BLANK FORMING PRESS FEED

FIG. 1

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The invention relates to box or carton blank forming machines. The general object of the invention is to provide a machine of the character described in which a web of paper is intermittently fed into and out of a creasing and cutting or blank forming press from a pair of intermittently active feed rolls to which the paper is supplied by continuously active metering feed rolls, with means for creating a definitely controlled loop in the paper web between said sets of rolls during the cutting operation of the press.

A further object of the invention is to provide certain improvements over the structure shown and described in my copending application Serial No. 121,725, filed October 17, 1949, for Carton Blank Forming Machines, among which are an improved means for controlling the formation of the loop in the paper, an improved brake means to arrest the travel of the web during the cutting operation, and improved means for controlling the operation of the intermittently active feed rolls at definite predetermined intervals even though the thickness of the web varies.

A further object of the invention is to provide a press which may be readily connected to a printing press for continuously printing the web before its passage to the blanking press.

The invention further consists in the several features hereinafter set forth and more particularly defined by claims at the conclusion hereof.

In the drawings:
Fig. 1 is a side elevation view of apparatus embodying the invention;
Fig. 2 is a plan view of the apparatus, parts being broken away;
Fig. 3 is a detailed vertical sectional view taken on the line 3—3 of Fig. 1;
Fig. 4 is a detailed vertical sectional view taken on the line 4—4 of Fig. 1;
Fig. 5 is a detailed vertical sectional view taken on the line 5—5 of Fig. 1, parts being broken away;
Fig. 6 is a detailed vertical sectional view taken on the line 6—6 of Fig. 6;
Fig. 7 is a detailed vertical sectional view through a part of the mechanism controlling the intermittently operated feed rolls;
Fig. 8 is a detailed vertical sectional view taken on the broken line 8—8 of Fig. 1;
Fig. 9 is a detailed vertical sectional view taken on the line 9—9 of Fig. 2.

Referring to the drawings, the numeral 10 designates a base frame structure on which housings 11 and 12 and spaced uprights 13 are mounted. The press itself includes a fixed platen 14 carried by the uprights 13 and a movable platen 15 slidably mounted on said uprights. One of the platens 14 or 15 carries the cutting and creasing dies while the other carries a base plate, these parts being indicated by the numerals 16 and 17. Brackets 18 mounted at one side of the platen facilitate introduction and removal of the parts 16 and 17.

Referring to Figs. 1, 2, and 3, the movable platen 15 is reciprocated by two sets of eccentrically driven connecting rods 19, there being two rods in each set, journalled at their upper ends on shafts 20 carried by the platen and mounted at their lower ends on eccentrics 21 mounted in spaced relation on spaced shafts 22 which are drivingly connected together by one to one gears 23 and 24. The left hand shaft 22, or main drive shaft of the machine, carries a pulley 25 connected by belted 26 with a pulley 27 on the shaft of an electric drive motor 28 mounted in the base of the machine.

Referring to Figs. 1 and 2, at the entrance end of the machine, the web W of carton stock is led over a convexly curved plate or bed 29 which acts to stiffen the web so that it may be efficiently guided between the laterally adjustable guide members 30 which are suitably mounted for movement toward or away from the web 29 on a screw shaft 31 journaled in the sides of the frame and carrying an operating crank 32.

After being properly laterally aligned, the web is threaded through a set of three rolls 33, 34, and 35 which are continuously driven metering rolls and then passes through loop forming mechanism, past braking mechanism to the intermittently active feed rolls 36 and 37 by which it is fed in between the platens of the press. Referring to Figs. 2, 4 and 5, the roller 33 is continuously driven from the shaft 38 for the roll 36, but at half the speed of the roll, through a gear drive connection therewith comprising a bevel gear 39 on said shaft meshing with a similar gear on a torque tube shaft 40 which at its other end carries a bevel gear 41 meshing with a larger gear 42 on the shaft 43 of the roll 33 which also carries a gear 44 meshing with a gear 45 on the shaft 46 of the roller 34, which gear 45 also meshes with a gear 47 on the shaft 48 of the roller 35.

The shaft 46 of the roller 34 is journaled in spaced arms 49 mounted for swinging movement at 50 on the frame of the machine and limited in its upper swing by the roller 44 and in its lower swing by engagement with a stop pin 51 fixed in each side of the frame. To al-
low free swinging movement of the roller 34, its weight is counterweighted by a spring 52 in a bore 53 in each arm, in a bushing fixed between an adjustable threaded plug 54 and a plunger or pin 55 adapted to engage the stop pin 51.

The shaft 48 of the roller 35 is mounted in the outer ends of arms 56 carried by an oscillatory shaft 51 journaled in the frame and carrying a crank arm 58 which is operated upon by a spring loaded plunger 59 similar in all respects to the plunger 59a, shown in Fig. 6, urged outwardly by a spring 60 mounted in a casing 61 having a spring loading screw 52 ad- justably mounted in the threaded bore of said casing. As spring loaded plunger 59 acts through the crank 58, shaft 57, and arms 56 to swing the roller 35 upwardly, toward the roller 34, this roller 34 in turn will be swung upwardly toward the roller 33. The nip or grip of the web between these three rolls is adjusted by the pressure or tension placed on the loading spring of plunger 59 by its adjusting screw.

To prevent a broken web from rolling up on the roll 35, a deflector plate 63 is mounted beneath the roll 34 and for a similar purpose a deflector plate 64, not shown in Fig. 2, but shown in Fig. 1, guides the web away from the rolls 34 and 35 after it leaves the nip between the rolls 34 and 33.

For threading the web through the rolls 33, 34 and 35 an air-operated piston 65 acts on the arm or crank 58 in opposition to the spring act- ing on the plunger 59 to swing the shaft 57 and arms 56 counterclockwise as viewed in Fig. 1 to move the roll 35 downwardly away from the roll 34 which is then free to move down- wardly from the roll 33 so that these rolls are opened up. The piston 65 is similar to the piston 59a, shown in Fig. 6, which is operated by compressed air from any suitable source and returned by a spring 66.

For controlling the formation of the loop L in the web between the set of feed rolls 33 and 34 and the set of rolls 36 and 37, an upper apron 67 and a lower apron 68 are provided. Fig. 1 shows the preferred form of these aprons. The apron 67, secured to the sides of the housing, is curved or inclined downwardly from the rolls 33 and 34 as indicated at 69 and then at 70 extends upwardly and forms a position adjacent to the brake mechanism hereinafter described. This apron checks the upward swing or snap of the web when it is drawn up from the looped or dotted line position shown in its position shutting the underside of said apron and also acts to produce a drag due to frictional contact of the paper with it as the web is fed through the press, which prevents the rolls 36 and 37 from overpowering the rolls 33, 34 and 35. The apron 68, mounted between the sides of the press, extends from the frame structure at a point 71 about midway of the loop and at its upper end 72 extends under the exit end of the apron 67 and slightly beyond said end and cooperates therewith to form a relatively narrow threat through which the web passes. The apron 68 checks the downward snap of the web. The deflector 64 acts as a guide for the web which on leaving the rolls 33 and 34 is fed downwardly toward the frame 10 as is ap- parent from Fig. 1.

Referring to Figs. 1, 3, 5 and 6, the brake mechanism includes an upper brake bar 73 fixed to the sides of the housing 12 and a moveable brake bar or member 74. A guide pin 75 is fixed to each end of the bar 74 and works in a bushing guide bore 16 in the bar 73. A spring 77 mounted in each end of bar 73 acts to nor- mally urge the bar 74 outwardly or to a release position. Pins 78 are also loosely mounted in guide bores 19 in the bar 73 and engage at one end with the bar 74. At their other ends, the pins 78 operatively engage a manually op- erable oscillatory shaft 80 eccentri- cally mounted at its ends in the housing 12 and carrying an operating handle 81 whereby the brake bar 74 may be moved away from the bar 73 for web threading purposes. The bar 74 is also engaged at its ends by screws 82 adjustably mounted in the ends of spaced resilient crank arms 83 which are carried by an oscillatory shaft 84, see Fig. 6.

The shaft 84 carries spaced crank arms 85 in which the shaft 86 of the feed roller 37 are journaled. Shaft 86 carries a gear 87 meshing with a gear 88 on the continuously rotated shaft 86 for the feed roller 56 which is mounted in between the frame 10 and the bed 15. The shaft 84 also carries a crank arm 89 which, as shown in Fig. 6, is engaged by oppositely disposed loading devices. The loading device which determines the gripping pressure between the rolls 36 and 37 includes the plungers 56, spring 58, casing 51, and load adjusting screw 52 previously referred to. By adjusting the screw 52 relative to the spring 58, greater or less pressure is applied to the arm 58 through the plunger 59a, to cause a counterclockwise swinging movement of the shaft 84 to swing the roll 37 toward the roll 36 and at the same time swinging the arms 53 downwardly to release the brake bar 74 from braking engagement with the web. The loading device which acts on the arm 38 to oppose the spring loaded plunger 59a and cause a release of the roll 37 from feeding en- gagement with the web comprises a hydraulically operated piston 90 slidably mounted in an operating cylinder 91 and yieldingly urged outwardly by the light pressure of a spring 92, see Fig. 6. A fluid transfer pipe 93 connects the cylinder 91 with the chamber 95 of a pump cylinder 95 in which a pump plunger 96 is slidably mounted, said plunger being normally urged outwardly by a spring 97 interposed be- tween the position adjacent the port 98 connected by a pipe 99 with a reservoir 100 for hydraulic fluid, see Figs. 6 and 7. The continuously rotated drive shaft 22 carries a cam 101 which has a high portion 102 extending along one-third of its periphery and a low portion extending along the other two-thirds of its peripheral. The cam 101 bears against a roller 103 on the free end of a lever tappet 104 pivot- ally mounted at 105 and engaging the outer end of the plunger 56. The spring 106 maintains the engagement of the tappet with the cam. The inlet and return of fluid from and to the pipe 99 and reservoir 100 is control- led by the pump plunger 96 which depending upon its position in the cylinder 95 either cuts off or passes the port 98. For guiding the plunger 96 and increasing its sealing contact with the bore of the cylinder 91, the same is shown as provided with a tubular extension 108 having a port 107 therein which cooperates with the port 98. This extension 108 could be omitted without changing the controlling effect of the plunger.

With the above construction, during two-thirds
of a revolution of the drive shaft 22 while the low portion of the cam 101 is passing the roller 103, the pump plunger 96 is retracted as shown in Fig. 7 and the port 98 is aligned with the port 101, and under these conditions the operating plunger 90 is retracted and the spring pressed plunger 59c is acting to move the roller 31 upwardly to produce a nipping engagement of the web between the rolls 36 and 37 and the feed of said web to the press, the brake bar 74 being then released. During the other one-third of the revolution of the drive shaft 22, with the cam 101 is making its cut, the high part 102 of the cam 101 forces the plunger 95 downwardly cutting off the port 98 and putting the fluid in the chamber 84, pipe 83, and cylinder 81 under pressure which, acting on the piston 90 moves it outwardly and swings the crank arm 89 and shaft 84 counterclockwise overcoming the pressure of the loaded plunger 59c and swinging the roller 37 out of gripping or feeding engagement with the web and simultaneously actuating the resilient or spring arms 83 and the screws 82 to put pressure on the brake bar 74 and clamp the web between said bar and the fixed bar 73. Thus through the control of the hydraulic system by the feed rolls 36 and 37, which are immittently engaged with the web to advance the same during the idle period of the press and the brake is engaged with the web during the blanking period of the press.

While the feed rolls 36 and 37 are engaging the web, if the thickness of this web varies, as it frequently does, on an increase of thickness of the web acting through the roll 37, crank 89 and shaft 84 on the arms 85 tending to swing the same downwardly, the piston 90 moves outwardly under the action of its spring 82, and more fluid is free to enter the hydraulic system through the port 98, so that no matter what thickness the web is at the time the roller 103 passes from the lower part to the high part of the cam, the piston 90 will be in contact with the crank arm 89 and be instantly available to shift the roll 37 to a release position relative to the web. This action would not be possible were the arms 83 retracted with the feed rolls 36 and 37 only in a fixed condition.

In order to vary the length of feed of the web to accommodate varying lengths of cartons, the speed of the feed rolls are varied relative to the speed of the shaft 22 through a drive between the roll 36 and drive shaft 22. The angle of the shaft 38 of the roll 36 carries a sprocket 108 connected by a chain 109 with a sprocket 110 on a lay shaft 111 which carries a gear 112 meshing with a gear 113 on a shaft 114 which carries a change gear 115 meshes with an idler gear 116 that also meshes with a change gear 117 on the drive shaft 22. The stud shaft for the idler gear 117 is carried on the free ends of arms 118 and 119 at their point of connection with each other, the other ends of said arms being pivotally connected at 120 and 121, respectively, with the frame of the machine, the arm 118 being slotted at 122 to permit angular adjustment of these arms relative to each other, so that the idler gear 117 may be meshed with different desired gear 115 and 116. By substituting different ratios of change gears 115 and 117 the speed of the roll 36 and consequently the roll 35 may be varied to vary the amount of web fed to the press during each rotation of the shaft 22. The gears 115 and 117 are quick change gears and the gears 112 and 113 may be also change gears of definite fixed ratios.

Because of the ability to change the speed of the feed without changing the speed of the drive shaft 22, this press may be direct connected to any suitable rotary printing press, and the plate cylinder of this press be driven from the shaft 22, and for this purpose, as shown in Figs. 2 and 3, the shaft 22 carries a spiral gear 123 meshing in one to one ratio with a spiral gear 124 mounted on a shaft 125 connected by universal joint 126 to one end of a transmission shaft 127 having a universal joint connection 128 at its other end with a shaft 129 adapted to be axially coupled to the plate cylinder of the press.

Referring to Fig. 6, for web threading operations, the piston 89a working in the bore of the cylinder 89b against the pressure of the spring 88 moves the shaft 84 and its crank arm 89 against the loading pressure of the plunger 59a to swing the roll 37 downwardly to separate the rolls 36 and 37.

Referring to Figs. 1 and 2, a feed screw 130 is journaled in the housing 12 and carries a hand crank 131 and has side web guide plates 132 mounted thereon, movable toward or away from each other to adjust for the varying widths of web, this guide being disposed between the brake and the feed rolls 36 and 37.

To summarize the operation of the apparatus, the web as it enters the press is guided in its desired lateral position by adjustment of the guide members 35, and with the rollers 33, 34 and 35 in opened or spaced condition, during the operation of the air piston 65, the web is threaded around and between these cylinders and then through the looping space between the aprons 67 and 68, then between the brake members 73 and 74 between the guide plates 133 and between the feed rollers 36 and 37, then in an open position due to the operation of the air piston 65, and then through the space between the platens 14 and 15, sufficient stock of the web having been left in this threading operation to form a loop such as the loop shown in dotted lines in Fig. 1. The motor 28 is then started which puts the shaft 22 and the various drive connections associated therewith in motion, thus positively driving the draw or feed rolls 36 and 35 and the feed rolls 36 and 37, it being assumed that at this point these feed rolls are driving and carrying the web through the press and taking up the slack formed by the loop to bring the web to its upper position shown in Fig. 2, and that the feed roll 37 is moved out of feeding relation with the roll 36, the brake bar 74 is moved into operative relation with the bar 73 to grip the web, and the platen 15 is making its cutting and creasing stroke. While the web is being held by the brake, the rolls 33, 34 and 35 are operating to supply more of the web to form a new loop between the aprons 67 and 68, and as soon as the press has retracted the platen 15 sufficiently to let the web pass through, the cam 110 running on its low side acts on the actuating mechanism previously described to permit the spring pressed plunger 57c to shift the feed roll 37 into driving relation with the web and the roll 36 and to release the brake bar 73 for another feed of the web between and between the platens of the press while taking up the loop. This cycle repeats itself, the feed rolls each time feeding so much of the web as constitutes the length of any one blank to be formed, which blank may or may not have printed indicia thereon depending on previous treatment of the web.
I desire it to be understood that this invention is not to be limited to any particular form or arrangement of parts except in so far as such limitations are included in the claims.

What I claim as my invention is:

1. The combination with a creasing and blank forming press, or mechanism for feeding a predetermined length of paper web to said press comprising a set of continuously active web feeding metering rolls and a set of intermittently active web feeding rolls, means for driving said intermittently active rolls at a higher speed than said continuously active rolls, means for rendering said intermittently active feed rolls inactive while a loop is built up in the web between said sets of rolls, means for positively driving the rolls of each set at predetermined speeds, an upper apron and a lower apron in which the loop is built up, and means for controlling the movements of said intermittently active metering rolls having their bite positioned to normally direct the web downwardly and toward the bottom portion of said lower apron, said lower apron extending upwardly to a position adjacent the upper apron at the end of the loop which is adjacent said intermittently active web feeding rolls, the upper apron being downwardly inclined intermediate its ends and engaging the upper surface of the web between said sets of rolls and disposed below a straight line extending between the nips of both sets of rolls and creating a frictional drag on the web between said sets of rolls when the loop is taken up.

2. The combination with a creasing and blank forming press, or mechanism for feeding a predetermined length of paper web to said press comprising a set of web feeding rolls, means for continuously driving said rolls while engaged with the said web, a movable support for one of said rolls, rotatable press-timed cam means acting for a predetermined period during a revolution of said rolls, a hydraulic system comprising a pump having a plunger operatively connected to said cam, a conduit for a source of hydraulic fluid connected to the pump and having a port controlled by said plunger, an operating piston and its cylinder in circuit with said pump and operable by fluid displaced by said plunger and operatively connected to said support to move the same during the predetermined period determined by said cam means so as to render the rolls inactive to feed the web during this period, the cylinder for said operating piston being connected with said source when said cam is inactive.

3. The structure as defined in claim 2 wherein the operating piston works in a cylinder having an open pipe connection with the pump cylinder which is in communication with said source when said port is open.

4. The combination with a creasing and blank forming press, of mechanism for controlling the feed of a web of carton stock in predetermined lengths to said press, comprising a brake means including a movable brake member and a feed means comprising a pair of rolls, one of which is movable toward said web from the other roll, for continuously driving said rolls while engaging the web, an oscillatory shaft, and means for rendering said intermittently active roll inactive while a loop is built up in the web between said sets of rolls, means for positively driving the rolls of each set at predetermined speeds, an upper apron and a lower apron in which the loop is built up, and means for controlling the movements of said intermittently active metering rolls having their bite positioned to normally direct the web downwardly and toward the bottom portion of said lower apron, said lower apron extending upwardly to a position adjacent the upper apron at the end of the loop which is adjacent said intermittently active web feeding rolls, the upper apron being downwardly inclined intermediate its ends and engaging the upper surface of the web between said sets of rolls and disposed below a straight line extending between the nips of both sets of rolls and creating a frictional drag on the web between said sets of rolls when the loop is taken up.

5. The combination with a creasing and blank forming press, of mechanism for feeding a predetermined length of paper web to said press comprising a set of web feeding rolls, means for continuously driving said rolls while engaged with the said web, a movable support for one of said rolls, rotatable press-timed cam means acting for a predetermined period during a revolution of said rolls, a hydraulic system comprising a pump having a plunger operatively connected to said cam, a conduit for a source of hydraulic fluid connected to the pump and having a port controlled by said plunger, an operating piston and its cylinder in circuit with said pump and operable by fluid displaced by said plunger and operatively connected to said support to move the same during the predetermined period determined by said cam means so as to render the rolls inactive to feed the web during this period, the cylinder for said operating piston being connected with said source when said cam is inactive.

6. The structure as defined in claim 2 wherein the operating piston works in a cylinder having an open pipe connection with the pump cylinder which is in communication with said source when said port is open.

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