfahren nach Anspruch 1 mit dem zusätzlichen Schritt des Perforierens (142p, 150p) des Beutels zwischen dem gesicherten Abschnitt und dem Produkt im Beutel, um einen Streifen von Öffnungen zu bilden.

3. Verfahren gemäß Anspruch 1, zusätzlich den Schritt aufweisend:

Fördern von Luft, die auf eine Temperatur im Bereich zwischen ungefähr 315 und 600 Fahrenheit aufgeheizt ist, damit sie auf die Oberfläche des Beutels trifft; und Ergreifen von Teilen des Beutels, die benachbart zu gegenüberliegenden Seiten des Abschnitts auf dem Beutel sind, auf die der Luftstrom trifft.

4. Verfahren zur Bildung eines manipulationssicheren Verschlusses auf einem Plastikbeutel, der ein Produkt enthält, bestehend aus den Schritten:

Bilden einer Reihe (132) von Perforationen in dem Beutel; und **dadurch gekennzeichnet**:

Ergreifen des Beutels an beabstandeten Stellen in der Nähe der Reihe von Perforationen zwischen einem Paar oberer Gurte (41, 43) und einem Paar unterer Gurte (51, 53), wobei die oberen und unteren Gurte horizontal voneinander beabstandet sind, so dass einer der oberen Gurte und einer der unteren Gurte gegenüberliegende Seiten eines Beutelhalsteils erfassen und einer der oberen Gurte und einer der unteren Gurte einen zweiten Teil des Beutelhalses erfassen, so dass ein Teil des Beutelhalses den Abstand zwischen dem oberen Paar von Gurten und dem unteren Gurtepaar überbrückt; und

Richten von temperaturgeregelter Luft, um auf den Beutel zwischen den ergriffenen Stellen, um einen versiegelten Streifen (130) neben der Reihe (132) von Perforationen zu bilden.

5. Vorrichtung zur Bildung eines manipulationssicheren Verschlusses an einem Plastikbeutel, der ein Produkt enthält, bestehend aus:

Mitteln (140p, 150p) zur Bildung einer Reihe von Perforationen im Beutel neben gegriffenen Bereichen des Beutels; und **gekennzeichnet durch**:

einem Paar oberer Gurte (41, 43) und ein Paar unterer Gurte (51, 53), wobei die oberen und unteren Gurte horizontal voneinander beabstandet sind, so dass einer der oberen Gurte (41) und einer der unteren Gurte (51) gegenüberliegende Seiten von Teilen des Beutelhalses ergreifen und einer (43) der oberen Gurte und einer (53) der unteren Gurte einen zweiten Teil des Beutelhalses greifen, so dass ein Teil des Beutelhalses den Abstand zwischen dem oberen Paar von Gurten und dem unteren Paar von Gurten überbrückt; und

Mittel (160, 170) zur Lieferung eines temperaturgeregelten Gases, um es gegen die Oberfläche des Beutels zwischen den ergriffenen Teilen zu richten, um Teile des Beutels zwischen den ergriffenen Teilen zur Formung eines versiegelten Streifens zu verschmelzen, wobei die Perforationen so angeordnet sind, um ein Entfernen des versiegelten Streifens zu erlauben.

6. Vorrichtung zur Bildung eines manipulationssicheren Verschlusses an einem Plastikbeutel gemäß Anspruch 5, wobei die Mittel zur Bildung einer Reihe von Perforationen im Beutel angrenzend an die ergriffenen Teile einen Amboss (150P) beinhalten, der einen Schlitz (152P) aufweist, der darin angrenzend an einer Seite des Beutelhalses eingeformt ist und ein Perforationsrad (140P), das Schneidezähne (142p) aufweist, die angrenzend an der anderen Seite des Beutelhalses angeordnet ist, so dass die Zähne den Beutel perforieren und in den Schlitz hineinreichen, der in dem Amboss eingeformt ist, sobald sich ein Beutelhals zwischen dem Amboss und dem Perforationsrad bewegt.

7. Vorrichtung zur Bildung eines manipulationssicheren Verschlusses an einem Plastikbeutel gemäß Anspruch 5, wobei die Mittel zum Zuführen temperaturgeregelten Gases, um auf die Oberfläche des Beutels zu treffen, einen oberen Verteiler (165) aufweisen, der oberhalb des Beutelhalses angeordnet ist, und einen unteren Verteiler (175), der unterhalb

des Beutelhalses angeordnet ist; und Mittel (160, 170) zum Zuführen von Luft durch den oberen und unteren Verteiler (165, 175) um sie auf den Beutelhals zu richten, wobei die Luft auf eine Temperatur erwärmt wird, die ausreichend zum Schmelzen des Beutelhalses ist, um einen versiegelten Streifen im Wesentlichen parallel zu der Reihe von Perforationen sich erstreckend zu bilden.

8. Vorrichtung zur Bildung eines manipulationssicheren Verschlusses an einem Plastikbeutel gemäß Anspruch 7 mit dem Zusatz eines Umlenkventils (262, 272) in der Nähe jedes der oberen und unteren Verteiler (165, 175), wobei das Umlenkventil so betätigbar ist, um den Luftstrom von den oberen und unteren Verteilern zur Abluft zu lenken, ohne den Luftstrom in die Umlenkventile zu unterbrechen.

9. Vorrichtung zur Bildung eines manipulationssicheren Verschlusses an einem Plastikbeutel, der ein Produkt gemäß Anspruch 5 enthält, beinhaltend:

einen Förderer (300), um einen Plastikbeutel, der ein Produkt beinhaltet, entlang eines Wegs zu bewegen, wobei der Beutel ein offenes Ende aufweist, das einen Hals (1265) 125) bildet, der über das Produkt im Beutel hinausragt;

eine Luftdüse (209), um den offenen Hals des Beutels abzuflachen, während der Beutel von dem Förderer bewegt wird;

ein paar obere Bürsten (210, 214) und ein Paar untere Bürsten (212, 216), wobei ein erstes Paar der oberen und unteren Bürsten Borsten aufweist, die so angeordnet sind, um den abgeflachten Hals des Beutels zu ergreifen und den Beutel transversal über den Förderer zu ziehen, wobei ein zweites Paar obere und untere Bürsten (214, 216) winkelig geneigte Borsten aufweist, um die Führungskante des Beutelhalses in Längsrichtung des Förderers zu bewegen, während die Folgekante des Beutelhalses von den ersten oberen und unteren Bürsten ergriffen ist.

Revendications

1. Procédé de formation d'un joint d'étanchéité inviolable sur un sac en plastique contenant une miche de pain, comprenant les étapes :

d'aplatir une partie de l'embouchure du sac adjacente à l'extrémité ouverte du sac ; et **caractérisé par** les actions de :

placer un segment de la partie aplatie de manière à former un pont entre une paire de courroies supérieures (41, 43) et une paire de courroies inférieures (51, 53), lesdites courroies supérieures et inférieures étant espacées horizontalement l'une de l'autre de telle sorte que l'une desdites courroies supérieures et l'une desdites courroies inférieures viennent en prise avec des côtés opposés d'une partie de l'embouchure du sac, et l'une desdites courroies supérieures et l'une desdites courroies inférieures viennent en prise avec une deuxième partie de ladite embouchure du sac, de telle sorte qu'une partie de l'embouchure du sac forme un pont entre ladite paire supérieure de courroies et ladite paire inférieure de courroies ;
déplacer l'embouchure (125) du sac de telle sorte que des courants d'air chauffé impactent la surface du sac s'étendant entre les courroies pour faire fondre ensemble des panneaux (125x, 125y) sur le sac afin de former une bande étanchéifiée (130), de telle sorte que le produit (125a) se trouvant dans le sac ne soit pas accessible ;
rassembler la partie aplatie du sac se trouvant entre le segment étanchéifié et le produit ; et
attacher une fermeture réutilisable (115) sur ladite embouchure.

2. Procédé selon la revendication 1, auquel on ajoute une étape de perforation (142p, 150p) du sac entre le segment attaché et le produit se trouvant dans le sac pour former une bande de perforations.

3. Procédé selon la revendication 1, comprenant les étapes de :

délivrer de l'air chauffé à une température dans la plage allant de 315 à 600° Fahrenheit (127 à 315° Celsius) sous la forme d'un courant destiné à impacter la surface du sac ; et
saisir des parties du sac adjacentes aux côtés opposés du segment du sac qu'impacte le courant d'air.

4. Procédé de formation d'une fermeture inviolable sur un sac en plastique contenant un produit, comprenant les étapes de :

former une rangée (132) de perforations dans le sac ; et **caractérisé par** les actions de :

saisir le sac à des positions espacées adjacentes à la rangée de perforations entre une paire de courroies supérieures (41, 43)

et une paire de courroies inférieures (51, 53), lesdites courroies supérieures et inférieures étant espacées horizontalement l'une de l'autre de telle sorte que l'une desdites courroies supérieures et l'une desdites courroies inférieures viennent en prise avec les côtés opposés d'une partie de l'embouchure du sac, et l'une desdites courroies supérieures et l'une desdites courroies inférieures viennent en prise avec une deuxième partie de ladite embouchure du sac, de telle sorte qu'une partie de l'embouchure du sac forme un pont entre la paire supérieure de courroies et la paire inférieure de courroies ; et
diriger de l'air à température commandée de manière qu'il impacte le sac entre les positions saisies pour former une bande étanchéifiée (130) adjacente à la rangée (132) de perforations.

5. Appareil permettant de former une fermeture inviolable sur un sac en plastique contenant un produit, comprenant :

des moyens (140p, 150p) permettant de former une rangée de perforations dans le sac, adjacentes aux parties saisies du sac ; et **caractérisé par** :

une paire de courroies supérieures (41, 43) et une paire de courroies inférieures (51, 53), lesdites courroies supérieures et inférieures étant espacées horizontalement l'une de l'autre de telle sorte que l'une desdites courroies supérieures (41) et l'une desdites courroies inférieures (51) viennent en prise avec des côtés opposés d'une partie de l'embouchure du sac, et l'une (43) desdites courroies supérieures et l'une (53) desdites courroies inférieures viennent en prise avec une deuxième partie de ladite embouchure du sac, de telle sorte qu'une partie de l'embouchure du sac forme un pont entre la paire supérieure de courroies et la paire inférieure de courroies ; et
des moyens (160, 170) permettant de délivrer du gaz à température commandée de manière qu'il impacte les surfaces du sac entre les parties saisies, pour faire fondre des parties du sac entre les parties saisies pour former une bande étanchéifiée, lesdites perforations étant placées de manière à permettre le retrait de la bande étanchéifiée.

6. Appareil permettant de former une fermeture inviolable sur un sac en plastique selon la revendication 5, lesdits moyens permettant de former une rangée de perforations dans le sac adjacentes aux parties saisies comprenant un contre-outil (150P) comportant une fente (152P) ménagée dedans, adjacente à un côté de l'embouchure du sac, et une roue perforatrice (140P) comportant des dents de coupe (142P) placées de manière adjacente à l'autre côté de l'embouchure du sac, de telle sorte que lesdites dents perforent le sac et s'étendent dans la fente ménagée dans le contre-outil quand une embouchure de sac se déplace entre le contre-outil et la roue perforatrice.

7. Appareil permettant de former une fermeture inviolable sur un sac en plastique selon la revendication 5, lesdits moyens permettant de délivrer du gaz à température commandée de manière qu'il impacte la surface du sac comprenant un collecteur supérieur (165) placé au-dessus de l'embouchure du sac et un collecteur inférieur (175) placé en dessous de l'embouchure du sac ; et des moyens (160, 170) permettant de délivrer de l'air par l'intermédiaire desdits collecteurs supérieur et inférieur (165, 175) afin qu'il impacte l'embouchure du sac, ledit air étant chauffé à une température suffisante pour faire fondre l'embouchure du sac afin de former une bande étanchéifiée s'étendant d'une manière sensiblement parallèle à ladite rangée de perforations.

8. Appareil permettant de former une fermeture inviolable sur un sac en plastique selon la revendication 7, auquel on ajoute une vanne d'aiguillage (262, 272) adjacente à chacun desdits collecteurs supérieur et inférieur (165, 175), ladite vanne d'aiguillage pouvant être actionnée pour détourner l'écoulement d'air desdits collecteurs supérieur et inférieur et évacuer l'air, sans interruption de l'écoulement d'air dans les vannes d'aiguillage.

9. Appareil permettant de former une fermeture inviolable sur un sac en plastique contenant un produit selon la revendication 5, comprenant :

un transporteur (300) permettant de déplacer un sac en plastique contenant un produit le long d'une trajectoire, ledit sac ayant une extrémité ouverte formant une embouchure (125) s'étendant au delà du produit dans le sac ;
une buse d'air (209) permettant d'aplatir l'embouchure ouverte quand le sac se déplace grâce audit transporteur ;
une paire de balais supérieurs (210, 214) et une paire de balais inférieurs (212, 216), une première desdites paires de balais supérieurs et inférieurs ayant des poils agencés pour venir en prise avec l'embouchure aplatie du sac et tirer le sac transversalement au transporteur,

lesdits deuxièmes balais supérieurs et inférieurs (214, 216) comprenant des poils inclinés de manière angulaire pour déplacer le bord d'attaque de l'embouchure de sac longitudinalement par rapport au transporteur tandis que le bord de queue de l'embouchure de sac est en prise avec les premiers balais supérieurs et inférieurs.

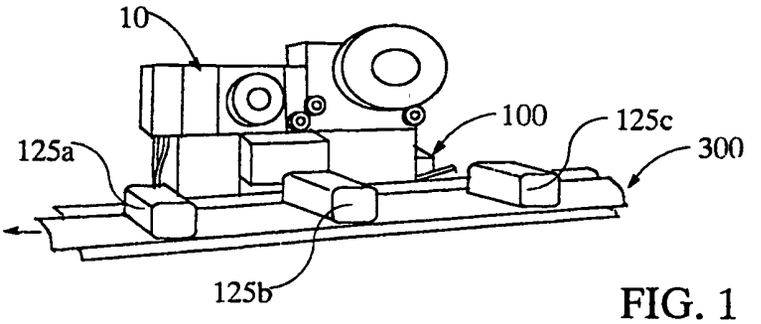

FIG. 1

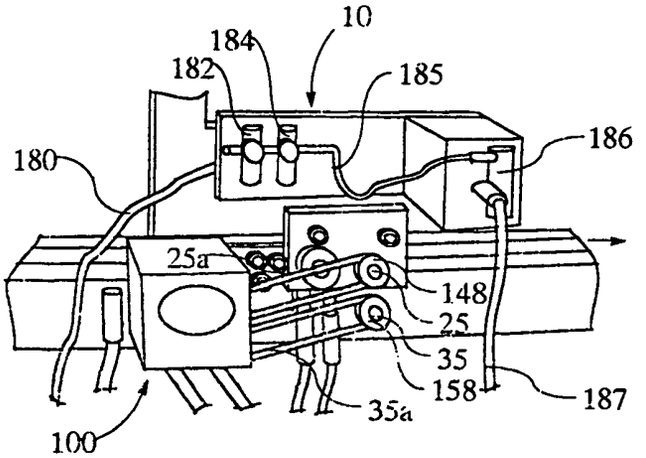

FIG. 2

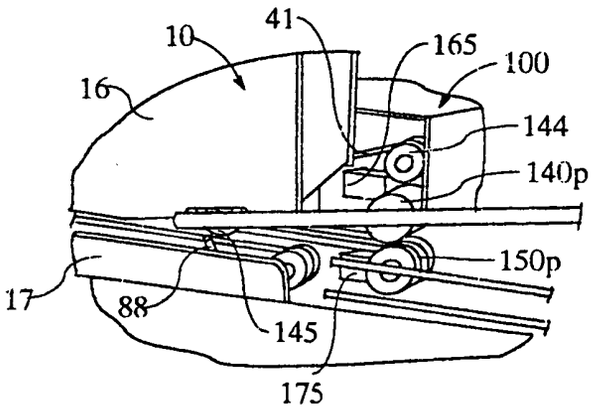

FIG. 3

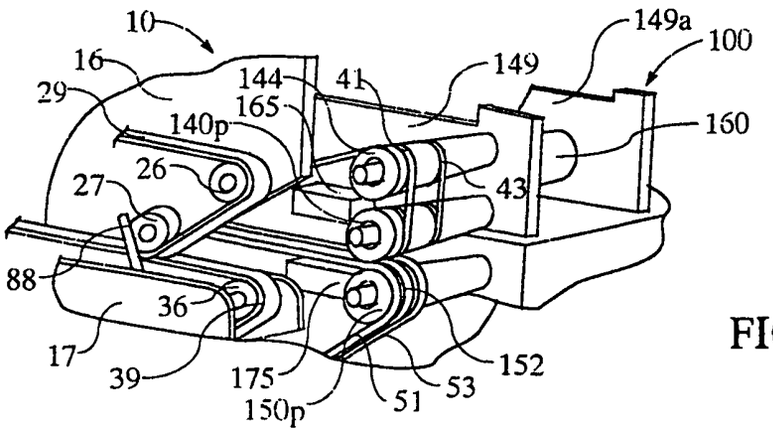

FIG. 4

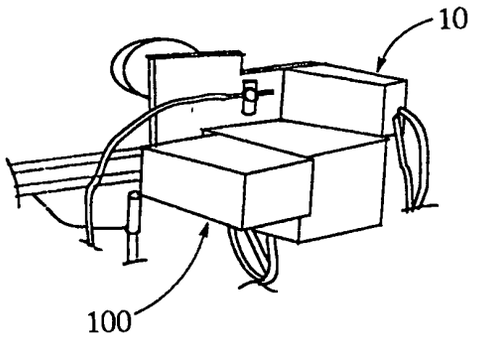

FIG. 5

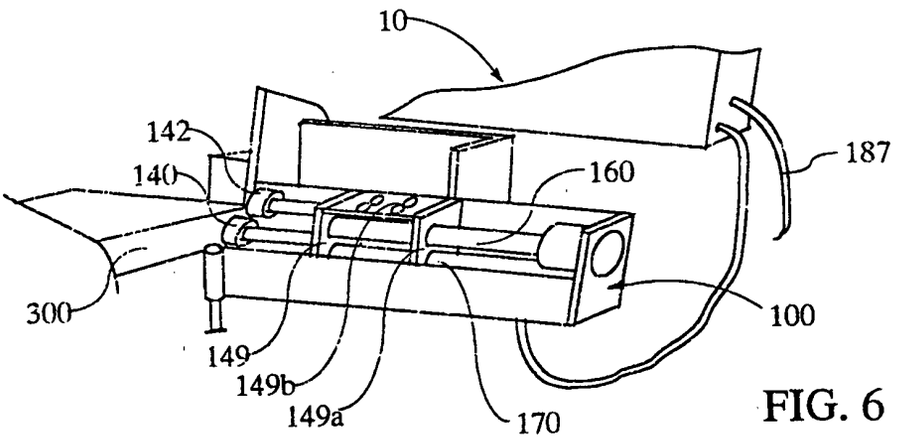

FIG. 6

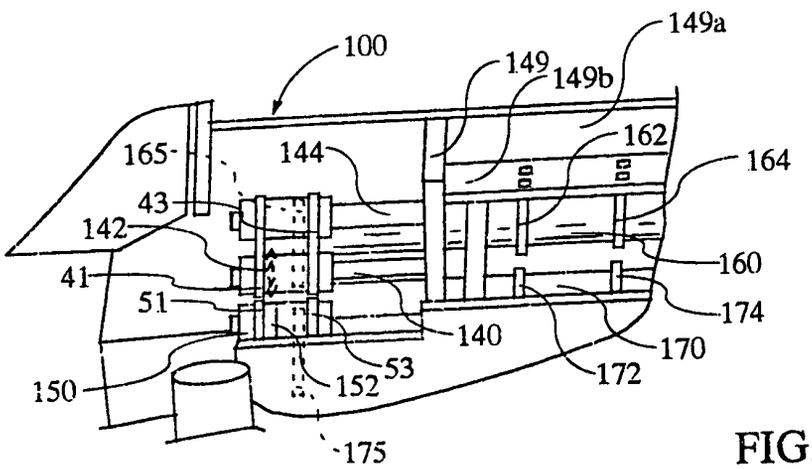

FIG. 7

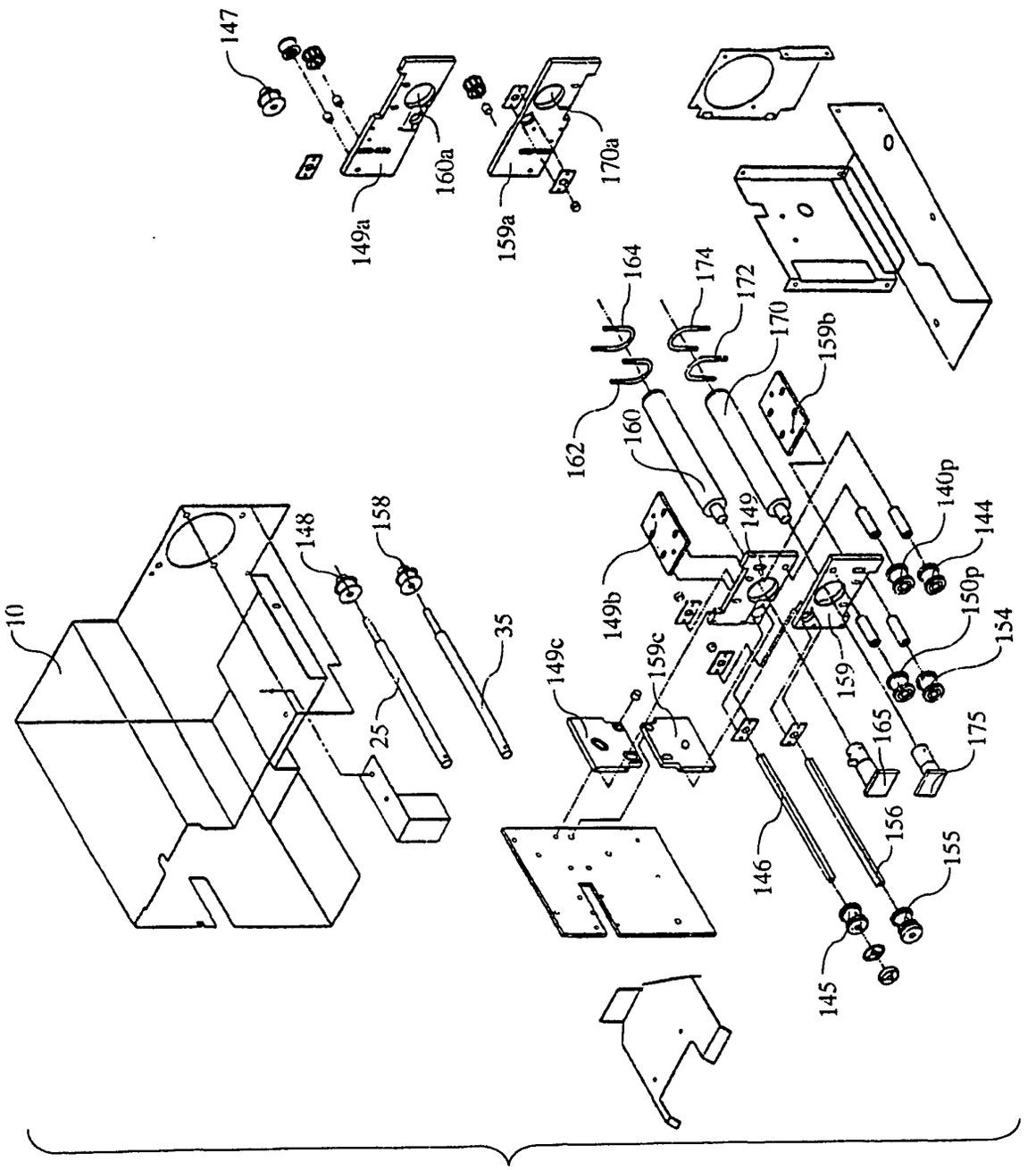
147
160a
149a
170a
159a
164
174
172
170
159b
162
160
149
140p
144
150p
154
149b
159c
149c
159
165
175
10
148
158
35
25
146
156
155
145

FIG. 8

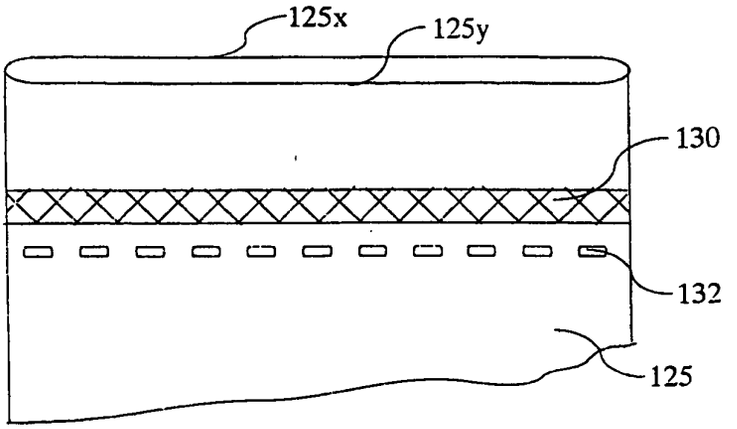

FIG. 9

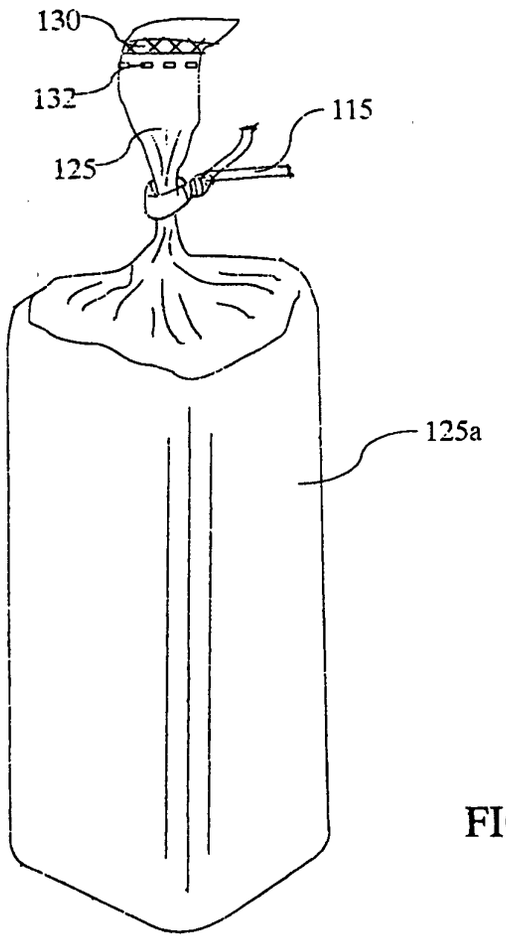

FIG. 10

BAG SEALING PROFILE FOR PRODUCTION SETUP
psi equal 25
MAXIMUM TEMPERATURE 600°F.

Conveyor Speed FPM	60	50	40	34	28
Servo-tyer FPM	125	104	85	71	56
Servo belt setting	11	10	9	8	7
Bag 2.0 mil	N/A	N/A	600	550	475
Bag 1.5 mil	500	535	500	485	440
Bag 1 mil	550	475	445	415	385

Note: The above temperatures are used as a guide only. Bag characteristics may require temperature adjustment for bag quality.

FIG. 11

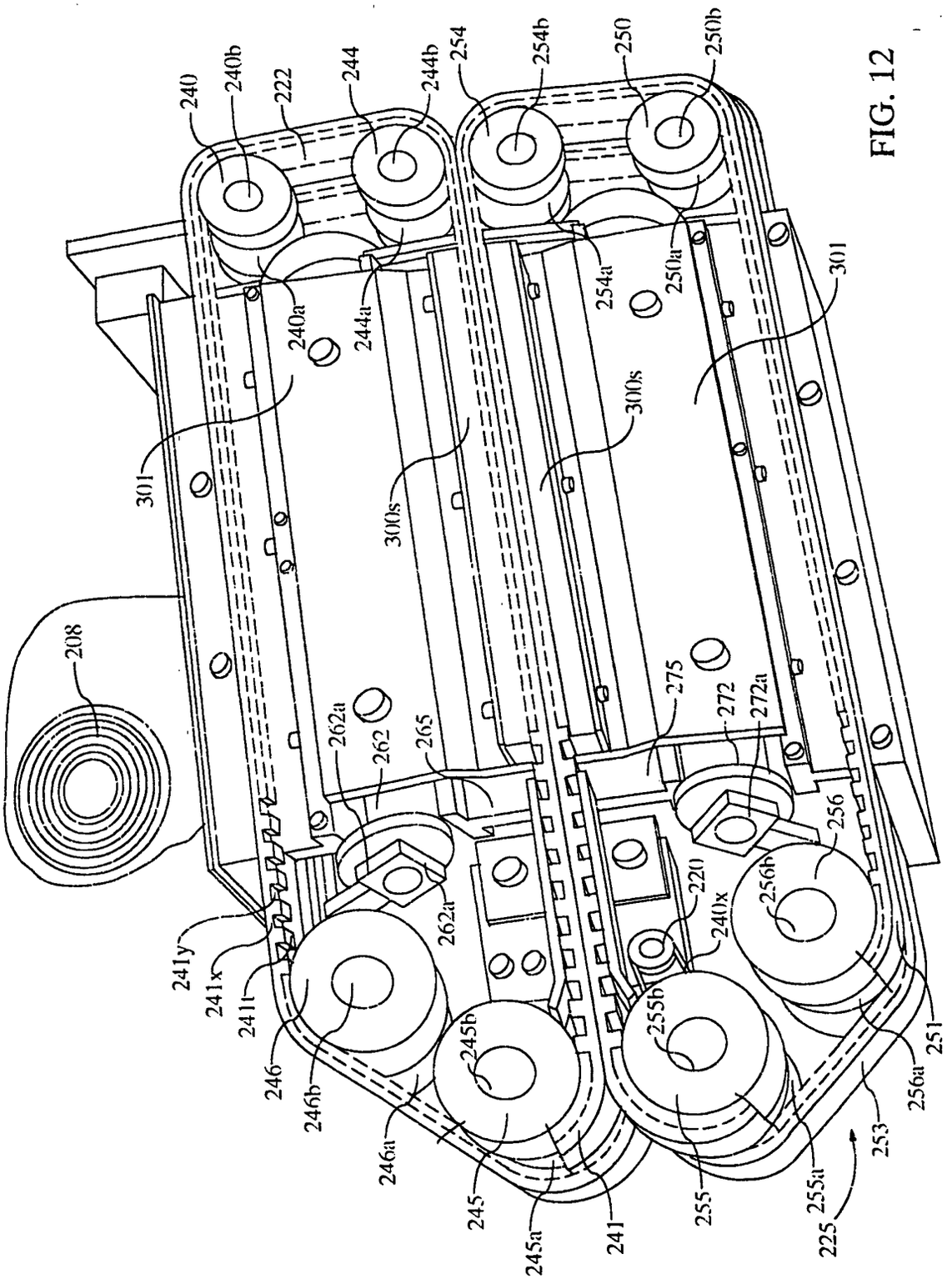
240
240b
222
244
244b
254
254b
250
250b
240a
244a
254a
250a
301
300s
208
262a
262
265
275
272
272a
256
256b
220
240x
241y
241x
241
246
246b
246a
245b
245
245a
241
255b
255
255a
225
253
256a
251

FIG. 12

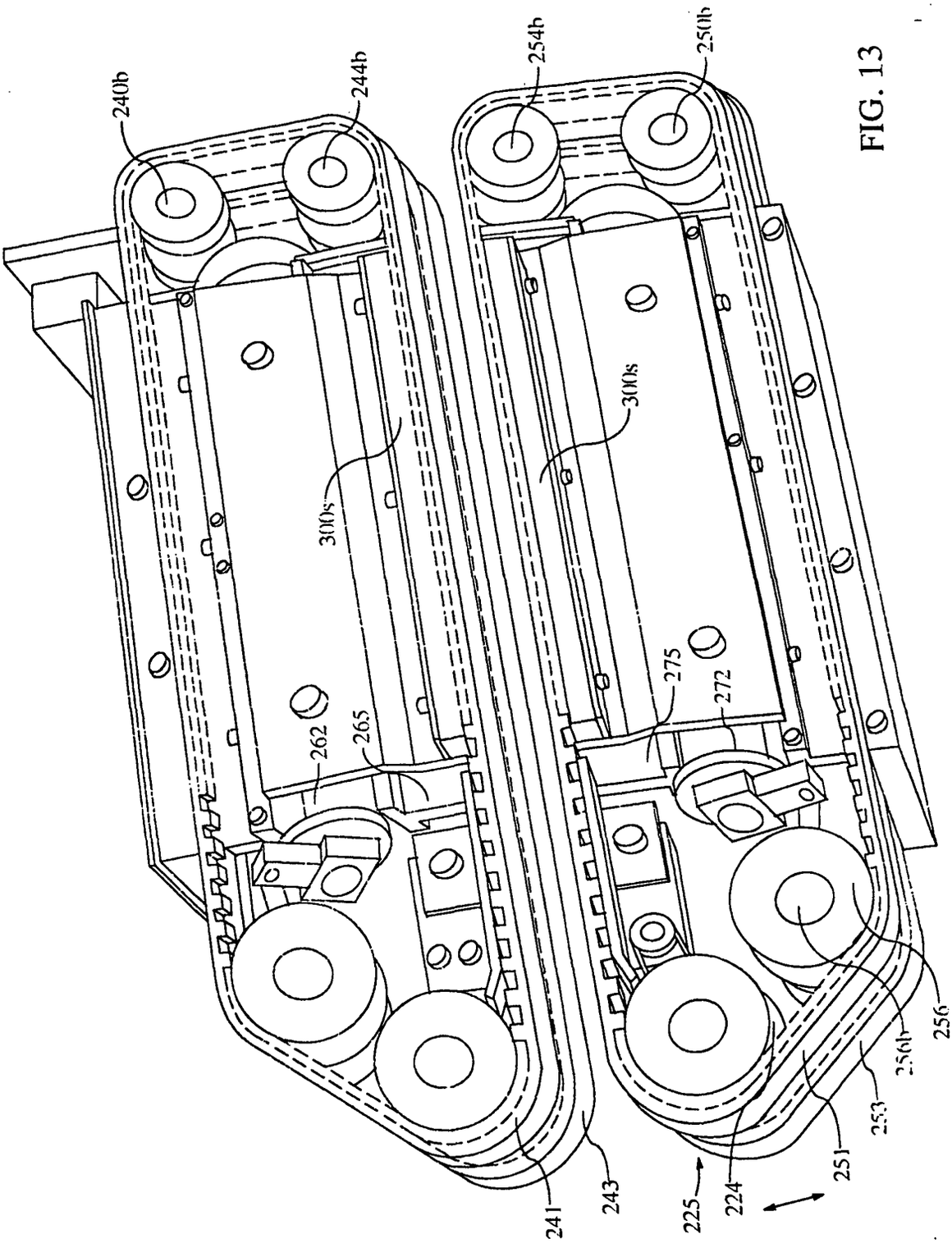
240b
244b
254b
250b
300s
300s
262
265
275
272
241
243
225
224
251
253
256b
256

FIG. 13

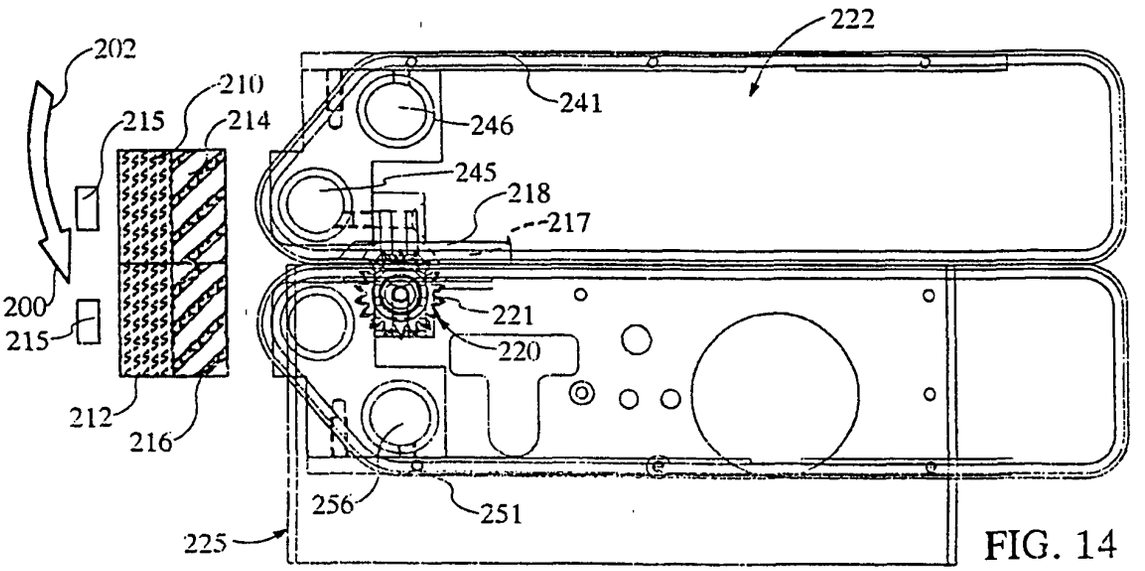
202
210
215
214
200
215
212
216
222
241
246
245
218
217
221
220
256
251
225

FIG. 14

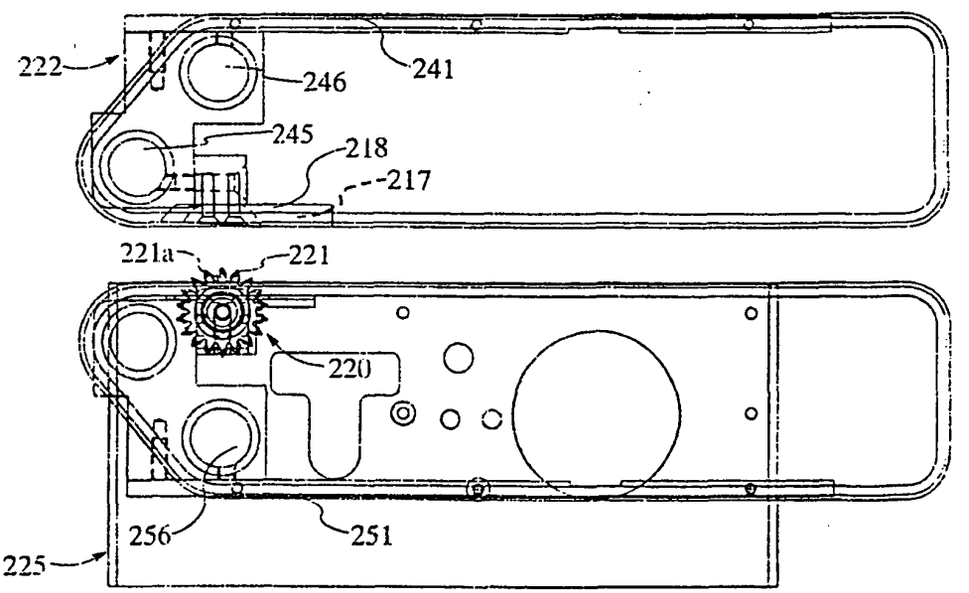
222
241
246
245
218
217
221a
221
220
256
251
225

FIG. 15

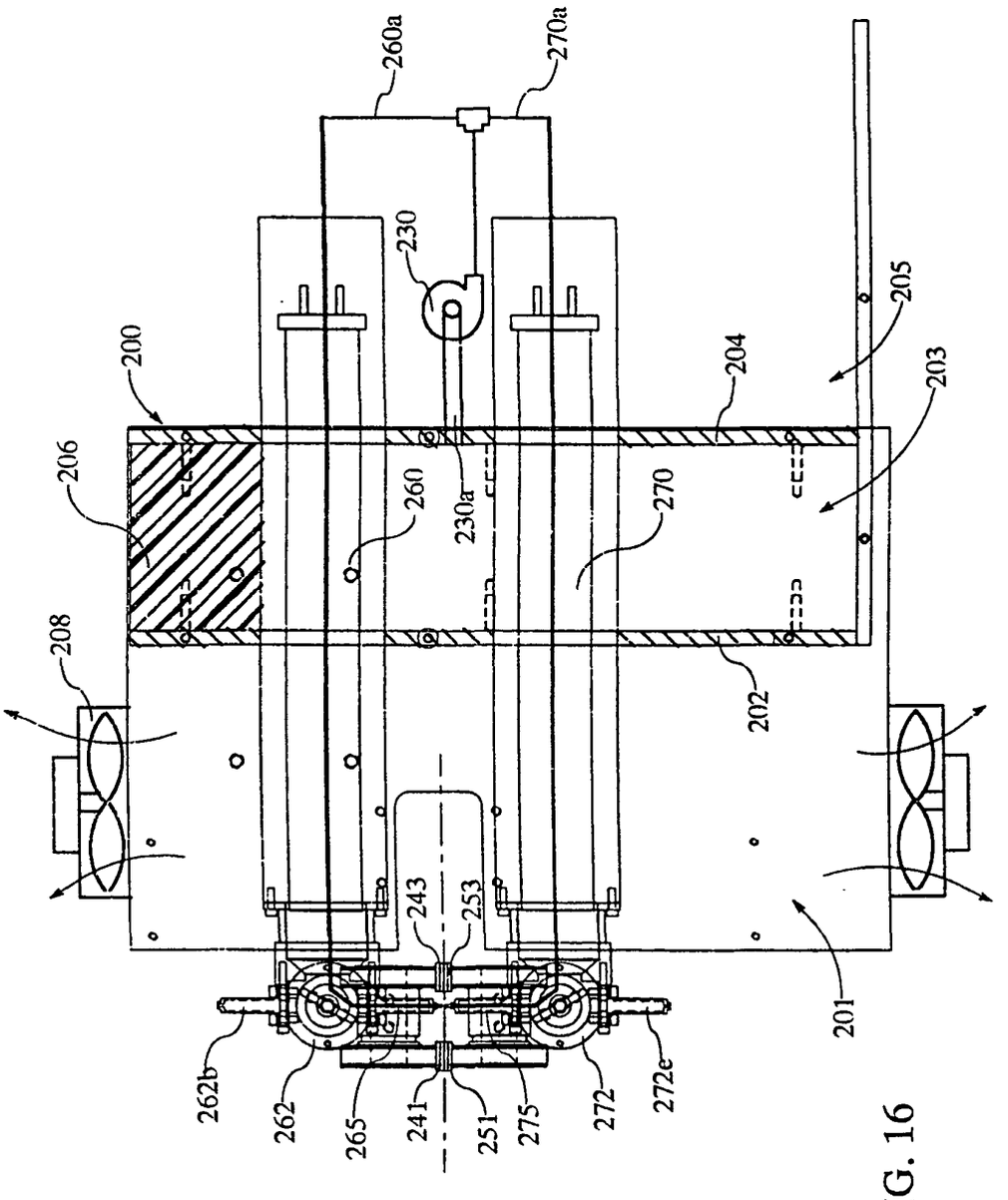
260a
270a
230
205
200
204
203
206
260
230a
270
208
202
243
253
201
262b
262
265
241
251
275
272
272e

FIG. 16

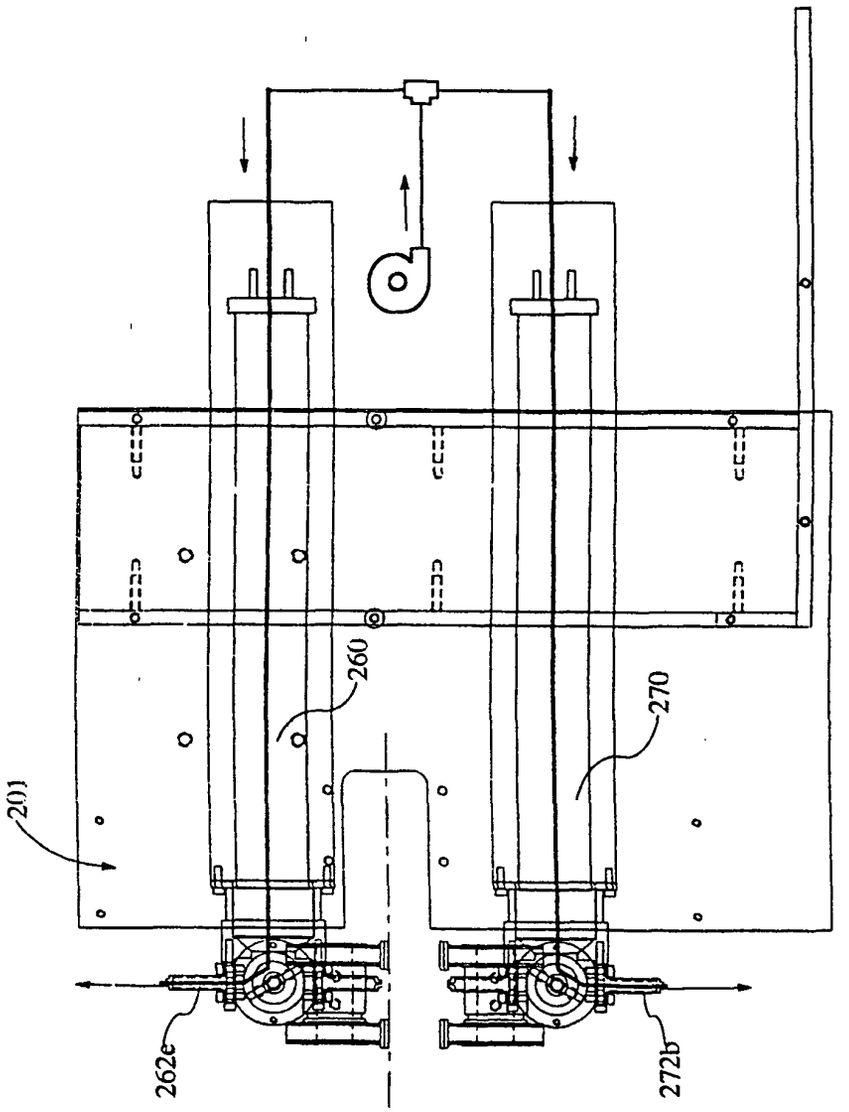

FIG. 17

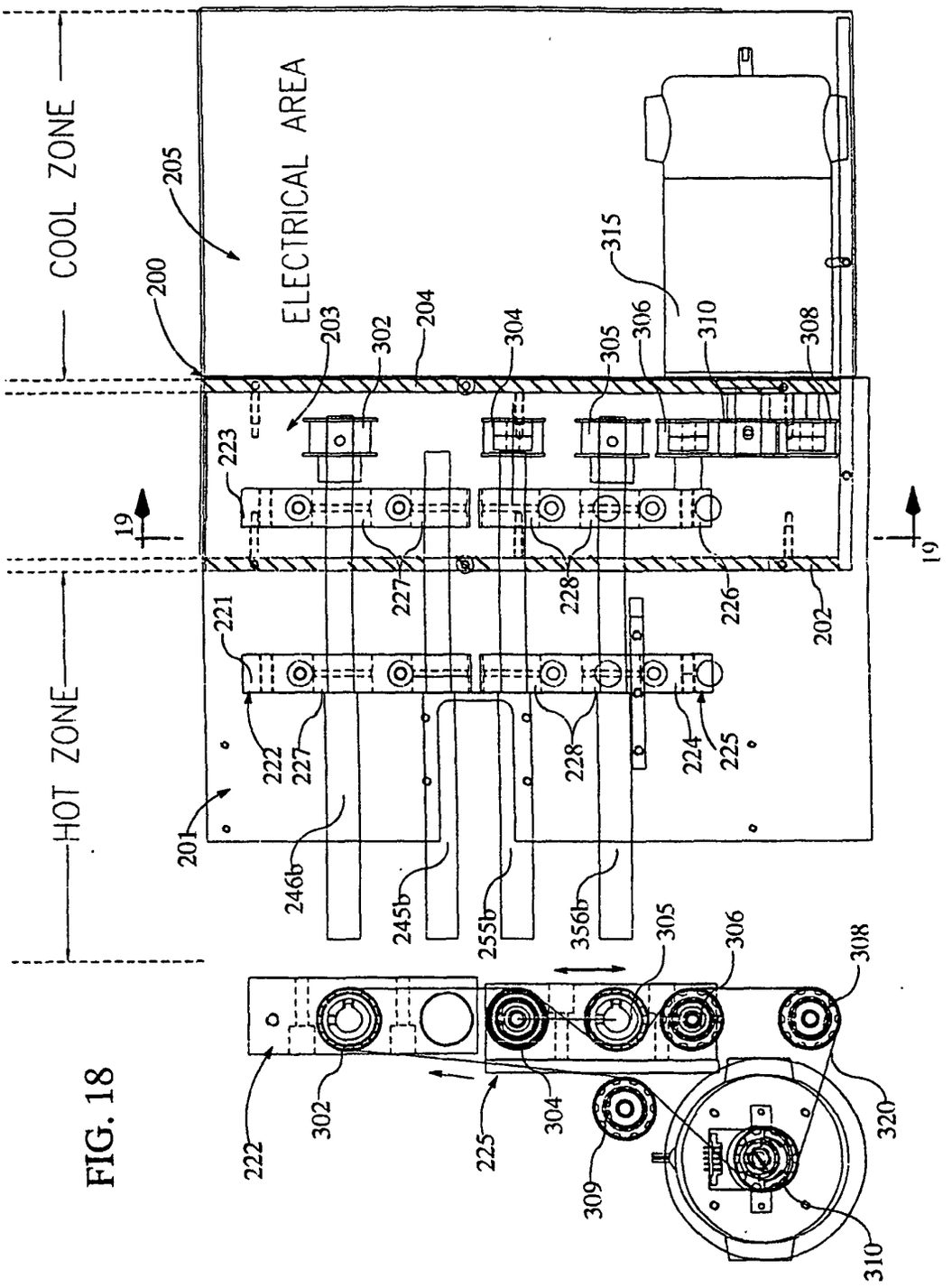
COOL ZONE
HOT ZONE
ELECTRICAL AREA
200
201
202
203
204
205
221
222
223
224
225
226
227
228
246b
245b
255b
356b
302
304
305
306
308
309
310
315
320
19
19

FIG. 18