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3,031,936

BOX MAKING MACHINES

Filed April 21, 1960

3 Sheets-Sheet 1

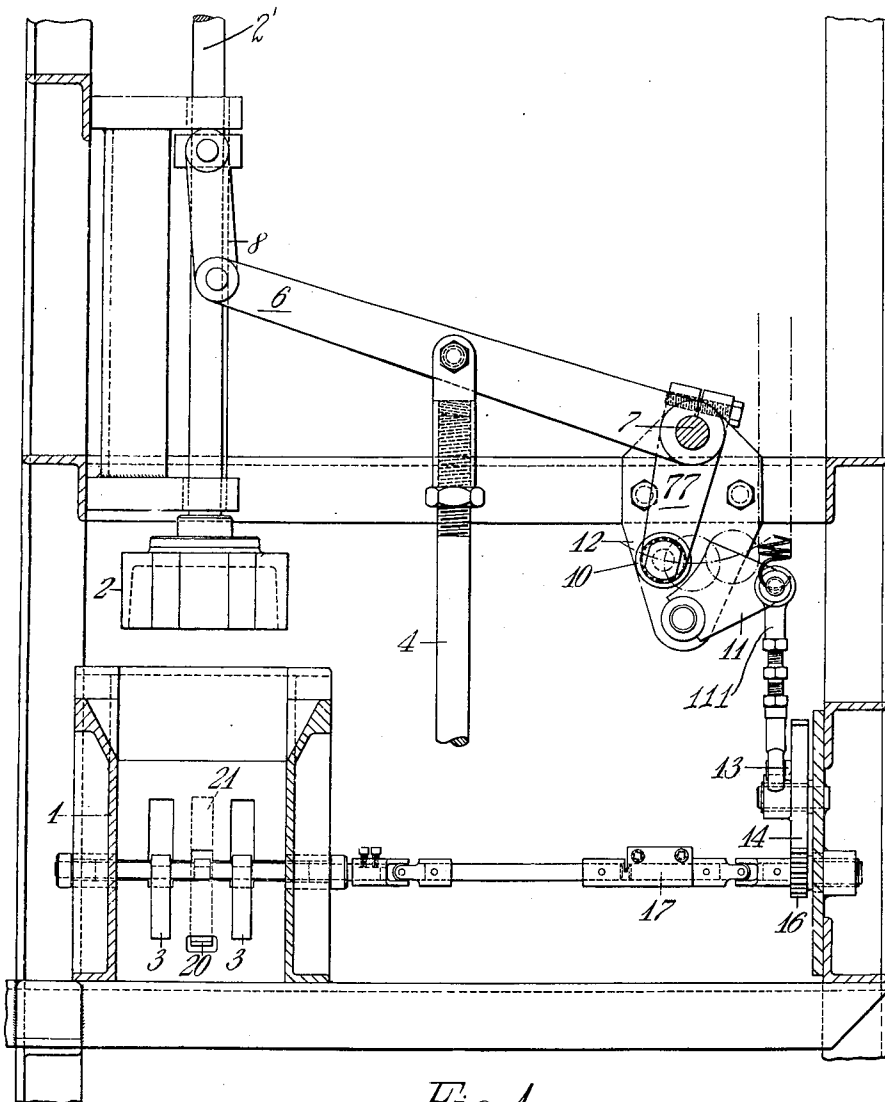


Fig. 1.

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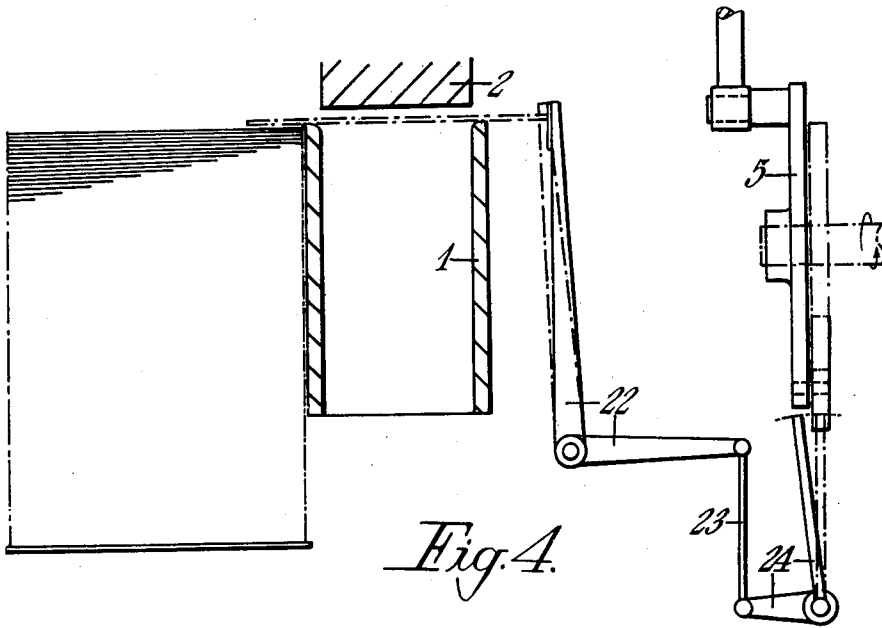


Fig. 4.

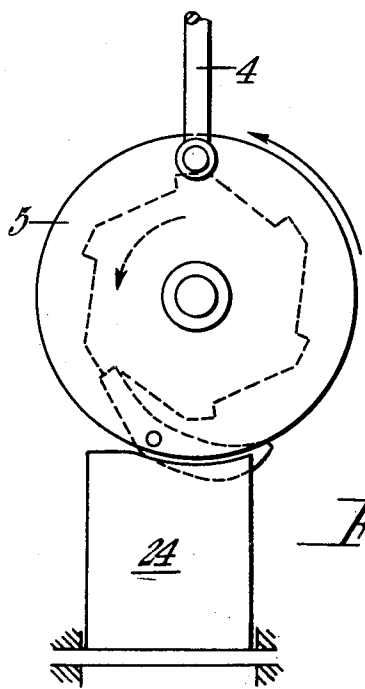


Fig. 4a.

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BOX MAKING MACHINES

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This invention relates to box making machines and more specifically to machines for making card boxes for use, for example, in the confectionery industry.

Hitherto such box making machines have been pneumatically or manually operated. Pneumatic operation has necessitated the provision of large compressors and associated equipment to provide the necessary pneumatic energy; and manual operation has imposed a severe limitation on the speed in which boxes may be made.

It is accordingly an object of the present invention to provide a box making machine which overcomes these disadvantages and which is mechanically driven and may be simply operated.

According to the present invention there is provided a box making machine embodying a folding box, a mechanically driven plunger, folding arms adapted to form one or more sides of the box to be formed and a trip mechanism adapted to actuate a clutch mechanism to cause drive to be transmitted to the plunger and folding arms when a blank, card or the like to be formed into a box is correctly located at the mouth of the folding box.

Preferably said plunger is driven through a connecting link by a connecting rod mounted on a crank wheel driven from a drive source through a clutch, the folding arms are driven from said crank wheel through said connecting link and suitable gearing, and the clutch mechanism comprises a pawl and toothed wheel arrangement, the pawl of which is adapted to be displaced by the trip mechanism.

One mode of carrying the present invention into effect will now be described, by way of example, with reference to the accompanying diagrammatic drawings in which:

FIGURE 1 is a cross sectional view of the folding box of a box folding machine according to the present invention.

FIGURE 2 is an end elevation looking on the right hand side of FIGURE 1.

FIGURE 3 is a detailed view taken on the line 111/111 of FIGURE 2, and

FIGURES 4 and 4a are diagrammatic views showing the trip actuated clutch mechanism of the machine.

As shown there is provided a box folding machine embodying a folding box 1 and an associated plunger 2. The mouth of the folding box is such that when the plunger urges a card, to be formed into a rectangular box, into the folding box the two opposite side walls of the box are formed prior to the sides constituting the ends of the box. Two folding arms or fingers 3 are pivotally mounted in recesses formed in the walls of the folding box adjacent the ends of the box to be formed. The folding arms or fingers 3 are adapted to swing through 180° in a manner hereinafter to be described in order to form the ends of the box being formed.

The plunger 2 is carried by a plunger rod mounted in fixed bearings. A connecting rod 4 attached at one end on a crank wheel 5 (FIGURE 4) is mounted at its other end via one end of connecting link 6 to a link 8 pivotally mounted on the plunger rod 2'. The arrangement is such that upon each complete revolution of the crank wheel 5, the plunger 2 is urged into and withdrawn from the folding box 1. The spindle 7, upon which the other end of connecting link 6 is rigidly mounted, is rotatably

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mounted in bearings 9 (FIGURE 2) and has an arm 77 carrying a ball-bearing-roller 10 rigidly mounted thereon. A quadrant or cam plate 11 is rockably mounted on a rigid bracket 12 carrying one of the bearings 9. The ball-bearing-roller 10 is adapted to engage and displace the quadrant plate 11 in one direction upon rotation of the spindle 7 by the connecting link 6. The cam plate 11 is moved in the opposite direction by a tension spring.

The quadrant or cam plate 11 has pivotally mounted thereon a connecting rod 111 secured at its other end to one of two segment gear wheels 14 by a crank pin 13. The gear wheels 14 are adapted to mesh with one another and with pinions 16 mounted upon one end of spindles 17. Each of the spindles 17 are universally jointed and carry at their opposite ends the folding arms or fingers 3.

Movement of the cam plate 11 by engagement of the roller 10 on arm 77 actuates the rod 111 to move the segment gears 14 and pinion gears 16 to move the tab folding fingers 3 to tab engaging position. Upon disengagement of the roller 10 from the cam plate 11, the rod 111, segment gears 14 and pinion gears 16 will be moved in the opposite direction by the tension spring to actuate the fingers 3 to fold the end tabs inwardly of the folded and formed box.

A pair of stops 20 are provided which project into the folding box 1 so as to hold the box being formed in its operative position. The stops 20 are constituted by one limb of L-shaped members 21 pivotally mounted at their opposite ends on pivots 221. A cam is mounted on each of the spindles 17 adjacent the folding arms or fingers 3 against which the L-shaped members 21 are adapted to abut. The arrangement is such that when a box has been formed and as the folding arms or fingers 3 return to their initial position under the action of the tension spring the L-shaped members 21 are displaced so as to withdraw the stops 20 into the folding box walls and allow the box to fall into a receiving tray, chute, etc.

As shown in FIGURE 4 a trip mechanism is provided which is adapted to actuate a one revolution clutch and cause drive to be transmitted to the crank wheel 5. The trip mechanism comprises a bell crank lever 22, one end of which constitutes a stop, which, when a card, to be formed into a box, is correctly positioned at the mouth of the folding box, is engaged and the bell crank lever 22 displaced. The opposite end of the bell crank lever 22 has a connecting link 23 mounted thereon, the other end of which is secured to a further bell crank lever 24. The opposite end of the further bell crank lever 24 constitutes the trip for a pawl clutch mechanism between a constant source of drive, e.g. an electric motor (not shown) and the crank wheel 5. The arrangement is such that upon displacement of the bell crank lever 22 by a correctly positioned card, the pawl on the clutch is caused to engage one of the teeth of the driven wheel and drive is transmitted to the crank wheel 5 for one revolution.

The blank or card having been correctly positioned and the trip mechanism actuated, the plunger 2 is moved downwards and the card urged into the folding box. As explained above, the mouth of the folding box is such that upon initial downward movement of the card, its sides, constituting the side walls are bent through 90° to form the side walls. These sides have tongues formed thereon. Upon further downward movement of the card, the ends are bent through 90° so as to form the end walls of the box. The end portions of the card constituting the end walls are twice the height of the side wall portion. Also the tongues on the side walls are bent through 90° so as to lie in substantially the same vertical plane as the end walls. The plunger having completed its downward stroke it commences its upward stroke and upon upward movement, the folding arms are rotated so

as to engage the tabs on the end wall portions and bend their upper portions through a 180° into the box so as to lock the side wall tongues and form the end walls of double thickness.

When the box has been formed the stops 20 are withdrawn and the box allowed to drop into a tray or chute. The folding arms are then returned to their initial position ready for the next box to be formed.

The universal joints in the spindles 17 enable the size of the folding box to be varied according to requirements.

It will be appreciated from the foregoing that the present invention provides a mechanically operated machine which may be simply operated quickly to form boxes. The machine may be associated, if desired, with automatic card feeding mechanism for positioning the cards above the mouth of the folding box and thus render the unit entirely automatic.

It will also be appreciated that the foregoing details are given by way of example only and that any desired modifications may be made to the invention in order to suit varying requirements.

We claim:

1. In a box making machine a folding box having a mouth adapted to support a box blank, a plunger mounted for movement into and out of said box for initiating folding movement of a box blank, a drive means, operating means for actuating said plunger and clutch means for connecting said drive means with said operating means and a trip mechanism including a movable member positioned adjacent the mouth of said folding box, engageable by a blank fed over said mouth and operably connected with said clutch means to couple said drive means with said operating means to cause drive to be transmitted to said plunger when a box blank is properly positioned over the mouth of said folding box.

2. A box making machine including a folding box having a mouth adapted to support a box blank, a plunger mounted for movement into and out of said box for initiating folding movement of a box blank, folding arm means operably associated with said folding box and adapted to form at least one side of a box, a drive means, operating means for actuating said plunger and folding arm means to effect folding of a box blank, a clutch means for connecting said drive means with said operating means and a trip mechanism including a movable member positioned adjacent the mouth of said folding box, engageable by a blank fed over said mouth and operably connected with said clutch means to actuate the same to couple said drive means with said operating means to cause drive to be transmitted to said plunger and folding arm means when a box blank is properly positioned over the mouth of said folding box.

3. A box making machine as claimed in claim 2, in which the operating means for said plunger includes a movable connecting link connected to said plunger and adapted when moved to reciprocate the plunger, a crank wheel, a connecting rod connected between said crank wheel and said connecting link for moving said link responsive to rotation of said crank wheel, the operating means for said folding arm means including movable means operably coupled with and operable in response to movement of said connecting link for actuating said folding arm means when said plunger has completed its movement into the folding box, such drive means comprising a driven shaft, and said clutch means being operably related between said driven shaft and crank wheel so that when the clutch is engaged the rotation of the crank wheel effects operation of the plunger and folding arm means.

4. A box making machine as claimed in claim 2 where-in said operating means includes a crank wheel, said drive means comprises a driven shaft, said clutch means including a toothed wheel carried by said driven shaft, and a pawl carried by said crank wheel for cooperation with

said toothed wheel responsive to actuation of said trip mechanism.

5. In a box making machine, a folding box having an open top adapted to support a box blank, a plunger mounted for movement into and out of said box for urging a box blank downwardly into said box to fold and form the side and end walls of a box, end wall tab folding fingers rotatably mounted in opposite ends of said folding box, a crankshaft, a one-revolution clutch on said shaft, means for driving said clutch, a crank on said shaft, a rock shaft, a rocker arm fixed to said rock shaft at one end and connected to said plunger at the opposite end, a pitman connecting said rock shaft and said crank, pinion gears connected to said fingers, a pair of intermeshing segment gears meshing with said pinion gears, a pivotally mounted cam plate, a link connecting said plate and one of said segment gears for moving said segment gears in one direction, a lever fixed to said rock shaft, a roller on said lever for engaging said plate, a tension spring connected to said plate for moving said segment gears in the opposite direction, a tripping finger disposed in the path of movement of a box blank and operable when a box blank is properly positioned on said folding box to trip said clutch, whereby said plunger will move a box blank downwardly into said folding box to fold and form the side and end walls of a box, said roller will engage said plate to actuate said segment gears and pinion gears in one direction to move said fingers into tab engaging position, and upon movement of said plunger upwardly out of said folding box said roller will be disengaged from said plate and said tension spring will move said segmental gears and pinion gears in the opposite direction to move said fingers and fold the end tabs into the folded and formed box.

6. In a box making machine a folding box having an open top adapted to support a box blank, a plunger mounted for movement into and out of said box for urging a box blank downwardly into said box to fold and form the side and end walls of a box, end wall tab folding fingers rotatably mounted in opposite ends of said folding box, a crankshaft, a one revolution clutch on said shaft, means for driving said clutch, a crank on said shaft, a rock shaft, a rocker arm fixed to said rock shaft at one end and connected to said plunger at the opposite end, a pitman connecting said rock shaft and said crank, pinion gears connected to said fingers, a pair of intermeshing segment gears meshing with said pinion gears, a pivotally mounted cam plate, a link connecting said plate and one of said segment gears for moving said segment gears in one direction, a roller on said lever for engaging said plate, a tension spring connected to said plate for moving said segment gears in the opposite direction, means disposed in the path of movement of a box blank and operable when a box blank is properly positioned on said folding box to trip said clutch, whereby said plunger will move a box blank downwardly into said folding box to fold and form the side and end walls of a box, said roller will engage said plate to actuate said segment gears and pinion gears in one direction to move said fingers into tab engaging position, and upon movement of said plunger upwardly out of said folding box said roller will be disengaged from said plate and said tension spring will move said segmental gears and pinion gears in the opposite direction to move said fingers and fold the end tabs into the folded and formed box.

7. In a box making machine a folding box having an open top adapted to support a box blank, a plunger mounted for movement into and out of said box for urging a box blank downwardly into said box to fold and form the side and end walls of a box, end wall tab folding fingers rotatably mounted in opposite ends of said folding box, a crankshaft, a one revolution clutch on said shaft, means for driving said clutch, a crank on said shaft, a rock shaft, a rocker arm fixed to said rock shaft at one end and connected to said plunger at the opposite end, a pit-

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man connecting said rock shaft and said crank, pinion gears connected to said fingers, a pair of intermeshing segment gears meshing with said pinion gears, a pivotally mounted cam plate, a link connecting said plate and one of said segment gears for moving said segment gears in one direction, a lever fixed to said rock shaft, a roller on said lever for engaging said plate, spring means for moving said segment gears in the opposite direction, means disposed in the path of movement of a box blank and operable when a box blank is properly positioned on said folding box to trip said clutch, whereby said plunger will move a box blank downwardly into said folding box to fold and form the side and end walls of a box, said roller will engage said plate to actuate said segment gears and pinion gears in one direction to move said fingers into tab engaging position, and upon movement of said plunger upwardly out of said folding box said roller will be disengaged from said plate and said spring means will move said segment gears and pinion gears in the opposite direction to move said fingers and fold the end tabs into the folded and formed box.

8. In a box making machine a folding box having an open top adapted to support a box blank, a plunger mounted for movement into and out of said box for urging a box blank downwardly into said box to fold and form the side and end walls of a box, end wall tab folding fingers rotatably mounted in opposite ends of said folding box, a crankshaft, a one revolution clutch on said shaft, means for driving said clutch, a crank on said shaft, a rock shaft, a rocker arm fixed to said rock shaft and connected to said plunger, a pitman connecting said rock shaft and said crank, pinion gears connected to said fingers, a pair of intermeshing segment gears meshing with said pinion gears, a pivotally mounted cam plate, a link connecting said plate and one of said segment gears for moving said segment gears in one direction, a lever fixed to said rock shaft, a roller on said lever for engaging said plate, spring means for moving said segment gears in the opposite direction, means disposed in the path of movement of a box blank and operable when a box blank is properly positioned on said folding box to trip said clutch, whereby said plunger will move a box blank downwardly into said folding box to fold and form the side and end walls of a box, said roller will engage said plate to actuate said segment gears and pinion gears in one direction to move said fingers into tab engaging position and upon movement of said plunger upwardly out of said box said roller will be disengaged from said plate and said spring means will move said segment gears and pinion gears in the opposite direction to move said fingers and fold the end tabs into the folded and formed box.

9. In a box making machine a folding box having an open top adapted to support a box blank, a plunger mounted for movement into and out of said box for urging a box blank downwardly into said box to fold and form the side and end walls of a box, end wall tab folding fingers rotatably mounted in opposite ends of said folding box, a crankshaft, a one revolution clutch on said

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shaft, means for driving said clutch, a crank on said shaft, a rock shaft, a rocker arm fixed to said rock shaft and connected to said plunger, a pitman connecting said rock shaft and said crank, pinion gears connected to said fingers, a pair of intermeshing segment gears meshing with said pinion gears, a pivotally mounted cam plate, a link connecting said plate and one of said segment gears for moving said segment gears in one direction, a lever fixed to said rock shaft, a roller on said lever for engaging said plate, spring means for moving said segment gears in the opposite direction and means to trip said clutch, whereby said plunger will move a box blank downwardly into said folding box to fold and form the side and end walls of a box, said roller will engage said plate to actuate said segment gears and pinion gears in one direction to move said fingers into tab engaging position and upon movement of said plunger upwardly out of said folding box said roller will be disengaged from said plate and said spring means will move said segment gears and pinion gears in the opposite direction to move said fingers and fold the end tabs into the folded and formed box.

10. In a box making machine a folding box having an open top adapted to support a box blank, a plunger mounted for movement into and out of said box for urging a box blank downwardly into said box to fold and form the side and end walls of a box, end wall tab folding fingers rotatably mounted in opposite ends of said folding box, a crankshaft, a one revolution clutch on said shaft, means for driving said clutch, a crank on said shaft, a rock shaft, a rocker arm fixed to said rock shaft and connected to said plunger, a pitman connecting said rock shaft and said crank, pinion gears connected to said fingers, a pair of intermeshing segment gears meshing with said pinion gears, a pivotally mounted cam plate, a link connecting said plate and one of said segment gears for moving said segment gears in one direction, a lever fixed to said rock shaft, means on said lever for engaging said plate, spring means for moving said segment gears in the opposite direction and means to trip said clutch, whereby said plunger will move a box blank downwardly into said folding box to fold and form the side and end walls of a box, said lever will engage said plate to actuate said segment gears and pinion gears in one direction to move said fingers into tab engaging position and upon movement of said plunger upwardly out of said folding box said lever will be disengaged from said plate and said spring means will move said segment gears and pinion gears in the opposite direction to move said fingers and fold the end tabs into the folded and formed box.

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