May 27 ,.1924. 1,495.191

J. MACNAUGHTAN

CARTON OPENING MECHANISM FOR PACKAGING MACHINES

Filed Nov. 9, 1922 4 Sheets-Sheet 1

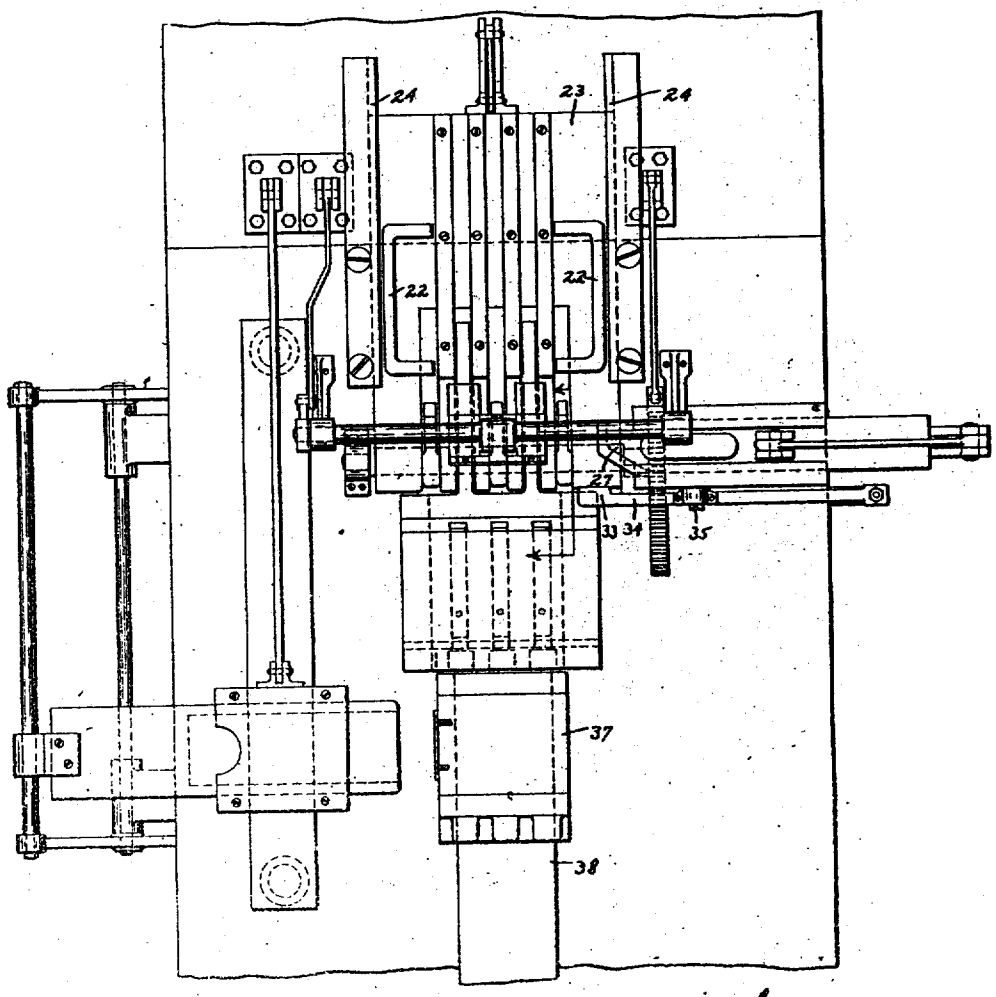

Fig. 1.

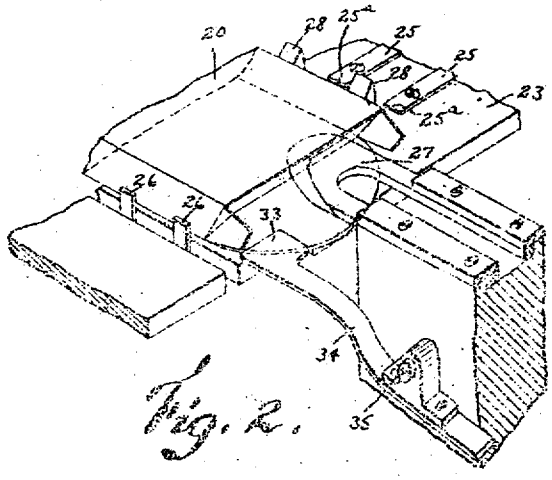

Fig. 2.

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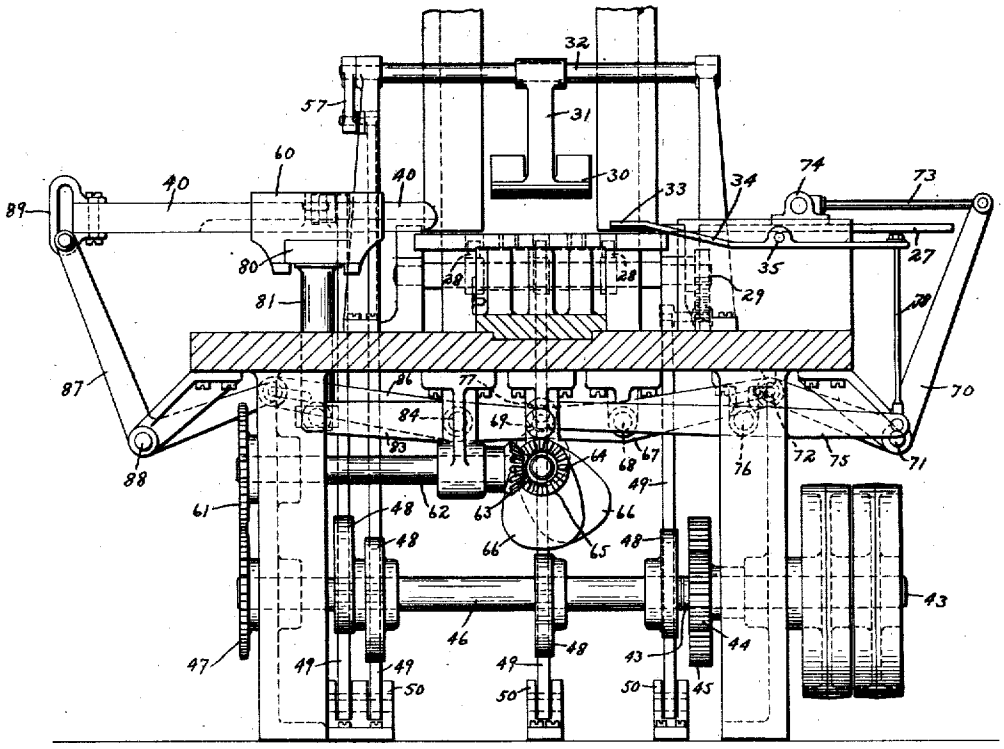

Fig. 3.

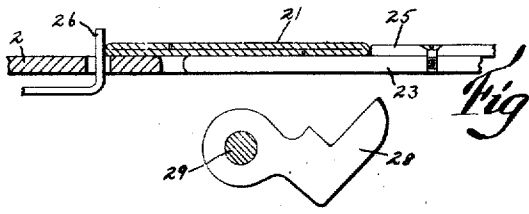

Fig. 4.

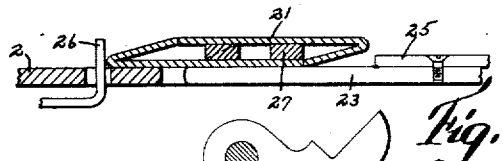

Fig. 5.

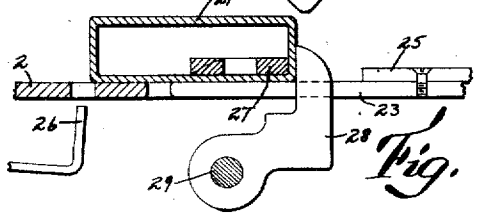

Fig. 6.

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CARTON OPENING MECHANISM FOR PACKAGING MACHINES

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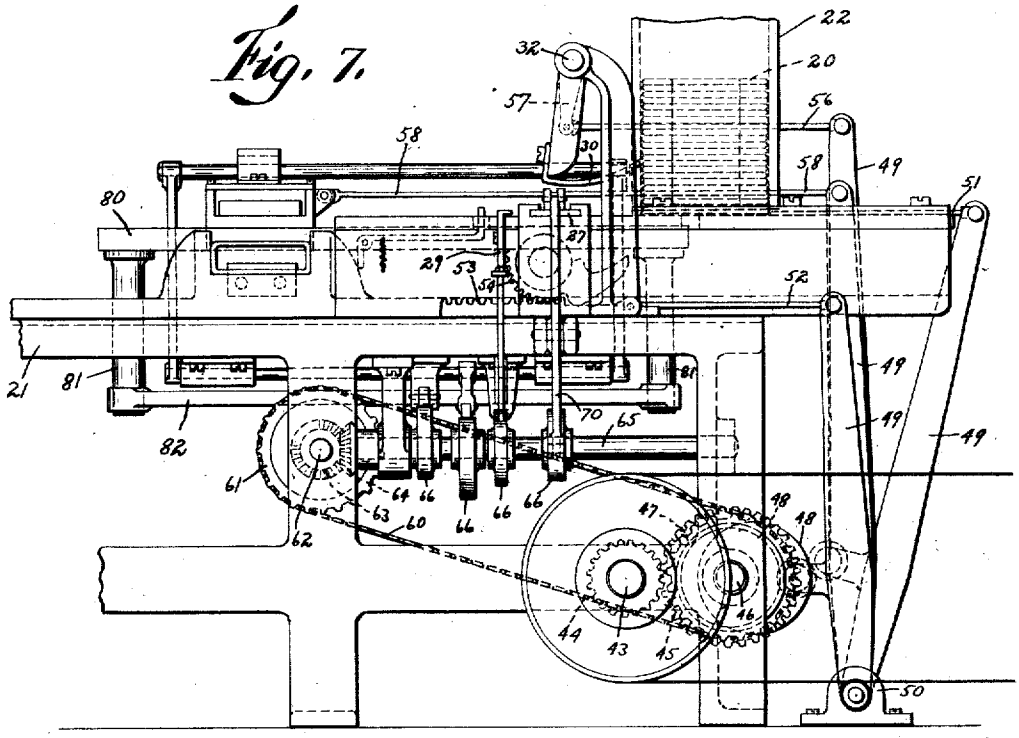
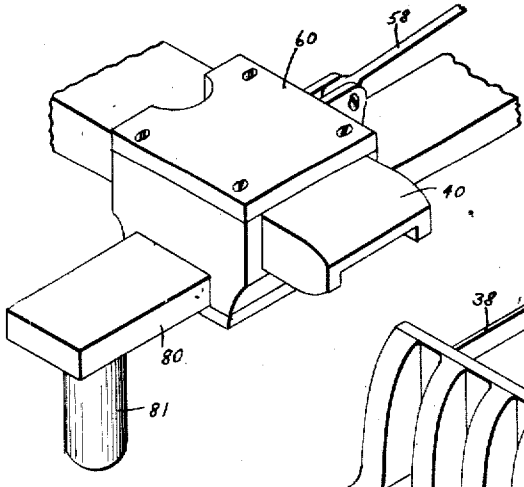
Fig. 7.





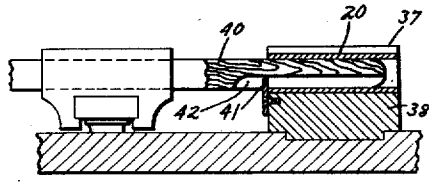


Fig. 9.

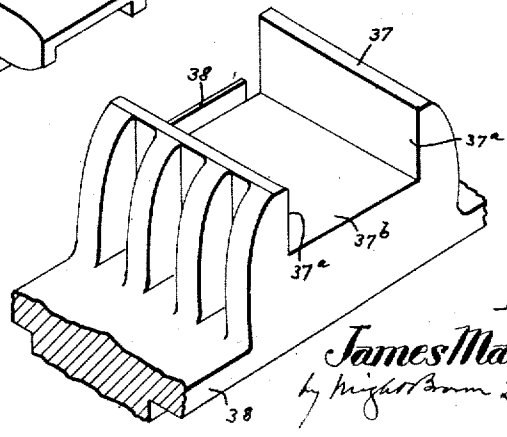


Fig. 8.

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CARTON OPENING MECHANISM FOR PACKAGING MACHINES

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Fig. 10.

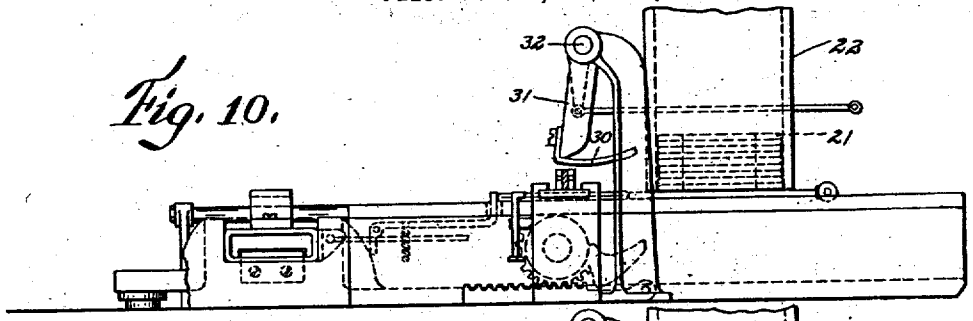


Fig. 11.

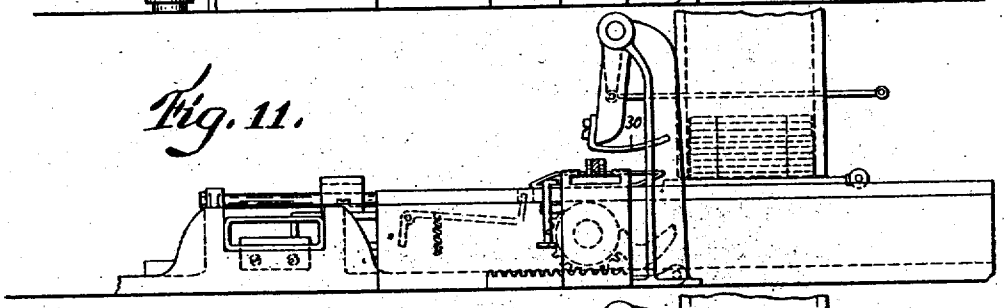


Fig. 12.

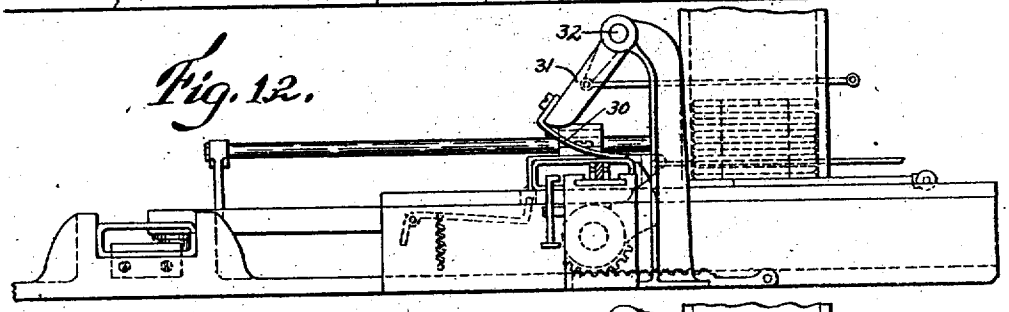


Fig. 13.

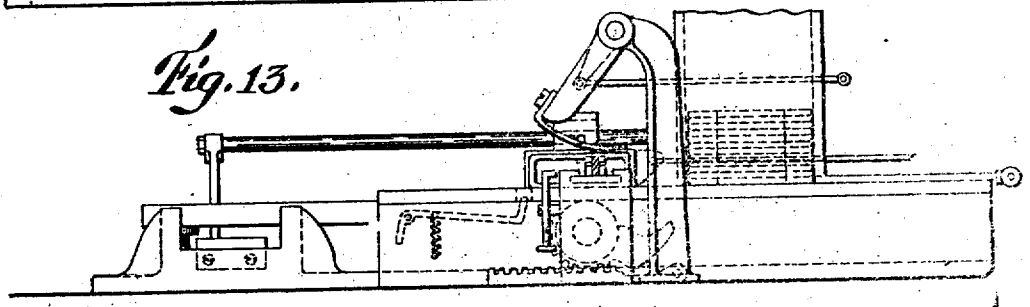
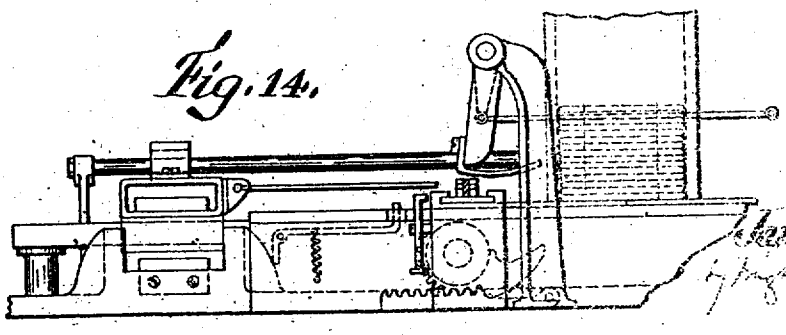


Fig. 14.



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Patented May 27, 1924. 1,495,191

UNITED STATES PATENT OFFICE.

JAMES MACNAUGHTAN, OF BROOKLINE, MASSACHUSETTS, ASSIGNOR TO GORDAN MACHINE COMPANY, OF WALTHAM, MASSACHUSETTS, A CORPORATION OF MASSACHUSETTS.

CARTON-OPENING MECHANISM FOR PACKAGING MACHINES.

Application filed November 9, 1922. Serial No. 599,774.

To all whom it may concern:

Be it known that I, JAMES MACNAUGHTAN, a citizen of the United States, residing at Brookline, in the county of Norfolk and State of Massachusetts, have invented new and useful Improvements in Carton-Opening Mechanism for Packaging Machines, of which the following is a specification.

This invention relates to automatic packaging machines having means for opening collapsed cartons having major and minor sides preparatory to confining charges of merchandise therein.

The object of the invention is to provide improved opening mechanism, whereby collapsed cartons may be automatically opened partly by internal and partly by external pressure, without the employment of means having a turning or partial rotary movement within the carton, my object being chiefly to avoid the complication and structural weakness which is involved in carton-opening means applying opening pressure wholly within the carton.

Of the accompanying drawings forming a part of this specification,—

Figure 1 is a top plan view of the portion of a packaging machine which includes carton-opening mechanism embodying my invention.

Figure 2 is an isometric view, showing the opening blade after it has partially entered the carton, the tab lever holding the tab securely to the base plate, the stop fingers which keep the carton from moving forward while being opened, the feed strips which push the box into position for opening, and the jaws for applying external pressure to the carton after the opening blade has been inserted.

Figure 3 is an end view.

Figures 4, 5, and 6 are sections to show the method of bringing the carton to shape after it has been fed by means of the feed strips up against the stop fingers.

Figure 7 is a side elevation.

Figure 8 is an isometric view, showing the plunger, the guide along which the plunger slides with one of its supporting rods by means of which it may be raised or lowered, and the receiving box which finally takes the opened carton and carries it along for various other operations.

Figure 9 is a section to show the method of removing the plunger from the carton, so as to leave the carton undisturbed in the receiving box.

Figures 10 to 14 inclusive are side elevations to show the carton in various positions. Figure 10 shows the feed strips pushing the lowest carton in the magazine into position against the stop fingers. In Figure 11 the opening blade is inserted into the carton and opens it partially. The carton which has been opened previously has been dropped into the receiving box and has started toward the other end of the machine, as shown in Figure 12. The jaws swing up to push the carton into shape while the opening blade is in the carton. When the carton is fully opened, the overhead finger swings out and holds the carton, preventing it from collapsing while the opening blade withdraws.

In Figure 13, the plunger guide is raised to the level of the carton, and the plunger is pushed into the carton as the blade withdraws. The receiving box has ejected the previous carton and is returning to the original position.

In Figure 14, the plunger with the carton is moved along the plunger guide, into position directly over the receiving box. The feed strips have pushed a new carton into position, and the returning receiving box has raised the stop fingers so as to limit the movement of the new carton. Figure 10 shows the plunger with its carton lowered into position inside the receiving box, after which the plunger withdraws, leaving the carton to be carried away by the receiving box.

The machine is provided with a vertical magazine adapted to contain a pile of collapsed cartons 20, the lowest carton resting on the horizontal bottom of the magazine. The vertical sides of the magazine are preferably formed by two upstanding angular members 22, spaced apart as indicated by Figure 1, and formed to permit a pile of cartons therebetween to move downward.

The lowest carton is ejected from the magazine by a reciprocating slide 23, which forms the bottom of the magazine, and is movable in guides 24, and provided with means such as the ends 25ª of strips 25, for engaging the rear edge of the lowest carton and pushing the carton forward. The strips

25 are attached by screws, or otherwise, to the slide 23.

A carton ejected by the slide is arrested by stop fingers 26, which are raised and lowered by means later described. The larger flap at one end of the ejected carton is held down or clamped by a presser-foot 33, formed on a lever 34, which is fulcrumed at 35, and is oscillated by means hereinafter described, to cause the foot to hold down the carton flap before and during the operation of opening the carton, and to release the flap after the carton has been opened. The carton is arrested in the path of a reciprocating opening blade 27, which has a wedged-shaped forward end, and is adapted to partly open the carton and cooperate with the stop fingers 26 in holding the partly opened carton while it is being acted on by swinging jaws 28. Said jaws are fixed to a rock-shaft 29, and as indicated by Figures 5 and 6, are adapted to fully open the carton. The blade 27, when inserted in the carton, bears on one of the major sides at its junction with one of the minor sides, and causes the carton to assume the rhomboidal form in cross section shown by Figure 5, the major sides being somewhat separated, and the minor sides inclined, so that one of them is in the path of movement of the jaws 28. The jaws swing upward when the carton is thus held, and strike the overhanging minor side of the carton, and swing the same against one edge of the blade 27, as shown by Figure 6. This operation completes the opening of the carton, the cross section of which is now rectangular.

To prevent the opened carton from collapsing while the blade 27 is being withdrawn, I provide a curved holding-down finger 30, fixed to an arm 31, on a rock-shaft 32. The rock-shaft is turned by means hereinafter described, to cause the finger 30 to alternately assume the positions shown by Figures 10 and 12, the finger being in Figure 10 position before, and in Figure 12 position after, the carton is opened. When in the latter position, the finger exerts confining pressure on the carton, so that the withdrawal of the blade 27 does not displace the carton.

After the withdrawal of the opening blade, the stop fingers 26 are lowered, and the opened carton is transferred by mechanism presently described, to a reciprocating box 37, which carries the carton forward for subsequent operations, in which the present invention is not involved. The box which is shown in perspective by Figure 8, is formed on a slide 38 movable horizontally on the table 21. The box has side faces 37a, and a bottom face 37b, forming the walls of an open ended receptacle in which the body portion of an opened carton may be deposited, and from which its end portions or flaps may project in opposite directions, to be acted on by other instrumentalities of a complete packaging machine.

The transferring mechanism whereby the opened carton is deposited in the box 37, is embodied as follows:

40 represents a plunger formed to enter and conform to the interior of the opened carton, and having a compound movement whereby it is caused to first move horizontally into the opened carton, after the withdrawal of the opening blade 27, then horizontally with the carton to a position over the box 37, the latter being below the plane in which the opening blade moves, as indicated by Figure 7, then downward into the box, thus depositing the carton in the box, and finally horizontally out of the carton, the latter being detained in the box by a detent lip 41 (Figure 9), which bears on one end of the carton.

The plunger 40 has a recess 42, in its under side, into which the detent projects, the recess being arranged to permit withdrawal of the plunger from the detent and the box. The plunger is returned after its withdrawal from the box, to position to enter the carton next opened.

From the foregoing it will be seen that the lowest carton is opened by the successive action of the blade 27 and the jaws 28, and is then transferred from the position where it was opened, so that it may be subsequently closed at one end, filled, and then closed at its opposite end by suitable means provided for these purposes. The reciprocating opening blade and the oscillating jaws constitute a simple and reliable means for opening a collapsed carton, without the complication and liability to derangement which is involved when the means for opening the carton operates wholly within the carton, and involves a member or members entering the carton, and then partly rotating or swinging within the carton. The opening blade 27 performs its function within the carton, and has only a reciprocating movement. The jaws 28 perform their function outside the carton, and have only an oscillating movement, so that neither of said instrumentalities has a compound movement.

It is obvious that the operating mechanism whereby the described movements are imparted to the essential instrumentalities in which the invention is embodied, may be of any suitable character. In this embodiment of the invention, said mechanism is embodied as follows:

The main shaft 43 of the machine is connected by gears 44, 45, with a shaft 46, carrying a sprocket wheel 47, and a plurality of cams 48, which cooperate with a corresponding plurality of levers 49, the lower ends of which are pivoted to fixed ears 50. One of the levers 49 is connected by a rod

51 (Figure 7) with, and reciprocates the carton-ejecting slide 23. Another lever 49 is connected by a rod 52 with a sliding rack 53, meshing with a gear segment 54 on the rock-shaft 29, which carries the jaws 28. The rack is reciprocated by the lever with which it is connected, and oscillates the jaws. Another lever 49 is connected by a rod 56 (Figure 7) with an arm 57, on the rock-shaft 32, carrying the carton-holding finger 30, said finger being oscillated by the lever with which it is connected. A rod 58 (Figures 7 and 8) connects another lever 49 with a slide 60, constituting a guide in which the plunger 40 is movable by means described later. The slide 60 is reciprocated by the lever 49, with which it is connected by the rod 58, and carries the plunger, and a carton in which it is inserted, from the opening station to a point over the box 37.

The sprocket wheel 47, on the shaft 46, is connected by a chain 60, with a sprocket wheel 61, on a shaft 62. A bevel gear 63 on the shaft 62, meshes with a bevel gear 64 on a cam shaft 65, having a plurality of cams 66.

Reciprocating motion is imparted to the opening blade 27 by one of the cams 66, through connections including a lever 67 (Figure 3) fulcrumed at 68, and having a trundle roll 69 bearing on the cam, a bell-crank lever 70, fulcrumed at 71, and having a pivotal and sliding connection at 72 with the lever 67, and a rod 73 connecting the lever 70 with an ear 74, fixed to the carton-ejecting slide 23. Oscillating motion is imparted from another cam 66 to the flap-clamping pressure-foot 33, by a lever 75, fulcrumed at 76, and having a trundle-roll 77 bearing on the cam last referred to, and a rod 78 connecting the lever 75 with the presser-foot lever 34.

The plunger-guiding slide 60 is movable on a guide bar 80, to move the plunger to its carton-entering position, and therefrom to a position over the box 37, this movement being effected by the mechanism already described, including the rod 58. The guide bar 80 is alternately raised and lowered by mechanism which includes two upright rods 81 (Figure 7), connected with opposite ends of the bar and movable vertically in fixed guides in the table 21, a bar 82 connected with the lower ends of said rod, and a lever 83 fulcrumed at 84, and having a trundle-roll at one end, bearing on one of the cams 66, its opposite end being slidably engaged with the lower bar 82.

The plunger 40 is reciprocated in the guiding slide 60 by mechanism which includes a lever 86 (Figure 3), fulcrumed at 84 beside the lever 83, and having at one end a trundle-roll bearing on one of the cams 66, its other end being slotted, and a bell-crank lever 87, fulcrumed at 88, and slidingly engaged at one end with the slotted end of the lever 86, and at its other end with a slotted head 89 on the plunger 40.

I claim:

1. Carton-opening mechanism comprising a supporting bed, means for locating a collapsed carton in a predetermined position thereon, carton-opening means including two successively operating instrumentalities, one having a reciprocating movement causing it to enter the carton, and partly open the same, and the other having an oscillating movement outside the carton to complete the opening, and a clamping presser-foot adapted to engage a flap at the end of the carton.

2. Carton-opening mechanism comprising a supporting bed, means for locating a collapsed carton, having major and minor sides, in a predetermined position thereon, with one of its major sides in contact with the bed, carton-opening means including two successively operating instrumentalities, one being formed to be inserted between the major sides, and having a reciprocating movement causing it to enter the carton, and partly open the same, and the other formed to contact with one of the minor sides, and having an oscillating movement outside the carton to erect the minor sides and complete the opening of the carton, a curved oscillatory holding-down finger adapted to bear on an opened carton, and prevent displacement thereof by said reciprocating instrumentality, when the latter is withdrawing from the carton, and means for oscillating said finger.

3. Carton-opening mechanism comprising a supporting bed, means for locating a collapsed carton, having major and minor sides, in a predetermined position thereon, with one of its major sides in contact with the bed, carton-opening means including two successively operating instrumentalities, one being formed to be inserted between the major sides, and having a reciprocating movement causing it to enter the carton, and partly open the same, and the other formed to contact with one of the minor sides, and having an oscillating movement outside the carton to erect the minor sides and complete the opening of the carton, a carton-receiving box, means for transferring an opened carton from the said opening instrumentalities to said box, and means for shifting the box to transfer the opened carton to other instrumentalities.

4. Carton-opening mechanism comprising a supporting bed, means for locating a collapsed carton, having major and minor sides, in a predetermined position thereon, with one of its major sides in contact with the bed, carton-opening means including two successively operating instrumentalities, one being formed to be inserted between the

major sides, and having a reciprocating movement causing it to enter the carton, and partly open the same, and the other formed to contact with one of the minor sides, and having an oscillating movement outside the carton to erect the minor sides and complete the opening of the carton, a carton-receiving box, a compound motion feed plunger, adapted to transfer an opened carton from said opening instrumentalities to said box, and means for shifting the box to transfer the opened carton to other instrumentalities.

5. Carton-opening mechanism comprising a supporting bed, means for locating a collapsed carton, having major and minor sides, in a predetermined position thereon, with one of its major sides in contact with the bed, carton-opening means including two successively operating instrumentalities, one being formed to be inserted between the major sides, and having a reciprocating movement causing it to enter the carton, and partly open the same, and the other formed to contact with one of the minor sides, and having an oscillating movement outside the carton to erect the minor sides and complete the opening of the carton, a carton-receiving box, a feed plunger adapted to enter an opened carton and force the latter into the box, means for imparting a compound motion to said plunger, and means for shifting the box to transfer the opened carton to other instrumentalities.

In testimony whereof I have affixed my signature.

JAMES MACNAUGHTAN.