Feb. 17, 1953 D. BARTLETTE ET AL 2,628,543

BOX-BLANK CUTTING ASSEMBLY

Filed Dec. 11, 1950 3 Sheets-Sheet 1

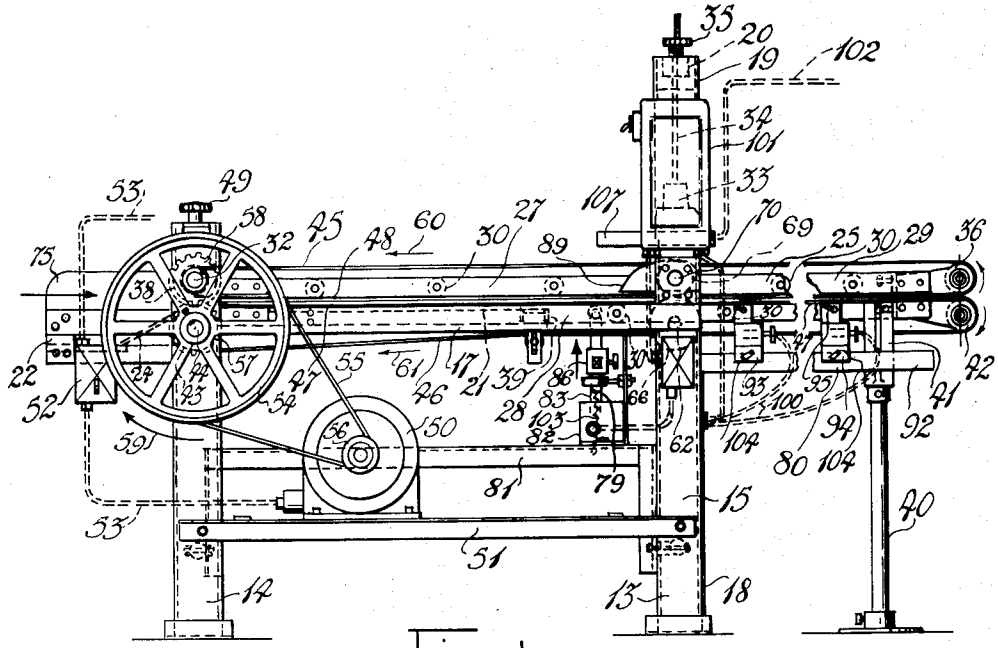

Fig. 1

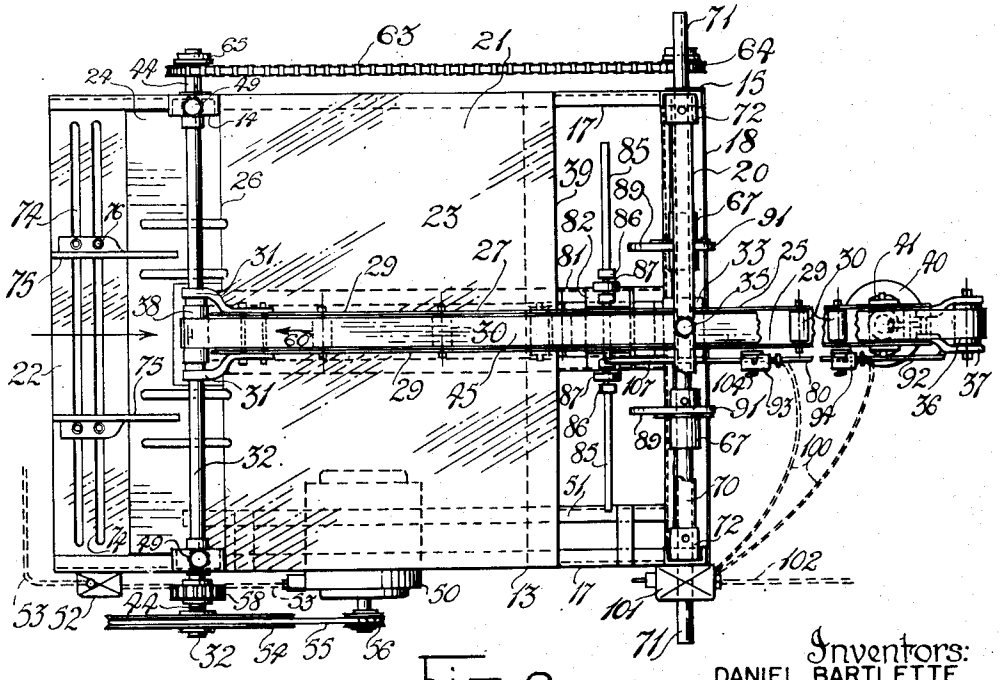

Fig. 2

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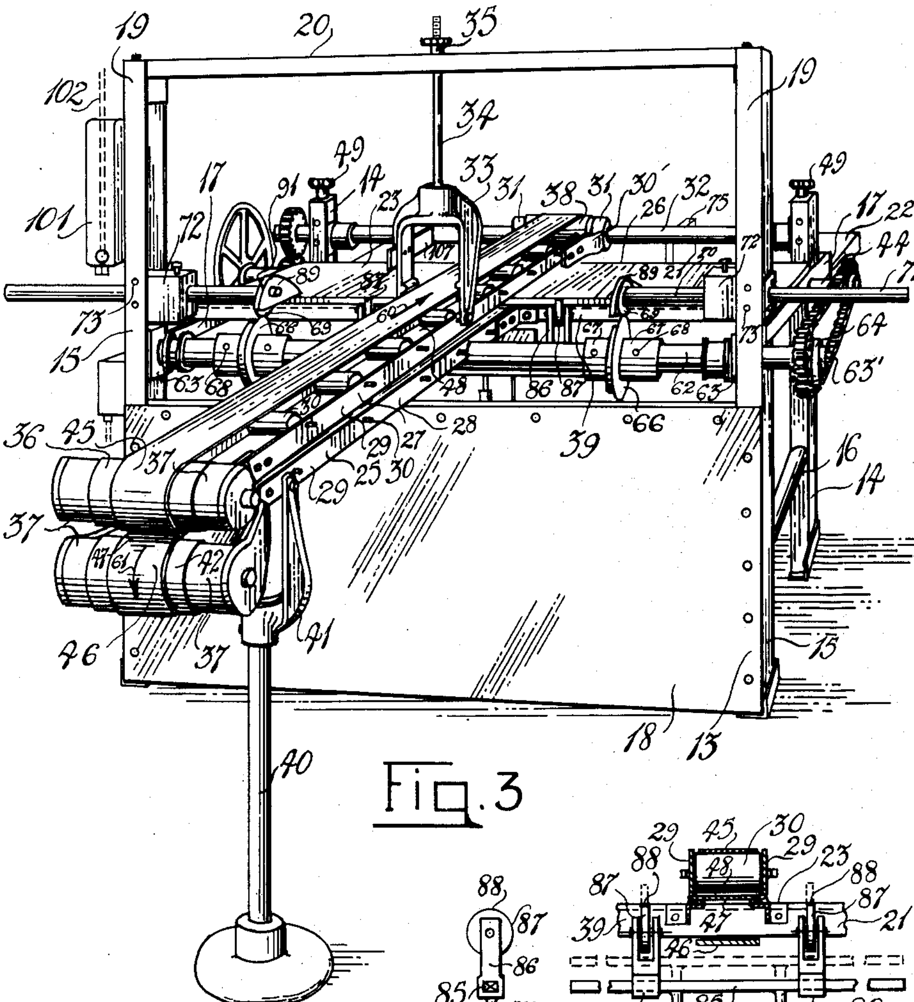

Fig. 3

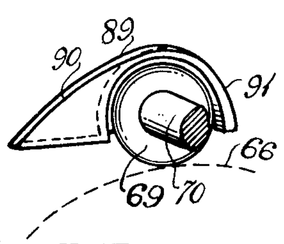

Fig. 4

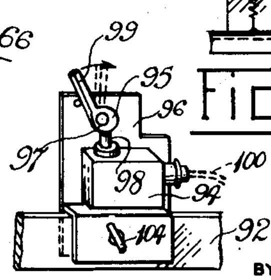

Fig. 5

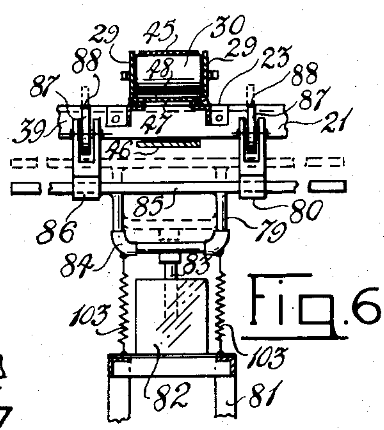

Fig. 6

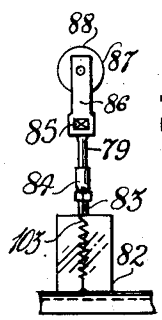

Fig. 7

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BOX-BLANK CUTTING ASSEMBLY

Filed Dec. 11, 1950 3 Sheets-Sheet 3

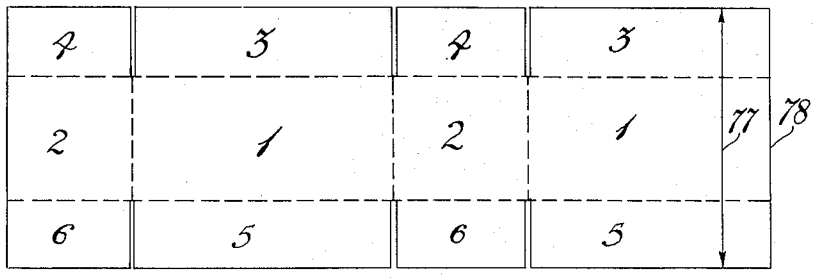

FIG. 8

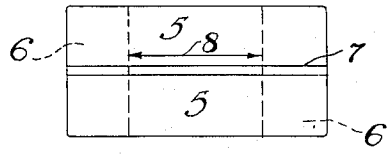

FIG. 9

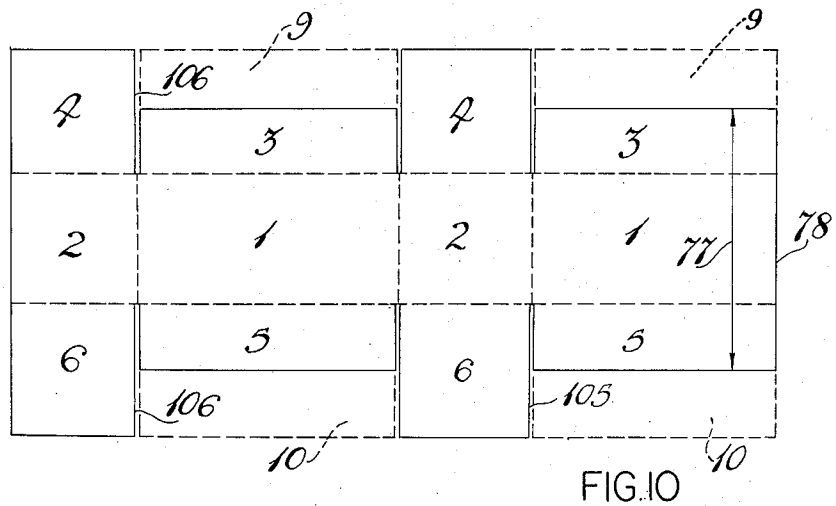

FIG. 10

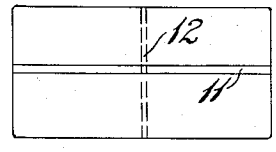

FIG. 11

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BOX-BLANK CUTTING ASSEMBLY

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7 Claims. (Cl. 93—58)

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This invention relates to cutting machines for cardboard box-blanks, more particularly to a machine whereby the side flaps of the blank which form the top and bottom closure panels may be cut to different widths in one operation, therefore, an object of the invention is to provide a device of the character herewithin described whereby rectangular box-blanks can be formed so that, when assembled, the top and bottom closure panels of the box comprise a double, reinforced layer of cardboard.

A further object of the invention in conjunction with the foregoing object is to provide a device of the character herewithin described, the use of which permits the cutting of box-blanks in one operation having different widths of flaps.

Yet another object of the invention is to provide a device of the character herewithin described which includes a self-feeding conveyor and flap lifting means controlled by the passage of the blanks through the machine to permit certain of the flaps to be lifted clear of the cutting elements as will hereinafter be described.

Still a further object of the invention is to provide a device of the character herewithin described in which the conveyor is adjustable for different thicknesses of cardboard.

Another object of the invention is to provide a device of the character herewithin described in which the various settings may be effected readily for the desired conditions of cutting.

A further object of the invention is to provide a device for the character herewithin described which is adjustable for use in the cutting of any size carton or box within the limits of the machine.

Yet another object of the invention is to provide a device of the character herewithin described which is self-contained, and easily operated by relatively unskilled labour.

Still another object of the invention is to provide a device of the character herewithin described which, due to the blanks being cut in one operation, effects a considerable saving of time thereby making the use of the machine economical in operation.

With the foregoing objects in view, and such other objects and advantages as will become apparent to those skilled in the art to which this invention relates as this specification proceeds, our invention consists essentially in the arrangement and construction of parts all as hereinafter more particularly described, reference being had to the accompanying drawings in which:

Figure 1 is a side elevation of the assembly.

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Figure 2 is a top plan view of Figure 1.

Figure 3 is a front perspective view of the machine.

Figure 4 is an enlarged fragmentary perspective view of one of the freely rotating cutting elements.

Figure 5 is an enlarged fragmentary perspective view of one of the micro-switches and actuator therefor.

Figure 6 is an enlarged fragmentary front elevation of the lifting means.

Figure 7 is an enlarged fragmentary side elevation of the lifting means.

Figure 8 is a plan view of a conventional rectangular cardboard box blank.

Figure 9 is a plan view of the blank in Figure 8 in the assembled condition.

Figure 10 is a plan view of the modified box-blank formed by this assembly.

Figure 11 is a plan view of a box formed from the blank shown in Figure 10.

In the drawings like characters of reference indicate corresponding parts in the different figures.

In the art of cardboard box making, it is conventional practice to cut a blank as illustrated in Figure 8 of the accompanying drawings which can be formed in one operation through a conventional cutting machine. Reference to this drawing will show that the blank includes longitudinal side panels **1**, transverse end panels **2**, longitudinal top side closure flaps **3**, transverse top side closure flaps **4**, longitudinal bottom side closure flaps **5**, and transverse bottom side closure flaps **6**. When a box of the character hereinabove described is assembled, it will be seen by reference to Figure 9 that the longitudinal closure flaps **5** meet along a common centre line indicated by reference character **7** but, due to the difference in the longitudinal and transverse dimensions of panels **1**, the transverse closure flaps **6** are separated by an amount indicated generally by the double-headed arrow **8**. This means that the base and top sides of the carton or box are only reinforced by double thicknesses of cardboard over the areas covered by the aforementioned transverse flaps **6**.

Under normal conditions, the base of the average carton formed by this method is sufficiently strong but for some time users of cardboard boxes dealing in relatively heavy canned goods and the like have specified that the base in particular of the box or carton be reinforced with a double thickness of cardboard over the entire area thereof.

Reference to Figures 10 and 11 will show a modified box-blank, the individual components of which are identified by the same reference characters as that of the box-blank shown in Figure 8.

However, it will be seen that the transverse flaps 4 and 6 are of a greater width than the longitudinal flaps 3 and 5 caused by the removal of the portions 9 and 10 from these flaps respectively. Thus, when the box is assembled from this blank, the underside and top side take the appearance shown in Figure 11 wherein the longitudinal flaps meet substantially along the centre line indicated by reference character 11 and the transverse flaps also meet along the transverse centre line indicated by the reference character 12 thus providing a base and top to the box comprising a double thickness of cardboard substantially over the entire area thereof. And, it is the primary function or object of the device hereinafter to be described to cut the blanks shown in Figure 10 in one operation.

Proceeding now to describe the invention in detail, it will be seen upon reference to the accompanying drawings that there is provided a supporting structure collectively designated 13 which includes a pair of rear vertical members 14 and a pair of front vertical members 15. Longitudinal members 16 and 17 connect the aforementioned vertical members together and, in conjunction with apron 18 spanning the aforementioned forward vertical members 15, provides rigidity for the structure. Reference to Figure 3 will show that the front vertical members 15 extend upwardly as at 19 and are spanned at the upper ends thereof by a cross bar 20, the purpose of which will hereinafter be explained.

Spanning the aforementioned longitudinal members 17 is a plate 21 which acts as a feed table for the assembly, said table extending rearwardly to adjacent the rear vertical supports 14. To the rear of these supports is a stacking platform 22 at a lower elevation than the upper surface 23 of the table 21, the stacking platform and the feed table being connected by an upwardly inclining ramp 24.

Extending substantially along the longitudinal axis of the framework 13, is a box-blank conveyor collectively designated 25 which extends substantially from the rear edge 26 of the feed table to a location well in advance of the apron 18 of the supporting structure 13 as clearly illustrated in Figure 3. This conveyor includes a pair of superposed belt carrying channels, the upper one of which is indicated by reference character 27, the lower one being indicated by the reference character 28. The upper channel 27 is constructed from a pair of longitudinal side plates 29 and is provided with a plurality of rollers 30 journalled for rotation therebetween. The rear end of channel 27 is secured to brackets 30' which terminate in bearings 31 by which means the upper channel is supported upon a transverse driven shaft 32 which in turn is journalled for rotation within the upper ends of the aforementioned rear vertical members 14.

Intermediate support of the upper channel 27 is provided by means of a fork 33 over-spanning said channel medially along the length thereof, said fork being supported from the aforementioned cross bar 30 by means of a screw-threaded rod 34, surmounted by vertically adjusting screw-threaded cap 35. From the foregoing, it will be appreciated that rotation of cap 35 causes rod 34 together with fork 33 to be raised or lowered thus raising or lowering channel 27 for the purpose hereinafter to be described.

A belt pulley 36 is journalled for rotation between bearings 37 secured to the forward end of the aforementioned upper channel 27 and a corresponding belt pulley 38 is secured to shaft 32 between bearings 31 at the rear end of channel 27.

The aforementioned lower channel 28 also comprises a pair of longitudinal side plates 29 between which are mounted a plurality of rollers 30. However, the rear ends of these side plates are secured to the front vertical edge 39 of the feed table 21 and extends forwardly from this point immediately below the upper channel 27 being supported at the forward end thereof by a vertical brace 40 upon which is mounted a fork 41 underspanning the lower channel 28.

A belt pulley 42 is journalled for rotation at the forward end of the lower channel 28 immediately subjacent the aforementioned belt pulley 36 mounted upon the upper channel 27. Also provided is a belt pulley 43 corresponding to and subjacent to the pulley 38 mounted upon cross shaft 32. Belt pulley 43 is secured to a further cross shaft 44 journalled within the rear vertical supports 14 immediately below shaft 32.

A flat belt 45 extends around pulleys 36 and 38 thus enclosing the upper channel 27 and a further flat belt 46 extends around pulleys 42 and 43 thereby enclosing the bottom channel 28. However, belt 46 which is associated with the lower channel 28 passes above and below the feed table 21, the table surface acting as a support for the upper run 47 thereof.

From the foregoing, and by reference to the accompanying drawings, it will be seen that the aforementioned upper run 47 of the lower belt 46 and the lower run 48 of the upper belt 45 are substantially in interfacial relationship along the length thereof and are maintained in position by means of rollers 30 in conjunction with the aforementioned vertical adjustment provided by cap 35 and threaded rod 34. Further adjustment of the rear end of the upper channel 27 is provided by screw caps 49 engaging the upper ends of the rear vertical supports 14 and providing limited vertical adjustment of cross shaft 32 in the conventional manner.

Means to drive the aforesaid belt of the conveyor 25 are provided in a form of a source of power 50 which, in this embodiment, is an electric motor mounted upon platform 51 spanning vertical members 14 and 15 below the feed table 21. A switch 52 is provided in a convenient position for the operator of the device, electric current entering via conduit 53 in the conventional manner. A relatively large diametered V-pulley 54 is secured to the aforementioned lower cross shaft 44 upon one end thereof, a belt 55 extending around this pulley and around a complementary pulley 56 secured to the drive shaft of the motor 50. Inboard of pulley 54 is a spur gear 57 also keyed to shaft 44 and engageable therewith is a further spur gear 58 secured to cross shaft 32 which is journalled for rotation immediately above shaft 44 as hereinbefore described. From this it will be appreciated that if the pulley 54 is caused to rotate in the direction of arrow 59 (reference Figure 1) then this will cause the belts 45 and 46 to move in the direction of arrows 60 and 61 respectively. Due to the proximity of the lower run 48 of the upper belt 45 and the upper run 47 of the lower belt 46, which will both be moving in the same direction, namely

from the rear to the front of the conveyor, a cardboard blank inserted at the rear end therebetween will be caused to move along the length of the conveyor by frictional engagement between the aforesaid upper and lower runs.

A cross shaft 62 is journalled for rotation within bearings 63 between the aforementioned forward vertical supports 15 substantially level with the feed table 21. A sprocket chain 63' extends around a sprocket 64 keyed to one end of shaft 62 and around a further sprocket 65 keyed to one outer end of the aforementioned shaft 44 which, as hereinbefore described, is connected to the source of power 50, thus providing rotation to shaft 62.

Circular, edge-sharpened cutter elements 66 are secured to shaft 62 by means of flanges 67, said elements being slideable along shaft 62 for width adjustment purposes and being secured thereto by means of set screws 68. Reference to Figure 3 of the accompanying drawings will show that one of these elements 66 is situated upon either side of the conveyor 25 and that shaft 62 passes substantially underneath said conveyor.

Associated with each of said elements 66 is a freely rotating cutting element 69. These elements 69 are freely journalled for rotation within the inboard ends 70 of supporting shafts 71 which, in turn, are supported by brackets 72 secured to the uprights 19 so that elements 69 are immediately above and substantially in edge contact with elements 66. In order to maintain the edge alignment of these pairs of elements when elements 66 are moved along shaft 62, shafts 71 can be moved in or out of the brackets 72 by means of set screws 73.

Before proceeding with the description of the device, it is believed to be helpful to describe briefly the operation of the machine up to this point.

A stack of cardboard blanks of a configuration similar to that shown in Figure 10 with the portions 9 and 10 in place is placed upon the stacking platform 22 at the rear of the machine and centered to align with the longitudinal axes of the conveyor 25. In this connection, it will be observed that there is provided a pair of transverse rails 74 upon which are mounted for sliding movement, a pair of position limiting guides 75 adjustable by means of thumb screws 76. The upper channels 27 of the conveyor 25 is then adjusted vertically with relation to the lower channel 28 as hereinbefore described depending upon the thickness of the individual blanks and the cutting elements 66 and 69 are positioned upon shafts 62 and 71 respectively to coincide with the desired width of the blanks as indicated by the double-headed arrows 77 in Figures 8 and 10.

The leading edge (Figures 8 and 10) 78, of the blank is then moved forwardly by hand up the inclined ramp 24 so that it enters between the belts 45 and 46 at the rear end of the conveyor. As the lower and upper runs respectively of the belt are moving in a similar direction from the rear towards the front of the conveyor, the blank is moved forwardly across the feed table 21 and through the cutting elements 66 and 69 thus sizing the blank to a configuration illustrated in Figure 8.

However, if it is desired to produce blanks similar to that illustrated in Figure 10, then the flaps 4 and 6 will have to be displaced and prevented from passing through the cutting elements, which elements only remove the portions

9 and 10 illustrated in phantom in Figure 10.

Means are provided to lift the flaps 4 and 6, these means being collectively designated 79 and shown in detail in Figures 6 and 7 of the accompanying drawings.

It will be appreciated that if the blank illustrated in Figure 10 is passing through the machine, then the forward flaps enumerated 3 and 5 have to be cut, the first pair of transverse flaps 4 and 6 then have to be lifted clear of the cutting elements, the rear flaps 3 and 5 have to pass through the cutting elements, and the rear transverse flaps 4 and 6 have to be lifted clear so it will be appreciated that it is desired to provide what is defined as intermittent blank-edge lifting means to accomplish this result. Further means are provided to control the aforementioned lifting means 79, this control means being collectively designated 80 and illustrated in Figures 1, 2 and 5.

Describing first the intermittent lifting means collectively designated 79, it will be seen that a further frame 81 is provided underneath the feed table 21 upon which is mounted a solenoid of conventional construction and designated by the reference character 82. The movable plunger 83 of the solenoid extends upwardly therefrom and has mounted thereupon a lifting fork 84 which includes a transverse bar 85. Slideably mounted along bar 85 and extending upwardly therefrom is a pair of what is defined as blank-edge striking fingers 86 which includes rollers 87 journalled for rotation therein.

Reference to Figures 1 and 2 will show that this lifting assembly 79 is situated forward of the leading edge 39 of the feed table 21 and that the striking fingers 86 are situated one upon each side of the conveyor 25 with the upper perimeters 88 of the rollers 87 substantially flush with the upper surface 23 of the feed table when the lifting assembly is in its lowermost position as illustrated in full line in Figure 6 of the accompanying drawings. However, when the solenoid 82 is actuated as will hereinafter be described, the plunger 83 together with fork 84 and fingers 86, moves upwardly to the position shown in phantom in Figure 6 thus causing the upper perimeters 88 of the rollers 87 to rise above the upper surface 23 of the table 21.

From the foregoing it will be appreciated that if the lifting means is caused to rise as the flaps 4 and 6 are passing thereover, these flaps will be bent upwardly with relation to the main panels 1 and 2 held between the belts 45 and 46.

Further means to maintain these lifted flaps clear of the cutting devices 66 and 69 are provided and take the form of what is defined as stationary conveying cams 89 associated with the upper cutting elements 69. The configuration of these cams is shown most clearly in Figure 4 of the accompanying drawings and will be seen to include an elongated upwardly inclining lifting surface 90 passing over the cutting elements 69 and then dropping sharply as at 91 after the flaps have passed thereover.

Summarizing the foregoing, the lifting assembly 79 is provided to initially raise flaps 4 and 6 as they pass thereover before they reach the cutting elements, this initial raising causing the flaps to engage upon the upper surface 90 of the cams 89 so that the flaps are conveyed over the cutting elements instead of therethrough.

The aforementioned means 80 for controlling the lifting assembly 79 is situated substantially in advance of the front apron 18 of the support-

ing structure 13 and in association with the leading end of the conveyor 25. It includes a support bar 92 extending forwardly of the supporting structure and slightly to one side of the conveyor being supported at the front end thereof by the aforementioned fork 41.

Slideably mounted upon this bar are a pair of micro-switches of conventional construction specifically designated 93 and 94. Micro-switch actuators 95 are pivoted to back plate 96 and include a cammed head 97 engageable with micro-switch plunger 98. The upper ends 99 of the actuators are normally in the position shown in Figure 5 and project upwardly across the space between the belts 45 and 46 so that they intercept the leading edge 78 of the blank passing through the conveyor, said interception causing the actuator to rotate thus depressing the plunger 98 of the micro-switch by means of the cammed head 97 of the actuator.

Electrical conduits 100 extend between the micro-switches and a conventional delay relay device 101 secured to the upper end 19 of one of the vertical supports 15. Further conduits 102 extend between delay relay unit 101 and the aforementioned solenoid 82 of the lifting assembly. A source of electrical power enters the delay relay unit via conduits 102 to supply energization thereto and as this apparatus is conventional, it is not deemed necessary to give structural details thereof. However, the function briefly is as follows:

When the plunger 98 of either of the micro-switches 93 and 94 is depressed, it completes an electrical circuit thus causing the delay relay unit 101 to send a surge of current to the solenoid 82 which causes the plunger 83 to rise momentarily. However, although the micro-switch plunger remains in the downward position, only a single surge of current is allowed to reach the solenoid 82 so that once the plunger 83 together with the lifting assembly associated therewith has elevated it is immediately returned to the downward position by means of the return springs 103 extending between the lifting fork 84 and the sub-framework 81.

In view of the foregoing, the progress of a box-blank through the machine is now as follows:

The micro-switches 93 and 94 are positioned along bar 92 by means of set screws 104, their position depending upon the dimensions of the box-blank passing therethrough. The front longitudinal flaps 3 and 5 of the box-blank (reference Figure 10) pass through the cutting elements as hereinbefore described at which time the front transverse flaps 4 and 6 are substantially above the lifting means 79. Before the leading edges 105 of the front transverse flaps 4 and 6 enter the cutting elements, the leading edge 78 of the box-blank strikes actuator 95 controlling the rear micro-switch 93 thus causing a surge of current in the lifting solenoid 82 which elevates the assembly and raises flaps 4 and 6 clear of the cutters as hereinbefore described.

As, however, there is only a surge of current due to the delay relay unit 101, the lifting assembly 79 retracts immediately thus permitting the rear longitudinal flaps 3 and 5 to pass through the cutters thereby removing portions 9 and 10 as shown in Figures 10 at which time the rear transverse flaps 4 and 6 are now over the lifting means 79. At this time, and before the leading edges 106 of the rear flaps can enter the cutting elements, the leading edge 78 of the blank strikes the actuator 95 of the forward micro-switch 94 thus causing a further surge of current to occur in solenoid 82 thereby actuating the lifting assembly and raising flaps 4 and 6 so that they pass over the cams 89 as hereinbefore described. By this means it will be realized that a blank is formed as illustrated in Figure 10 of the accompanying drawings which, when assembled, forms a box illustrated in Figure 11.

In conclusion, it will be observed that there is provided a relatively short bar 107 extending rearwardly above the conveyor and secured to one leg of the fork 33. This is provided in the event that it is necessary to cut a box-blank having relatively small dimensions under which circumstances it would not be possible for the leading edge thereof to strike the rear micro-switch 93 before the transverse flaps enter the cutters.

Under these circumstances, one of the micro-switches is removed from the supporting bar 92, reversed in position, and suspended from bar 107 so that the actuator 95 thereof hangs downwardly within the path of the leading edge of the blank before same enters the cutting elements thus ensuring that the transverse flaps are lifted in time to avoid passing through the cutters.

Since various modifications can be made in the invention as hereinabove described, and many apparently widely different embodiments of same made within the spirit and scope of the claims without departing from such spirit and scope, it is intended that all matter contained in the accompanying specification shall be interpreted as illustrative only and not in a limiting sense.

What we claim as our invention is:

1. An assembly for the cutting of box-blanks of cardboard and the like, comprising in combination a supporting framework, a feed table spanning said framework, a box-blank conveyor mounted upon said framework, a pair of blank-edge cutting devices associated with said conveyor, a source of power for said conveyor and said cutting devices, lifting means spanning said conveyor to lift intermittently selected edges of said box-blank, means actuated by said box-blank for controlling the movement of said lifting means, said cutting devices including a cross shaft connected to said source of power, and means to maintain clear of said cutting devices the edges of said box-blank lifted by said lifting means.

2. The device according to claim 1 in which said means to maintain said lifted edges clear of said cutting devices comprises a pair of stationary conveying cams associated with said cutting elements.

3. The device according to claim 1 in which said lifting means includes a solenoid situated beneath said conveyor, a lifting fork associated with said solenoid, and blank-edge striking fingers upstanding from said lifting fork.

4. The device according to claim 1 in which said means for controlling the movement of said lifting means includes a supporting bar extending forwardly from said framework, a pair of micro-switches slideably mounted upon said bar, slightly to one side of said conveyor, micro-switch actuators associated with said micro-switches, a delay relay unit electrically connected to said micro-switches, and to said lifting means, the leading edge of the associated box-blank striking said actuators during the movement of said box-blank through said machine.

5. The device according to claim 1 in which said means to maintain said lifted edges clear of said cutting devices comprises a pair of station-

ary conveying cams associated with said cutting elements, said lifting means including a solenoid situated beneath said conveyor, a lifting fork associated with said solenoid, and blank-edge striking fingers upstanding from said lifting fork.

6. The device according to claim 1 in which said means for controlling the movement of said lifting means includes a supporting bar extending forwardly from said framework, a pair of micro-switches slidably mounted upon said bar slightly to one side of said conveyor, micro-switch actuators associated with said micro-switches, a delay relay unit electrically connected to said micro-switches, and to said lifting means, the leading edge of the associated box-blank striking said actuators during the movement of said box blank through said machine, said means to maintain said lifted edges clear of said cutting devices comprising a pair of stationary conveying cams associated with said cutting elements.

7. The device according to claim 1 in which said means for controlling the movement of said lifting means includes a supporting bar extending forwardly from said framework, a pair of micro-switches slidably mounted upon said bar, slightly to one side of said conveyor, micro-switch actuators associated with said micro-switches, a delay relay unit electrically connected to said micro-switches, and to said lifting means, the leading edge of the associated box-blank striking said actuators during the movement of said box-blank through said machine, said lifting means including a solenoid situated beneath said conveyor, a lifting fork associated with said solenoid, and blank-edge striking fingers upstanding from said lifting fork.

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REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

Number	Name	Date
1,547,603	Metz	July 28, 1925