APPARATUS FOR PACKING ARTICLES OF RECTANGULAR BLOCK SHAPE IN BOXES HAVING SEPARATE LIDS


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7 Claims. (Cl. 53—282)

This invention concerns apparatus for packing articles of rectangular block shape in boxes having separate lids.

The boxes in question are primarily for containing cigarettes for retail sale and are therefore substantially of the same shape as the ordinary consumer package made of paper or thin card and containing, say, twenty cigarettes. A batch of twenty cigarettes is normally oblong in cross-section and the shape is such as to constitute an article of rectangular block shape, as this phrase is used in the present specification. The boxes, in the specific example described later, are made of a plastic material, that is, moulded, and a box body is moderately rigid and of a shape and size corresponding to that of the article to be contained therein. Each box has a lid which is a separate article consisting of a top panel provided with flanges to form a skirt which fits over the open end of the box body. Thus the lid has two opposed narrow flanges corresponding approximately to the thickness of the article and two opposed wide flanges corresponding to the width of the article.

According to the invention there is provided apparatus for packing articles of rectangular block shape in boxes having separate lids, comprising means for feeding an article to a position where it is to be inserted into a box body, means for feeding a box body to said position and a pusher arranged to push the article into the body, means for feeding a lid, having a top panel and four side flanges constituting a skirt, towards the filled box body and for bringing a flange of the lid into contact with the box body at one side thereof and at the open end of the box body and so that part of the skirt of the lid slides over the open end of the box body at said side, whereby the lid top panel is disposed at an angle to the plane of the open end of the body and means for thereafter swinging the lid through such angle to cause the remaining part of the skirt of the lid to slide over the remainder of said open end.

Means may be provided for inserting a thin plate between a flange of the lid and the body at that side of the box body remote from the first said side towards the end of the swinging movement of the lid, and actuating said thin plate to distend the corresponding flange of the lid to facilitate the sliding movement of the lid over the said remainder of the open end of the box body.

The apparatus may further comprise a rotatable turret having pockets equally spaced around its axis of rotation to receive and hold the box bodies and means for intermittently rotating said turret in angular stages corresponding to the angular pitch of the pockets to move the pockets successively to different positions of rest, a pusher for feeding a body into a pocket at one rest position and a further pusher for feeding an article into said body after the first has rotated to move said pocket to a different rest position, a lid carrier movable from a lid receiving position to a lid applying position to which the loaded box body is brought by a further movement of the turret, said carrier being pivoted at one end of a pivoted lever, and a cam for causing a swinging movement of the lever to swing the carrier and bring the lid into contact with the body at one side as aforesaid, and a further cam capable of rotating the carrier on its pivot at the lever end to cause the lid to swing through the said angle and complete the fitting of the lid on to the box.

Other features of the invention are explained in the following description and set forth in the appended claims.

The invention will be further described with reference to the accompanying drawings in which:

FIGURE 1 is a diagrammatic plan of a machine embodying the apparatus,

FIGURE 2 is a front elevation of FIGURE 1,

FIGURES 3 to 6 show different stages in the assembly of a box and its contents,

FIGURE 7 is a plan view of the apparatus for fitting lids to boxes,

FIGURE 8 is an elevation, looking in the direction of the arrow A, FIGURE 7,

FIGURES 9 and 10 are views of a part of FIGURE 7 showing lid fitting devices in differentoperative positions,

FIGURE 11 is a view showing more clearly the shapes of three cams shown in FIGURES 8, 9 and 10 and in fragmentary form in FIGURE 7,

FIGURES 12 and 13 are fragmentary views of FIGURE 8, showing some details more clearly,

FIGURE 14 is a section on line 14—14 FIGURE 7 and shows a device for applying spots of adhesive to the interior of the box body,

FIGURE 15 is a diagram of essential driving devices.

Referring first to FIGURES 1 to 6, cigarettes are fed from a hopper 1 to a machine bed 2 along which they are conveyed in batches of the number required in each box and wrapped in metal foil in apparatus 3, all in the conventional manner. The wrapped batches 4, FIGURE 3, enter into pockets of a rotatable drum 5, FIGURE 1, and as they move around, a label 6, FIGURE 3, is applied by a device at 7 and when a wrapped batch has moved through one revolution of the drum it is discharged to a conveyor 8 and brought to a position 9 from which it is pressed into a box body B held in a pocket of an eight-stage turret wheel 10. As will be explained in detail later with reference to the other views, box bodies are fed to a turret pocket at 11 being received from a chute 12 while lids 1 are put on at position 13, these lids being supplied from a chute 14. After a lid has been fitted to a box, the finished article, FIGURE 5, is discharged to a conveyor 15 and carried to other mechanism where further operations take place. These vary according to requirements. For instance, an adhesive strip 16, FIGURE 6 can be applied to fix the lid or, alternatively, the whole box can be wrapped in transparent or other material in which case the strip 16 may be regarded as a tear strip. For some boxes a label 6A, FIGURE 3, may be applied to one or both sides and in such cases a labeler is provided in advance of the apparatus for wrapping the box. At 17, FIGURES 1 and 2, is a magazine in which surplus wrapped batches can be stored, to be used up in the event of a shortage in the supply. As the provision of a supply of surplus batches for packing and like machines usually means that the whole machine cannot start full production until part of the machine has been run to provide this surplus, such an arrangement is not liked by some users, so alternatively, conventional detecting devices may be fitted to stop the supply of box bodies and lids to the turret if the supply of wrapped batches is interrupted, the turret then rotating idly until the batch supply is again satisfactory. The most usual cause of an interruption of the batch supply is that correct numbers of cigarettes are not coming from the hopper and a defect of this kind usually persists for several batches.

Referring now to FIGURES 7 to 13, the turret wheel 10 is fixed to a shaft 18 which is intermittently rotated in the direction of the feathered arrow, FIGURE 7, by any convenient mechanism and so that the wheel moves 45°...
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at each movement. In FIGURE 7 the wheel is drawn upside-down relatively to the position shown in FIGURE 1. At position 11 a box body B is pressed into a kind pocket formed by two side guides 19 and 20 and a cover plate 21, the latter being supported by a half-spiider consisting of an arcuate strip 22 and arms 23 which are fixed to a ring 24 in which the shaft 18 rotates, the ring being anchored by a strip 24A fixed to a support bar 24B. The box body is pressed into the pocket by a pusher 25 which makes a stroke each time the turrent has moved one stage, and a stop 26 fixed to the turrent wheel locates the box body in position. It will be seen from FIGURE 7 that the pusher 25 only presses on one corner of the body, at the edge of the open end. As the cam 25 is not adequate for pressing the empty body into the pocket and it also allows of a speedy disengagement of the pusher on its return stroke so that the turrent can move at the instant the body is pressed home. The wheel has large apertures 27 at each pocket position for the purpose of ejecting a finished box as explained later. The next movement of the turrent takes the body on one stage where adhesive is applied to the interior of the body by the members 88 which are described in detail when FIGURE 14 is discussed. At the succeeding stage, corresponding to the position 9, FIGURE 1, a wrapped band 44 is pressed into the body by a pusher 28. A mouthpiece 28A is shown in broken lines to facilitate the entry of the band into the box body. The actual mouthpiece used is described in detail in United States Patent No. 3,057,126 and there is no need to describe it here, except to say that it moves into the body with the band and then is drawn out again, as indicated by a doubleheaded arrow. As the band is a close fit in the body, means are provided to grip the band as the mouthpiece goes back, to ensure that the band is not pulled out again by the retreating mouthpiece. The gripping means also holds the box body against displacement. This means comprises a gripper 21A which is operated by mechanism described later and presses up against the underside of the box body while sufficient reaction to provide the necessary grip is given by another cover plate 21. The turrent wheel moves again, bringing the loaded body to the position 13 where the lid L is to be applied. The general method of fitting the lid can be gathered from FIGURE 4, where the lid is shown as arranged to swing through a considerable angle, pivoting on one end, but a better general impression is given by FIGURES 7, 9 and 10, where three positions of the lid during the fitting operation are shown.

From FIGURE 4 it will be seen that the box body is necked at B1. The lid has a top from which four flanges extend so that the lid has a skirt which can fit over the neck of the body and be substantially flush with the sides of the body. This flush-fitting feature is of no consequence to the invention but the narrow flanges of the lid are marked F1 and F2 in FIGURE 4 as they are referred to when the lid-fitting operation is being described.

Referring mainly to FIGURES 7, 9 and 10, a lid carrier 29 is provided and is of L shape, the lids being fed to the carrier so that the lid top contacts the long limb of the L and the short limb contacts one narrow flange F1 of the lid. The carrier has a base member 29A so that the lid is adequately supported during movements of the carrier.

The lid carrier 29 is attached to one arm 30 of a bell crank lever pivoted at 31, the other arm 32 having a roller 33 at its free end which engages with a cam 34. Only a fragment of the cam is shown in FIGURE 7 to avoid obscurity but the whole cam shape is shown in FIGURES 9 to 11.

During the first part of the movement the carrier 29 moves, as one, with the arm 30 but the attachment between arm 30 and carrier comprises a pivot 35 about which the carrier 29 can swing, subject to control by a further cam 36 with which a roller 37 on the end of an arm 38 fixed to the carrier at the pivot, engages under the tension of a spring 38A. Thus the carrier first swings from the position shown in FIGURE 7 to the position shown in FIGURE 9 so that the lid flange F1 comes into contact with the body, and the skirt at that end of the lid begins to slide over the open end of the box body; that is, over the aforesaid neck. The movement of lever 30 continues for a little while and simultaneously the carrier 29 is caused to swing on its pivot 35 by the cam 36 and the whole of the lid is thereby fitted to the box body.

Since the flange F2, opposed to the aforesaid flange F1, would normally foul the rim of the neck, a device 39, acting after the manner of a shoe-horn, is provided to dislodge the flange F2 somewhat so that the lid and box body are assembled without difficulty. During the movement of the lid from the position shown in FIGURE 7 nearly to the position of FIGURE 10, the lid is held securely on the carrier by a pin 40, which engages the flange F2 with light pressure. The pin 40 is fixed to a lever 41 pivoted at 42 to the carrier and having a roller 43 pressed by a spring 44 against a fixed cam 45.

The part 39 is also operated by a fixed cam 46 which engages a roller 47 at the end of a lever 48 to which 39 is fixed, the lever being pivoted at 49 to an arm 50 of a bell crank lever. This bell crank lever is pivoted at 51 to a lug 52 of a fixed bracket 53. The other arm 54 of the bell crank lever has a roller 55 at its free end which engages a third cam 56, under the influence of a spring 50A.

The combined movements of arm 50 and lever 48 cause the part 39 to execute the desired movements, as will now be explained with reference to FIGURES 9 and 10.

In FIGURE 7 the arm 30 is about to swing on its pivot 31 and at about the same time the arm 50 will move downwards as viewed in the figure, the net result being that that flange F2 of the lid overtake the part 39 so that the latter is inside the lid as shown in FIGURE 9. Further movements bring the parts to the position shown in FIGURE 10 during which movements the cam 46 has caused the lid flange to distend, while the part 39 has moved farther out of the interior of the lid as the distension takes place. As in FIGURE 10 the lid is properly fitted to the box body, the turrent is about to make another movement, so that the lid is pulled off the small part of 39, which is still inside the lid, the release of part 39 being assisted by its own movements caused by the extreme end of cam 46.

The carrier 29 has a support plate 57, of arcuate shape, fixed to it whose purpose will be described, during the following description of FIGURE 8. From this figure it will be seen that the bracket 53 forms a bearing for a shaft 58 which carries the three cams 34, 36 and 55. The lower end of shaft 58 has a mitre wheel 59 fixed to it which is driven by another mitre wheel 60 fixed on a horizontal shaft 61 which carries two disc cams 62 and 63. The cam 62 engages a roller 64 on one end of a double-armed lever 65 pivoted at 66 and the other end of the lever is pivoted at 67 to a substantially vertical bar 68. The upper end of the bar 68 is pivoted at 69 to a lever 70 pivoted at 71 and having a bent plate 72 at its free end. From the pivot 69 extends a link 73 whose upper end is pivoted at 74 to an arm 75 of a bell crank lever pivoted at 76. The other end 77 of the bell crank lever has a pin 78 at its end which acts as a lid feeder in the chute 14. Lids are urged along a track 79 FIGURE 1 in the direction of the arrow, the lids coming from the machine which makes them or from any other suitable source of supply. The leading lid comes to rest against a stop 80. FIGURE 8 and is then moved through the chute in the following manner. As the arm 72 rocks, lids are pushed by the pin 78 from the horizontal part of the chute to the curved part and pass down to the vertical part, superimposed as shown.

At the base of the chute the lowest lid is supported by the member 29A of the carrier and the bent plate 72 acts
as a gate which rises as the carrier 29 is about to swing away from the chute 14, carrying the lowest lid to the fitting position. As the carrier goes away from the chute, the column of lids in the chute is supported by the plate 57 whose upper face is flush with the upper face of the lid 22. When the carrier returns, the column of lids slides off the plate 57 so that the lowest lid drops into the carrier to rest on the part 29A.

As the belt plate 72 has to return towards the position where it acts as a gate while the carrier 29 is moving back to the lid receiving position the base member 29A is cut out at 29B to permit the plate 72 to move downward while the carrier is still moving.

The cam 63 engages a roller 81 on a slotted cam rod 82 whose upper end is fixed to a bent bar 83 which carries the gripper 21A at its free end.

As mentioned earlier, 17 is a magazine, an optional feature, in which surplus wrapped batches can be stored. As is common in all cases where part of a machine supplies one item of the final product and another part independently supplies another item, it is desirable, as far as possible, to provide a store of items to cover periods when the normal supply of said items fail. In this case the most likely failure of supply is to be the supply of wrapped batches, as the box parts would normally come from plastic forming machines, or a large store.

Therefore when the apparatus is first set to work, the part making the wrapped batches can be run to make a store for the magazine 17. If the normal supply of batches fails, a pusher 84 feeds batches from the base of the magazine to the position 9.

The apertures 27 in the turret wheel 10 are provided to allow a rising platform 85 to move a finished box upwards so that it can go along conveyor 15 to a labeller or to other devices for applying the strip 16, or a complete wrapping, as previously described.

On FIGURE 3 are two dotted circles marked 86. These represent gum spots which are applied to the interior of the box body before the wrapped batch is thrust in. As the batch goes in, it smears the spots along the interior of the body so that the wrapper of the batch sticks to it and does not pull out as cigarettes are removed by the user. The device for applying these spots is shown in FIGURES 7 and 14. A dish 87 contains gum and two dabbers 88 pivoted at 89 are oscillated by a lever 90 connected to a cam rod 91 to move from the dish up into the interior of the box and back again. The cam to operate rod 91 is not shown at all, but it is obvious that a cam arrangement is in the supply of the two dabbers may be used and arranged to apply spots of adhesive to the interior of both the broad sides of the box body. As the material which the box is made of is extremely thin, about .006", the interior of the neck is almost flush with the interior of the body part, the difference being just perceptible, and in viewing FIGURE 14 this must be taken into account. Therefore as stated above the gum applied to the interior of the neck will be spread by the wrapped batch on to the interior of the body portion.

FIGURE 15 shows the essentials of the driving arrangements. A shaft 92, is shown which may be the mainshaft of the machine, driving the mechanism on bed 2 and all other devices, except the turret 10, at the rate of one revolution per article. It has a sprocket wheel 93 fixed to it which drives shaft 61 by means of a chain 94 and another sprocket wheel 95 fixed on 61. On the same shaft 96 which drives another bevel gear wheel 97 fixed on a shaft 98 which is parallel to the shaft 18 to which the turret 10 is fixed.

A slotted disc 99 fixed on shaft 18 is driven by a roller 100 carried by an arm 101 fixed to shaft 98. As the slots in 99 are 45° apart it will be seen that the turret rotates once every eight revolutions of shaft 92.

For the articles necessary to fill the surplus magazine it is only necessary to withhold the supply of boxes and lids for a short time while a surplus of wrapped batches accumulates.

For some consumers a shallow lid, which is discarded, is preferred, but some consumers particularly women, who keep cigarettes in handbags, prefer a deep lid, the top panel of which is clear of the batch so that the ends of the cigarettes, at the mouth of the box, do not become distorted while the box is in use.

The apparatus so far described is suitable for applying both kinds of lids but in the case of deep lids the apparatus is not pushed entirely home being but only securely fastened on the neck of the box. Later the lid is pushed home by a pusher (not shown) positioned along the conveyor 15.

What I claim as my invention and desire to secure by Letters Patent is:

1. Apparatus for pecking articles of a rectangular block shape in boxes having separate lids, comprising a rotatable turret having pockets equally spaced around its axis of rotation to receive and hold box bodies, means for intermittently rotating said turret in angular stages corresponding to the angular pitch of the pockets to move the pockets successively to different positions of rest, a pusher for feeding a body into a pocket at one rest position, means for feeding an article to a subsequent rest position, a further pusher arranged to push the article into said body after the turret has rotated to move said pocket to said subsequent rest position, and at a lid-applying position to which the loaded box body is brought by a further movement of the turret, means for applying to the filled box body a lid having a top panel and four side flanges constituting a skirt, said means comprising a lid carrier movable from a lid-receiving position to a lid-applying position, said carrier being pivoted at one end of a pivoted lever, a cam for causing a swing movement of the lever to swing the carrier and bring a flange of the lid into contact with the box body at one side thereof so that part of the skirt of the lid slides over the open end of the box body at said side, whereby the lid top panel is disposed at an angle to the plane of the open end of the body, and means for thereafter swinging the lid through such an angle comprising a further cam operable to rotate the carrier on its pivot at the lever end, whereby the remaining part of the skirt of the lid is slid over the remainder of the said open end to complete the fitting of the lid on the box.

2. Apparatus so claimed in claim 1 having a mouthpiece movable into and out of the box body and through which an article is pushed into the box body and a clamping device to grip the body to prevent displacement of the body or article as the mouthpiece moves out of the body.

3. Apparatus for packing articles of a rectangular block shape in boxes having separate lids, comprising a rotatable turret having pockets equally spaced around its axis of rotation to receive and hold box bodies, means for intermittently rotating said turret in angular stages corresponding to the angular pitch of the pockets to move the pockets successively to different positions of rest, a pusher for feeding a body into a pocket at one rest position, means for feeding an article to a subsequent rest position, a further pusher arranged to push the article into said body after the turret has rotated to move said pocket to said subsequent rest position, and at a lid-applying position to which the loaded box body is brought by a further movement of the turret, means for applying to the filled box body a lid having a top panel and four side flanges constituting a skirt, said means comprising a lid carrier movable from a lid-receiving position to a lid-applying position, said carrier being pivoted at one end of a pivoted lever, a cam for causing a swing movement of the lever to swing the carrier and bring a flange of the lid into contact with the box body at one side thereof so that part of the skirt of the lid slides over the open end of the box body at said side, whereby the lid top panel is disposed at an angle to the plane of the open end of the body, and means for swinging the lid through such angle
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comprising a further cam operable to rotate the carrier on its pivot at the lever end, whereby the remaining part of the skirt of the lid is slid over the remainder of the said open end, and means for inserting a thin plate between a flange of the lid and the body in that side of the box body remote from the first said side, towards the end of the swinging movement of the lid and actuating said thin plate to depress part of the wall of the box at said remote side and distend the corresponding flange of the lid to facilitate the sliding movement of the lid over said remainder of the open end of the box body to complete the fitting of the lid on the box.

4. Apparatus as claimed in claim 3 wherein the lid carrier consists of an L shaped piece having vertical walls with one long limb to engage the top panel of the lid and a short limb at right angles to the first said limb to engage a flange of the lid and a horizontal plate at the base of the walls to support the lid.

5. Apparatus as claimed in claim 4 comprising a chute down which lids are fed by gravity with two opposed flanges of the skirt horizontal, a platform at the bottom of the chute to support the lids and attached to the lid carrier and projecting away from the long limb on the side remote from the interior angle of the L and spaced vertically from the plane of the said horizontal plate by the distance between said opposed flanges, whereby as the carrier moves under the chute by the swinging movement, the platform moves out of the chute and the lowest lid falls into the carrier and as the carrier moves away from the chute and towards a box body positioned to receive a lid the remaining lids move down the chute and become again supported by the platform.

6. Apparatus as claimed in claim 4 comprising a double-armed lever pivoted to the carrier and engaging a cam with one end, the other end being arranged to grip the lid in the carrier by light pressure on the flange remote from the angle of the L.

7. Apparatus as claimed in claim 3 wherein the said thin plate is fixed to one end of a double-armed lever, pivoted to a cam-operated lever movable at the same time and at substantially the same rate as the carrier, the other end of the first said lever engaging a fixed cam which swings the plate into engagement with lid and box body, said plate being actuated by the combined movement of the two levers and being withdrawn from the finished box as the turret moves the said box away from the position where the lid is fitted to the box.

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