UNITED STATES PATENT OFFICE

MACHINE FOR THE MANUFACTURE AND DELIVERY OF PARALLELEPIPEDAL PAPERBOARD BOXES

Gérard Bardet, Paris, France

Application June 30, 1949, Serial No. 102,408
In France July 5, 1949

5 Claims. (C.l. 93—44.1)

Figures 1 to 4 diagrammatically illustrate the various steps of the box manufacturing process. Figures 5 and 6 illustrate the machine in vertical sectional and top plan view respectively.

Figure 7 is a vertical section of a detail taken on line VII—VII in Fig. 5.

Figure 8 is a vertical section taken on line VII—VII in Fig. 5 showing the die in a subsequent position.

Figure 9 is a horizontal section taken on line IX—IX in Fig. 5.

Figures 10, 11 and 12 are diagrammatic detail views of modifications.

In the manufacture of parallelepipedal boxes by the method according to the invention a blank A is started from which is cut out, stamped with fold lines, slitted and locally glue-coated as shown in Fig. 1 in which D designates the glue-coated areas of the blank. In a first step in the manufacturing process the side flaps B, B of the blank are bent upwards to channel shape as illustrated in Fig. 2. Thereafter the end lugs C sheared out in each side flap are bent in as shown in Fig. 3 to provide a backing for the respective glue-coated blank end flaps D, D which are likewise bent upwards and thereby assembled with said lugs to a finished box as shown in Fig. 4.

The box-making machine may be supplied either with ready cut-out, lined out and slitted blanks piled up in a magazine or with band paperboard to be stamped out on the machine itself by a mechanism working in step therewith.

As shown in Fig. 5, the box-making table is provided on a turret 6 rotatably mounted on a vertical fixed shaft 7, keyed at 8 on said shaft is a die 9 in the edge 10 of which a cam groove 36 is milled which is adapted through the medium of a follower 11 carried by the die rod 20 and guided therein to vertically reciprocate said rod which is guided in a bracket 38 rigid with the turret 6. The locally glue-coated blanks are brought one by one in step with the operation of the machine onto a fixed grate 12 which is slotted at 53, 53 at either side of the box-shaping aperture as shown in Fig. 6. Projecting upwards through either slot are a pair of studs 13 adapted to catch the blank and to drag it along; moreover, a vertically swiveling flap 14 actuated through the medium of a rod 31, a lever 32 and a follower 30 guided in a cam groove 35 milled in the disc 8 is swung erect for sufficient time to correctly center the blank with respect to the aperture in the table.
As shown in Figs. 5 and 6, the main parts of the machine are the die 1 the dimensions of which correspond to those of the box to be manufactured and which is carried on a table 2 which is formed with an aperture slightly larger in width than the finished box while the length of the aperture is equal to that of the paperboard blank. Resiliently mounted below the table and vertically aligned with it are a pair of cheeks 3 equal in size to the sides of the box. These cheeks are so mounted that they can move a small distance away from the sides of the die as shown in Fig. 8. The blank once correctly positioned on the table is caught by the die and forced downwards and its side marginal portions are squeezed between the same and either cheek to channel shape as shown in Fig. 2; the lugs C at the ends of the side marginal portions as well as the end marginal portions D still extend beyond the end faces of the die.

As a second step in the manufacturing process the said end lugs C are laid flat against the end faces of the die each by one leg of a pair of clamps 4 moved horizontally towards each other (see Fig. 9). Said clamps are carried directly by the table. As long as the die is moved down said clamps are completely retracted so that the end lugs C and the end flaps D are not interfered with; they become effective to lay the end lugs C flat against the end faces of the die as soon as the bottom or web portion of the channel has moved a little distance below the level of the clamp top edges. The clamps are carried each by a rod 40 slidably received in a guide 39; pivoted to said rods are a pair of 2-armed levers 41 interconnected by a motion-reversing link 46. The other arm 42 of one of the levers 41 carries a follower 48 rolling on a cam 44 provided on the disc.

As the last step in the manufacturing process the glue-coated end flap D of the blank is bent upward by a pair of end cheeks 5 similar to the side cheeks 3 by which the first stop was performed (see Fig. 5); the die then proceeds in its downward motion between the said end cheeks the extent of the full height of the box, following which it remains stationary for a sufficient time to ensure that a reliable assemblage is obtained. As to the ejection of the finished box, it is performed by the die itself which, as it completes its downward stroke, will force the box clear of the lower edges of the end cheeks; as the die begins again to ascend the top edges of the box will engage the lower edges of the end cheeks so that the box is stripped automatically.

It will be appreciated that the actuation of all the parts of the box-making mechanism proper, i.e., the reciprocation of the die, the bending up of the blank side flaps, the bending in of the end lugs of said side flaps, the bending up of the glue-coated end flaps and the stripping of the finished box, is derived exclusively from the rotation of the turret. As already stated, the die is stopped in the course of its downward stroke as it comes into register with the end cheeks 5 due to the provision of a pair of arcuate guide bars 15 concentric with the vertical axis 7. One of the two said guides which are carried by the machine frame is fixed while the other is directly urged towards the former by springs 55. For the time the die is moved along between the two guides, which time corresponds to that for which the die is stopped in its downward motion, the glue-coated end flaps 15 of the blank are vigorously pressed against the extensions C of the blank sides, which extensions are already laid flat on the end faces of the die, whereby the reliability of the assemblage is improved.

Further advantages, in addition to those briefly pointed out in hereinbefore, result from the setting of the reciprocatory motion of the die under the control of the rotation of the turret; effectively, it becomes possible to increase the capacity of the machine by equipping the turret with a plurality of box-making stands in each of which a paperboard blank is taken as the stand considers moves past one and the same blank intake station from which a finished box is ejected at one and the same box delivery station, to derive the motion of the end flap bend-up mechanism directly from the rotational motion of the turret through levers cooperating with fixed arrangements. Said extensions C may be used for swinging the end flaps D erect instead of the resiliently mounted end cheeks 5 illustrated in Fig. 5.

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

1. A machine for manufacturing parallelepipedal paperboard boxes from rectangular, lined...
out, slit, and locally glue-coated blanks comprising a fixed vertical shaft, a turret rotateable about said fixed shaft, a plurality of stands mounted in the turret and equipped each with a rectangular prismatic box-shaping die to the horizontal top face of which a rod is secured which is guided in a vertical reciprocatory motion in the turret, a horizontal table with a rectangular aperture therein for the passage of the die therethrough, having its width equal to that of the finished box and its length equal to that of the blank, means on the table to correctly position a blank laid on the same with respect to said aperture, a pair of parallel vertical side cheeks resiliently mounted below the table alongside the side edges of said aperture adapted to bend the side portions of the blank and to press them against the vertical side faces of the die as the latter forces the blank downwards through the aperture in the table, two pairs of clamps mounted below the table and being movable towards each other at right angles to said side cheeks to inwardly bend the blank at the ends of either side portion of the blank and lay them flat against the vertical end faces of the die after said end lugs have been bent upwards together with the said side portions of the blank during the downward stroke of the die and away from each other upon the top face of the die clearing either pair of clamps, a pair of vertical end cheeks resiliently mounted below the respective pairs of clamps substantially in the planes of the die end faces adapted as the die is sunk between the two side cheeks to cooperate with the end faces of said die to lay the glue-coated end flaps of the blank flat against the lugs providing the extensions of either blank side flap and previously laid flat against the end faces of the die by the aforesaid clamps and means controlled by the rotation of the turret, adapted first to sink the die through the position therebelow and to cause each pair of clamps to move upwards, and to move said clamps clear of the box and lift the die clear of the table, ready for the production of a further cardboard box from a new blank laid on the table of the machine, in the next cycle of operation.

3. A machine for manufacturing parallelepipiedal cardboard boxes from rectangular, lined out, slit, and locally glue-coated blanks comprising a fixed vertical shaft, a turret rotateable about said fixed vertical shaft, a pair of arcuate guide bars secured to the machine frame concentric with said shaft, springs urging said guide bars towards each other, a plurality of stands mounted on said turret and equipped each with a rectangular prismatic box shaping die to the horizontal top face of which a vertical rod is secured which is guided in a vertical reciprocatory motion in the turret, the said rod and die assembly being stopped for a while during their downward stroke, a horizontal table with a rectangular aperture therein for the passage of the die therethrough, having its width equal to that of the finished box and its length equal to that of the blank, means on the table to correctly position a blank laid on the same with respect to said aperture, a pair of parallel vertical side cheeks resiliently mounted below the table alongside the side edges of said aperture adapted to bend the side portions of the blank upwards and to press them against the vertical side faces of the die as the latter forces the blank downwards through the aperture in the table, two pairs of clamps mounted below the table and being movable towards each other at right angles to said side cheeks to inwardly bend the blank at the ends of either side portion of the blank and lay them flat against the vertical end faces of the die after said end lugs have been bent upwards together with the said side portions of the blank during the downward stroke of the die and away from each other upon the top face of the die clearing either pair of clamps, a pair of vertical end cheeks resiliently mounted below the respective pairs of clamps substantially in the planes of the die end faces adapted as the die is sunk between the two side cheeks to cooperate with the end faces of said die to lay the glue-coated end flaps of the blank flat against the lugs providing the extensions of either blank side flap and previously laid flat against the end faces of the die by the aforesaid clamps and means controlled by the rotation of the turret, adapted first to sink the die through the position therebelow and to cause each pair of clamps to move towards each other in the box-making stroke of the die and secondly to move said clamps clear of the box and lift the die clear of the table, ready for the production of a further cardboard box from a new blank laid on the table of the machine, in the next cycle of operation.

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7. A pair of followers mounted each on the back side of either end of the die by the aforesaid clamps, a pair of bendable against each pair of vertical end cheeks resiliently mounted below the pair of clamps substantially in the planes of the die end faces adapted as the said die is sunk therebetween to cooperate in bending the blank end flaps upwards and to press them against the blank end lugs already laid flat against said die end faces and means controlled by the rotation of the turret adapted first to sink the die through the table making stroke of the die and secondly to move said clamps clear of the box-making face of the box to sink the die through the table, ready for the production of a further paperboard box from a new blank laid on the table of the machine, in the next cycle of operation.

8. A machine for manufacturing parallelepipedal paperboard boxes from rectangular, lined out, slitted and locally glue-coated blanks comprising a fixed vertical shaft, a turret rotatable about said fixed vertical shaft, a disc arranged rigidly with said shaft above said turret, formed in its edge with a camming groove, a plurality of stands mounted on said turret and equipped each with a rectangular prismatic box-shaping die to the horizontal top face of which a vertical rod is secured which is guided in a vertical reciprocatory motion in the turret, a horizontal table with a rectangular aperture therein for the passage of the die therethrough, having its width equal to that of the finished box and length equal to that of the blank, means on the table to correctly position a blank laid on the same with respect to said aperture, a pair of parallel vertical side cheeks resiliently mounted below the table along side the sides edges of said aperture adapted to bend the side portions of the blank upwards and to press them against the vertical side faces of the die as the latter forces the blank downwards through the aperture in the table, two pairs of clamps mounted below the table in alignment with the respective end faces of the die at either side of the path of the latter and interconnected by a back web parallel with the sides of the die, a rod rigid with either clamp back extending towards the outside of the same and guided for the reciprocation of the clamp at right angles to the related side of the die, a vertical rock shaft mounted in the turret, an arm keyed to the one end of said rock shaft having its outer end pivoted to the one of said clamp-reciprocating rods, a horizontally swingable 2-arm lever also mounted in the turret having one of its ends pivoted to the other clamp-reciprocating road, a link connecting the opposite end of said lever to a point of said arm between said rock shaft and said outer end so that the clamps are reciprocated always in opposite directions, an additional arm keyed to the opposite end of said vertical rock shaft, a follower on the free end of said additional arm, a cam face on the edge of said disc cooperating with said follower adapted through the medium of said rock shaft and the arm-and-link system at the opposite end of said first to pull the clamp-carrying rods towards each other as the die comes into alignment with the same in the course of the stroke by means of the lugs at either end of either blank side flap which previously were bent upwards together with the latter are laid flat against the end faces of the die, and secondly away from each other once the die in its downward stroke has cleared the said clamps, a pair of vertical end cheeks resiliently mounted below the pair of clamps substantially in the planes of the die end faces adapted as the said die is sunk therebetween to cooperate in bending the blank end flaps upwards and to press them against the blank end lugs already laid flat against said die end faces and means controlled by the rotation of the turret adapted first to sink the die through the table making stroke of the die and secondly to move said clamps clear of the box and lift the die clear of the table, ready for the production of a further paperboard box from a new blank laid on the table of the machine, in the next cycle of operation.

9. A machine for manufacturing parallelepipedal paperboard boxes from rectangular, lined out, slitted and locally glue-coated blanks comprising a fixed vertical shaft, a turret rotatable about the same, a horizontal fixed grid rigid with the machine frame and provided therewith with a pair of slots concentric with said shaft, a plurality of stands mounted on said turret and equipped each with a rectangular prismatic box-shaping die to the horizontal top face of which a rod is secured which is guided in a horizontal reciprocatory motion in the turret, a horizontal table arranged immediately below said grid, partaking of the rotation of the turret and provided with a rectangular aperture equal in width to the width of the finished box and in length to the length of the blank for the passage of the die through said aperture, a pair of studs rigid with the table, in alignment with the trailing side of the aperture in the same and projecting through and beyond the pair of concentric slots in said grid adapted to drag a paperboard blank laid on the grid and lay it on the table in correct relation with the aperture in the latter, a vertically swingable flap pivoted to the under side of the table, retractable below the latter or protractable above the top of the same in alignment with the side edges of the aperture in the table considering the direction of rotation of the table, a link having one end thereof pivoted to said flap, a 2-arm lever swingable about a horizontal shaft having one of its ends pivoted to the other end of said link and provided at its opposite end with a follower adapted by cooperating with a cam groove milled in the edge of the disc and through the medium of the said lever and said link to retract said flap downwards clear of the table as the latter meets said grid and to retract said flap as said table clears said grid in order to push the blank dragged on the table by the aforesaid studs home against the latter and thereby to correctly position said blank with respect to the aperture in the table, a pair of vertical parallel side cheeks resiliently mounted below the table along side the side edges of said aperture adapted to bend the side portions of the blank upwards and to press them against the vertical side faces of the die as the latter forces the blank downwards through the aperture in the table, two pairs of clamps mounted below the table and being moveable towards each other at right angles to said side cheeks to bend the blank end flaps upwards and to press the said blank end lugs against the vertical end faces of the die after said end lugs have been bent upwards together with the said side portions of the blank during the downward stroke of the die and away from each other upon the top face of the die clearing.
either pair of clamps, a pair of vertical end cheeks resiliently mounted below the respective pairs of clamps substantially in the planes of the die end faces adapted as the die is sunk between the two side cheeks to cooperate with the end faces of said die to lay the glue-coated end flaps of the blank flat against the lugs providing an extension at either end of either blank sheet and already laid flat against the end faces of the die by the aforesaid clamps and means controlled by the rotation of the turret adapted first to sink the die through the table to a position therebelow and cause each clamp pair to move towards the other in the box-making stroke of the die and secondly to move said clamp pairs clear of the box and lift the die clear of the table, ready for the production of a further paperboard box from a new blank laid on the table of the machine, in the next cycle of operation.

GERARD BARDET.

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