

PATENT SPECIFICATION

(11)

1 271 756

DRAWINGS ATTACHED

- (21) Application No. 44666/69 (22) Filed 10 Sept. 1969
(31) Convention Application No. 759 719 (32) Filed 13 Sept. 1968 in
(33) United States of America (US)
(45) Complete Specification published 26 April 1972
(51) International Classification B65B 11/10 49/00
(52) Index at acceptance

B8C 10B1A 10B1D1 10F1 10F3 10J1 10J2A 10J4D 10J4E
10T4 3E2B

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(54) PACKAGING MACHINE AND METHOD

(71) We, THE MEAD CORPORATION, a corporation organised and existing under the laws of the State of Ohio, United States of America, of 118 West First Street, Dayton, Ohio 45402, United States of America, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

The present invention relates to packaging apparatus and to a method of packaging; more particularly the invention provides apparatus for packaging a plurality of articles in a carrier carton of the wrap-around type formed from an elongate carton blank comprising a plurality of panels separated by fold lines transverse to the elongate direction of the blank and being provided with a pair of article retaining and carton reinforcing flaps astride one such fold line, and to a method of packaging a plurality of articles in such a carrier carton.

In a first aspect of the present invention, there is provided apparatus for packaging a plurality of articles in a carrier carton of the wrap-around type formed from an elongate carton blank comprising a plurality of panels separated by fold lines transverse to the elongate direction of the blank and being provided with a pair of article retaining and carton reinforcing flaps astride one such fold line; the apparatus comprising means for moving the carton blank transversely of its elongate direction and for moving its associated articles in synchronism therewith along a predetermined path, means for folding an end portion of the blank defining at least a side and lap panel of the carton alongside the associated articles, a tucking stud movable in synchronism with the blank and associated articles generally alongside said pre-

[Price 25p]

determined path and in a laterally convergent direction towards said path with the stud extending generally normally towards said end portion of the blank so folded, and guide means for engaging said end portion of the blank so folded such that the tucking stud is arranged to engage said flaps in the course of the laterally convergent motion of the tucking stud towards said path and to fold the flaps inwardly of the carton whilst said end portion is restrained against substantial sideways displacement by said guide means.

The invention also provides in a second aspect thereof a method of packaging a plurality of articles in a carrier carton of the wrap-around type formed from an elongate carton blank comprising a plurality of panels separated by fold lines transverse to the elongate direction of the blank and being provided with a pair of article retaining and carton reinforcing flaps astride one such fold line; the method comprising the steps of moving a group of articles along a predetermined path, placing one of said carton blanks with its elongate direction transverse to the direction of said path, moving the carton blank transversely of its elongate direction and in synchronism with the group of articles, folding an end portion of the blank defining at least a side and lap panel of the carton alongside the associated articles on each side thereof, moving a tucking stud in synchronism with the blank and associated articles generally alongside said predetermined path and in a laterally convergent direction towards said path with the stud extending generally normally towards one of said end portions so folded, engaging said one end portion so folded such that the tucking stud engages said flaps in the course of the laterally convergent motion of the tucking stud towards said path so that the flaps are folded inwardly of the

carton whilst said one end portion is restrained against substantial sideways displacement, and joining the two end portions of the carton together to complete the package.

The invention is hereinafter more particularly described by way of example only with reference to the accompanying drawings, in which:—

- 10 Figure 1 shows a schematic side view of an embodiment of apparatus constructed in accordance with this invention;

- 15 Figure 2 shows a perspective view of a finished package formed by the machine of Figure 1;

Figure 3 is a plan view of a blank from which the package of Figure 2 is produced by the apparatus of Figure 1;

- 20 Figure 4 is an enlarged view taken along the line 4-4 of Figure 1;

Figure 5 is a side elevational view of the part of the apparatus shown in Figure 4; and

- 25 Figure 6 is an end view taken along the line indicated 6-6 in Figure 5.

- In the drawings, the numeral 1 is used to designate the main or top panel of the carton. It will be understood that this panel is designated as the top panel for the sake of example and convenience and could constitute the bottom panel depending on the orientation of the finished carrier carton. Formed in the top main panel 1 for engaging recessed ends of packaged cans are a plurality of tabs 2, 3, 4 and 5. These tabs are foldably secured to the top main panel by fold lines designated respectively at 6, 7, 8 and 9. The tabs 2-5 are simply folded downwardly and inwardly through approximately 180° so that an abutment ledge is formed for engaging the upwardly protruding chime of the end cans thereby to secure the cans against dislodgment through the open ends of the carrier.

- 45 The carrier is designed for two rows of cans; and for separating the cans in one row from the adjacent cans in the other row, a plurality of separator tabs 10, 11 and 12 are struck from the top main panel 1 and are foldably joined thereto along their respective fold lines 13, 14 and 15. Separator tabs 10-12 are simply folded inwardly through approximately 90° to be interposed between the cans in a manner known *per se*.

- 55 For the purpose of facilitating carrying of the completed package, finger gripping tabs 16 and 17 are struck from top main panel 1 and are foldably joined thereto along fold lines 18 and 19 respectively.

- 60 A pair of side panels 20 and 21 are foldably joined to the side edges of top main panel 1 along fold lines 22 and 23 respectively. A bottom lap panel 24 is foldably joined along fold line 25 to the

opposite edge of side panel 20 from top main panel 1 while bottom lap panel 26 is foldably joined along fold line 27 to the corresponding edge of side panel 21.

In order to interconnect the bottom lap 70 panels 24 and 26 and thereby to form a composite bottom panel for the carrier carton, locking tabs 28-31 are driven through openings defined by retaining tabs 32-35 respectively in a manner known *per se*.

When the carton 13 in assembled condition with articles "C" disposed there-within to form the finished package, the bottom portions of the packaged articles in one row are separated from the bottom 80 portions of the cans in the other row by a medial separator panel 36 which is foldably joined to bottom lap panel 24 along a fold line 37 in a manner known *per se*.

In order to facilitate opening of the 85 package, a pull tab 38 is formed in one of the side panels of the carrier carton such as panel 21 and cooperates with a plurality of cuts generally designated by the numeral 39 so that a pull exerted on tab 38 90 effectively tears the side panel 21 and renders the packaged articles "C" readily accessible to the ultimate user.

For the purpose of tightening the carton blank about the articles immediately prior 95 to driving the locking tabs 28-31 into the openings defined by retaining tabs 32-35, tightening apertures are formed in the bottom lap panels 24 and 26. These tightening apertures are arranged to receive 100 machine elements which are manipulated so as to perform the desired tightening operation in a manner known *per se*.

The tightening apertures designated generally by the numerals 40-42 in bottom 105 lap panel 24 and the apertures designated by the numerals 43-45 in bottom lap panel 26 are provided with reinforcing flaps. These flaps are designated by the numerals 46-57 in Fig. 4. Main flap 46 is struck from bottom 110 lap panel 24 and is foldably joined thereto along fold line 58 while main flap 47 is struck from bottom lap panel 24 and is foldably joined thereto along fold line 59. In like fashion, the remaining main flaps 115 48-57 are foldably joined to their associated bottom lap panels. When machine elements enter the tightening apertures the main flaps such as 46 and 47 are arranged to be swung inwardly to serve as reinforcing strengthening means along the edges of the tightening 120 apertures.

The tightening apertures are extended across the fold lines 25 and 27 and into the lower portions of the side panels. Thus, 125 the tightening aperture flaps further comprise supplementary flaps 60-65 formed in the lower portion of side panel 20 and similarly supplementary flaps 66-71 formed in the lower portion of side panel 21. 130

Supplementary flap 60 is foldably joined to side panel 20 along fold line 72 and to the adjacent end edge of its associated main reinforcing flap 46 by fold line 73 which is aligned with fold line 25.

In like fashion, the supplementary flaps 61-65 are foldably joined to the side panel 20 and to their associated main reinforcing flaps while supplementary flaps 66-71 are foldably joined to side panel 21 and to their associated main reinforcing flaps.

When the carrier carton is assembled from the carton blank depicted in Fig. 4 into the completed set-up condition depicted in Fig. 1, the main and supplementary flaps are folded inwardly so that the flaps appear as indicated for example in Fig. 2.

Thus the tightening aperture generally designated by the numeral 41 is defined by hinge lines 74 and 75 by which the main reinforcing flaps 48 and 49 are adjoined to the bottom lap panel 24. As is apparent particularly from Fig. 3 these hinge lines 74 and 75 converge in the direction of tightening movement of the tightening element, i.e., away from the side panel 20 and toward the medial line of the carrier. Stated otherwise, fold lines 74 and 75 are disposed in diverging relation in the direction of side panel 20. Of course the can "C" rests atop the main reinforcing flaps 48 and 49 as will be readily understood particularly from Fig. 2.

The supplementary reinforcing flaps such as 62 and 63 are struck from the lower portion of side panel 20 and are foldably joined to the main reinforcing flaps 48 and 49 respectively by fold lines 76 and 77 as can best be seen from Fig. 3. Supplementary reinforcing flap 62 is foldably joined to side panel 20 along fold line 78 while reinforcing flap 63 is foldably joined to side panel 20 along fold line 79 as is best shown in Fig. 3.

From Fig. 3 it is apparent that fold lines 76 and 77 which interconnect the main and supplementary reinforcing flaps 48, 62, and 49, 63 are aligned both with each other and with the fold line 25 interconnecting side panel 20 and bottom lap panel 24.

We shall now describe in greater detail how the flaps 46-57 and 60-71 may be manipulated into positions of enveloping relationship relative to the articles being packaged. The packaging apparatus of Figure 1 comprises a schematically represented base designated by the numeral 80, and a schematically represented hopper 81 in which a stack of blanks "B" (i.e. as shown in Fig. 3) is disposed. Articles to be packaged are designated at "C" and arranged to move along a predetermined path through the machine by means (not shown) in the direction of the arrow 82 from left

to right. During such movement through the machine, carton blanks disposed with their elongate direction transverse to the direction of movement atop article groups such as are indicated at G1-G4 are held above their associated article group for movement in synchronism therewith by a suitable conventional hold down mechanism generally designated by the numeral 83. As the article groups move through the positions designated G1-G8 the end portions of the blanks (defining carton side and lap panels) are folded downwardly alongside the associated group of articles by guides 83a and are subsequently folded underneath the associated article group, following which the two end portions of each blank are secured together.

In order to manipulate the article retaining and carton reinforcing flaps described above into proper positions of cooperation relative to the articles "C", a mechanism 84 schematically represented in Fig. 1 is mounted alongside the machine frame 80.

It will be understood that the mechanism 84 as shown in Fig. 1 is for the purpose of manipulating the flaps on one side only of the carrier. It will be understood of course that a similar mechanism would be mounted on the opposite side of the machine to manipulate the flaps on the opposite side of the carton.

As described in detail heretofore, the article retaining and blank reinforcing flaps are astride the fold lines separating the bottom lap panels from the side walls. It will be understood that such flaps could be provided astride other fold lines. The mechanism 84 would then require to be differently located.

As is apparent from Figs. 4, 5 and 6, the flap manipulating mechanism 84 comprises a base plate 85 mounted on adjustable support elements 86, 87 and 88. An endless conveyor element (here shown as a chain 89) is trained about a plurality of sprockets 90, 91, 92 and 93. Endless chain 89 is driven through a gear box 94 which in turn is driven by a sprocket 95 and a driving chain 96 from a driving element not shown in the drawing but which is of a kind known *per se* and is synchronized with the operations of the remainder of the packaging machine (and in particular the travel of the articles along their path).

Sprocket 93 is a laterally adjustable idler sprocket which may be employed to control the tension of endless element 89. Sprocket 91 is utilized to dispose the trailing portion 97 of the working reach of endless element 89 between sprockets 90 and 91 generally alongside the path of movement of the articles and in a laterally converging relationship with the said path as

the articles "C" move from left to right.

Furthermore, adjustment of sprocket 91 laterally relative to the path of movement of the articles "C" affects the diverging path of movement of the leading portion 98 of the working reach of conveyor 89, such portion being that which is disposed between sprockets 91 and 92.

The flaps of the carton are manipulated by tucking studs mounted on the endless chain element 89 and designated by the numerals 99, 100, 101, 102 and 103. In the drawings the tucking studs are shown along the working reach only of endless element 89 for the sake of clarity and convenience although it will be understood that these studs are disposed about the entire length of the endless element 89 and that the studs are spaced apart by a distance which corresponds to the spacing between the pairs of flaps in the carton and also in such manner as to accommodate the particular spacing between article groups. It will be apparent that, in the working reach of endless element 89, the tucking studs extend generally normally towards the end portions of the carton blank which have been previously folded down alongside the articles of the group, as explained above.

The aperture such as 43 which is defined by the flaps 52, 66 and 53, 67 is generally triangular in shape as is apparent from Figures 3 and 5. As is apparent in Figure 5, the base plate 85 is adjusted by means of the adjustable studs 86, 87 and 88 so as to tilt downwardly from left to right. Thus the tucking stud moves downward relative to its associated flaps as the article group moves from left to right, entering the top portion of an opening such as 43 and moving downwardly somewhat to ensure a complete inward folding of the associated flaps.

Guide means 104 and 105 are provided for engaging the end portion of the carton blank in its position folded downwardly generally alongside the associated articles. The tucking studs are arranged to engage their respective flaps in the course of laterally convergent motion of the tucking studs towards the path of travel of the articles (that is as the tucking studs are carried along on their element 89), and whilst the end portion of the carton is restrained against substantial sideways displacement by the guide means 104 and 105.

After the inward folding of the flaps by the tucking studs has been completed, the studs are disengaged from their associated apertures in the carton. To this end, guide means are provided for swinging the end portions of the carton blank away from the apparatus 84 and towards and about the article group whereby to bring the reinforcing and retaining flaps into the desired

gripping relationship with the respective ends of their associated articles. Formation of the package is then completed by means not shown which secure the lap panels at the ends of the carton blank together.

The leading portion 98 of the working reach of the endless element 89 is disposed in diverging relationship with respect to the path of movement of the article groups (as is best known in Fig. 4) to facilitate withdrawal of the tucking studs.

Best results are achieved if the base plate 85, the endless element 89, and their associated sprockets and tucking studs are tilted inwardly toward the path of movement of the article groups as is best shown in Fig. 6.

While the machine described above is employed to deposit the elongate blanks atop the article groups and to fold the blank end portions downwardly, it will be understood that the blank could be disposed initially underneath its article group and the blank end portions comprising carton side panels and top lap panels folded upwardly. The lap panels in such instance would be folded over the articles. In such an instance the base plate 85 would probably be tilted in a direction opposite from that shown in Fig. 5 to aid in movement of the studs upwardly toward the apex of the openings such as 43. Tilting opposite to that shown in Fig. 6 would be employed so that studs such as 91 would still be disposed in a normal relationship to the carton side wall and associated lap panel during engagement of the tucking studs with their flaps.

WHAT WE CLAIM IS:—

1. Apparatus for packaging a plurality of articles in a carrier carton of the wrap-around type formed from an elongate carton blank comprising a plurality of panels separated by fold lines transverse to the elongate direction of the blank and being provided with a pair of article retaining and carton reinforcing flaps astride one such fold line; the apparatus comprising means for moving the carton blank transversely of its elongate direction and for moving its associated articles in synchronism therewith along a predetermined path, means for folding an end portion of the blank defining at least a side and lap panel of the carton alongside the associated articles, a tucking stud movable in synchronism with the blank and associated articles generally alongside said predetermined path and in a laterally convergent direction towards said path with the stud extending generally normally towards said end portion of the blank so folded, and guide means for engaging said end portion of the blank so folded such that the tucking stud is arranged to engage said flaps in the course



the articles "C" move from left to right.

Furthermore, adjustment of sprocket 91 laterally relative to the path of movement of the articles "C" affects the diverging path of movement of the leading portion 98 of the working reach of conveyor 89, such portion being that which is disposed between sprockets 91 and 92.

The flaps of the carton are manipulated by tucking studs mounted on the endless chain element 89 and designated by the numerals 99, 100, 101, 102 and 103. In the drawings the tucking studs are shown along the working reach only of endless element 89 for the sake of clarity and convenience although it will be understood that these studs are disposed about the entire length of the endless element 89 and that the studs are spaced apart by a distance which corresponds to the spacing between the pairs of flaps in the carton and also in such manner as to accommodate the particular spacing between article groups. It will be apparent that, in the working reach of endless element 89, the tucking studs extend generally normally towards the end portions of the carton blank which have been previously folded down alongside the articles of the group, as explained above.

The aperture such as 43 which is defined by the flaps 52, 66 and 53, 67 is generally triangular in shape as is apparent from Figures 3 and 5. As is apparent in Figure 5, the base plate 85 is adjusted by means of the adjustable studs 86, 87 and 88 so as to tilt downwardly from left to right. Thus the tucking stud moves downward relative to its associated flaps as the article group moves from left to right, entering the top portion of an opening such as 43 and moving downwardly somewhat to ensure a complete inward folding of the associated flaps.

Guide means 104 and 105 are provided for engaging the end portion of the carton blank in its position folded downwardly generally alongside the associated articles. The tucking studs are arranged to engage their respective flaps in the course of laterally convergent motion of the tucking studs towards the path of travel of the articles (that is as the tucking studs are carried along on their element 89), and whilst the end portion of the carton is restrained against substantial sideways displacement by the guide means 104 and 105.

After the inward folding of the flaps by the tucking studs has been completed, the studs are disengaged from their associated apertures in the carton. To this end, guide means are provided for swinging the end portions of the carton blank away from the apparatus 84 and towards and about the article group whereby to bring the reinforcing and retaining flaps into the desired

gripping relationship with the respective ends of their associated articles. Formation of the package is then completed by means not shown which secure the lap panels at the ends of the carton blank together.

The leading portion 98 of the working reach of the endless element 89 is disposed in diverging relationship with respect to the path of movement of the article groups (as is best known in Fig. 4) to facilitate withdrawal of the tucking studs.

Best results are achieved if the base plate 85, the endless element 89, and their associated sprockets and tucking studs are tilted inwardly toward the path of movement of the article groups as is best shown in Fig. 6.

While the machine described above is employed to deposit the elongate blanks atop the article groups and to fold the blank end portions downwardly, it will be understood that the blank could be disposed initially underneath its article group and the blank end portions comprising carton side panels and top lap panels folded upwardly. The lap panels in such instance would be folded over the articles. In such an instance the base plate 85 would probably be tilted in a direction opposite from that shown in Fig. 5 to aid in movement of the studs upwardly toward the apex of the openings such as 43. Tilting opposite to that shown in Fig. 6 would be employed so that studs such as 91 would still be disposed in a normal relationship to the carton side wall and associated lap panel during engagement of the tucking studs with their flaps.

WHAT WE CLAIM IS:—

1. Apparatus for packaging a plurality of articles in a carrier carton of the wrap-around type formed from an elongate carton blank comprising a plurality of panels separated by fold lines transverse to the elongate direction of the blank and being provided with a pair of article retaining and carton reinforcing flaps astride one such fold line; the apparatus comprising means for moving the carton blank transversely of its elongate direction and for moving its associated articles in synchronism therewith along a predetermined path, means for folding an end portion of the blank defining at least a side and lap panel of the carton alongside the associated articles, a tucking stud movable in synchronism with the blank and associated articles generally alongside said predetermined path and in a laterally convergent direction towards said path with the stud extending generally normally towards said end portion of the blank so folded, and guide means for engaging said end portion of the blank so folded such that the tucking stud is arranged to engage said flaps in the course



of the laterally convergent motion of the tucking stud towards said path and to fold the flaps inwardly of the carton whilst said end portion is restrained against substantial sideways displacement by said guide means.

2. Apparatus according to Claim 1, wherein the tucking stud is mounted for movement parallel to the surface of a base plate which is in turn mounted to allow adjustment of the angle it makes to the horizontal in a vertical plane at right angles to the direction of the predetermined path.

3. Apparatus according to Claim 1 or Claim 2, wherein the path of said tucking stud, during its movement in synchronism with the blank and associated articles and generally alongside said predetermined path, diverges from the horizontal in the direction of the free end of the end portion of the blank in its position folded alongside the associated articles.

4. Apparatus according to Claim 2 and Claim 3, wherein said base plate is mounted in a manner to allow adjustment of the degree of divergence of the path of movement of the tucking stud from the horizontal.

5. Apparatus according to any preceding claim, wherein the carton blank and its associated articles are moved in synchronism with the blank immediately above its associated articles, and wherein the folding means are arranged to fold said end portion of the blank downwardly and alongside the associated articles.

6. Apparatus according to any preceding claim, wherein the tucking stud is mounted on an endless element arranged for continuous motion, and having a working reach in which the tucking stud moves generally alongside said predetermined path and in a laterally convergent direction towards said path with the stud extending generally normally towards said end portion of the blank so folded.

7. Apparatus according to Claim 6, wherein the tucking stud is movable in synchronism with the blank and associated articles generally alongside said predetermined path and in a laterally convergent direction towards said path with the stud extending generally normally towards said end portion of the blank so folded in a trailing portion of the working reach of the endless element, and wherein the working reach of the endless element includes a leading portion in which the tucking stud moves in a laterally divergent direction away from said path.

8. Apparatus according to Claim 6 or Claim 7, wherein a plurality of similar tucking studs are mounted on said endless element.

9. Apparatus for packaging a plurality of articles in a carrier carton of the wrap-around type formed from an elongate carton blank comprising a plurality of panels separated by fold lines transverse to the elongate direction of the blank and being provided with a pair of article retaining and carton reinforcing flaps astride one such fold line, the apparatus being substantially as hereinbefore described with reference to and as shown in the accompanying drawings.

10. A method of packaging a plurality of articles in a carrier carton of the wrap-around type formed from an elongate carton blank comprising a plurality of panels separated by fold lines transverse to the elongate direction of the blank and being provided with a pair of article retaining and carton reinforcing flaps astride one such fold line; the method comprising the steps of moving a group of articles along a predetermined path, placing one of said carton blanks with its elongate direction transverse to the direction of said path, moving the carton blank transversely of its elongate direction and in synchronism with the group of articles, folding an end portion of the blank defining at least a side and lap panel of the carton alongside the associated articles on each side thereof, moving a tucking stud in synchronism with the blank and associated articles generally alongside said predetermined path and in a laterally convergent direction towards said path with the stud extending generally normally towards one of said end portions so folded, engaging said one end portion so folded such that the tucking stud engages said flaps in the course of the laterally convergent motion of the tucking stud towards said path so that the flaps are folded inwardly of the carton whilst said one end portion is restrained against substantial sideways displacement, and joining the two end portions of the carton together to complete the package.

11. A method of packaging a plurality of articles in a carrier carton of the wrap-around type formed from an elongate carton blank comprising a plurality of panels separated by fold lines transverse to the elongate direction of the blank and being provided with a pair of article retaining and carton reinforcing flaps astride one such fold line, the method being substantially as hereinbefore described with reference to the accompanying drawings.

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