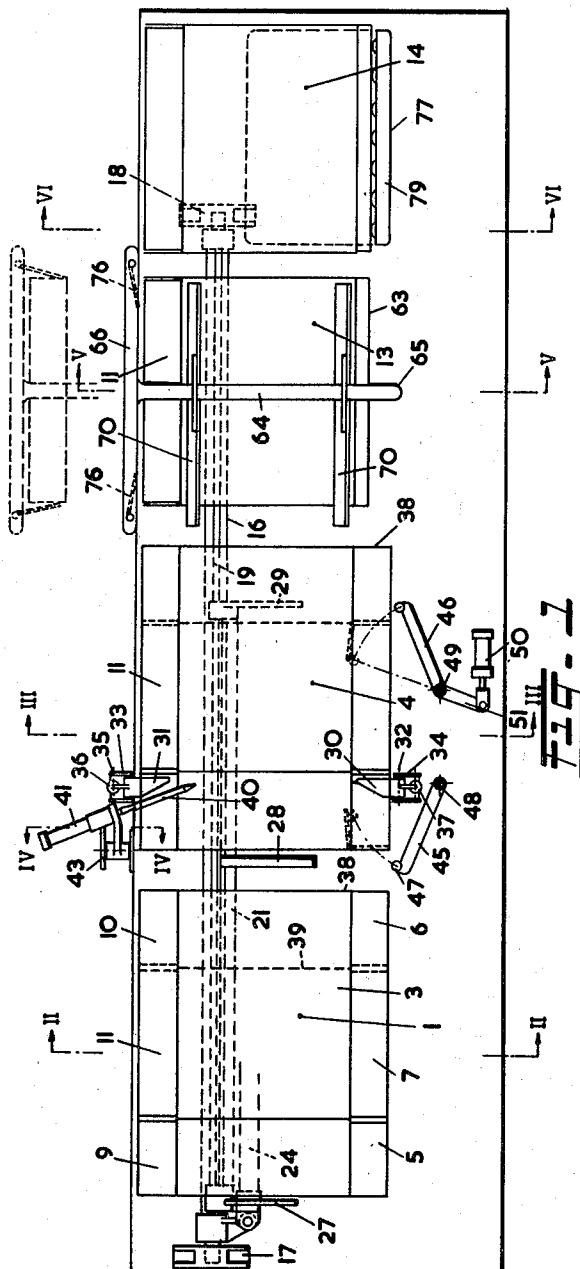


G. E. EUWE
PACKAGING MACHINE

Filed May 23, 1960

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BY
Brently. Free. Evans & Moore

HIS ATTORNEYS

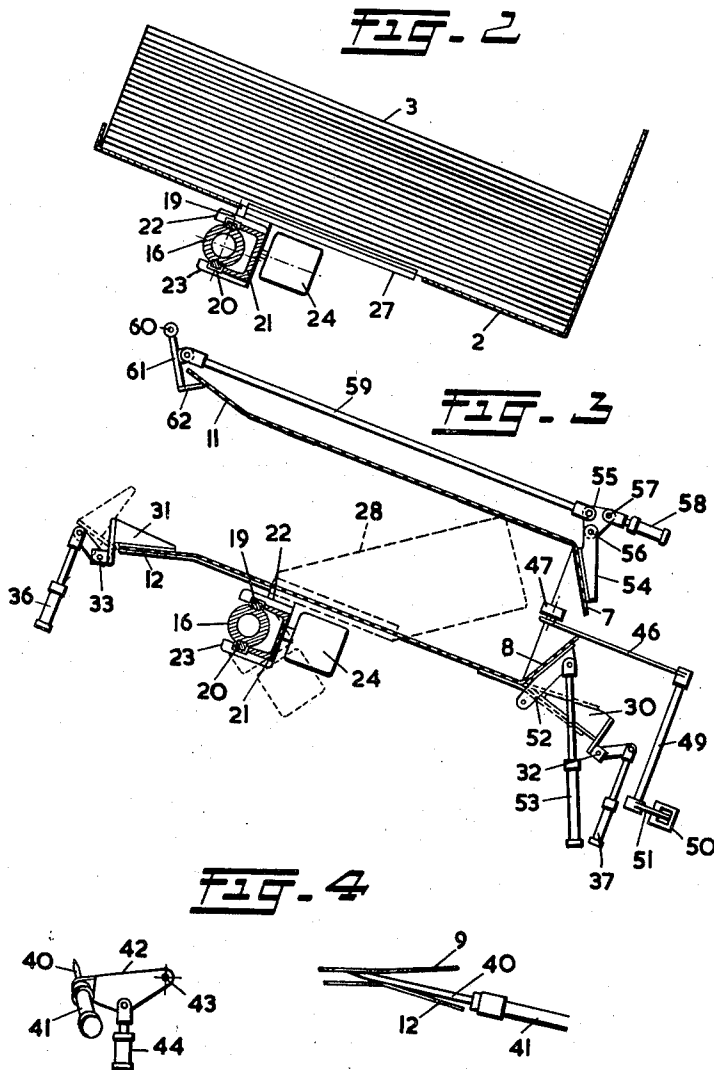
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PACKAGING MACHINE

3,153,309

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INVENTOR.
GERRIT EVERT EUWE

BY
Gerrit Evert Euwe
HIS ATTORNEYS

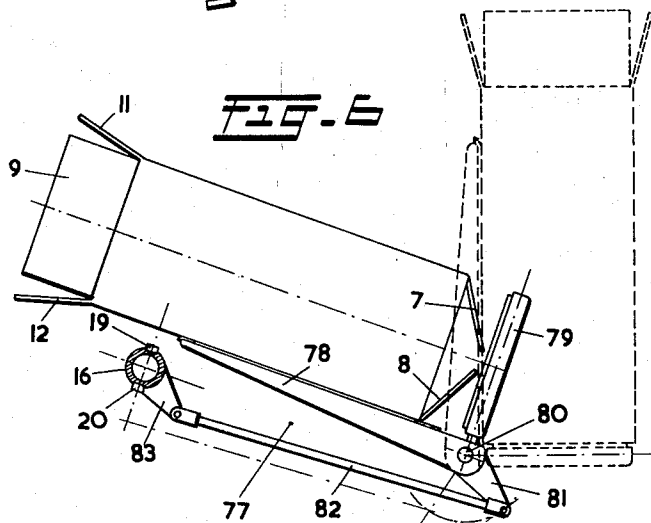
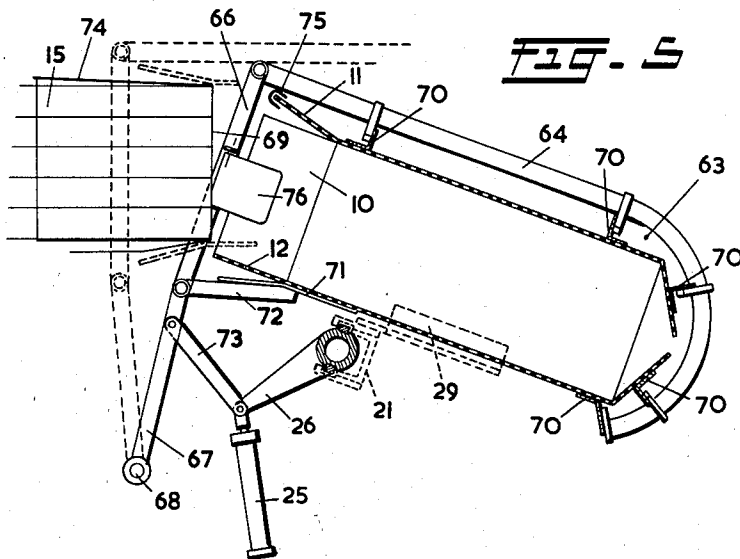
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3 Sheets-Sheet 3



INVENTOR.
GERRIT EVERT EUWE

BY

Andrew J. Free, James H. Donohue

HIS ATTORNEYS

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3,153,309

PACKAGING MACHINE

Gerrit Evert Euwe, Vlaardingen, Netherlands, assignor to
Lever Brothers Company, New York, N.Y., a corporation of Maine

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This invention relates to the field of packaging. In particular, the invention relates to erecting a flat-folded carton and positioning the erected carton ready for its contents to be inserted.

The invention is mainly concerned with flat-folded cartons which can be formed into rectangular parallelepiped boxes which, for example, can be used as outer casings.

According to one aspect of the invention there is provided a machine comprising an erecting section for erecting a flat-folded carton leaving one end open, a filling section where contents can be filled into the erected carton, transporting means for transporting the carton from the erecting section to the filling section so that the carton enters the filling section moving parallel to an edge of the carton at said open end, and pivoting means for pivoting the carton at the filling section about an axis parallel to said edge so that the flaps of the carton at said open end can engage over contents awaiting to be filled therein or a chute through which said contents can pass.

Said flaps preferably engage over the contents or the chute for the full length of the flaps, but they may only engage over for part of the length of the flaps. It is to be understood that when said flaps engage over said contents or chute, they do not necessarily contact said contents or chute.

The arrangement can be such that during the transport of the carton from the erecting section to the filling section one side of the carton moves in one plane. Preferably this plane makes an acute angle to a horizontal plane and then the arrangement may be such that at the end of said pivoting operation, said open end of the carton being pivoted is in a vertical plane.

The transporting means can comprise a reciprocable transporter member provided with an arm, the arrangement being such that in operation the arm engages the carton at the erecting section and transports this carton in a straight line parallel to said axis to the filling section during an advancing stroke of the transporter member, the transporter member then rotating about a line parallel to said straight line to move the arm out of the path of the carton so that during the return stroke of the transporter member the arm passes by the next carton at the erecting section.

The machine can include a storage section comprising a hopper for storing a stack of the flat-folded cartons, the transporting means being arranged to transport the bottom carton of said stack to the erecting section when the carton at the erecting section is transported to the filling section. The transporter member can be provided with another arm which is arranged for engagement with the bottom carton of said stack to transport this carton in said straight line to the erecting section during said advancing stroke of the transporter member.

The pivoting means can be arranged to perform said rotation of the transporter member at the same time as said pivoting operation of the carton at the filling section.

The bottom carton of said stack is preferably transported from said stack to the filling section in one plane.

The machine can include an ejection section for eject-

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ing cartons from the machine, the pivoting means being arranged to bring the carton at the filling section after said pivoting operation back to the position in which it entered the filling section, and the transporting means being arranged thereupon to transport this carton in said straight line from this latter position to the ejection section. This ejection section can comprise a roller conveyor which is usually in an inoperative position but is arranged to be turned into an operative position each time said pivoting operation is performed.

The filling section can comprise a cage arranged to receive the erected carton from the erecting section, the pivoting means being arranged to pivot the cage about said axis. The erecting section can comprise a wedge which is arranged to penetrate between and partly separate two adjacent end flaps of the carton when in the flat-folded state, and a part, preferably a pin, which is arranged to penetrate between said separated end flaps and the sides of the carton to which these flaps are attached and to pivot one of these sides relative to the other.

Preferably, said axis is horizontal and the transporting means is arranged to transport the cartons in a horizontal straight line.

According to another aspect of the invention there is provided a method of filling a flat-folded carton with contents comprising erecting the flat-folded carton leaving one end open, moving the erected carton in a direction so that a side of the carton adjacent said open end moves in one plane, said moving stopping when said open end is opposite said contents or a chute through which said contents can pass, pivoting the carton about an axis external to the carton and parallel to said direction so that the flaps at said open end engage over the contents or the chute, and then filling the carton with said contents.

The invention will now be particularly described with reference to the accompanying diagrammatic drawings, in which:

FIGURE 1 is a plan of a packaging machine according to the invention;

FIGURE 2 is a cross-section on the line II—II of FIGURE 1 and shows the storage section;

FIGURE 3 is a cross-section on the line III—III of FIGURE 1 and shows the erecting section;

FIGURE 4 shows two views of part of the mechanism for erecting the flat-folded cartons;

FIGURE 5 is a cross-section on the line V—V of FIGURE 1 and shows the filling section; and

FIGURE 6 is a cross-section on the line VI—VI of FIGURE 1 and shows the ejecting section.

FIGURE 1 shows the layout of the machine in which the storage section 1 comprises a hopper 2 (FIGURE 2) which holds a stack of flat-folded cartons 3. With each cycle of the machine the bottom flat-folded carton of the stack is withdrawn and transported to the erecting section 4 where the carton is erected, this comprising successively opening the flat-folded carton, closing the narrow bottom flaps 5 and 6, and partly closing the broad bottom flaps 7 and 8. With the next cycle of the machine the erected carton with closed bottom flaps 5, 6, 7, 8 and open top flaps 9, 10, 11 and 12 is transported to the filling section 13. At the same time the next flat-folded carton is transported from the hopper 2 to the erecting section 4. At the filling section 13 the contents for one carton are put into the erected carton. Then the filled carton is transported to the ejecting section 14 with the next cycle of the machine.

The cartons are transported from section to section through the machine in a horizontal direction and in such

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a way that the lower side of each carton, that is the side carrying the flaps 8 and 12 (FIGURES 3, 5 and 6), is moved in one plane which makes an acute angle to a horizontal plane. In this way, the extended top flaps 9, 10, 11 and 12 at the open end of the carton can freely pass a stack of articles 15 (FIGURE 5) until said open end is opposite these articles. Then, by pivoting the carton about a horizontal axis external to the carton, the flaps 9, 10, 11, 12 at the open end can engage over the end of the stack of articles 15.

The machine will now be described in greater detail.

The cartons are transported through the machine by a transporting means which comprises a shaft 16 rotatably mounted in bearings 17 and 18. The shaft 16 is provided with two axial keys 19 and 20 which are fixed diametrically opposite each other and serve as guides for a reciprocable transporter member 21 in the form of a beam of U-section. The beam carries supports 22, 23 provided with key-seats which slidably engage the keys 19, 20. The transporter member 21 is reciprocated by an air-cylinder 24 arranged parallel to the shaft 16 and secured at one end to the member 21 and at the other end to the shaft 16.

The shaft 16 together with the slide 21 and air-cylinder 24 can be rotated in either direction by an air-cylinder 25 (FIGURE 5), of which one end is pivoted to the framework of the machine and the other end is pivoted to an arm 26 rigidly connected to the shaft 16. When the cylinder 25 is actuated in such a way that its piston rod is forced out, the shaft 16 is rotated clockwise in FIGURES 2, 3, 5 and 6 to move the cylinder 24 from the position shown in FIGURE 3 by full lines to that in dotted lines. When the cylinder 25 is actuated in such a way that its piston rod is retracted, the shaft 16 is rotated anti-clockwise until again it occupies the position shown in FIGURES 2, 3, 5 and 6.

To move the bottom flat-folded carton at the storage section 1 to the erecting section 4, the slide 21 is provided with an arm 27 in the form of a narrow plate, as shown in FIGURE 2. To transport an erected carton from the erecting section 4 to the filling section 13 and a filled carton from section 13 to the ejecting section 14 simultaneously, the slide is provided with further arms 28 and 29, respectively, which are also in the form of pusher plates as shown in dotted lines in FIGURES 3 and 5.

Transport of the cartons from section to section takes place during the advancing stroke of the slide 21 which is effected by actuating the cylinder 24 to retract its piston rod whilst the shaft 16 occupies the position shown in full lines in FIGURE 3. At the end of this advancing stroke cylinder 25 is actuated to rotate shaft 16 clockwise (FIGURES 2, 3, 5 and 6) thus also rotating clockwise slide 21 and the pusher plates 27, 28 and 29 until the cylinder 24 has reached the position indicated by dotted lines in FIGURE 3. In this position of the shaft, the pusher plates 27, 28 and 29 are outside the path of the cartons, so that when cylinder 24 is thereupon actuated to effect the return stroke of the slide 21, to the left in FIGURE 1, the pusher plates 27, 28 and 29 pass by the cartons which are thus not moved by this return stroke. After the end of the return stroke, the cylinder 25 is actuated to rotate the shaft 16 anti-clockwise back to the position shown in full lines in FIGURE 3 to commence the next cycle. The pusher plate 27 is very narrow as it only transports the bottom flat-folded carton from the hopper 2. Pusher plate 29 is also relatively narrow because the filled carton it transports from section 13 to section 14 is fairly rigid so that the surface of contact between plate 29 and the filled carton need not be very large. Plate 28, however, which serves to convey an empty erected carton which has one end opened and is, therefore, easily deformable, must have a large surface so that a considerable part of a side of the empty carton is contacted by the plate 28 during the advancing stroke.

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The mechanism for erecting a flat-folded carton at section 4 comprises two wedges 30 and 31 which are arranged on either side of the shaft 16. The part of each block coming into contact with the carton at this section has the shape of a triangular pyramid as shown in FIGURES 1 and 3. The wedges 30 and 31 are rotatable on shafts 32 and 33 which are parallel to the shaft 16. The shafts are mounted in supports 34 and 35, respectively, which are in turn attached to the framework of the machine. The block 31 can be moved by an air-cylinder 36 from the position shown in full lines in FIGURE 3 to the position shown in dotted lines and vice versa; the wedge 30 can be moved in a similar way by an air-cylinder 37. The arrangement is such that whilst the cartons are being moved simultaneously from section 1 to section 4, from section 4 to section 13, and from section 13 to section 14, the wedges 30 and 31 are in a raised position. In other words, in a position corresponding with the position of wedge 31 as shown in dotted lines in FIGURE 3, the wedges thereby remaining outside the path of transport of the cartons. After the foremost edge 38 of a flat-folded carton has passed the wedges 30 and 31 during the transport of this carton from section 1 to section 4, but before the folding line 39 of this carton passes these wedges, the wedges are swung down to press against the flaps 7 and 11 and to take up the position shown in full lines in FIGURES 1 and 3. Further movement of the flat-folded carton causes the wedges 30 and 31 to be inserted between the bottom flaps 5 and 8, and between the top flaps 9 and 12, respectively. When the advancing movement of this carton to section 4 is completed, the blocks 30, 31 are in the position shown in FIGURE 1 having partially separated these pairs of adjacent flaps, the under-flaps 8 and 12 being pressed down. A pin 40, near wedge 31, is then inserted between the top flaps 9 and 12 and between the sides of the carton attached to these flaps, as shown in FIGURE 1. To effect this insertion, the pin 40 is moved axially by the piston of an air-cylinder 41 to which it is attached. The cylinder 41 is secured to a support 42 (FIGURE 4) which is pivotable on a shaft 43 whose axis is parallel to the plane along which the cartons are transported but is at right angles to the direction of transport of the cartons. The support 42 is pivoted upwards through 90° by an air-cylinder 44 after the pin 40 has been inserted between the sides of the carton, as a result of which the carton is entirely opened. During this movement of the pin 40, the carton is held in position by the plate 27, and the wedges 30 and 31 remain in contact with the flaps 8 and 12. Thereupon, the narrow bottom flaps 5 and 6 are closed by rollers 47 mounted on closing arms 45 and 46 which are linked together and secured on rotatable shafts 48 and 49, respectively. The closing arms 45 and 46 are pivoted inwards from the position shown in FIGURE 1 to that shown in FIGURE 3 by an air-cylinder 50 which is pivotally attached to an arm 51 rigidly secured to the shaft 49. As soon as the narrow bottom flaps 5 and 6 have been folded inwards and the wedges 30 and 31 have been returned to their raised position, the wide bottom flaps 7 and 8 are simultaneously folded partly inwards until they have reached the partly closed position shown in FIGURE 3. The flap 8 is folded inwards by a pivoted arm 52 which is actuated by an air-cylinder 53. The flap 7 is folded inwards by an arm 54 pivoted intermediate its length at 56 and actuated by an air-cylinder 58 pivotally attached at 57 to the arm 54, the other end of the air-cylinder 58 being pivotally attached to the framework of the machine. A rod 59 is pivotally attached at one end to the arm 54 at 55. The other end of the rod 59 is pivotally attached to a hook-shaped arm 61 which is pivoted at 60 to the framework of the machine. As shown in FIGURE 3, the construction is such that when the cylinder 58 is actuated to turn the arm 54 about the pivot 56 in a clockwise direction to fold the flap 7 into the position shown, the hook end 62 of the lever 61 folds the flap 11 slightly outwards to the position

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shown. Whilst the bottom flaps of the opened carton are being closed, the shaft 16 is first rotated by the cylinder 25 to bring the plates 27, 28 and 29 below the path of the cartons, after which the cylinder 24 returns the slide 21 together with the plates 27, 28 and 29 into the position shown in FIGURE 1. Thereupon, the cylinder 25 rotates the shaft 16 anti-clockwise in FIGURE 3 to return the cylinder 24 to the position shown in full lines and so also return the plates 27, 28 and 29 back into the path of the cartons. Thus, as soon as a carton has been erected as in FIGURE 3, the slide 21 is ready again for the next transport cycle, whereby together with the supply of a new flat-folded carton from the hopper 2 by the plate 27, the erected carton is transported by the plate 28 from the erecting section 4 to the filling section 13. Naturally, the pin 40 will have been withdrawn by cylinder 41 beforehand and the arms 45, 46, 52, 54 and the lever 61 will have been moved out of the path of the moving cartons at the appropriate time.

The filling section 13 comprises a cage 63 consisting of a central tube 64 which has a bend 65 at one end and rigidly secured to a frame 66 at the other end. The frame 66 is provided with downwardly extending arms 67 which are pivoted at their lower ends on a shaft 68. The axis of the shaft 68 is parallel to that of the shaft 16 and consequently is parallel to the two longer edges of the carton (FIGURE 5) at its open end, that is parallel to the long free edges of the flaps 11 and 12. Furthermore, the axis of the shaft 68 coincides with the line of intersection of the plane through the free edges of the flaps 9, 10, 11 and 12 in FIGURE 5 and a vertical plane through the stack of articles 15 awaiting to be inserted into the carton, this vertical plane being spaced from the end of the stack 15 by approximately the length of the flaps 9, 10, 11, 12 and being the vertical plane into which the open end of the carton is pivoted for its flaps to engage over the stack 15. To support a carton in the cage 63 a number of supports 70 are attached to the tube 64 and a support 71 is carried by an arm 72 attached rigidly to the frame 66. A link 73 is pivotally attached at an end to one of the arms 67 and is pivotally attached at the other end to the piston rod of the air-cylinder 25 at the point where the piston rod is also pivoted to the arm 26. These parts have been arranged in such a way that when the cylinder 25 is actuated to rotate the shaft 16 clockwise, the cage 63 is pivoted about the shaft 68 in an anti-clockwise direction (FIGURE 5) until the cage 63 has reached the position shown schematically by dotted lines in FIGURE 5. The open end of the carton in the cage 63 is thereby pushed over the end of the stack of objects 15 and also over the discharge end of a chute 74 surrounding this end of the stack 15. During this pivoting operation of the cage 63, the flap 11 is held slightly back as shown in FIGURE 5 by a U-section guide 75 secured to the cage, the flap 11 entering this guide 75 when the carton was transported from section 4 to section 13. The flap 12 is automatically spread slightly outwards during the pivoting operation by the support of the stack 15 or by the base of the chute 74, whilst the flaps 9 and 10 are spread slightly outwards by spreaders 76 hinged to the frame 66. These spreaders are spring biased to the position shown in FIGURE 1, but during the pivoting operation of the cage the spreaders 76 contact the edges of the stack 15 or chute 74 and are pivoted to the position shown in FIGURE 5. When the cage 63 has pivoted into the position as shown schematically by dotted lines in FIGURE 5, the stack of objects 15 is pushed through the chute 74 by a pushing device (not shown) until the front 69 of the stack has reached the bottom of the carton in the cage 63. Then the cage is pivoted back again by the cylinder 25 into the position shown by full lines in FIGURE 5, thus returning the carton to the position in which it entered section 13. During the next transport cycle of slide 21, the pusher plate 29 transports the filled carton out of the cage 63 to the ejecting section 14.

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The ejecting section 14 is formed by an ejector table 77 (FIGURE 6) consisting of a platform 78 with a perpendicularly attached side 79 formed by a roller conveyor. The ejector table can pivot on a shaft 80 which has been arranged in such a way that the roller conveyor 79, when the table is pivoted to the position shown by dotted lines in FIGURE 6, slopes in the conveying direction of the rollers. The filled carton thus automatically moves down the roller conveyor 79 and is ejected from the machine, for example onto an endless belt conveyor.

The pivoting mechanism for the ejector table 77 comprises an arm 81 rigidly secured to the platform 78, the end of the arm 81 being pivotally attached to one end of a rod 82. The other end of the rod 82 is pivotally attached to an arm 83 rigidly secured to the shaft 16. Thus, when shaft 16 is rotated clockwise by the cylinder 25, the table 77 is rotated clockwise to the ejecting position shown in dotted lines in FIGURE 6. When the shaft 16 is next rotated anticlockwise, the table is returned to the position shown in full lines in FIGURE 6.

Thus, whilst the shaft 16 is at the end of its clockwise movement and is in the position in which the cylinder 24 occupies the position in broken lines in FIGURE 3, the articles 15 are inserted into the carton at section 13, the filled carton at section 14 is ejected down the roller conveyor 79, and the slide 21 executes its return stroke, all simultaneously. The shaft 16 is then rotated anti-clockwise, the slide 21 actuated to execute its advancing stroke to advance the carton at each section to the next section, the flat-folded carton entering section 4 is erected, and finally the shaft 16 is rotated clockwise. The cycle of operations can then be repeated.

The actuation of the cylinder 25 to rotate the shaft 16 anti-clockwise and introduce a new working cycle of the machine can be given by an attendant, but is preferably given by an interconnected stacking machine arranged to build up the stack of objects 15 and push this stack forward and into the carton covering the end of the stack.

What is claimed is:

1. A machine comprising a hopper for containing a stack of flat-folded cartons so that the bottom flat-folded carton is in a plane which is inclined at an acute angle to a horizontal plane, an erecting section for erecting a said flat-folded carton leaving the flaps at one end open, a filling section where a said erected carton can be filled, the filling section comprising pivoting means for pivoting a said erected carton at the filling section about a horizontal axis with said open end leading so that this carton moves from a position in which one of its sides is in said inclined plane to a filling position in which said one side is in a horizontal plane, said pivoting means being arranged to return this carton after filling to the position it occupied before said pivoting, and transporting means for successively transporting a carton from said hopper to said erecting section, from said erecting section to said filling section, and then transporting the filled carton from the filling section, all this transporting taking place in a horizontal direction parallel to said axis and with said one side of the carton moving in said inclined plane.

2. A machine as claimed in claim 1 in which said transporting means comprises a reciprocable member, three arms on said reciprocable member for engaging and transporting simultaneously during a transport stroke a flat-folded carton in said hopper, an erected carton at said erecting section and a filled carton at said filling section.

3. A machine as claimed in claim 2 in which said member is rotatable about an axis parallel to said horizontal direction, said pivoting means being arranged to rotate said reciprocable member to move said arms out of the path of said cartons at the end of each said transport stroke.

4. A machine as claimed in claim 3 in which said filling section includes a pivotable cage for supporting the carton at this section.

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