

[54] **PACKAGING MACHINE FOR SEALING FLEXIBLE TAPE TO CARTONS**

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[51] Int. Cl. **B32b 31/04, E04b 2/00**

[58] Field of Search **156/522, 552; 53/373, 329**

[56] **References Cited**

UNITED STATES PATENTS

3,656,682 4/1972 Giuliani 53/329

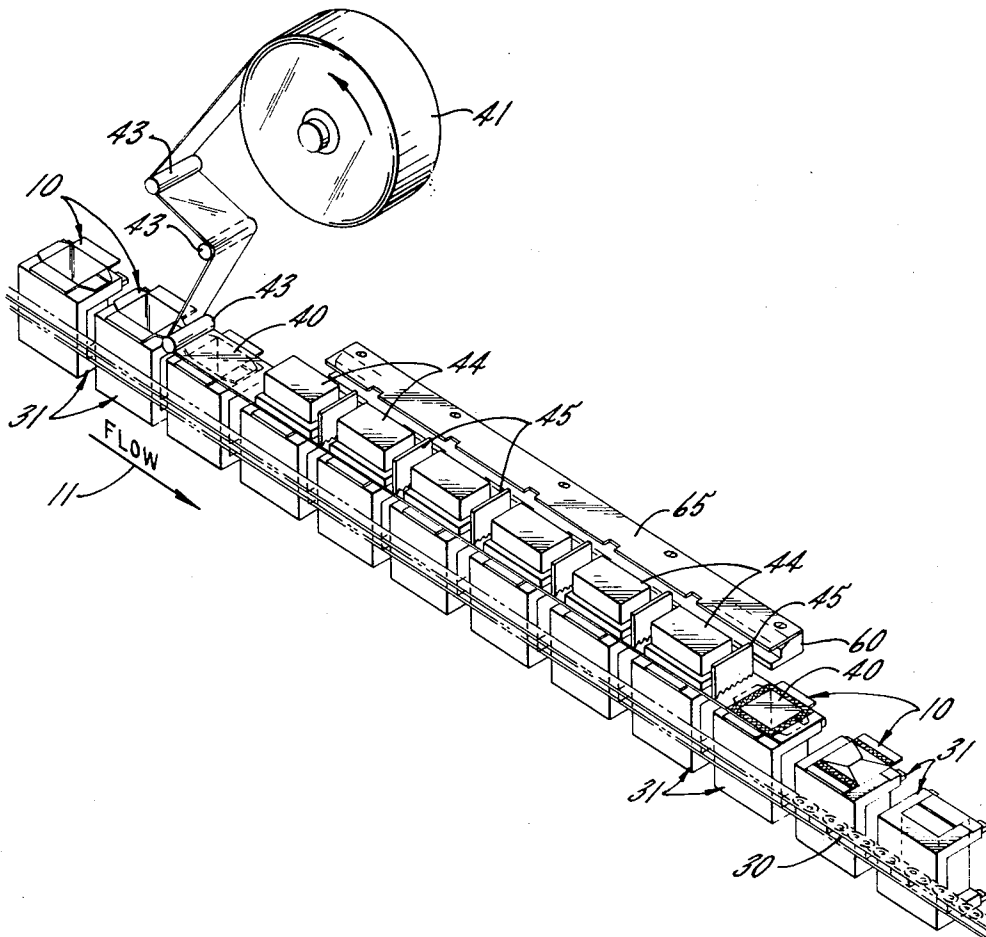
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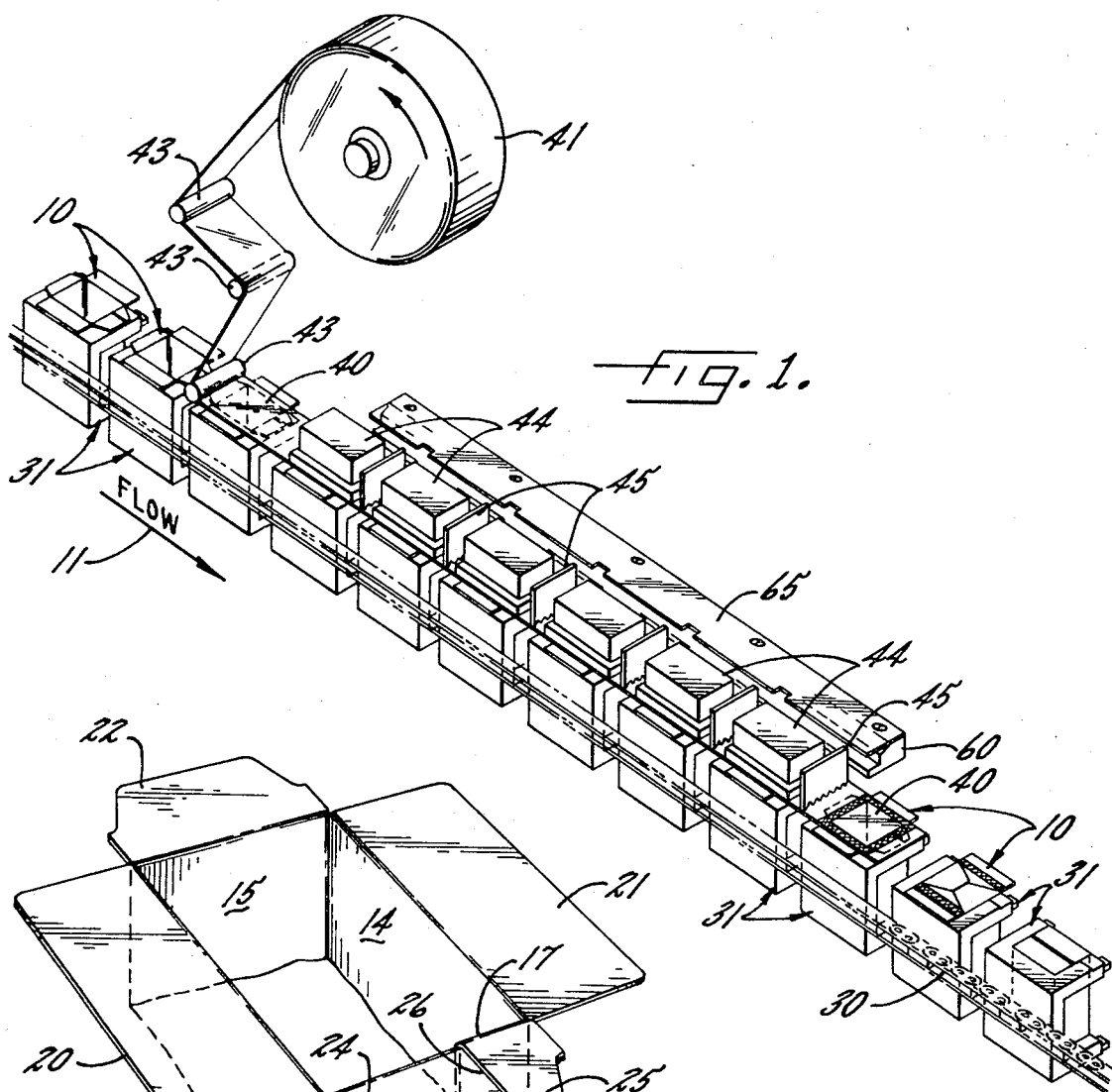
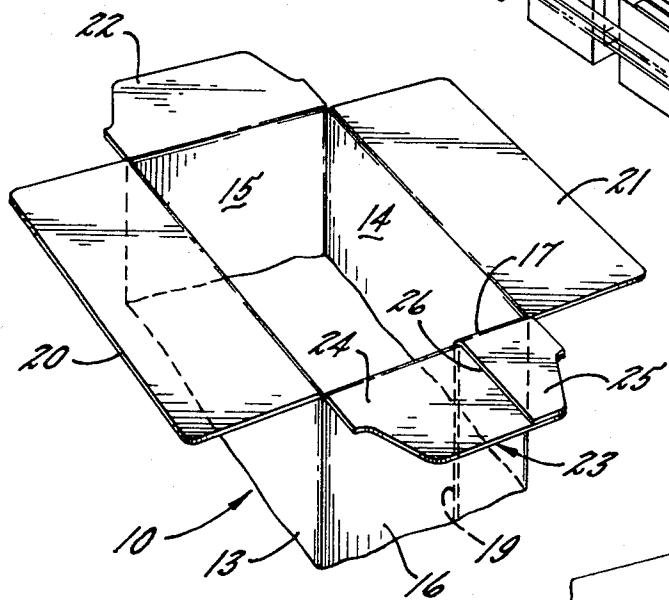
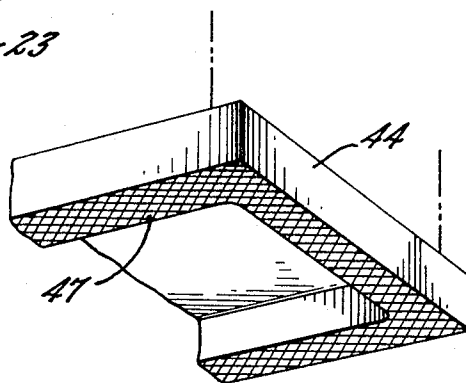
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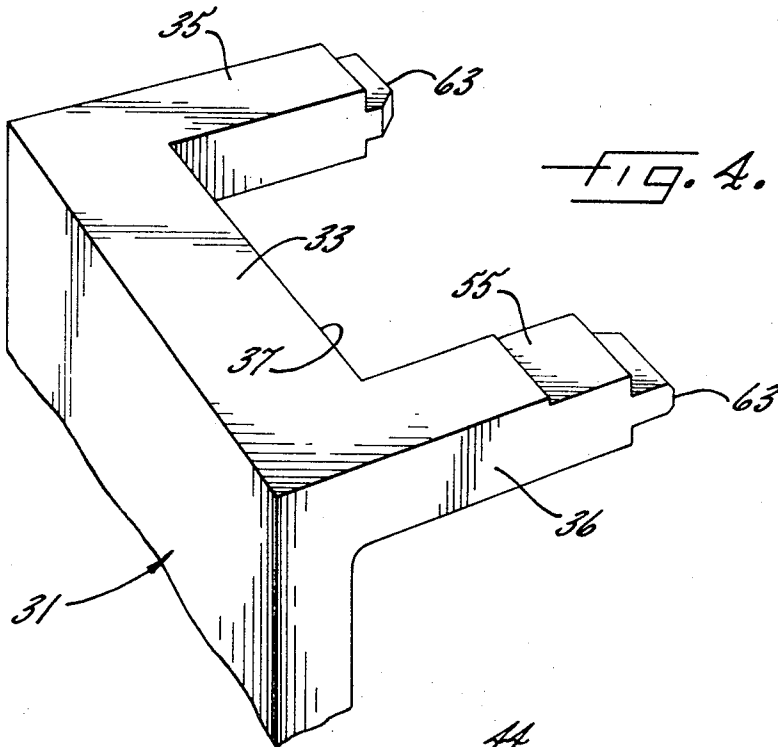
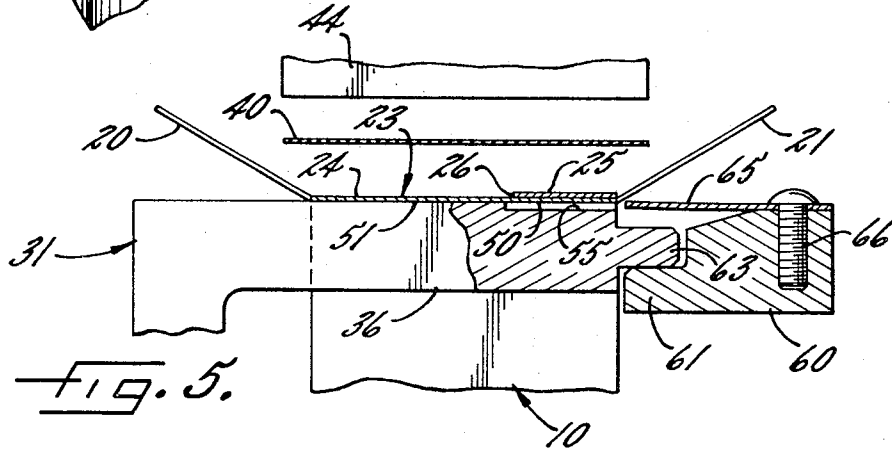
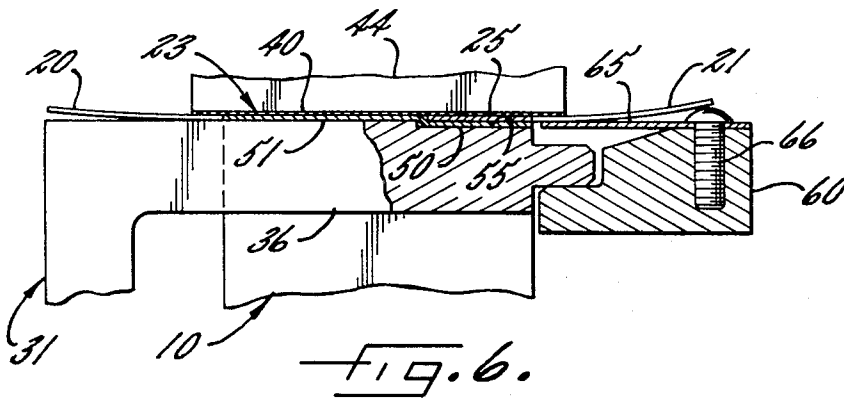
[57] **ABSTRACT**

A flexible tape is sealed to the outfolded flaps of a carton while the latter is being supported in a holder and advanced along a predetermined path. The holder is formed with a relieved depression to enable vertical deflection of a raised portion of one of the dust flaps during sealing and thereby make the inner surface of such flap flat and planar so as to effect a better seal between the flap and the tape. A bar sustains part of the sealing thrust exerted on the carton holder and carries a flexible leaf spring which yieldably backs and supports one of the side flaps during sealing.

4 Claims, 6 Drawing Figures







PACKAGING MACHINE FOR SEALING FLEXIBLE TAPE TO CARTONS

BACKGROUND OF THE INVENTION

This invention relates to a packaging machine having a sealing shoe for sealing a flexible tape to the four outfolded flaps and across the open end of a carton which is supported in a holder for advancement by the machine through various carton forming and filling stations. More particularly, the invention relates to a machine for sealing the tape to a carton which includes a manufacturer's joint extending into one of the flaps and making that flap a compound flap having a partial flap section overlapping a full flap section and creating a distinct right angular step in the inside face of the flap. A machine for sealing cartons of this type is disclosed in Giuliani U. S. Pat. No. 3,656,682.

SUMMARY OF THE INVENTION

The primary aim of the present invention is to provide a new and improved machine of the above character which effects better and more uniform sealing of the tape to the carton by eliminating the step in the compound flap and by making the inside face of such flap flat and planar while the tape is being pressed against the flap by the sealing shoe.

A more detailed object is to achieve the foregoing by providing the carton holder with a relieved depression which registers with the partial flap section to enable deflection of that section and to receive the corresponding portion of the full flap section during sealing of the tape, the depression thereby enabling positioning of partial flap section and the remaining portion of the full flap section in the same plane to provide a planar surface to which the tape is sealed.

A further object of the invention is to provide an improved bar which supports the carton holder and partially sustains the sealing pressure exerted by the sealing shoe, the bar being uniquely constructed to properly back and support the outer flap of the carton during sealing in spite of changes in elevation between the bar and the holder.

These and other objects and advantages of the invention will become more apparent from the following detailed description when taken in conjunction with the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a perspective view schematically showing a new and improved machine embodying the novel features of the present invention.

FIG. 2 is a fragmentary perspective view of an exemplary carton adapted to be handled by the machine.

FIG. 3 is a fragmentary perspective view of the underside of the sealing shoe.

FIG. 4 is a fragmentary perspective view of one of the carton holders.

FIG. 5 is a fragmentary cross-section taken vertically through a holder and a carton and showing the elements just prior to sealing of the tape.

FIG. 6 is a view similar to FIG. 5 but showing the elements during sealing of the tape.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

As shown in the drawings for purposes of illustration, the invention is embodied in a packaging machine of

the type which prepares paperboard cartons 10 for filling with a product, fills the cartons and thereafter closes the cartons, all of the operations occurring while the cartons are being advanced continuously along a predetermined path in the direction of the arrow 11 (FIG. 1). A machine of this general type is disclosed schematically in the above-mentioned Giuliani patent and is disclosed in more detail in my U. S. Pat. No. 3,589,248. Since the general organization of such a machine is known, the present machine has, for the most part, been illustrated schematically in the accompanying drawings and its overall operation will be described only briefly.

An exemplary carton 10 adapted to be handled by the machine is shown in FIG. 2. The carton is rectangular in cross-section and includes two side panels 13 and 14 and two somewhat narrower end panels 15 and 16, the end panel 15 being integrally joined at its margins to the margins of the side panels. The end panel 16 is joined integrally at one of its margins to the side panel 13 and, at its opposite edge, is overlapped by and glued to a glue panel 17 joined integrally to the side panel 14 and extending along the inner side of the end panel 16. A so-called manufacturer's joint 19 is defined on the inner side of the end panel 16 and extends vertically along the edge of the glue panel 17.

Major side flaps 20 and 21 are hinged resiliently to the upper margins of the side panels 13 and 14, respectively, while smaller dust flaps 22 and 23 are hinged resiliently to the upper margins of the end flaps 15 and 16, respectively. Four flaps (not shown) which are mirror images of the flaps 20 to 23 are hinged to the lower margins of the panels. Prior to filling and closing of the carton 10, the flaps 20 to 23 are outfolded from the carton and extend outwardly and slightly upwardly from the panels 13 to 16.

The dust flap 23 is a compound flap as a result of the manufacturer's joint 19 extending upwardly into the flap. As shown in FIG. 2, a full flap section 24 is hinged to the end panel 16 and is overlapped by and glued to a partial flap section 25 which is hinged to the upper margin of the glue panel 17. The partial flap section 25 extends across somewhat less than half the length of the full flap section 24 and its edge defines a distinct right angular step 26 on the inner face of the dust flap 23, the step constituting a continuation of the manufacturer's joint 19 extending along the inner side of the end panel 16.

To advance the cartons 10 along the path, the machine includes a power-driven and continuously movable carrier in the form of an endless chain 30 (FIG. 1). Each carton is supported for advancement with the chain by upper and lower U-shaped holders 31 (FIGS. 1 and 4) which are attached to the chain. The upper holders have been illustrated in detail and, as shown in FIG. 4, each comprises an inner horizontal web 33 located adjacent the chain. The web is formed integrally with and spans the inner ends of trailing and leading horizontal legs 35 and 36 which extend outwardly from the web. The legs and the web thus define a U-shaped recess 37 within which the upper end portion of the carton is received, the carton being positioned in the recess such that the outwardly folded side flap 20 overhangs the web 33 while the dust flaps 23 and 22 overhang the trailing and leading legs 35 and 36, respectively, with the partial flap section 25 overlying the outboard end of the leading leg. The lower end portion of

the carton and the lower flaps are positioned similarly with respect to the lower holder.

After each initially flat carton 10 has been erected or squared into tubular form and placed into a pair of holders 31, the top and bottom flaps are outfolded and a sealing tape (not shown) is applied to the bottom of the carton while the latter is being advanced by the chain 30. The bottom flaps then are folded inwardly across the bottom of the carton and a charge of product is deposited into the carton.

Upon continued advance of the filled cartons 10 by the chain 30, a flexible sealing tape 40 (FIGS. 1 and 2) is stretched across and simultaneously sealed to the upper ends of a group of six cartons. As shown in FIG. 1, a roll 41 of sealing tape is positioned above the carton path, and the free end of the tape is attached to the carton immediately ahead of the six to be sealed. Accordingly, as that carton advances, it draws the tape off of the roll and around guide rollers 43 and then over the flaps 20 to 23 and across the open upper ends of the six cartons to be sealed. Thereafter, six heated sealing shoes 44 which move along the path with the cartons shift downwardly to press the tape against and seal the tape to the flaps thereby to seal the cartons with a moisture impervious membrane. Six cutters 45, which also move with the cartons, then sever the tape between the trailing flap 22 of each carton and the leading flap 23 of the adjacent following carton to separate the six cartons of the group from one another. The cutters are positioned to separate the first carton of the group from the immediately preceding carton while leaving the tape uncut behind the last carton of the group so that the last carton may draw the tape off of the roll 41 and across the upper ends of the next group of cartons to be sealed. After the tape has been cut to separate the cartons, the dust flaps 22 and 23 are folded inwardly across the tape and then the side flaps 20 and 21 are folded inwardly across the dust flaps and are glued closed to complete the packaging operation.

Now that the overall operation of the machine has been explained, the sealing shoes 44 and the manner of sealing the tape 40 to the cartons 10 will be described in more detail. As shown in FIG. 3, the underside of each sealing shoe is substantially flat and planar and preferably is formed with embossed sealing surfaces 47 which extend around the periphery of the shoe and which are effective to press the tape to the inner margins of the flaps 20 to 23. As an incident to pressing the tape against the flaps, each shoe presses the dust flaps 22 and 23 of the respective carton downwardly against the upper faces of the legs 35 and 36 of the upper holder 31 and presses the inner side flap 20 downwardly against the upper face of the web 31. The inner faces of the flaps are either made of or coated with a thermoplastic material and thus the heat and pressure applied by the shoe serves to heat-seal the tape to the flaps. Difficulty previously has been encountered, however, in achieving an effective moisture-tight seal between the tape and the compound dust flap 23 because of the right angular step 26 which is present on the inner surface of the flap to which the tape is sealed.

In accordance with one aspect of the present invention, a better and more effective seal is produced between the tape 40 and the compound dust flap 23 by relieving that portion of the carton holder 31 which registers vertically with the partial flap section 25 of the compound flap in order to enable that section and the

corresponding portion 50 (FIG. 6) of the full flap section 24 to deflect vertically relative to the remaining portion 51 of the full section when pressure is applied to the flap by the sealing shoe 44. As a result of such vertical deflection, the inside face of the partial flap section 25 is positioned in substantially the same horizontal plane as the adjacent portion 51 of the full flap section 24 and the right angular step 26 is substantially eliminated during sealing so that the inner face of the compound flap 23 is substantially flat and planar at the time the tape is sealed. Accordingly, instead of bridging the step 26, the tape is sealed to a substantially planar surface along the entire length of the compound flap 23 thereby to reduce the chances of the contents of the container leaking out between the tape and the flap along the seam defined at the edge of the partial flap section 25.

More specifically, a relieved depression 55 (FIGS. 4 and 5) is formed in the upper face of the leading leg 36 of each upper holder 31 and directly underlies the partial flap section 25 and the corresponding portion 50 of the full flap section 24. The depression opens out of the outer end of the leg 36 and is approximately equal in depth to the thickness of the material from which the carton 10 is made. Also, the depression corresponds substantially in shape to the shape of the partial flap section, and the edges of the depression are located in exact vertical registry with or just very slightly outboard of the edges of the partial flap section.

Before the sealing shoe 44 is shifted downwardly, the tape 40 overlies the flaps but, for purposes of clarity, the tape has been shown in FIG. 5 as being spaced upwardly from the flaps. Initially, the compound dust flap 23 is located approximately as shown in FIG. 5, assuming that the tension in the tape 40 is sufficient to deflect the flap to a substantially horizontal position. In this condition, the partial flap section 25 is located above the inner face of the major portion 51 of the full flap section 24.

Upon being shifted downwardly, the sealing shoe 44 engages the tape 40 and first presses downwardly against the elevated partial flap section 25. As a result, that section and the underlying portion 50 of the full flap section 24 are deflected vertically and the portion 50 is received in the depression 55 as shown in FIG. 6. At the same time, the upper face of the partial flap section 25 is depressed into substantially the same horizontal plane as the upper face of the major portion 51 (see FIG. 6) and, as the shoe completes its downward stroke, the tape thus is sealed to a substantially flat and planar surface which is free of the step 26. After the sealing shoe has been retracted, the memory of the resilient material of the carton 10 may tend to return the partial flap section 25 toward its original elevated position. It has been found, however, that the high quality seal produced across the compound flap 23 is not affected detrimentally since the taut tape tends to hold the partial flap section in its deflected position and since the heat and pressure applied during sealing destroys the memory of the carton material to some degree.

It should be appreciated that the lower sealing tape is applied to the lower flaps of the cartons 10 in a manner similar to the application of the upper tape. Also, the lower faces of the leading legs of the lower holders 31 are formed with relieved depressions (not visible)

which serve the same purpose as the depressions 55 in the upper holders.

During the time the tape 40 is being sealed to the upper ends of a group of six cartons 10, the open outer ends of the upper holders 31 for such cartons are closed by an elongated bar 60 (FIGS. 1 and 5) which also supports the outer ends of the holders and helps sustain part of the sealing pressure exerted on the holders by the sealing shoes 44. The manner of mounting and supporting the bar is disclosed fully in my above-mentioned patent. It will suffice here merely to say that the bar initially is retracted laterally outwardly from the holders as the group of six cartons begins approaching the sealing shoes. During the approach, the bar is shifted laterally inwardly to cause a lower ledge 61 (FIG. 5) on the bar to move inwardly into underlying engagement with lugs 63 projecting outwardly from the legs 35 and 36 of the holders. The bar moves along the carton path in unison with the holders and serves to close off the open sides of the holders. In addition, the bar is supported rigidly by the frame of the machine and, by virtue of the engagement of the ledge 61 with the lugs 63, sustains part of the sealing pressure applied to the holders and keeps the holders from being cocked downwardly and twisting the chain 30.

The upper surface of the bar 60 also serves to back and support the outer side flaps 21 of the cartons 10 during sealing of the tape 40 to the cartons. According to another aspect of the invention, the upper surface of the bar is constructed in a unique manner to insure proper support for the outer flaps even though the holders 31 might assume somewhat lower positions relative to the bar after extended service use because of wear between the ledge 61 and the lugs 63. For this purpose, the upper surface of the bar is formed by a resiliently flexible leaf spring 65 (FIG. 5) attached to the bar by screws 66 and extending along the carton path beneath the outer flaps 21. In a new machine, the leaf is disposed in a plane which is more elevated than the plane containing the upper surfaces of the holders 31.

As the sealing shoes 44 press downwardly on the outer flaps 21, the flaps engage the leaf 65 and the latter flexes vertically to yieldably back and support the flaps as the tape is sealed (see FIG. 6). If wear between the ledge 61 and the lugs 63 cause the holders 31 to eventually lower slightly relative to the bar 60, the leaf 65 is still disposed somewhat above the holders 31 and is capable of yielding as the flaps are pressed downwardly thereby to enable depression of the flaps to nearly horizontal positions during sealing and also to avoid creating a vertical step between the ends of the legs 35 and 36 and the upper surface of the bar 60 as otherwise would be the case if the upper surface were rigid and if the bar lowered beneath the legs as a result of wear.

A bar (not shown) similar to the bar 60 is used to support the lower holders 31 during sealing of the lower tape and also carries a flexible leaf. The ledge on the lower bar overlies the lugs on the lower holders and the leaf is mounted on the lower side of the bar.

From the foregoing, it will be apparent that the present invention brings to the art a new and improved packaging machine which effects better sealing of the tape 40 to the cartons 10 by virtue of the relieved depressions 55 in the holders 31. Also, the flexible leaf 65 insures that the outer side flaps 21 will be properly

backed and supported during sealing in spite of wear which occurs between the holders and the bar 60.

I claim as my invention:

1. A machine for applying a flexible sealing tape to the outfolded side flaps and dust flaps of a carton, one of said dust flaps being a compound flap having a partial flap section overlapping a full flap section and defining therewith a distinct step in the inside face of said compound flap, said machine comprising a movable carrier, a carton holder attached to said carrier for advancement along a predetermined path, said holder comprising a generally U-shaped member having an inner web located adjacent said carrier and having leading and trailing horizontal legs extending outwardly from and spanned by said web, said holder supporting a carton in an upright position between its legs with all of said flaps folded outwardly, with said compound dust flap extending along one face of one of said legs and with said partial flap section positioned at the outer end portion of such leg, means for guiding the sealing tape horizontally across the flaps, a sealing shoe movable vertically against the sealing tape to seal the latter to the flaps while pressing the inner side flap against said web and the dust flaps against said legs, and a depression formed in the outer end portion of said one face of said one leg in approximate registry with said partial flap section to permit vertical deflection of the latter and to receive the corresponding portion of said full flap section when said compound dust flap is pressed against said one leg by said sealing shoe thereby to substantially eliminate said step and enable positioning of said partial flap section and the remaining portion of said full flap section in approximately the same horizontal plane during sealing of said tape to said flaps.

2. A machine as defined in claim 1 further including a bar movable laterally toward and away from said path in timed relation with the movement of the carton, said bar engaging and supporting the outer ends of said legs and closing off the open outer end of said holder when moved toward said path, and a resiliently flexible leaf carried on said bar and yieldably backing the outer side flap as the latter is deflected vertically during sealing of said tape.

3. A machine for applying a flexible sealing tape to the outfolded four flaps of a carton, one of said flaps being a compound flap having a partial flap section overlapping a full flap section and defining therewith a distinct step in the inside face of said compound flap, said machine comprising a movable carrier, a carton holder attached to said carrier for movement therewith, said holder comprising a member having at least one horizontal face and having a recess extending vertically therethrough, said carton being located in said recess with all four of said flaps folded outwardly and with said compound flap extending along said one face of said member, means for guiding the sealing tape horizontally across the flaps, a sealing shoe movable vertically against the sealing tape to seal the latter to the flaps while pressing at least said compound flap against said one face of said member, and a depression formed in said one face of said member in approximate registry with said partial flap section to permit vertical deflection of the latter and to receive the corresponding portion of said full flap section when said compound flap is pressed against said member by said sealing shoe thereby to substantially eliminate said step and enable positioning of said partial flap section and the remain-

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ing portion of said full flap section in approximately the same horizontal plane during sealing of said tape to said flaps.

4. A machine for applying a flexible sealing tape to the outfolded side flaps and end flaps of a carton, said machine comprising a movable carrier, a carton holder attached to said carrier for advancement along a predetermined path, said holder comprising a generally U-shaped member having an inner web located adjacent said carrier and having leading and trailing horizontal legs extending outwardly from and spanned by said web, said holder supporting a carton in an upright position between said legs with all of said flaps folded outwardly, with said end flaps extending along said legs

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and with the inner one of said side flaps extending along said web, means for guiding the sealing tape horizontally across the flaps, a sealing shoe movable vertically against the sealing tape to seal the latter to the flaps while deflecting the flaps vertically, a bar movable laterally toward and away from said path in timed relation with movement of the carton, said bar engaging and supporting the outer ends of said legs and closing off the open outer end of said holder when moved toward said path, and a resiliently flexible leaf carried on said bar and yieldably backing the outer one of said side flaps when such flap is deflected vertically during sealing of said tape.

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