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Rejsa

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[54] **METHOD AND APPARATUS FOR FORMING SIFT PROOF GLUED FLAP SEALS FOR CARTONS**

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[52] **U.S. Cl.** **53/47,** 53/383, 118/323

[51] **Int. Cl.** **B65b 7/20**

[58] **Field of Search** 53/47, 383; 118/323

[56] **References Cited**

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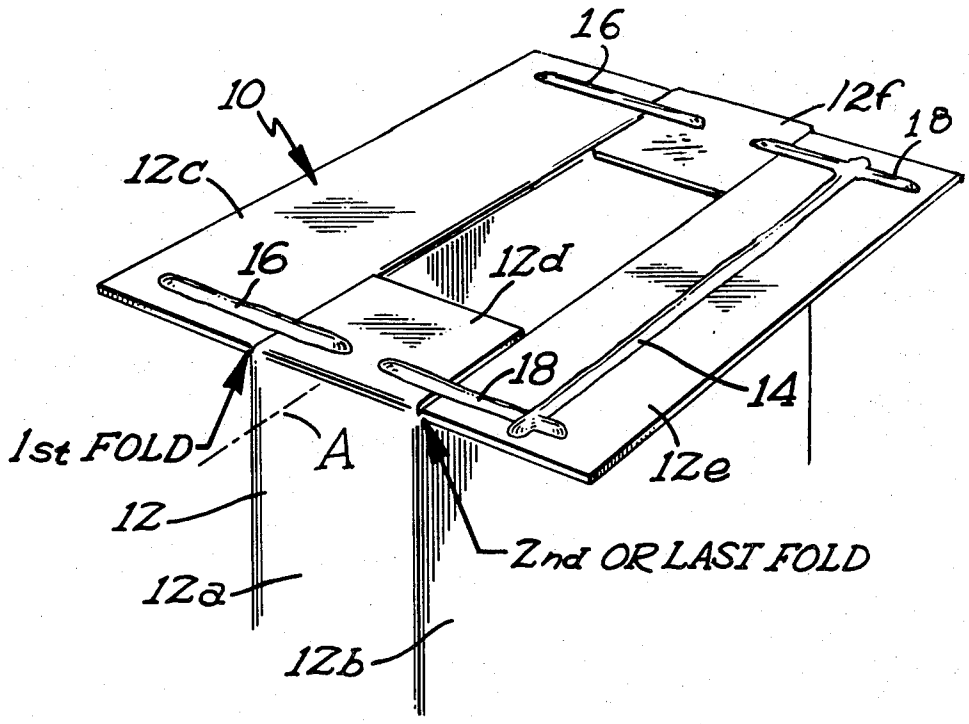
[57] **ABSTRACT**

An adhesive applicator is described which includes five adhesive applying nozzles for placing beads of fluid adhesive on a line of moving cartons. Four of the nozzles are moved diagonally with respect to the path along which cartons are moved beneath the adhesive applicator. One nozzle is stationary and is used to produce a straight line of adhesive paralleling the path of motion. The moving nozzles are mounted just above the flaps of the carton which are held in a horizontal position. Each moving nozzle is mounted on a pivot axis positioned above the nozzle opening and oriented at an angle of approximately 30° to the direction of carton motion so that relative movement between the carton and nozzle is at right angles to the main axis of the carton producing a bead across the flaps which is positioned perpendicular to the direction of carton travel. In this manner, an adhesive bead of considerable thickness and of just the desired pattern is applied to the flaps while the cartons move continuously below the glue nozzles. When the flaps are folded inwardly one after the other, the pressure on the adhesive beads causes a squeezing out of adhesive into all the voids of the flap contact area thereby producing a sift proof seal.

6 Claims, 6 Drawing Figures



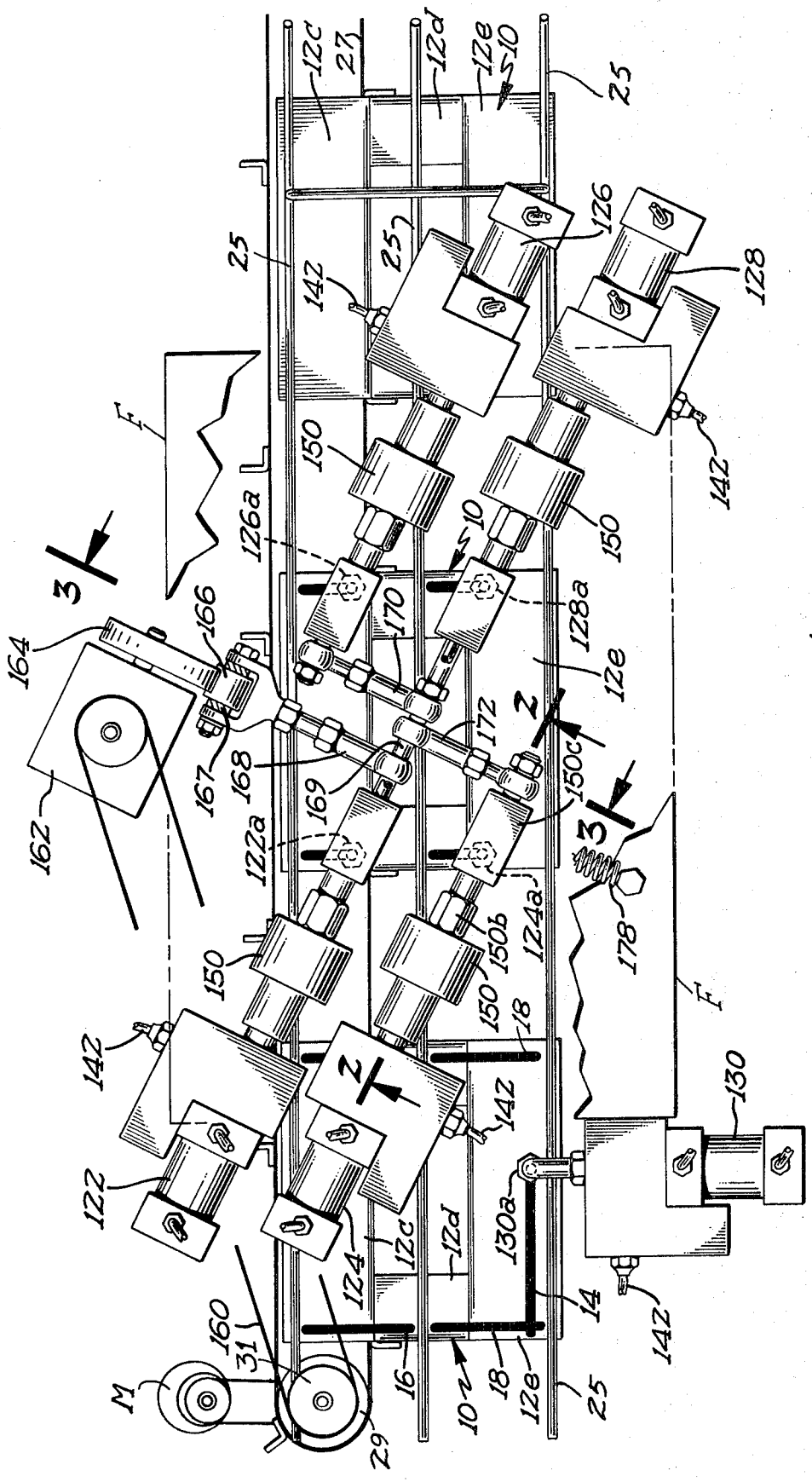

12c
27
12d
12e
10
25
126
128
142
150
126a
128a
170
172
168
167
166
164
162
169
122a
150c
124a
150b
178
130
130a
122
124
160
31
M
29
16
14
18
12e

Fig 1

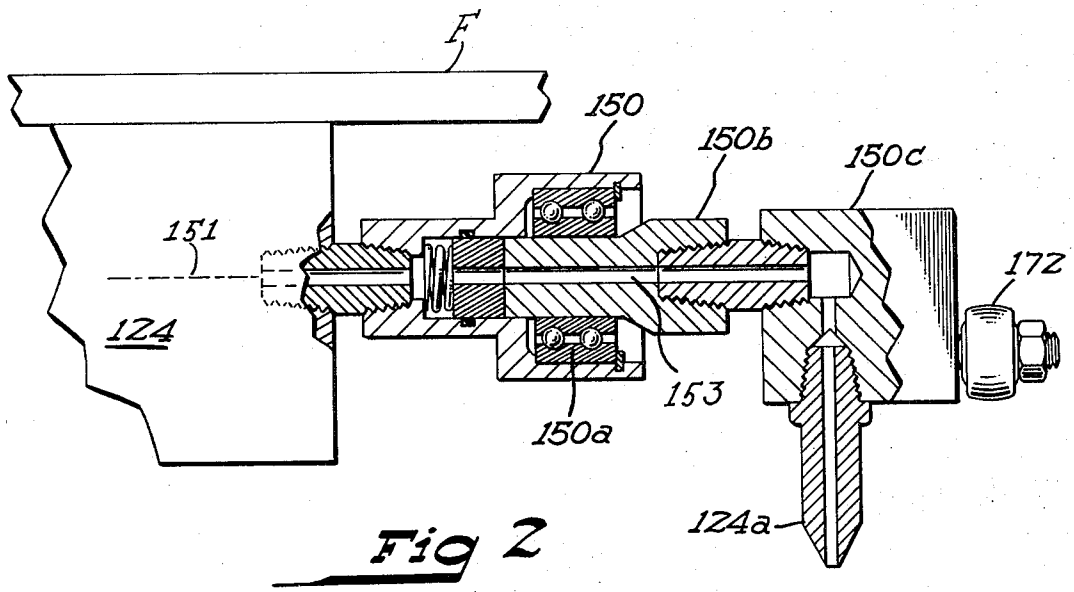

F
150
150b
150c
151
172
124
153
150a
124a

Fig 2

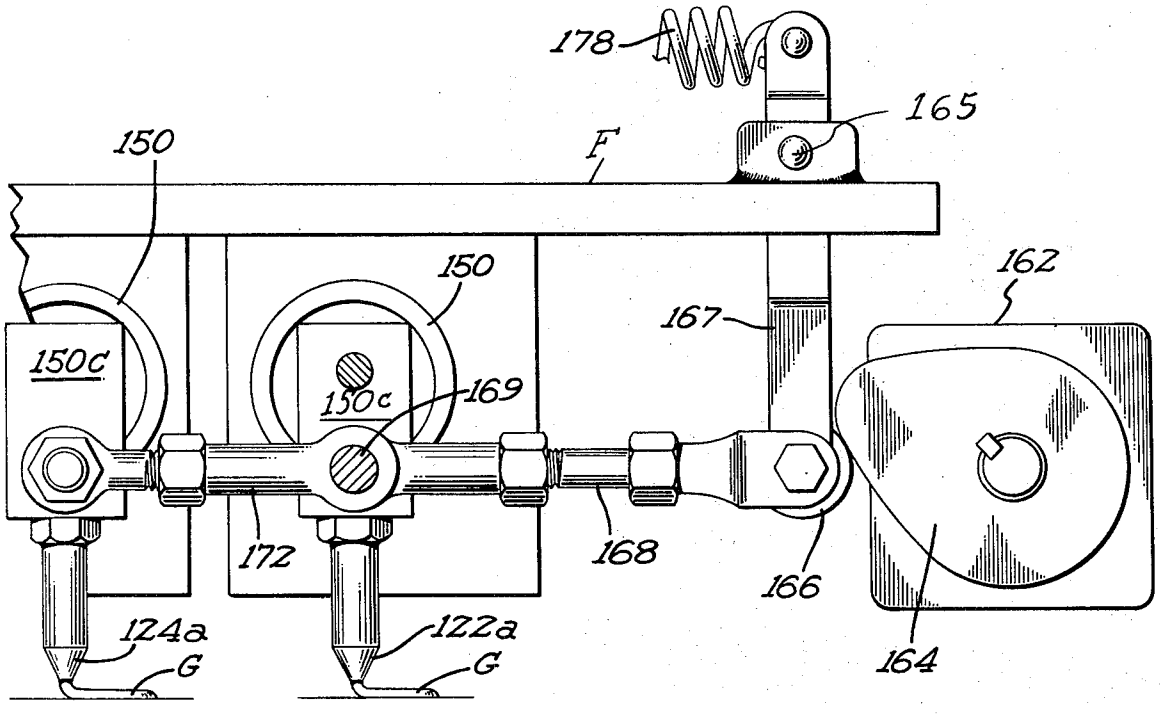

178
165
150
F
150
162
167
150c
150c
169
172
168
166
164
124a
122a
G
G

Fig 3

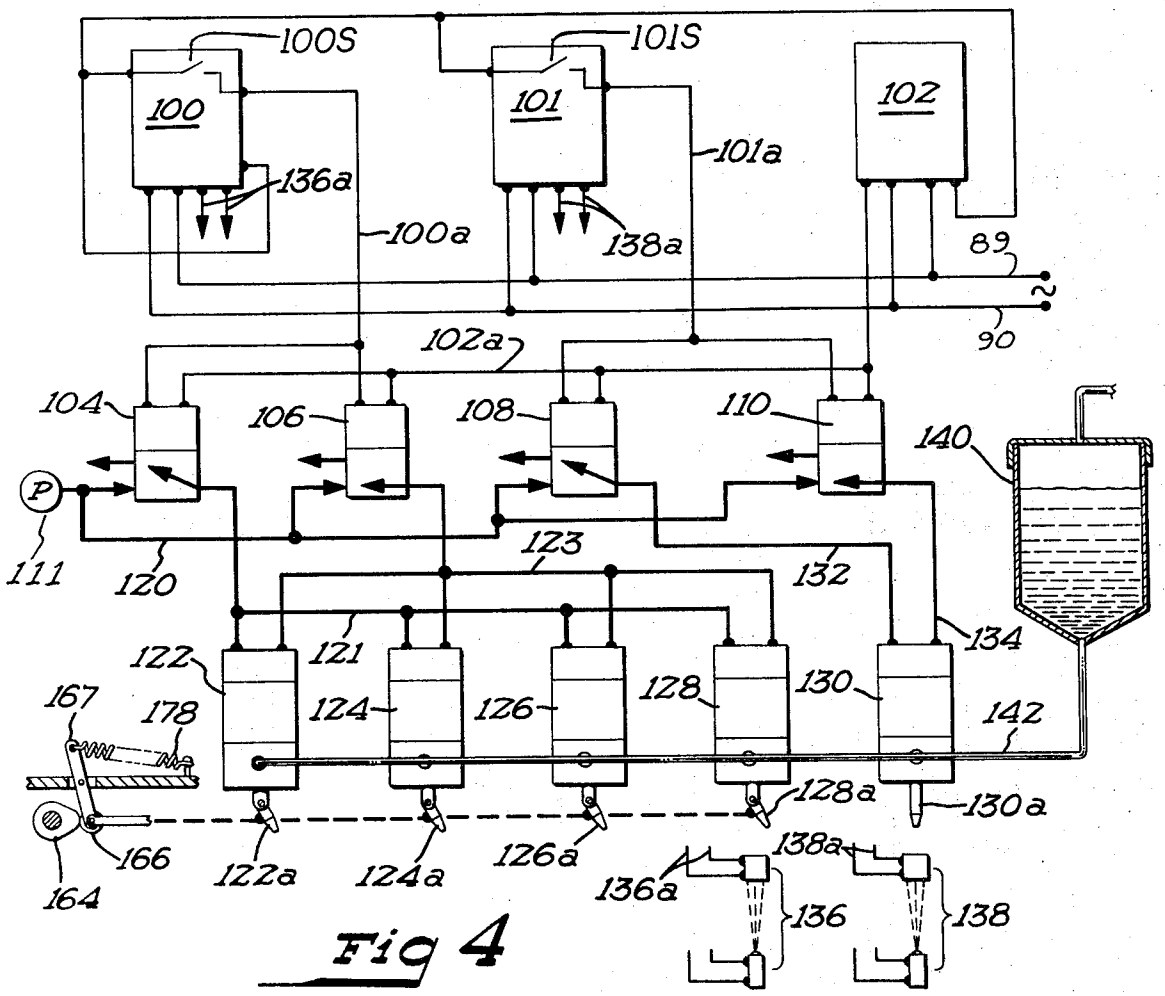


Fig 4

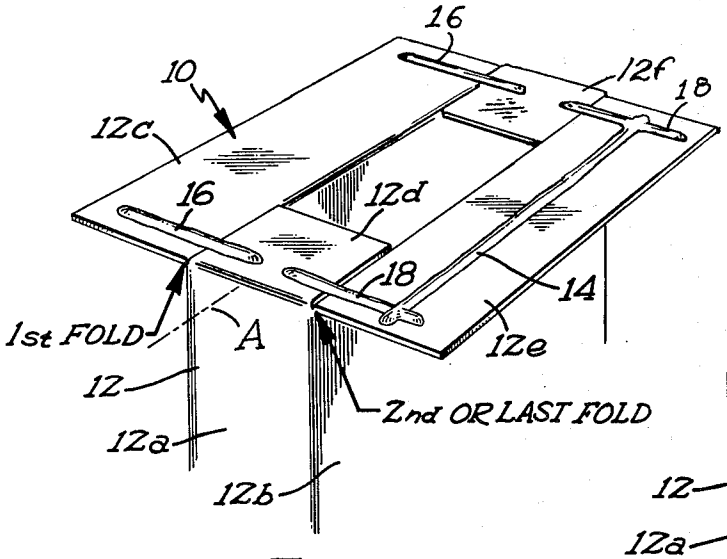


Fig 5

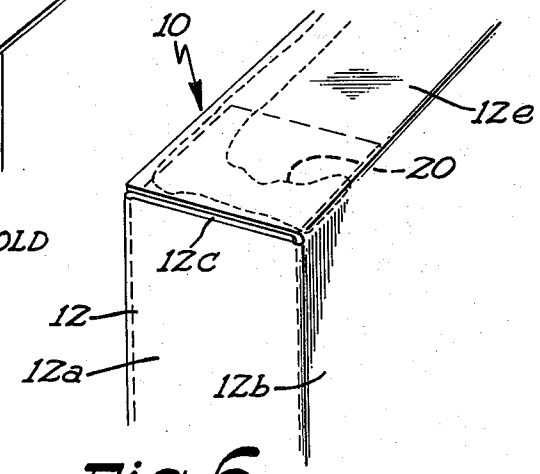


Fig 6

METHOD AND APPARATUS FOR FORMING SIFT PROOF GLUED FLAP SEALS FOR CARTONS

FIELD OF THE INVENTION

The present invention relates to carton gluing and more particularly to glue applicators for applying beads of glue to cartons and to a method of sift proofing cartons.

THE PRIOR ART

Although unlined paperbound cartons have been used for years to ship flour, dry mixes and other powders, no satisfactory sift-proof seal has been successfully developed. Thus, unsightly accumulation of powder on the cartons is common. The powder can also attract insect pests and make directions difficult to read.

Conventional methods of adhesive application such as wheels, spray application, wipers, etc. apply the adhesive in a very thin layer with little "squeeze-out" and also apply adhesive to areas where it is not effective. Moreover, existing jet applicators do not apply adhesive beads at an angle of 90° to the direction of carton travel and have not as far as is known been successful in producing a sift-proof carton.

Moreover, prior adhesive applicators of the type described have been slow in operation, were not adapted to applying adhesive in bead form to a line of continuously moving cartons, were ineffective in producing sift-proof cartons or have been subject to malfunction particularly with respect to precise timing of the start and stop of the adhesive application. Other applicators of the general type described have not been capable of operating at the speeds for which the present invention is designed, namely, on the order of about 200 to 300 cartons per minute.

OBJECTS OF THE INVENTION

The primary objects are to provide a) a method of applying adhesive more effective than adhesive wheels, spray applicators, wipers, etc. for producing a reliable sift-proof seal for a carton of the type with flaps which are folded in overlapped position and glued in place, b) provision for utilizing the flow characteristics of adhesives for effectively forcing adhesive into all of the interstices between the layers of the folded carton end flaps to thereby reliably seal the carton flaps against the leakage of powdered contents, c) provision for reliably applying adhesive as a bead at an angle of **90°** to the direction of carton travel without stopping the motion of a line of moving cartons, d) provision for reliably starting and stopping the flow of adhesive and for controlling the location of the bead on the carton, e) and more specifically provision for applying adhesive as a bead which extends both longitudinally and transversely and for utilizing the fluidity of the adhesive to allow excess adhesive to be squeezed into the interstices between carton flaps to thereby reliably form a carton resistant to sifting of powdered contents.

THE FIGURES

FIG. **1** is a plan view of the apparatus.

FIG. **2** is a vertical sectional view taken on line **2—2** of FIG. **1.**

FIG. **3** is a vertical sectional view taken on line **3—3** of FIG. **1.**

FIG. **4** is a semidiagramatic, schematic illustration of the glue applying controls.

FIG. **5** is a perspective view of a portion of one of the cartons just after the adhesive has been applied.

FIG. **6** is a view similar to FIG. **5** after the flaps have been folded to the closed position.

SUMMARY OF THE INVENTION

Briefly, the present invention provides a method of forming sift-proof cartons which comprises providing a carton with end flaps and placing a first pair of the opposing flaps in a predetermined position adapted to receive adhesive on their exposed surfaces. The second opposed flaps are preferably folded centrally toward one another and adhesive is applied to the first pair of flaps at right angles to the fold line of each of the first pair of flaps. Preferably adhesive is also applied along a line running parallel to the fold line of one of the flaps. The bead of adhesive has a height which is on the same order as the width thereof and the flaps are folded to the closed position while the adhesive is in a fluid condition.

The invention also embodies an apparatus for applying adhesive, simultaneously advancing the cartons along a predetermined axis and includes at least one moving nozzle which deposits the adhesive along the line extending transverse to the direction of packaged movement. A stationary nozzle is employed for depositing adhesive along a line parallel to the axis of package motion.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Refer first to FIG. **5** which illustrates a portion of the top of a carton prior to folding the flaps to the closed position. The carton indicated generally at **10** is provided with vertically disposed carton panels **12** including an end panel **12*a*** and side panels **12*b*** of a substantially larger size. The top flaps include a left top flap **12*c***, a center top flap **12*d***, a right side top flap **12*e***, and a rear top flap **12*f***. Laterally extending beads of adhesive **16** and **18** are applied as described below in a direction extending normal to the longitudinal axis of the carton as seen from above, i.e., along the axes of flaps **12*c*** and **12*e*** while a longitudinally extending bead **14** is applied to flap **12*e*** in approximately the center. It should be noted that the beads **16** and **18** extend across the gap between the flaps **12*d***, **12*f*** and the flaps on either side thereof. The transverse beads are located approximately ⅛ to ½ inch and preferably about ¼ inch from the end panels of the carton on either end. At the time of the folding operation, the beads **16, 18** and **14** are still in a wet or plastic condition, i.e., fluid so that they are capable of flowing whereupon when flap **12*c*** is folded downwardly over flaps **12*d*** and **12*f*** and the flap **12*e*** is placed on top of flap **12*c***. When this is done the fluid adhesive will flow toward the end panels **12*a*** as well as toward the center of the container and a portion of it will be forced into the cracks along the side edges of flap **12*d*** and **12*f*** thereby reliably sealing the corners and edges to provide a substantially sift-proof container.

The adhesive applicator will now be described with reference to FIGS. **1–4.** The adhesive applicator includes a plurality of nozzles to apply the several beads **16, 18** and **14** to the carton as the carton moves continuously. The nozzle which applies the bead **14** is station-

ary while the remaining nozzles of which there are four oscillate with the center of oscillation of the nozzle shaft at an oblique angle to the direction of travel of the carton so that the bead of adhesive may be applied to the carton flap at an angle of 90° with respect to the direction of carton travel. To impart oscillatory movement to the nozzles it is convenient to suspend each moving nozzle from a pivot point positioned above the cartons and to provide a means for swinging the nozzle back and forth below.

The primary advantage of this manner of applying adhesive is that when the flaps are folded to the closed position, the adhesive beads are pressed together in bead to bead relationship resulting in a squeezing out of adhesive into all of the voids and interstices of the flap contact area. This is particularly important because the adhesive is pressed into the carton corners where the most leaks occur while in prior methods of adhesive application, (wheels, wipers, sprays, etc.) the adhesive is applied in thin layers with little squeeze-out. These prior systems, moreover, apply adhesive to areas where it is not effective. The adhesive can comprise a hotmelt adhesive, a cold resin type adhesive with a water base or the like provided only that the adhesive is thick enough to form a bead. The adhesive nozzle moving means is preferably connected directly to the carton advancing mechanism and the nozzle can be turned on and off by actuation through suitable photoelectric cell or other sensor operatively connected to the nozzle and adapted to operate when each carton is moved to a predetermined point on the machine.

Concerning the details of the nozzle construction refer now to FIGS. **1–4.** As seen best in FIG. **1,** the cartons **10** enter the apparatus from the right hand side and travel toward the left with the flaps **12***c* and **12***e* folded outwardly while the flaps **12***d* and **12***f* are folded centrally. The flaps are held in the selected position by the usual flap positioning rods **25.** Motion is imparted to the cartons by a belt conveyor **27** driven by a motor driving sprockets **29** and **31.**

The controls for turning on and off the nozzles, starting and stopping the flow through the nozzles will now be described with particular reference to FIG. **4.** Alternating current is provided through a commercial power line consisting of conductors **89** and **90** connected to a DC power supply **102** which serves to prevent irregularities in operation due to fluctuation in line voltage and thereby provides more uniform operation. DC power from supply **102** is supplied to photoelectric control units **100** and **101** which open and close moving nozzles **122** to **128***a* and stationary nozzle **130***a* respectively. Adhesive is supplied through a line **142** from a supply container **140.** The photoelectric control unit **100** is wired to solenoid operated valves **104** and **106** by conductor **100***a* which is coupled through the DC power supply by a normally open switch **100***s*. Similarly, photoelectric control unit **101** is connected by a conductor **101** a to the operated valves **108** and **110** which receive DC power from supply **102** when the normally open switch **101***s* is closed. A pneumatic supply compressor **111** provides pressure to the solenoid operated shut-off valves. The valve **104** is connected via line **121** to open all of the adhesive flow control actuators **122, 124, 126** and **128** which are coupled to the moving nozzles **122***a*, **124***a*, **126***a* and **128***a* respectively. The solenoid operated valve **106** is coupled via line **123** to valves **122–128** for closing the same to thereby shut off the flow of adhesive supply. The valve **108** is connected via line **132** to valve **130,** the stationary, the pneumatically operated valve **130** of nozzle **130***a* and the valve **110** is connected via pipe **134** to close valve **130** of the stationary nozzle **130***a*. Thus, because the opening and closing of the nozzles is done by separate valves, much faster time response is provided than if the same valve were used since the lines are filled at all times with hydraulic fluid and there is no requirement for the pressure to build up within the valves. On the otherhand, if the same valves were used for emptying and filling, some of the lines would be empty and a time lag would occur while hydraulic pressure was built up within the empty lines.

Photocell **136** and **138** positioned in substantial alignment with the nozzles **122***a* and **130***a* respectively and in a location to be actuated and in this way sensing the leading edge of the flaps **12***c*. The photocell **136** is connected to the photoelectric control unit **100** by wires **136***a* and photocell **138** is connected to photoelectric control unit **101** by conductors **138***a* so that during operation as the leading edge of the flap **12***c* breaks, the beam of photocell **136** the normally open switch **100***s* closes thereby opening all four of the nozzles **122***a* to **128***a* the long axis and axis of motion of the carton as seen from above is designated A in FIG. **5.** The beads of adhesive **16** and **18** are there laid down at right angles to fold lines of flaps **12***c* and **12***e*. When the conductors **138***a* are energized, the noramlly open switch **101***s* closes thereby opening the stationary nozzle **130***a*. When conductors **136***a* are de-energized after an adjustable time delay, valve **106** closes all four nozzles.

Refer now to FIGS. **1, 2,** and **3** with reference to the construction of the nozzles themselves. As seen in the figures, the hydralically operated adhesive valves **122, 124, 126,** and **128** are mounted in a fixed position and supported in any convenient manner upon a framework F, only a portion of which is shown. While four of the moving nozzles are provided, only one will be described in detail since they are identical to one another except for their locations.

As shown in FIG. **2,** a rotary coupling **150** is provided between the valve **124** and the nozzle **124***a*. Coupling **150** has an internal bearing **150***a* which enables the nozzle **124***a* to pivot about the axis **151** of the adhesive duct **153** within the outlet portion **150***b* of the coupling **150.** From duct **153** the adhesive enters a block **150***c* and through the nozzle **124***a*.

As seen in FIG. **1,** the motor M is also coupled to a positive drive element such as a timing belt or chain **160** to a right angle gear box **162** having an outlet shaft to which is secured a timing cam **164** that engages a follower **166,** suspended from an arm **167** pivoted at **165** upon the supporting framework F and connected via an adjustable push rod **168** to a nozzle operating shaft **169** which is secured to the pivoted nozzles **122***a* and **128***a* which are connected to the lower ends of the nozzle blocks **150***c* of the nozzles **122***a* and **128***a*. Coupling links **170** and **172** respectively connect the shaft **169** to the nozzle blocks **150***c* of the nozzles **124,** and **126** respectively thereby linking the push rod **168** and follower **166** to all of the pivoted nozzle blocks upon which the nozzles **122***a–128a* are mounted. A spring **178** is connected between the top of the arm **167** on the framework F to maintain the follower **166** in contact with cam **164.**

As shown in FIG. **1**, the axes of all of the rotary couplings **150**, the links **168–172** and the cam **164** are oriented at an oblique angle with respect to the axis of movement of the cartons. The angle between the axis of rotation of the nozzles is determined by the carton determinations and glue pattern determinations. Thus, as seen in FIG. **5**, by joining a line between the beginning of bead **16** at the upper left and the beginning of bead **18** at the lower right an angle is designed with the axis A of motion and it is this angle to which the rotary joints of the glue nozzles are set with respect to the path A. Thus, during operation as the cam **164** rotates the follower **166** and the links cause the nozzles to oscillate so that their tips follow a line which is oriented at an angle to the path taken by the cartons beneath the nozzles and because the conveyor belt **27** and the timing belt **160** are synchronized with the rotation of the cam **164**, the forward motion of the carton is accompanied by transverse movement of the tips of each of the nozzles relative to the carton. It is in this way that the adhesive is reliably applied in a bead at a right angle to the direction of travel of the carton.

The cartons thus move continuously beneath the adhesive applicator as a bead of adhesive is applied at right angles to the direction of carton motion and since different valves are employed for starting and stopping the adhesive flow, the initiation and shut-off of the adhesive can be accomplished in a relatively short period of time, for example, the adhesive flow can be reliably started and stopped in **25** milliseconds, and will produce a bead of adhesive 1½ inches long with the cartons traveling at a speed of about 160 FT/min. Additionally, because DC power is used to operate the variations in on time or off time will not vary as a result of the fluctuations in AC current.

It should be noted that the adhesive is applied in a bead form. By the term "bead" it is meant having a substantial height, the average height of the bead being on the same order as its width (from ½ to 1½ times the width) to provide for the possibility of squeeze-out when the adhesive beads are pressed together bead to bead and it is a result of the squeeze-out or flow of the bead and the contact of the beads with one another which causes the adhesive to flow into all of the voids of the flap contact area which is so important in filling the interstices between the edges and corners of the carton flaps to prevent sifting of powdered contents from the container. I have found that when a liquid adhesive such as a water base resin emulsion glue, a bead of about 1/16 inch diameter can be used. A bead of about the same size is satisfactory when a hot melt adhesive is used. After the adhesive has been applied, the flaps are folded to the closed position conventionally, for example, by engagement with folding shoes (not shown). As can be seen best in FIG. **6**, the adhesive beads **14, 16** and **18** are spread as indicated at **20** both transversely and longitudinally of the package when the carton flaps are folded to the closed position. The adhesive will flow into the cracks between the superimposed flaps and between the flaps and the corner openings in the carton thereby sealing the package against sifting.

I claim:

1. A method of providing a sift proof carton comprising; providing a carton having four end flaps on one end thereof, placing a first pair of opposing flaps in an outwardly spread position and the other two opposing flaps in an inwardly folded position adapted to receive adhesive on their exposed surfaces, advancing the carton on an axis parallel to the edges of the flaps, applying adhesive to the exposed surfaces in the form of beads at each end of each of the first pair of flaps having a cross-sectional height which is on the same order as the width thereof along two lines extending at right angles to the axis of motion of the carton, applying another bead of adhesive to one of the first pair of flaps along a line running parallel to the fold lines of the first pair and extending from the bead of adhesive at one end to the bead of adhesive at the other end, folding the first pair of flaps onto the other flaps to thereby press the beads of adhesive onto themselves and spread the adhesive between the flaps to thereby force at least part of the adhesive into the interstices between the folds of the flaps to provide a carton resistant to the sifting of powdered contents therein.

2. An apparatus for dispensing adhesive for sealing a carton to provide a sift proof seal therein comprising in combination conveyor means for advancing the cartons in an upright position, means for holding the side flaps in a horizontally disposed laterally extending position and the end flaps in a horizontal position extending centrally from the edges of the top of the carton, movable nozzle means for expelling adhesive onto the flaps, valve means for the nozzle, said nozzles being adapted to move along an axis positioned obliquely to the axis of movement of the cartons, m eans for sensing the position of said cartons in succession and operatively connected to the valve means, the valve means being connected to the nozzles for starting and stopping the flow of adhesive therethrough, stationary nozzle means positioned to apply a bead of adhesive along the length of one of the side flaps whereby actuation of the sensing means controls the flow of adhesive from the moving nozzles onto the exposed surfaces of the flaps to form a bead located adjacent to both the leading and the trailing end of the carton.

3. The apparatus according to claim **2** wherein the nozzles are mounted for pivotal movement along axes extending at an oblique angle with respect to the axis of carton movement and the side edges of the carton flaps, each nozzle includes a nozzle opening positioned in spaced relationship from its axis of pivotal movement, linkage means connected to the nozzles and actuating means operatively connected to the linkage for oscillating the free ends of the nozzles and means for operating the actuating means in timed relationship with the conveyor for advancing the cartons.

4. The apparatus of claim **3** wherein the actuating means comprises a rotating cam in operative engagement with said link means and means to force the link means against the cam.

5. The apparatus of claim **2** wherein five nozzles are provided, one being stationary and the other four comprising moving nozzles positioned for pivotal movement on parallel axes oriented obliquely with respect to the hinge connection between the side flaps and the carton, the moving nozzles comprising a first pair positioned to deposit adhesive adjacent the leading edges of the side flaps and a second pair positioned to deposit adhesive adjacent to the trailing edges of the same flaps, the nozzle openings being positioned between the pivot axes and the flaps, means for simultaneously oscillating the nozzles in the same direction, means operatively associated between the nozzle oscillating means

and the conveyor for synchronizing the conveyor and the nozzle oscillating means, means communicating with the nozzles for supplying adhesive to the nozzles, said valve means starting and interrupting the flow of adhesive through the nozzles in timed relationship with movement of the nozzles in a selected direction while the nozzles are positioned adjacent the ends of the flaps, and a means for starting and interrupting the flow of adhesive through the stationary nozzle when the corresponding flap passes into proximity with the stationary nozzle to thereby deposit a strip of adhesive extending from one end to the other of one side flap on an axis parallel to the fold line of the side flap.

6. The apparatus of claim **5** wherein the adhesive applied from the moving nozzles is deposited in a ribbon extending substantially from the free marginal edge of the side flaps centrally of the carton and onto the outside surface of the adjacent end flaps and in overlapping relationship with the interstice between the side flaps and the end flaps.

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