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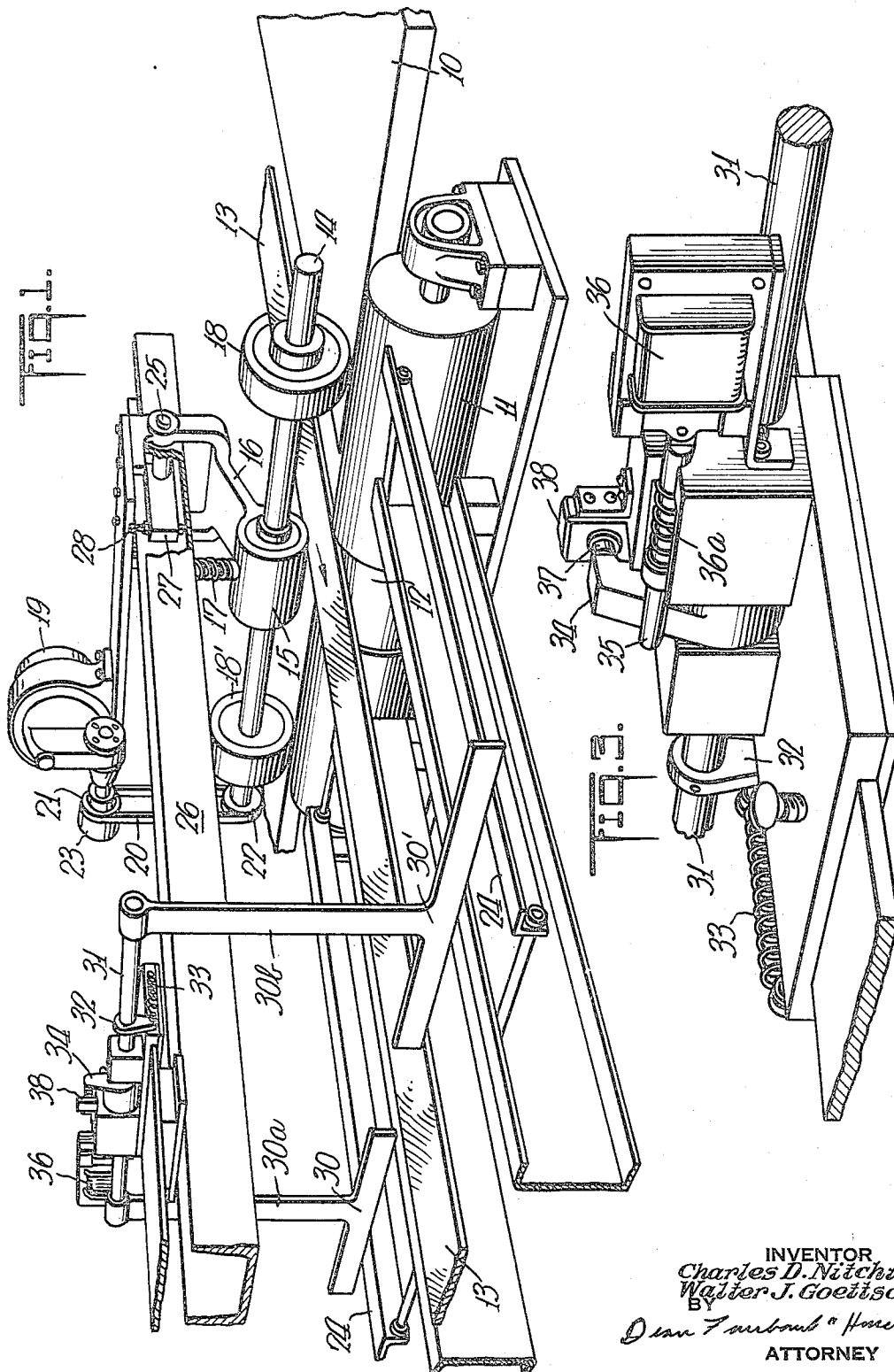
C. D. NITCHIE ET AL

2,728,274

BOX SQUARING DEVICES

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2 Sheets-Sheet 1



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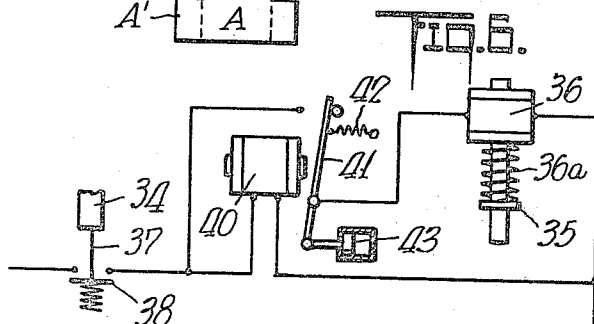
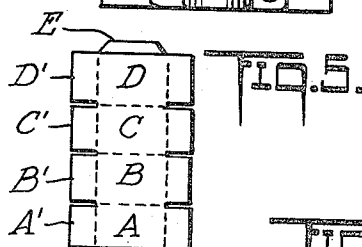
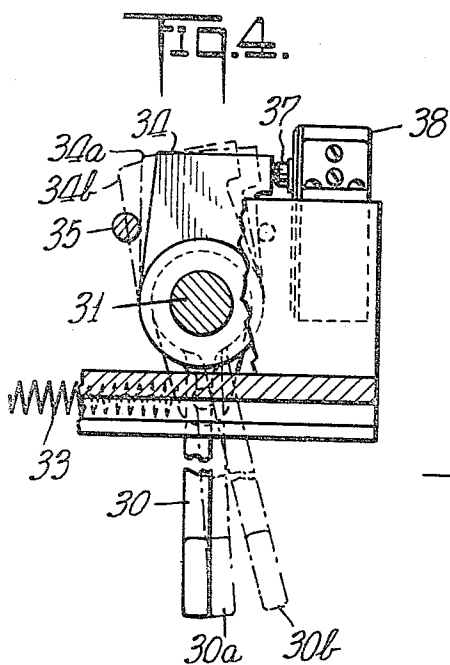
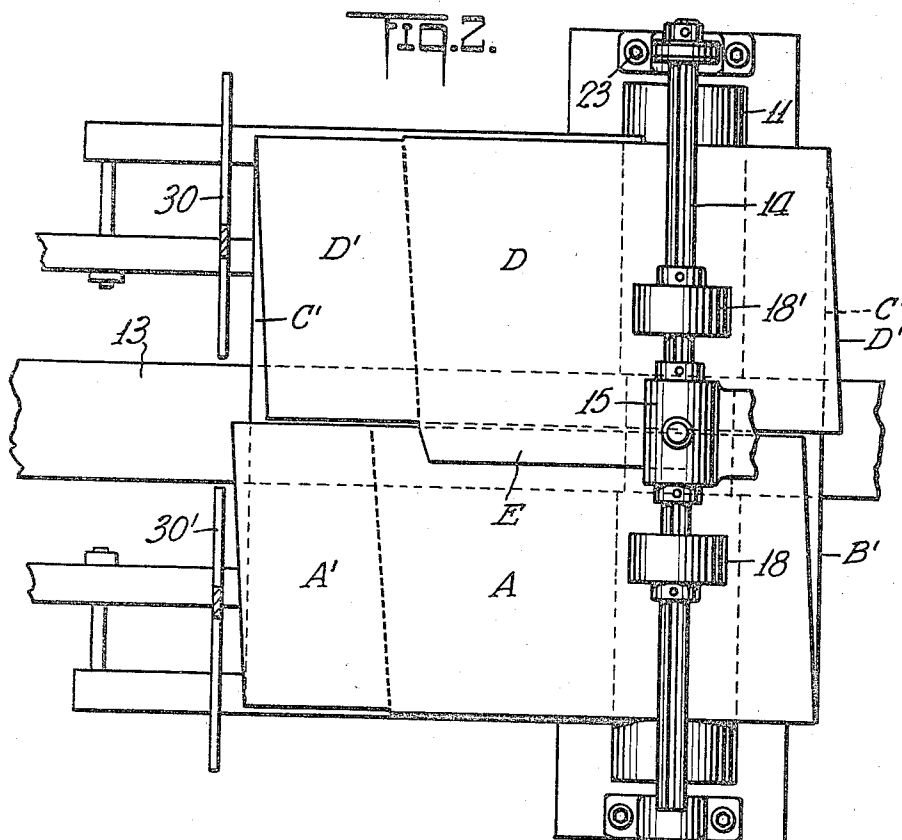
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BOX SQUARING DEVICES

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2 Sheets-Sheet 2



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BOX SQUARING DEVICES

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Application January 8, 1953, Serial No. 330,248

6 Claims. (Cl. 93—36)

A common type of box blank has four wall sections with parallel scored lines therebetween, each terminating in a slot at each end, and has transverse score lines connecting the first mentioned ones at the inner ends of the slots. The blank at one edge may have a flap for attachment by adhesive to the opposite edge of the blank, or the edges may be connected together by tape after being folded. In making a collapsed box from the blank shown, glue is applied to the flap and the blank is folded to bring the opposite edges together, and the flap on one end is glued to the opposite end panel. If the blank be of the type which is to be taped there is no flap and no glue is applied. In either case, and due to the character of the sheet material, which may be double faced corrugated paper, the fold lines may not be exactly parallel, and therefore it is necessary to square the blank by slight slipping of the abutting panels before they are secured together by the flap or by a strip of tape.

The main object of this invention is to provide means for automatically effecting this adjustment of the fold lines of the blank before the edges are secured together.

In the preferred embodiment of the invention there is provided a stop in the path of movement of the folded over portions of the blank, and means are provided for releasing the stop after the blank has been squared and the stop has been moved by the blank to a limited extent, as distinguished from the construction shown in prior copending application Serial No. 310,775, filed September 22, 1952 by Charles D. Nitchie as sole inventor, and in which there are separate stops in the paths of movement of the fold lines. The front edges of all parts of the blank are brought into a position exactly at right angles to its path of movement, and the flap may be pressed down to permanently connect together the opposite edges of the blank.

In the accompanying drawings we have shown merely one embodiment of our improved machine. In these drawings:

Fig. 1 is a perspective view of the main features of a machine embodying our invention, portions being broken away.

Fig. 2 is a top plan view of a portion of the machine, and showing a box blank with the panels askew to an exaggerated extent.

Fig. 3 is a perspective view, and on a larger scale, of a portion of the control mechanism appearing at the upper left hand corner of Fig. 1.

Fig. 4 is a vertical longitudinal section showing the target support and control.

Fig. 5 is a plan view of the blank before folding, and on a smaller scale, and

Fig. 6 is a wiring diagram.

The blank to be taped has four panels A, B, C and D, with intermediate score lines to form the four side walls of the box, the panel D having a flap E for attachment to the edge of panel A. This flap is omitted if the edges of the blank are to be connected by a strip of adhesive coated tape. Each of the panels has a pair of flaps, one

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at each end, integral therewith at transverse score lines; and they are separated from each other by slots, whereby the flaps may be folded to form the top and bottom of the box.

The blank as shown in Fig. 2 is not accurately folded, and thus the advance portion of the flap A' on the wall A may engage and be stopped by a target before the flap D' on the wall D reaches that target. Likewise, it might be so folded that the flap D' would engage the target ahead of the flap A'.

As one important feature of the invention the target has limited movement with the blank, and means are provided for stopping it after it has moved a short distance and holding it against further movement while the belt moves the other portions of the blank, and until the entire front edge of the blank has engaged it and has moved it that limited distance.

In connection with the machine there is provided a table 10 for a stack of folded blanks, or on which the blanks may be folded in succession, either manually or by suitable mechanism, to bring the opposite edges together; and glue is applied to the flap E or the part to which it is to be secured, but the flap is not pressed down. Adjacent to one edge of the table there is an idler roller 11 which is at such an elevation that the top of the table is substantially tangent thereto. This roller intermediate of its ends has a shallow peripheral groove 12 to receive a belt 13 for conveying the blanks, the groove being of such depth that the upper surface of the belt is in a plane substantially tangent to the roller.

Our improved apparatus is mounted astride of the conveyor, and either beyond the glue applier or before the taper.

Above the roller 11 is a shaft 14 journaled in a bearing 15 carried by an arm 16 pivoted to swing vertically, and pressed down by a spring 17 engaging the bearing 15. On this shaft are a pair of rubber covered rollers 18, 18' which may be adjusted toward and from each other for box blanks of different widths, and which are pressed down onto the roller 11 by said spring. The shaft may be driven in any suitable manner, as for instance by a motor 19 mounted on the frame of the machine, through a belt 20 and pulleys 21 and 22. Pulley 21 is connected to the motor shaft by an overrunning clutch 23 so that when a folded blank is taken from the table 10 and advanced by the belt 13, the rollers 18, 18' and the roller 11 will all run at the surface speed of the blank while in contact with such blank, until the forward movement of the blank is arrested by the stops 30 and 30'. The overrunning clutch 23 then delivers power from the motor 19 so that the rollers 18 and 18' turn at a very much reduced speed, urging forward such of the box panels as are not already in contact with the stops 30 and 30'.

The belt 13 is shown as very much narrower than the folded blank, and the outer fold lines may be supported by and slide along the frame members 24, which members, as well as the rollers 18, 18', may be adjusted toward and from each other for squaring blanks of different sizes. The belt might be very much wider if desired.

The downward movement of the rollers 18, 18' by the action of the spring 17 is limited, but is sufficient to maintain the belt 20 taut and to permit gripping the blank intermediate of the edges of the panels A and D and between the rollers 18, 18' and the roller 11, to advance the blank. For limiting this movement of the rollers 18, 18' thereby to regulate the spacing between them and the roller 11, the arm 16 is secured to a shaft 25 journaled in the side walls of an upper frame member 26, which is preferably a channel with upstanding side walls, and the shaft 25 has an arm 27 in the channel and provided with an adjustable screw 28 for engaging the bottom wall of the channel so that the minimum spacing

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and the pressure on the blank may be controlled. It is noted that the blank is not gripped at the adhesive coated flap, so that the latter is not pressed down, and it can slip on the panel A as the blank is being squared.

Beyond the rollers 18, 18' is a target which is shown as having two sections 30, 30', but these may be integral. It is supported by an overhead shaft 31 which has a short depending arm 32 connected to a spring 33 which yieldingly resists but permits the swinging of the target with the blank. The machine is advanced to a position in which the target is spaced from the rollers 18, 18' to a distance less than the length of the blank, so that the target stops any portion of the front edge which is in advance of any other portion of said edge while the rollers 18, 18' continue to act on and urge forward such parts of the front edge as have not engaged the target.

When the flap A' engages the target the latter stops other than limited further movement of the edge of this flap, and the belt 13 continues to push panels B and C forward until they engage the target squarely. The roller 18' acts to push the wall D forward until the front edge of the flap D' engages the target, at which time the blank is properly squared with all portions of the front edge against the target. At that time the target is released so that the blank may swing the target out of its path. Obviously the squaring operation is the same whether the flap A' or the flap D' is in advanced position.

Various means may be employed for stopping and then releasing the target, but as illustrated, the target shaft 31 has an upwardly extending arm 34, and in the path of movement of this arm there is a stop 35 which may be moved to inoperative position by a solenoid 36, and against the action of a spring 36a, after the blank has been squared, so that the squared blank may be delivered from the machine.

In order to give adequate time for the blank to be straightened by the pushing of it against the target, the closing of the circuit of solenoid 36 to withdraw the stop 35 is delayed for a brief interval. During this interval the flap which is in advanced position moves the target a limited distance, but the circuit of the solenoid 36 remains open, and the belt 13 and the rollers 18 and 18' continue to push forward those portions of the blank which have not been advanced far enough, and until the entire front edge is against the target.

When the flap A' engages the target section 30' the latter will be in the position shown in solid lines in Fig. 4. As the belt and roller urge the blank forward it pushes the target to the position 30a against the action of the spring 33. In this movement the arm 34 on the target moves away from the push button 37 and against the stop 35, and to the position a shown in Fig. 4. This closes the switch 38 but does not immediately result in the release of the target, and the blank is urged forward against the target until the blank has been straightened. After a time interval sufficient to insure the proper straightening of the blank by the continuing action of the belt and rollers the target is released so that the blank can swing it to position 30b, and out of the path of the blank.

Various means may be employed for insuring the proper time interval after the engagement of the arm 34 with the stop 35, and before the release of the stop. One such means is shown in the wiring diagram, Fig. 6. As shown, when arm 34 moves away from the push button 37, the switch 38 closes a circuit through a magnet 40. This magnet acts to close a switch 41 in the circuit of the solenoid 36 which then withdraws the stop 35 from the path of movement of the arm 34 on the target. A spring 42 normally holds the switch 41 open so that the circuit of the magnet 40 is open. The switch 41 is connected to the plunger in a dash pot 43 which retards but does not prevent the movement of the switch 41 under the pull of the magnet 40 and against the action of the spring 42. Thus adequate time is afforded for the blank to be forced

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against the target and straightened before the stop 35 is pulled back to release the arm 34 and let the blank be moved along by the belt 13. When the blank passes the target the latter is pulled back to normal position by the spring 33 to open the switch 38, and it remains open until the next blank engages and moves the target.

From the foregoing it will be seen that during this adjusting operation one of the rollers 18, 18' slips on the panel A, and the other roller advances the panel D. When the front edges of all four flaps on the front end of the blank engage the target, and both rollers 18, 18' must slip on the blank, the resistance to such slipping then becomes sufficient to overcome the pressure exerted by the spring 33, and the blank will then push the target out of its path. When the rear end of the blank passes the target the spring 33 will pull the target back to the position shown in solid lines in Fig. 4, the switch 38 will open, and the spring 42 will open the switch 41.

It will be understood that the specific machine illustrated and above described is merely one embodiment of the invention, and that various changes may be made in the details of construction and the arrangement of the parts without departing from the scope of the invention.

Having thus described our invention what we claim as new and desire to secure by Letters Patents is:

1. A machine for squaring a box blank which has been folded to bring its opposite edges together but out of register, said machine including means for advancing the blank in the direction of the fold lines, a stop in the path of movement of the blank and against which the blank is forced by said advancing means, means for positively preventing displacement of the stop by the blank from the path of the latter, and means responsive to pressure of the blank on the stop for releasing said stop after a predetermined time interval to permit the blank to displace the stop from said path.

2. A machine for squaring an inaccurately folded box blank preliminary to taping together the abutting opposite edges thereof, said machine including a belt conveyor and cooperating driven rollers for advancing the blank, a transversely extending stop in the path of movement of the blank and against which said belt and roller press the blank to straighten it, means for yieldingly resisting displacement of said stop by the blank, means for locking said stop against further such displacement after an initial limited movement thereof, and means responsive to said initial limited movement of the stop for releasing said locking means after a predetermined time interval during which said conveyor has straightened the blank against said stop.

3. An apparatus for squaring the folds of an inaccurately folded box blank, said apparatus including means to advance the blank, a target in the path of movement of the leading edge of the folded blank, said advancing means comprising devices for frictionally engaging the blank so as to press the latter against the target with sufficient force to straighten the folds, a stop in the path of movement of the target for preventing other than limited movement of the target with the blank when the latter initially engages the target, and delay action means responsive to the said limited movement of the target for releasing the target from said stop after a pre-determined time interval to permit the blank to move the target out of its path.

4. A machine for straightening the folds of an inaccurately folded box blank to square the blank, said machine including a conveyor belt for advancing the folded blank, a transversely extending stop in the path of movement of the blank and against which the blank is pressed by said belt, driven rollers for pressing the blank onto said belt so as to permit the belt to press the blank against the stop with sufficient force to straighten the folds, said stop having yieldingly resisted movement with said blank, means for locking the stop against displacement by the blank from the path of the latter, and delayed action means re-

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sponsive to a limited movement of the stop with the blank for ultimately releasing said locking means after a predetermined time interval.

5. A box blank squaring machine having means for advancing a folded box blank in the direction of its fold lines but permitting limited slipping movement of the blank, a target in the path of movement of the blank for stopping the advance of incorrectly folded portions of the blank, means for yieldingly resisting movement of said target while the blank is being pressed against said target 10 by said advancing means, a stop in the path of movement of the target for limiting its movement with said blank, an electromagnet for moving said stop to inoperative position, means responsive to an initial movement of the target for actuating said magnet, and means for retarding the stop-moving action of said magnet while said blank advancing means forces said blank against said target and straightens said blank. 15

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6. A machine for squaring a box blank which has been folded to bring together its opposite edges, and preliminary to securing said edges together, said machine including means for advancing the blank in the direction of the fold lines, a single stop means in the path of movement of the blank and having limited yieldingly resisted movement with the blank, a locking device to prevent displacement of the stop means from the path of the blank, and delayed action means for releasing said locking device after said blank has been forced against said locking device to square it for subsequent displacement of the stop from said path.

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