

[54] **MACHINE FOR OPENING CARTONS**

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Related U.S. Application Data

[63] Continuation of Ser. No. 807,522, March 17, 1969, abandoned.

[30] **Foreign Application Priority Data**

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[51] Int. Cl.....B31b 1/80, B31b 5/26

[58] Field of Search93/53, 52, 36.8, 39.1 P

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[57]

ABSTRACT

Machine for opening cartons comprising a magazine for flattened cartons, means for opening and converting cartons to a parallelepipedal shape, means for transferring cartons, means for displacing the flaps with respect to the faces of the carton whereby presenting said cartons with the flaps closed at one end thereof, means acting transversely to the longitudinal axis of the carton in cooperation with said opening means, means for separating two opposite flaps of said end and whereby causing said flaps to move apart towards the exterior of their respective initial planes and constitute two guide planes for the two other flaps of the said end and means for inwardly folding back said other flaps.

10 Claims, 8 Drawing Figures

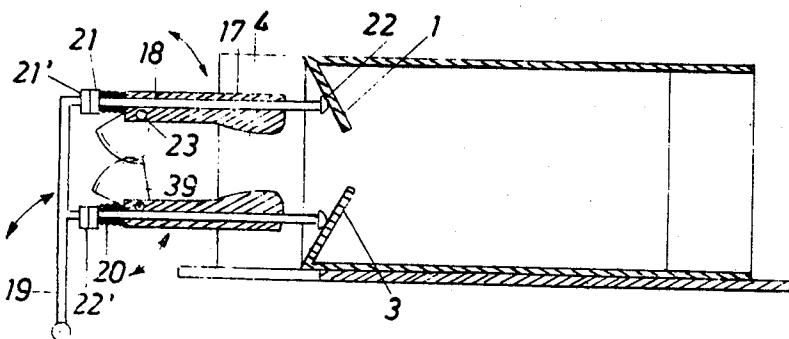
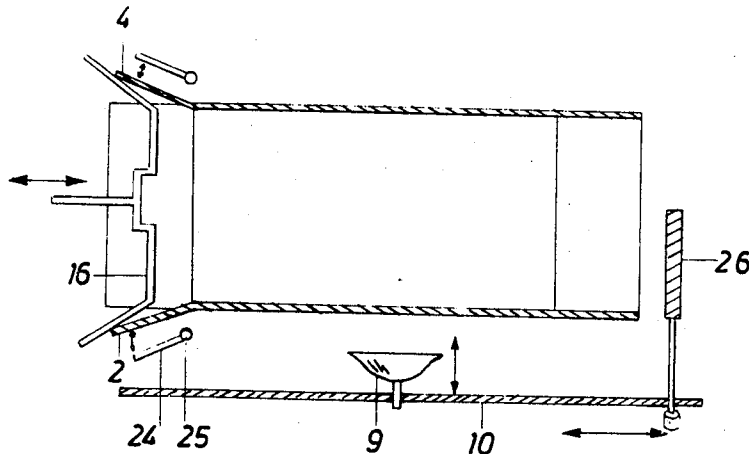


FIG. 1

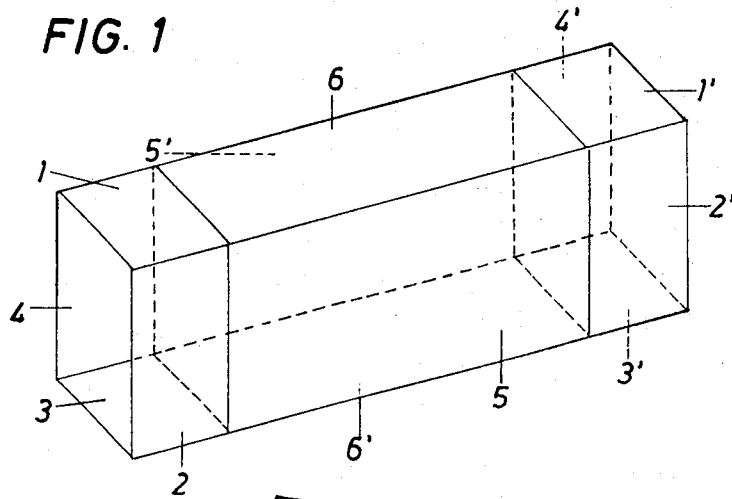


FIG. 8

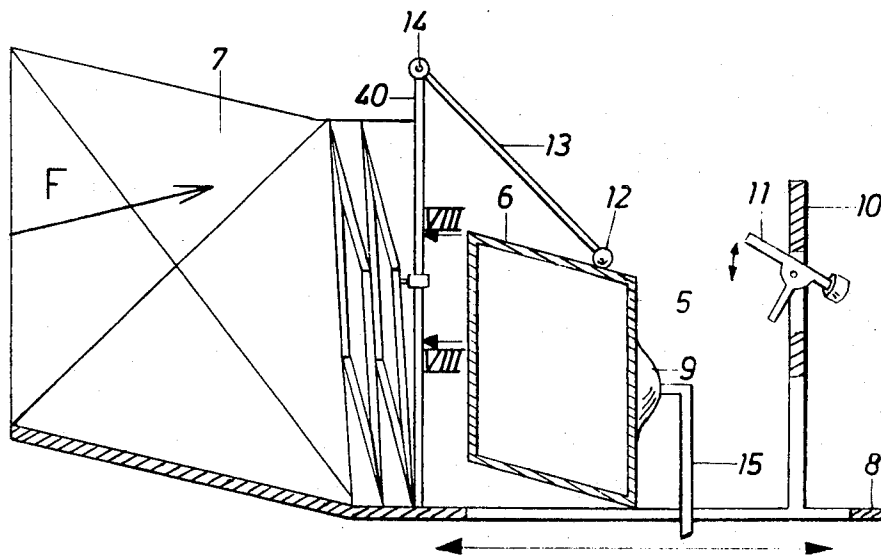
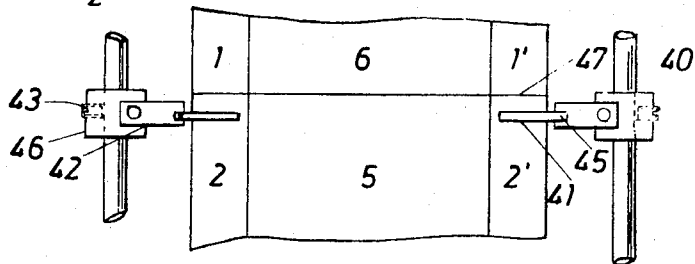


FIG. 2

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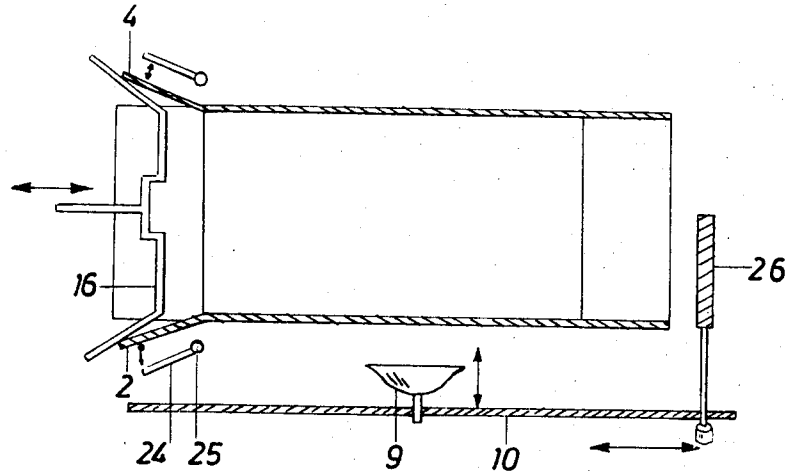


FIG. 3

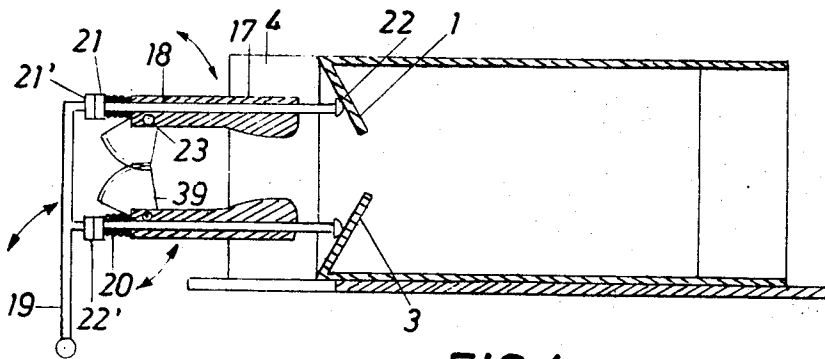


FIG. 4

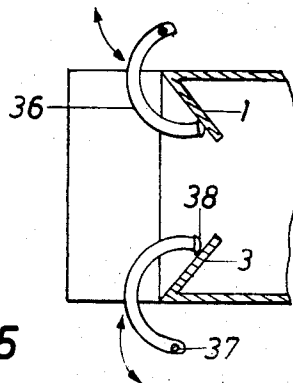


FIG. 5

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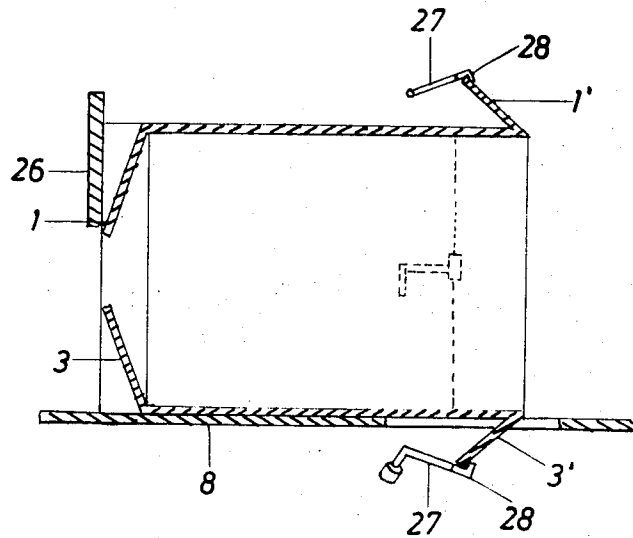


FIG. 6

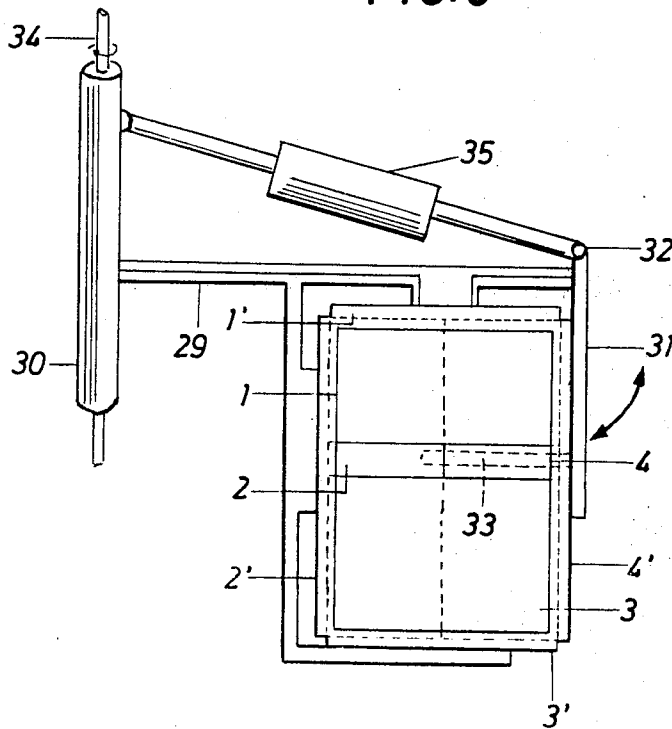


FIG. 7

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MACHINE FOR OPENING CARTONS

This is a continuation of the copending application Ser. No. 807,522 filed on Mar. 17, 1969, now abandoned.

The present invention relates to a machine for opening cartons taken from a magazine in which they are stored in flattened form and for presenting the said cartons to a boxing machine in a position such that the bottom flaps are closed and the opposite flaps are open.

The said cartons are made up of four hinged faces provided at each end with an extension in the form of a flap; the flaps located at one end of the carton are intended to constitute the bottom when this end is closed while the flaps located at the other end are intended to close the said carton after filling.

It is known to open cartons by means of levers or guides and to transfer them to the boxing machine in the open condition by means of a belt-conveyor. The cartons thus pass in front of a series of stations which contribute in turn to the carton-forming process by working on the different flaps on each side of the transverse axis of the cartons. Devices of this type have substantial space requirements and entail the need for complicated mechanisms if the location of the boxing machine is such that the cartons have to undergo a change of direction in order to be brought into position in front of the inlet of the machine.

It is possible to obtain a less bulky unit by forming the carton at a fixed station and to reduce the difficulties which arise from a fixed-station arrangement by limiting the work on the flaps at the said fixed station to one of the carton ends the work on the other end is carried out by components of simple design during a transfer of a carton in the direction of its longitudinal axis. In this manner, the carton thus formed can be transferred subsequently towards the inlet of the boxing machine by the same components or a number of the said components which have taken part in the previous operation.

The transfer of a carton towards the boxing machine inlet with the opening end of the said carton placed downstream can be carried out by translational motion in the direction of the longitudinal axis of the carton or alternatively, and in order to meet the different problems of position location of machines, in a circular arc by pivotal motion of the carton about a vertical axis or even by superposing the two machines about a horizontal axis.

It will be noted that the design concept referred to results in a machine which makes it possible to form cartons having indifferently rectangular or square cross-sections simply by adjusting the components which work on the upper flaps and on the flaps of one lateral face of the carton.

The present invention is directed to a machine for opening cartons which are placed in a magazine, for converting the said cartons to a parallelepipedal shape and for presenting them to a boxing machine with the flaps closed at one end and open at the other by means of a transfer unit which maintains the carton in the position assumed on completion of the forming operation, the opening station being provided with means for producing action transversely to the longitudinal axis of the carton and cooperating with means for producing action along the said axis in order to endow the carton with a parallelepipedal shape.

The carton can be formed by the combined action of a suction force applied to one face of the carton in a direction having a horizontal component and of a counterweight whose action is exerted in a direction having a vertical component.

Preferably, the counterweight will be attached to the extremity of a rod which is capable of rotation about a horizontal axis so as to exert a vertical pressure under the action of its weight on the top face of the carton in the direction of the rear edge of this latter when the suction force subsequently acts in a horizontal direction.

The combination of these two forces is sufficient to endow the carton with its parallelepipedal shape.

The carton-forming operation will be additionally facilitated by the action of two retractable obstacles disposed at the outlet of the magazine and adapted to retain the flaps which are joined to the rear face of the carton when the front face is subjected to a tractive force. The shape, size and position of the obstacles referred to are such that these latter pass between the two flaps of the front face when this latter is displaced as a result of the tractive force and more especially when the magazine is provided with a sloping floor on which the vertical cartons are displaced in sliding motion along one of their edges.

Provision is made in accordance with the invention for means which serve to close the flaps of one of the carton ends and which in turn comprise means for working transversely to the longitudinal axis of the carton at the opening station and cooperating with means which work along the said axis in order to endow the carton with its parallelepipedal shape and means for closing the flaps of one carton-end, characterized in that the said closing means comprise means for separating the two opposite flaps of the said carton-end and for causing the said flaps to move apart towards the exterior of their respective initial planes so as to constitute two guide planes for the two other flaps of the said carton-end and means for inwardly folding the said other flaps.

The parallelepipedal shape is perfected by inwardly displacing the lower and upper flaps beyond the folding plans after the two lateral flaps have been opened outwards.

It will be noted that the said flaps remain in the position which they have been caused to assume by reason of the tendency towards deformation of the newly opened carton.

The cartons thus formed which may or may not have closed bases are transferred along their longitudinal axes to a holding station by means of a push-plate which may also maintain the base flaps in the closed position and it is during this transfer that rocker-arms disposed around the transfer path can engage the opening flaps so as to fold them back against the outer walls of the faces.

Provision is made of the holding station for transfer means comprising components for maintaining the base flaps in the closed position and the other flaps in the folded position against the outer walls, the said means being adapted to take the carton as thus formed and to carry this latter towards the boxing machine in a movement of rotation about a vertical or horizontal axis.

The following description relates to a particular embodiment in accordance with the invention of a machine for opening cartons in which these latter are stored vertically in the magazine. Both the description and the accompanying drawings to which reference will be made are given by way of example. In these drawings:

FIG. 1 is a view in perspective of the carton;

FIG. 2 is a diagrammatic view showing the extraction of the carton from the magazine and the components for providing the carton with a parallelepipedal shape;

FIG. 3 is a top view in which the separation of the lateral sides of the carton is shown diagrammatically;

FIG. 4 is a diagrammatic sectional view showing the inward displacement of the lower and upper flaps of the carton;

FIG. 5 is a view of components for inwardly displacing the flaps in another form of construction;

FIG. 6 is a sectional view of the device for carrying out the longitudinal transfer of the carton during which the front-end flaps are open;

FIG. 7 is a diagrammatic view of the device for transferring the carton from the forming machine to the boxing machine and locking on the opening-end of the carton;

FIG. 8 is an external view taken along the line VIII—VIII of FIG. 2.

FIG. 1 shows the carton which is composed of four hinged faces 6, 5, 6', 5' having terminal extensions in the form of flaps which are in turn hinged to the faces designated by the reference numerals 1, 2, 3, 4 in the case of the bottom-end flaps and by the references 1', 2', 3', 4' in the case of the opening-end flaps.

In accordance with FIG. 2, the machine comprises a magazine 7 in which the flattened carton, the adjacent faces 5 and 6 of which are located in vertical extension with respect to each other, are disposed vertically in adjacent relation; a frame having a floor 8 is provided with a slideway for guiding the motion of the suction cup 9, the said floor 8 being adapted to form the carton opening station in conjunction with the wall 10 which carries a positioning bracket 11; a counterweight 12 is attached to the end of a rod 13 which is adapted to move in rotation about the pivot-pin 14.

The suction cup 9 is supported by an arm 15. The travel of the said arm is carried out by any suitable means between the two end points of the double arrow which is shown in the figure. The said arm 15 is hollow and puts the interior of the suction cup into communication with a suction source which is in operation during the entire travel of the cup from the left-hand side toward the right-hand side of the figure and does not come into operation during the return travel.

In accordance with FIG. 8, two upright members 40 serve to limit the section of the magazine and are each adapted to carry a flat rod 41, which is joined by means of a rivet 45 to a blade spring 42, the said spring being in turn attached to a slide-block 46 which can be positionally adjusted on the upright member 40 by means of the screw 43. This position is dependent on the size of the cartons: the rod 41 is located slightly below the slits determined on the one hand by the adjacent edges of the flaps 1', 2'. The length of the rods 41 is such that the latter can pass freely between the flaps 1', 2' and 1, 2.

The folded cartons are placed vertically in adjacent relation on the sloping floor of the magazine. The volume constituted by the said cartons is supported at the rear end by means of a spring system (not shown in the figure) which is materialized by the arrow F. The cartons are maintained in slightly inclined position with respect to the vertical by the head cartons which rest on their edges on the horizontal portion of the magazine floor and are held by the rods 41 which are inclined against the upper portion of the flaps 2 and 2' at a very small distance from their upper extremity which determines with the lower extremity of the flaps 1 and 1' the slits 47 mentioned earlier.

When the suction cup is applied against the face 5 of the carton, the weight of the carton and the inclined position of this latter with respect to the vertical cause a slight downward collapse of the carton in the direction of inclination which thus increases to an extent such that the rods 41 reach the level of the slits 47. The faces 5 and 6 together with their flaps move forward without any resistance under the tractive force exerted by the suction cup. The rods 41 are applied against the flaps 4 and 4' of the rear portion of the carton, thus contributing to the separation of the opposite walls of the said carton. Since the tractive force of the rods 41, the blade springs 42 bend at the appropriate moment in order not to damage the flap according to the characteristic of the spring, allow the carton to pass out of the magazine and return to the position of equilibrium in order to support the following carton.

Furthermore, during the movement of displacement of the carton, the counterweight 12 bears under the action of its weight on the top face 6 of the carton and acts in conjunction with the force of horizontal suction of the suction cup as a component of a force which tends to produce final conversion of the carton to the approximate shape of a parallelepiped. At the end of travel of the suction cup, the positioning bracket 11 moves downwards and supports the carton during the flap-folding operation.

In FIG. 3, a separator 16 is constituted by a rod which is elbowed at the extremities and forms a trapezoidal figure, the small base of which is slightly smaller than the width of the carton. This enables said rod to penetrate between the lateral flaps 2 and 4 and to separate these latter to a sufficient extent to facilitate subsequent folding of the upper and lower flaps.

In FIG. 4, two symmetrical assemblies are each composed of a pusher 17 in which is freely mounted for translational motion a rod 18 having an annular shoulder (21 and 22) at each extremity. A spring 20 which works in compression is fitted between the shouldered rod extremity 21 and the pusher 17. The pusher 17 is pivoted about a horizontal pin 23 which is disposed in such a manner that the extremity of the pusher 17 is applied against the outer face of the flap so as to guide this latter toward the folding plane. The two pushers are coupled by means of toothed sectors 39 which form a double gear. A rod 19 is provided with two abutments 21' which are positioned in such manner that each abutment comes up against the extremity 21 of the two rods 18 when the pushers 17 have reached the end of travel.

When the separator 16 moves the flaps 2 and 4 outwards and frees the front end of the carton, the two as-

semblies 17, 18, 20 are set in motion and the spring 20 is in the position of equilibrium. The pushers 17 come into contact with the outer walls of the upper flap 1 and lower flap 3 and displaces these latter inwards. When the rods 18 have reached the end of travel, the rod 19 moves forward and its abutments 21' come into contact with the rod shoulders 21. The two rods 18 slide within the pushers 17 while compressing the springs 20 and the extremity 22 of the pusher causes the inward displacement of the two flaps beyond the folding plane; the carton thus assumes a perfectly parallelepipedal shape; the two flaps 2 and 4 are thus retained inside the carton and maintain this latter in the open position without any other assistance. The rod 19 withdraws and the springs 20 return the pushers while expanding. The assemblies 17, 18, 20 then return to their initial position.

Two arms 24 which are shown in FIG. 3 and which are adapted to move in rotation about the axis 25 are then applied against the outer faces of the lateral flaps 2 and 4 and fold back these latter so as to close the base of the carton.

On condition that such an expedient is permitted by the conditions of location of the different machine components, it is possible as shown in FIG. 5 to replace the combination of pushers 17 and rod 19 by two arcuate arms 36 which are capable of pivoting about pins 37 and the displacement of which is so adjusted that the extremities 38 of said arms are applied against the outer force of the flaps and displace these latter beyond the folding plane solely as a result of the pivotal motion of said arms about the pin 37.

As shown in FIG. 6, a push-plate 26 which is capable of translational motion along the frame 10 is intended to move into position prior to the withdrawal of the arms 24 so as to maintain the bottom-end flaps in the closed position. Provision is made around the transfer path for four rocker-arms 27 having a predetermined length which is adjusted so as to take the ends of the opening flaps at the time of transfer of the carton. The said rocker-arms are provided with endhooks 28 which are shaped in such a manner as to retain the flaps during the onward progression of the carton.

The push-plate 26 which is guided along the frame 10 is intended to displace the carton in the longitudinal direction towards a holding station; as and when this translational motion takes place, the opening flaps 1', 2', 3', 4' come up against the extremities 28 of the rocker-arms and are held back by these latter. The carton continues to be displaced in the forward direction by the push-plate 26 and passes between four guides which maintain the opening-end flaps folded back against the outer wall of the carton faces. These flaps have thus moved clear of the rocker-arms which then return to the position of equilibrium after the carton has passed. The carton is then in the holding station in which it is ready to be taken by the transfer arm 29 and moved into position opposite to the inlet of the boxing machine.

As shown in FIG. 7, the transfer arm comprises on the one hand a stationary frame 29 which is rigidly fixed to a hub 30 and an upright member 31 which is adapted to move about the pin 32 and to which is attached the rod 33 or arcuate arm for passing behind the base of the carton. The frame 29 constitutes a kind of

U-shaped jaw in which the carton is adapted to fit; whereupon the upright member 31 which completes the engagement of the carton can be folded back against the fourth face. The movement of the upright member 31 is carried out by means of a jack 35 which serves to place said member in the horizontal position when the arm is located opposite to the carton and to move downwards in order to grip the carton.

The position of the carton on completion of the forming operation is retained during the transfer operation; the top opening-end flaps 1', lateral opening-end flaps 2' and bottom opening-end flaps 3' are maintained in the folded-back position against the outer walls by the frame 29, the bottom-end flaps are closed by the rod 33 and the lateral flap 4' is closed by the movable upright member 31.

The transfer arm performs a movement of rotation about the pin 34 and presents the opening end of the carton in front of the boxing machine inlet.

During the translational motion of the carton to the holding station and the transfer of said carton to the boxing machine, another carton has been formed and the flaps of this latter have been folded. The transfer push-plate 26 has been returned to the front end of the machine and again guided along the frame 10 but in the raised position by means of a counterweight in such a manner as to pass above the carton during the forming operation.

All the movements can be controlled by a number of different means such as cams, rocker-arms, gear systems and the like and synchronism of operations can be obtained by means of microswitches.

What is claimed is:

1. A machine for opening cartons comprising a magazine for said cartons, means for drawing out the cartons one after the other from said magazine, means for opening said cartons, means for closing the flaps of a first end face of each carton, means for bringing successively each carton onto a transfer way, means for outwardly spreading the opposite flaps of the second end face, guiding means located downstream of said spreading means for keeping said opposite flaps spread outwardly, receiving means for said cartons to keep said opposite flaps spread outwardly, and means for transferring each carton on said transfer way to said receiving means.

2. The machine as defined in claim 1 wherein said machine comprises a pre-boxing machine.

3. The pre-boxing machine as defined in claim 2 wherein said cartons are knocked-down cartons.

4. The pre-boxing machine as defined in claim 3, including means for converting said cartons into a parallelepipedal shape.

5. The pre-boxing machine as defined in claim 4 wherein said transfer way has a direction perpendicular to said first end face.

6. The pre-boxing machine as defined in claim 5 wherein said opposite flaps of the second end face are spread opposite to said first end face.

7. The pre-boxing machine as defined in claim 6 wherein said spreading means is located on the paths followed by the edges of said opposite flaps during the movement of the carton on said transfer way.

8. The pre-boxing machine as defined in claim 7 wherein said receiving means cooperate with means for transferring the cartons to a boxing machine.

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9. The pre-boxing machine as defined in claim 8 wherein said receiving means comprise a frame closed on three sides and a movable plate to close off the opening of said frame when the carton is housed therein.

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10. A pre-boxing machine as defined in claim 9 wherein said means for translating said each carton comprise pushing means for exerting a thrust on said first end face.

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