ABSTRACT OF THE DISCLOSURE

Machine for creasing and forming covers of molded egg cartons and closing the covers of molded egg cartons.

BACKGROUND OF THE INVENTION

In Pat. No. 3,191,844, there is disclosed a new type of molded egg carton. Such egg cartons cannot be closed with conventional carton closing machines. There is, therefore, a need for a machine which can be utilized for closing such cartons.

SUMMARY OF THE INVENTION AND OBJECTS

The carton creasing, forming and carton closing machine is for use with an egg carton of the type which has a bottom section and at least one hinged cover with inclined side walls secured to the bottom section. The machine consists of a framework and means is provided on the framework for engaging the bottom section of the carton for retaining it in a predetermined angular position. Means is provided for engaging at least one of the covers for creasing and forming the cover so that the inclination of the side walls is reduced. Means is then provided for closing the covers on the bottom sections. In general, it is an object of the present invention to provide a carton creasing, forming and closing machine which is particularly adaptable for certain types of molded egg cartons.

Another object of the invention is to provide a machine of the above character in which the carton moves while the covers are being creased, formed and closed.

Another object of the invention is to provide a machine of the above character which creases and forms the egg carton so that the carton is particularly adaptable for use with large eggs.

Another object of the invention is to provide a machine of the above character which can crease and close the cartons very rapidly.

Another object of the invention is to provide a machine of the above character which is relatively simple to operate.

Additional objects and features of the invention will appear from the following description in which the preferred embodiments are set forth in detail in conjunction with the accompanying drawing.

BRIEF DESCRIPTION OF THE DRAWING

FIGS. 1A and 1B are a top plan view of a machine incorporating the present invention.

FIGS. 2A and 2B are a side elevational view of the machine shown in FIG. 1.

FIG. 3 is a cross-sectional view taken along the line 3--3 of FIG. 2A.

FIG. 4 is a cross-sectional view taken along the line 4--4 of FIG. 2A.

FIG. 5 is a cross-sectional view taken along the line 5--5 of FIG. 2B.

FIG. 6 is a cross-sectional view taken along the line 6--6 of FIG. 2B.

FIG. 7 is a top plan view of a molded egg carton of the type described in U.S. Pat. No. 3,191,844 with the covers in an open position.

FIG. 8 is an end elevational view of the cartons shown in FIG. 7 with certain portions broken away and also showing in broken lines the positions of the covers in a closed position.

FIG. 9 is an enlarged detail view showing the manner in which the cartons are creased and formed in the carton creasing and closing machine.

FIG. 10 is a side elevational view of a portion of another carton creasing, forming and closing machine.

FIG. 11 is a partial cross-sectional view of still another embodiment of the carton creasing, forming and closing machine.

DESCRIPTION OF THE PREFERRED EMBODIMENT

The carton creasing and closing machine 16 is used for reforming and creasing egg cartons 17 of the type shown in FIGS. 7 and 8 and also disclosed in U.S. Pat. 3,191,844. As disclosed in said Pat. 3,191,844, the carton is comprised of a bottom section 18 having a generally rectangular configuration in plan as can be seen in FIG. 7 with a plurality of egg receiving pockets 19. The egg receiving pockets 19 are aligned in such a manner that there are provided two spaced parallel rows of pockets extending longitudinally of the carton and six spaced parallel rows extending transversely of the carton.

A plurality of upstanding frusto-conical posts 21 are formed as a part of the bottom section of the carton along the longitudinal centerline of the bottom section in between the longitudinally extending and transversely extending rows of pockets 19. Each of the posts 21 is provided with a slot 22 of a predetermined width and depth which is in line with the longitudinal centerline of the bottom section 18 and extends in the same direction as the longitudinal centerline. As can be seen from FIG. 8, the posts 21 extend substantially above the plane of the lips 23 formed on the outer upper margin of the bottom section.

A pair of covers 26 are mounted on the bottom section 18. The covers 26 are generally rectangular in plan as can be seen in FIG. 7. Each of the covers is provided with spaced side walls 27 and 28 which are inclined with respect to a top wall 29 and generally perpendicular with respect to end walls 31. The covers 26 are formed integral with the bottom section 18 and are hinged to the bottom section by fold lines 32 which form hinges between the bottom section and the side walls 27 of the covers 26. As can be seen from FIG. 8, the covers 26 are spaced parallel to each other and are both adapted to be folded inwardly so that their inclined side walls 28 are flush with the bottom plates 22 provided in the posts 21. Also note that the slots 22 have such a depth that the top walls 29 of the covers are parallel to the lips 23 of the bottom section.

As explained in Pat. 3,191,844, the carton 17 can be made of any suitable material such as paper pulp to provide a molded egg carton. The inclined side wall provided in the covers 26 and the bottom section 18 facilitate striping the carton from the mold and also facilitate nested positioning of the cartons for shipment before they are filled with eggs. Other features of the carton can be ascertained from Pat. 3,191,844.

The carton creasing and closing machine is particularly adapted to be used for the creasing and closing of the cartons hereinbefore described. It consists of a framework 36 which forms a platform or table 37 lying in a horizontal plane. As can be seen from FIGS. 1A and 1B, the platform 37 is sufficiently wide so that it can accommodate two rows of cartons simultaneously.

Means is provided for advancing the cartons on the platform or table 37 and consists of a pair of conveyor belts 38 formed of a suitable material such as corrugated...
rubber. The entrance ends of the conveyor belt 38 are mounted upon a large roller 39 carried by a shaft 41 rotatably mounted in the framework 36. The upper run of the conveyor belt 38 travels on the platform 37. The conveyor belts 38 are driven by rollers 42 mounted upon a shaft 43. The shaft 43 has a sprocket 44 mounted thereon which is driven by a chain 46. The chain 46 is driven by suitable motive means such as an electric motor (not shown) which drives a sprocket (not shown) which drives the chain 46. A belt tightening roller 47 mounted upon a shaft 48 is provided and engages the lower run of the conveyor belt 38. As the conveyor belt 38 is adapted to be supplied with cartons 17 by suitable means such as another conveyor 49 shown in broken lines in FIG. 1A.

Means is provided for holding the cartons 17 down onto the conveyor belts 38 so that they are positively advance by the conveyor belts and consists of hold-down fins 51. The hold-down fins 51 are L-shaped in cross section as can be seen particularly in FIG. 3. The fins 51 are positioned above the platform 37 a predetermined distance so that their lower extremities enter the slots 22 in the cartons 17 and hold the cartons in engagement with the belts 38. Means is provided for supporting the fins 51 in these positions and consists of threaded studs 52 secured to the fin 51. The studs 52 are secured to a cross bar 53 by additional nuts 53. The bar 54 is mounted upon spaced parallel vertical standards 56 secured to the framework 36. The forward ends of the hold-down fins 51 are mounted upon a cross member 57 by additional studs 52 and nuts 53. The cross member 57 is supported by standards 58 mounted on the framework 36.

The entrance ends of the hold-down fins 51 are provided with upwardly turned rounded portions 51a. As hereinbefore explained, the fins 51 are L-shaped in cross section and are provided with horizontally extending portions 51b which extend outwardly from the ends of the fins 51. The fins 51 have a length which extends from near the inlet end of the conveyor belts 38 to the point at which the cover is being folded into the slots of the carton as hereinafter described. The fins 51 are provided at a height so that the reinforcing portion 51a does not interfere with movement of the covers of the cartons when they are folded inwardly by the machine. The fins 51 are of a thickness which is only slightly less than the width of the slot 22 provided in the cartons.

The cartons 17 are introduced onto the conveyors 38 with their covers open such as shown in FIG. 7. Thus, the guide straps 60 engaging and creasing and forming station 59 and the covers 26 on each side of the bottom section 18 of the cartons are engaged by guide straps 61 having one end secured to the platform 37 by screws 62 and have the other end secured to the sides of guide members 63 by suitable means such as welding. The guide members 63 are mounted upon posts 64 and are secured to the platform 37 by bolts 65. Each of the guide members is provided with a portion 63a which is secured to the post which is generally parallel to the platform 37 and another portion 63b which is inclined with respect to the portion 63a at the same angle at which the covers of the cartons are bent. Thus, for example, the portion 63b can be inclined at an angle from the vertical of approximately 14°. As the cartons are advanced by the conveyor belts 38, the covers engage the guide straps 61 which are twisted through substantially 90° to cause movement of the covers through substantially 90° so that the covers are generally in a vertical position as shown particularly in FIG. 3 when they clear the straps 61.

It will be noted that the straps 61 on opposite sides of the belt 38 are bent in opposite directions so that the covers of the cartons are lifted upwardly in opposite directions and moved towards the open end of the carton. These guide straps 61 are formed of any suitable material such as stainless steel.

Means is provided for reforming and creasing the covers of the cartons as they are advanced through the machine and consists of a roller 71 for each of the covers of the cartons secured to a shaft 72 set screws 73. The shaft 72 is rotatably mounted in bearings 74 mounted upon standards 76 secured to the framework 36. The creasing and forming rollers 71 are formed of a suitable material so that they will grip the covers as the cartons are moved to the machine. One material which has been found to be satisfactory consists of soft rubber. However, if longer life is desired, a knurled metal roller can be provided in its place. The shaft 72 has a pulley 78 mounted thereon which is driven by a belt 79. The belt 79 is driven by a large pulley 81 mounted upon a shaft 82. The shaft 82 is driven by a spur gear 83 which is driven by a spur gear 84 mounted upon the shaft 43. Each of the rollers is provided with a cylindrical surface 86 and a truncated tapered surface 87 adapting a spaced face 88.

As can be seen from FIG. 3, the covers 26 have been lifted approximately 90° by the guide straps 61 and enter the guide members 63 and are grasped by the soft rubber rollers 71 which are driven at a slightly greater speed as, for example, 10% than the belt 38 and thus have a tendency to grasp the covers and to engage the guide members 63. As they are being advanced into the guide members 63 by the rubber rollers 71, the rubber rollers are creasing the cover by engaging the outer side wall 28. The surface 87 places a crease in the corner of the carton, whereas the surface 86 engages the side wall 28 and forces it below a plane horizontal to the platform 37 by a predetermined angle such as 10°. Thus, it can be seen that as the cartons are advanced by the conveyor belts, the covers 26 are creased and also formed from the broken line conformation shown in FIG. 9 to provide the desired configuration shown in solid lines in FIG. 9. For a description of the creasing and forming machine, see U.S. Patent 2,199,367.

After the covers have been creased and formed, the cartons advance into what can be termed a missing egg detecting station 91. Conventional means is provided for detecting whether an egg is missing and consists of a photocell detector 92 mounted upon the framework 36 and overlying the belt 38 in alignment with each longitudinal row of each carton as it passes into the station 91. If the photocell is not engaged by the cover, the carriage 27 is moved so that it passes either of the rows of any of the cartons 17 passing through the machine, a signal is supplied to a solenoid 96. The solenoid 96 is provided with a plunger 97 which is connected to an arm 98 by a link 99. The arm 98 is connected to a shaft 100 which is mounted in a frame member 101 carried by posts 102 secured to the framework 36. A pair of arms 104 are mounted on the shaft 100 and are provided with a gate member 106 which is normally in a downward position as shown in FIG. 4. When a carton advances out of the cover creasing and forming station, it is held in a 90° raised position by the gate member 106 as shown in FIG. 4.

It will be noted that a gate member 106 is provided only on one side of each of the belts 38 for engaging one cover of each of the cartons 17. When the photocell 92 senses that there is an egg missing in either row of the cartons, the solenoid 96 is energized to cause raising of the gate member 106 and to permit the cover to drop to the dotted line position shown in FIG. 4. When the carton is lifted, the stiffness of the material which is utilized for the cartons 17 is sufficient to force the covers to flop downwardly immediately as soon as the gate member 106 is raised.

The other cover of each of the cartons is adapted to be engaged by an L-shaped member 111 secured to the member 101 mounted upon the posts 102. Thus, even though
there is an egg missing in the row adjacent the cover 26 which is engaged by the member 111, the cover is not dropped.

The cartons are continuously advanced by the conveyor belts, regardless of whether an egg drops down because an egg is missing. They advance into the carton closing station 116 in which the carton covers are closed. Means is provided in the station 116 for closing the carton covers and consists of a pair of rollers 117 and 118 rotatably mounted on members 119 which are secured to standards 121 mounted upon the framework 36. As can be seen particularly from FIGS. 1B and 1C, the rollers 117 and 118 are inclined at a substantial angle and are adapted to engage the cover or covers 26 which are still being held in a raised position by either the gate member 106 or the angle member 111. Thus, the rollers 117 and 118 move the covers 26 through their first increment of closing after they have been creased and formed, as shown by the broken lines in FIG. 5.

Thereafter, the cartons are advanced still further and they engage the second set of closing rollers 123 and 124 which are similarly rotatably mounted upon members 119 secured to standards 121 mounted upon the framework 36. The rollers 123 and 124 are inclined at an angle and engage the top covers to push the inner walls 28 into the slots 22 of the carton. At the same time that this is occurring, slide rollers 131 and 132 adjustably positioned on members 136 mounted upon the framework 36 engage the outer side walls 27 of the carton and serve to push the covers inwardly to facilitate the entry of the inner walls 28 into the slots 22 of the posts 21. The rollers 131 and 132 also facilitate bringing the covers of the carton into their final form. The final closing of the covers is accomplished by a large closing roller 136 mounted upon a shaft 82 which is driven in the manner hereinbefore described. The roller 136 is centrally disposed over the conveyor belt and is of such a width that it is clear of both the gaps between the frames of each of the cartons so that it will not tear or break the covers. The rollers are provided with rounded edges so they also will not score or tear the covers.

The machine can be operated continuously to continuously crease and reform the carton covers and to close the cartons. In the event that one of the covers is lying in a flat position as, for example, when the gate member 106 is raised to indicate that an egg is missing, the operator attending the machine knows that when a cover is down, an egg must be missing in the exposed row and if no egg is missing in the exposed row, there must be one missing in the row which is covered. The operator can then remove this carton out of the machine and hand fill the same with an egg and cover the same with the covers by hand.

The creasing and the reforming of the covers forms the covers so that the side walls extend in substantially vertical directions and to greatly increase the space within the carton covers which makes the cartons particularly desirable for utilization with large eggs.

By way of example, fins 51 which are utilized in the machine can have a thickness such as .0078 of an inch. The inner side wall 28 of the carton can have a thickness such as .0055 of an inch so that the combined thickness of the two covers is slightly greater than the width of the slot so that when both of the inner walls of the two covers are moved into the slots, they frictionally engage the slots and frictionally hold the covers in place within the slots in the posts.

Two additional alternative embodiments for the machine are shown in FIGS. 10 and 11 in which the covers can be creased and reformed in positions other than positions raised 90° from the horizontal. Thus, as shown in FIG. 10, the guides 63 have been lowered. The cartons are adapted to be engaged by a soft roller 142 mounted upon a shaft 143 rotatably mounted in a sleeve 144 secured to the framework 36. The shaft 34 is driven by a pulley 146 which can be driven from a suitable source of power such as an electric motor. In this embodiment, it can be seen that the cover 26 is creased and formed in the same manner as in the embodiment hereinbefore described.

In the other embodiment shown in FIG. 11, a different type of roller 151 is provided which has a large inclined office 151a and a small cylindrical surface 151b. The roller 151 is driven in a manner similar to the roller 142. However, a bearing block 156 of a different configuration is mounted in a block 147 secured to the framework 36. The sleeve 144 is mounted in a block 147 secured to the framework 36. The carton cover is creased and reformed in much the same manner as hereinbefore described. The principal difference between the arrangement shown in FIGS. 10 and 11 and the one hereinbefore described is that the arrangement shown in FIGS. 10 and 11 requires additional width for the machine, particularly when two rows of cartons are being closed substantially simultaneously.

It is apparent from the foregoing that there has been provided an improved carton creasing, forming and closing machine which is adapted for use with egg cartons of a particular type. The machine can be relatively economically manufactured and can be readily operated by relatively unskilled labor. The machine can also be readily adjusted.

What is claimed is:

1. A carton creasing, forming and closing machine for use with egg cartons of the type having a bottom section and at least one hinged cover, said cover being formed with inclined side walls at least one of which is hinged to the bottom section, said machine comprising a framework, means for closing the covers and forming the bottom section of the carton and retaining it in a predetermined angular position, rotatable means engaging the cover for forming the cover so that the inclined side walls are inclined at a lesser angle and means for closing the cover on the bottom section, and conveyor means adapted to engage the cartons for continuously advancing the cartons through the machine.

2. A machine as in claim 1 together with means for raising the cover of the carton prior to the time that it is formed and wherein said means for forming the cover of the carton engages the cover of the carton after it has been raised.

3. A machine as in claim 1 wherein said means for forming the carton cover includes a roller having at least a portion of its surface inclined with respect to the remainder of the roller.

4. A carton creasing, forming and closing machine for use with egg cartons of the type having a bottom section and at least one hinged cover, said cover being formed with inclined side walls at least one of which is hinged to the bottom section, said machine comprising a framework, means mounted on the framework for engaging the bottom section of the carton and retaining it in a predetermined angular position, means engaging the cover for forming the cover so that the inclined side walls are inclined at a lesser angle, means for closing the cover on
the bottom section, and means for sensing when an egg is not present in a carton and means responsive to said egg sensing means to cause said cartons to indicate when an egg is missing from a carton.

5. A machine as in claim 4 wherein said means for causing said cartons to indicate when an egg is missing from a carton includes a gate movable between cover retaining and cover releasing positions, and means actuating said gate in response to said means for sensing.

6. A carton creasing, forming and closing machine for use with egg cartons of the type having a bottom section and at least one hinged cover, said cover being formed with inclined side walls at least one of which is hinged to the bottom section, said machine comprising a framework, means mounted on the framework for engaging the bottom section of the carton and retaining it in a predetermined angular position, means engaging the cover for forming the cover so that the inclined side walls are inclined at a lesser angle, said forming means being positioned so that the covers are formed while they are in a horizontal position, and means for closing the cover on the bottom section.

7. In a machine for creasing and forming cartons and for closing cartons of the type which have a bottom section and a pair of covers hinged to opposite sides of the bottom section with each of the covers having inclined side walls, a framework, conveyor means mounted on the framework for engaging the bottom section and for continuously advancing the carton, rotatable means engaging the covers for creasing and forming the covers so that the side walls are inclined at a lesser angle, and means for closing the covers on the bottom section.

8. In a machine for creasing and forming cartons and for closing cartons of the type which have a bottom section, a pair of covers hinged to opposite sides of the bottom section with each of the covers having inclined side walls, and having posts on the longitudinal center line with slots in the posts, a framework, conveyor means mounted on the framework for engaging the bottom section and for advancing the carton, means engaging the covers for creasing and forming the covers so that the side walls are inclined at a lesser angle, means for closing the covers on the bottom section, and a hold-down fin positioned so that the slots in said posts travel along the fin, said fin having a length so that when the covers are moved to a closed position with the side walls entering the slots, the fin is no longer present in the slots.

9. In a machine for creasing and forming cartons and for closing cartons of the type which have a bottom section, a pair of covers hinged to opposite sides of the bottom section with each of the covers having inclined side walls, and posts on the longitudinal center line with slots in the posts, a framework, conveyor means mounted on the framework for engaging the bottom section and for advancing the carton, means engaging the covers for creasing and forming the covers so that the side walls are inclined at a lesser angle, and means for closing the covers on the bottom section including a plurality of rollers engaging the covers, said rollers being inclined at different angles with respect to the covers and serving progressively to move the cover towards a closed position as the carton is advanced.

10. A machine as in claim 9 wherein said means for closing the covers also includes rollers disposed on opposite sides of the cover and engaging the side walls of the covers.

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