July 6, 1948. C. CHRISTIANSEN 2,444,496

BOX SEALING MACHINE

Filed June 1, 1944 2 Sheets-Sheet 1

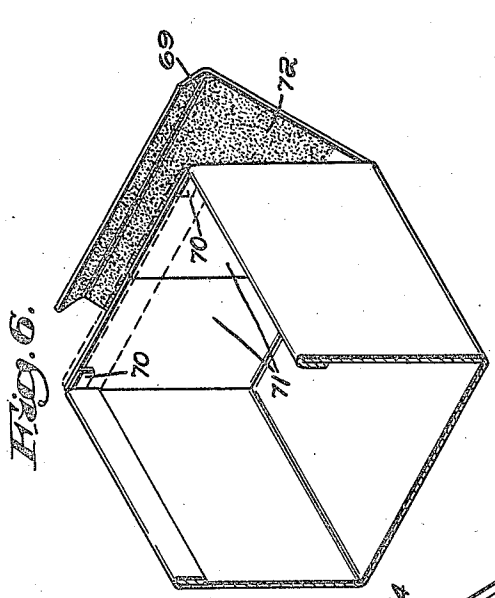

Fig. 6.

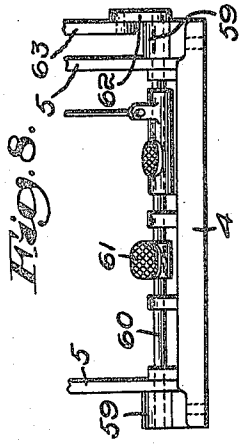

Fig. 8.

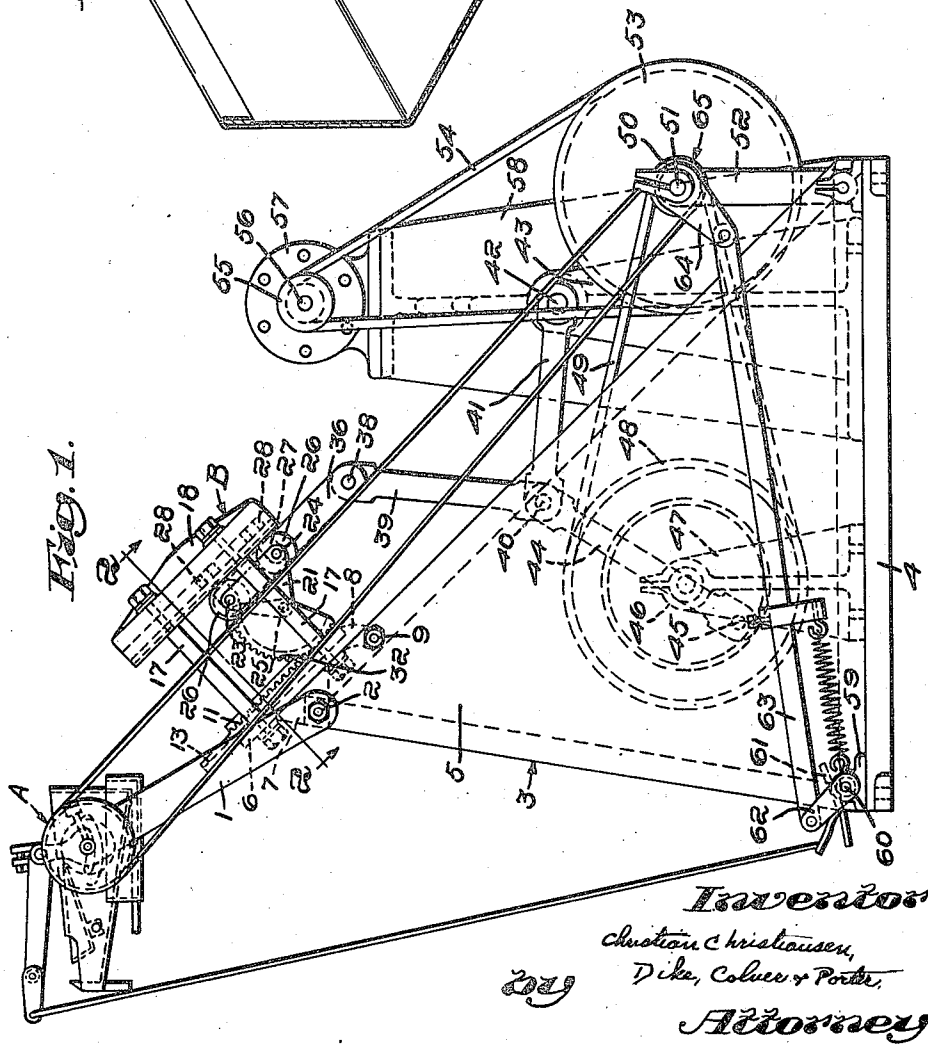

Fig. 1.

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Fig. 2.

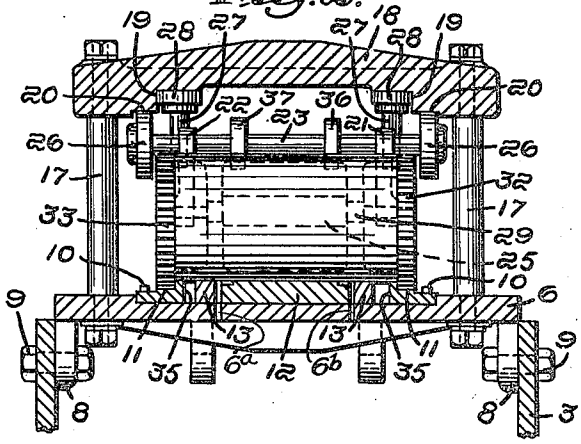


Fig. 4.

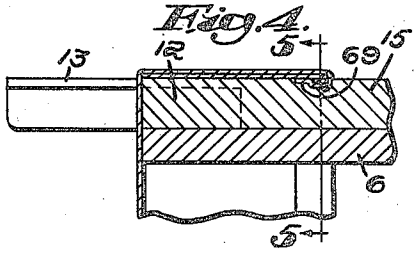


Fig. 5.

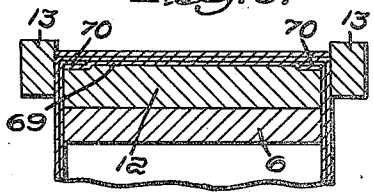


Fig. 3.

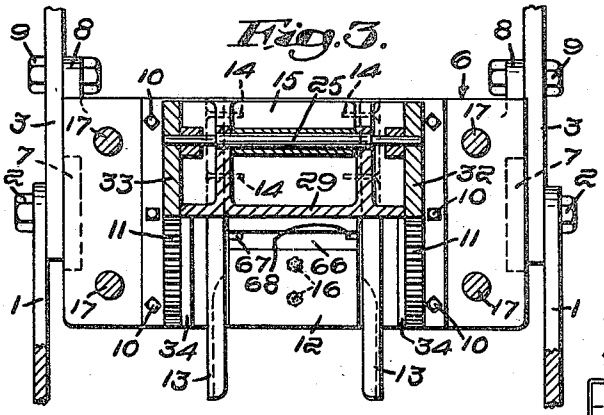


Fig. 9.

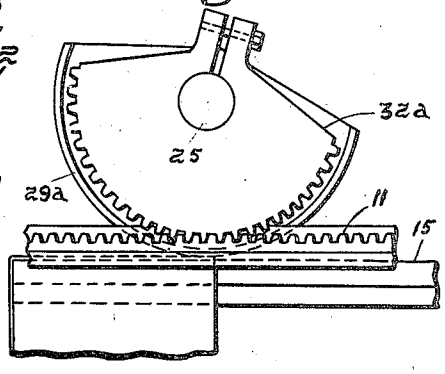
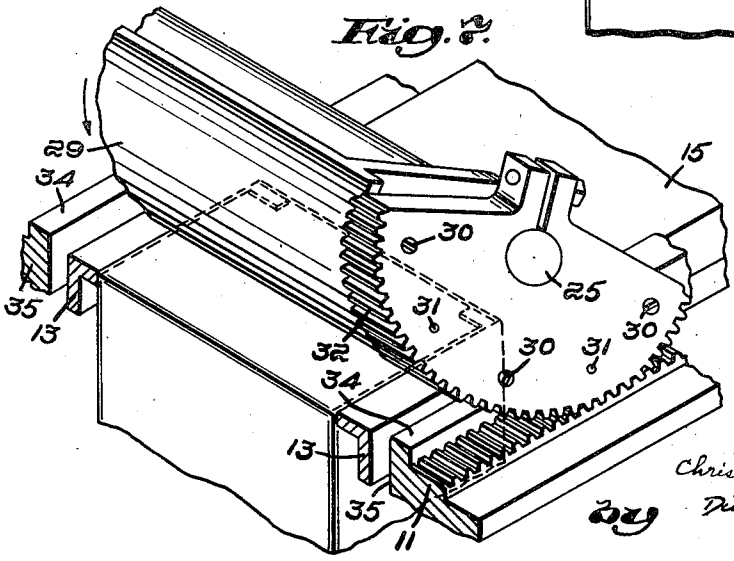


Fig. 8.



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UNITED STATES PATENT OFFICE

2,444,496

BOX SEALING MACHINE

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Application June 1, 1944, Serial No. 538,235

5 Claims. (Cl. 93—36.3)

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This invention relates to an improvement in machines for pressing or sealing the glued ends of box blanks to the infolded side tabs of the blanks to form boxes and box covers. The invention is used especially for sealing plain cardboard boxes of the type commonly used as containers for shoes.

The application is a continuation in part, and of all common subject matter of application Ser. No. 484,271, filed April 23, 1943.

Boxes of this type are made from blanks which are cut to form a top or bottom surface, side walls having flaps adapted to be folded inwardly, and ends extending from the top or bottom surfaces which are adapted to be folded up against infolded end flaps, folded over the tops of the flaps, and secured in position. The inner surfaces of the ends are coated with glue and, after being held in the final position, are pressed against the outer surfaces of the end flaps to form a tight bond.

The object of the present invention is to provide simpler, lighter and less expensive mechanism for pressing the ends, which have already been coated with adhesive, against the flaps to form a strong, secure end wall for the box.

The present invention includes mechanism for applying pressure progressively over the surfaces of the parts to which the glue has already been applied, the pressure applied being greater than the weight of the pressing means, and the progressive application of the pressure being adapted to squeeze out any surplus glue and to insure the proper spreading and distribution of the glue during the bonding operation.

The nature and objects of the invention will best be understood from the following description of an illustrative embodiment thereof shown in the accompanying drawings.

In said drawings,

Fig. 1 is a side elevation of a machine embodying the invention.

Fig. 2 is a section on the line 2—2 of Fig. 1.

Fig. 3 is a plan view, partly in horizontal section, of a portion of the mechanism shown in Fig. 2.

Fig. 4 is a detail view showing the position of the folded box blank when inserted into the machine.

Fig. 5 is a section on the line 5—5 of Fig. 4.

Fig. 6 is a perspective view of one end of a partially folded box blank.

Fig. 7 is a perspective view of the pressing mechanism of the present invention during one phase of its operative movement.

Fig. 8 is a detail view in front elevation of a part of the machine of Fig. 1.

Fig. 9 is a detail view in side elevation showing a modified form of a part of the machine of Fig. 1.

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In the drawings, a glue applying mechanism generally indicated at A is supported by a pair of arms 1, 1 secured by bolts 2 to the top of a frame 3 comprising a base 4 and upright side plates 5. This mechanism is more fully described and claimed in a co-pending application of the present inventor, Serial No. 484,270, filed April 23, 1943 (now Patent No. 2,379,216), and forms no part of the present invention.

The pressing mechanism B is mounted at an angle on the frame 3 of the machine (see Fig. 1) to allow the operator to insert box blanks easily and quickly into the machine. In this mechanism, a bed 6 is provided with lugs 7 and 8 secured to the frame 3 as by bolts 2 and 9. Secured to the bed 6 as by bolts 10, are spaced parallel gear racks 11. The bed 6 is also adapted to receive and support, in the space provided therefor by said racks, an assembly comprising a flat platen 12 adapted to provide a rigid support for the inside of the box, and parallel guides 13 secured, as by screws 14, to the sides of the rear portion 15 of the platen. The space between the racks 11 is wide enough to permit the bed 6 to receive platens of varying sizes, the size chosen depending on the size of the box blank upon which the machine is to operate at any given time. The guides 13 are attached to the particular platen to be used, and the assembly is then placed in the bed 6 and secured thereto as by bolts 16. A portion of the bed 6 underlying the guides 13 is cut away to form slots indicated at 6a and 6b underlying the guides 13 to enable the sides of the folded box blank to slide inwardly over the edges of the platen 12. Extending upwardly from the bed 6 are posts 17 which bear a head 18 having pairs of horizontal and vertical guide surfaces 19, 19 and 20, 20 respectively, formed thereon. Mounted within the frame formed by said bed 6 and head 18 is a reciprocably movable carriage comprising end members 21 and 22 connected at the top by rods 23 and 24 and at the bottom by a shaft 25 rotatably journalled in the end members. The rods 23 and 24 each bear pairs of rolls 26 which are adapted to follow the guide surfaces 20, 20. Extending upwardly from rods 23 and 24 are posts 27 which carry rolls 28 which are adapted to follow the guide surfaces 19, 19. The shaft 25 carries a segmental drum or rotary press 29 on either end of which are secured, as by screws 30 and dowels 31, the segmental gears 32 and 33 which are adapted to follow the racks 11. The full weight of the drum 29 is not borne by the gear racks, or the platen, however, as the drum rests upon the top surfaces 34 of supporting and guiding rails 35, 35 carried by the bed 6 adjacent the racks 11. The rails 35 and the racks 11 may be integrally formed, as shown in Figs. 2 and 7. Since the rails do not allow the press to bear

on the platen and the rolls 26, 26 do not allow the press to rise, the press is supported unyieldingly with its surface a distance from the platen which is less than the thickness of the elements of the box which are to be glued together.

The diameter of the segmental drum 29 is not the same as the pitch diameter of the segmental gears 32 and 33. In the machine shown in Fig. 1, the diameter of the drum is slightly smaller than the pitch diameter of the gears, while in the modified form shown in Fig. 9, the diameter of the drum 29a is slightly greater, as shown by contrast with segmental gear 32a. By "slightly" greater or less, I mean of the order of $\frac{3}{16}$ inch, i. e., when the pitch diameter of the gears is almost 6 inches, the diameter of the drum should be about $\frac{3}{16}$ inch greater or smaller.

The difference in diameter shown in Fig. 1 causes the drum to be carried bodily forward and back over the platen with a wiping movement in the direction of travel, due to the fact that the drum is not rotated quite enough to keep pace with the forward movement of the carriage. In the mechanism shown in Fig. 9, the wiping movement is reversed, since the rotative movement of the periphery of the drum exceeds that of the gears, i. e., the rotative movement is greater than what would ordinarily result from the linear movement of the carriage if the drum and gears had the same effective diameter.

Secured to the rods 23 and 24 are two rearwardly extending bars 36 and 37 bearing in their ends a cross rod 38 engaged by one end of a link 39 pivoted at 40 to one or more links 41 pivoted at 42 to an upright 43 supported by the base 4. The link 39 is also pivoted at 40 to one or more links 44 connected to the crank 45 on a crank shaft 46 journalled in suitable bearings in a standard 47 supported by the base 4. Secured to the crank shaft 46 is a pulley 48 adapted to be driven by a belt 49 from a pulley 50 on a shaft 51 suitably journalled in a support 52 rising from the base 4. The shaft 51 also carries a large pulley 53 adapted to be driven by a belt 54 from a pulley 55 secured to the shaft 56 of a motor 57 supported on an upright 58 rising from the base 4. Journalled in suitable bearings 59 on the base 4 of the frame is a shaft 60 to which is secured a starting pedal 61, and secured at the end of the shaft 60 is an arm 62 pivoted to a link 63 pivotally connected at its other end to an arm 64 of a clutch mechanism (indicated at 65) of any suitable and well known type for connecting the pulley 50 with the shaft 51.

The support or platen 12 is preferably formed with a transverse groove 66 (Fig. 3) having two small grooves or indentations 67 and 68 at either end thereof. The groove 66 is adapted to receive the infolded portion 69 of the end 72 (see Fig. 6) and the grooves 67 and 68 are adapted to receive the two small reinforcing tabs 70 of the box blank, these grooves thus serving to compensate, during the pressing operation, for the extra thickness formed by these parts.

In preparing the box for pressing, the operator applies glue to the end 72 by the glue applying mechanism A, folds the side flaps 71 inwardly as shown in Fig. 6, brings the glued end 72 up close against the outer surfaces of the flaps 71, and folds the flap 69 over the top of said flaps 71 and also over the reinforcing tabs 70 which extend from the sides of the blank. The position of the parts of the blank is then as shown in Figs. 4 and 5. The operator then inserts the folded blank between the guides 13 and pushes it forwardly into the machine (see Fig. 7) until it fits completely over and upon the platen 12 in such manner that the inner surfaces of the flaps 71 lie flat on the top surface of the platen 12 and the infolded glued flap 69 lies in the groove 66. When the folded blank is in this position, the reinforcing tabs 70 lie directly over the grooves 67 and 68 formed in the groove 66.

The operator then depresses the starting pedal 61 to start the machine, and, through the driving mechanism above described, the segmental drum 29 is rotated counterclockwise in Fig. 1 over the rails 35 which hold it properly spaced from the platen, and the segmental gears 32 and 33 follow the gear racks 11. As the segmental drum advances, it rolls over and presses the folded layers of the box blank together so that the glued end 72 forms a tight seal with the outer surfaces of the flaps 71 and the folded flap 69 forms a tight seal with the top part of the inner surfaces of the flaps 71 and seals in the small reinforcing tabs 70. The drum is not allowed to rise as it moves forwardly, since the carriage in which it is mounted must follow the guides 20, 20 formed in the head of the machine. Since the space between the peripheral surface of the drum and the top surface of the platen is substantially constant, the pressure on the folded glued blank may consequently be much greater than the weight of the drum. As the drum moves forwardly it presses downward upon and squeezes at any one time only a small additional portion of the blank held between the drum and the platen. Consequently, the area of the blank which offers resistance to the pressing means is small at any given time and the amount of force required for pressing is far less than that which would be required for pressing the whole surface at once. The forward movement of the drum also serves to spread the glue evenly as it progresses, any excess glue being pushed ahead of the drum, and any dry spots being covered.

When the diameter of the drum is less than the pitch diameter of the segmental gears, as shown in Fig. 1, the drum is dragged along bodily as well as being rotated. The peripheral surface of the drum, therefore, is not only pressed downwardly on the box blank as it is turned, but also is given a wiping motion in the direction of travel. This motion serves to wipe off any glue that may get stuck on the drum and prevents it from accumulating. It also in effect "irons" the surface of the blank and so aids in bonding the parts. When the mechanism of Fig. 9 is used, the wiping motion is reversed. The advantages of the modified form are that a larger drum can be used, that any glue that may get stuck on the platen is more readily loosened, and that the ironing movement is toward the parts already stuck together, so that there is a greater balance of forces, i. e., those created by the forward pressing and the backward ironing movements.

Since the degree of pressure applied to the blank is not determined by the weight of the drum, the drum can be made as light as is consistent with the proper degree of strength, and since the pressure is progressively applied to a small part of the blank, the machine as a whole need not be constructed from the heavy parts heretofore used in pressing operations in which the pressure is applied to the entire surface or to a substantial

portion of the surface of the blank at one time. Both because of the squeezing action due to the forward rectilinear movement of the drum between the fixed support and head of the pressing mechanism, and because of the progressive application of pressure, the machine of the present invention weighs hardly one third as much as the usual type of pressing machines now in use. The lightness of its construction and the pressing of small portions of the blank at any one time allow the machine to operate on approximately one fifth of the power formerly used, make for far quieter operation of the press, and practically eliminate shock or jar during operation. It is, therefore, not necessary to use the machine on specially reinforced flooring, a matter which is particularly important at the present time, when the difficulty in transporting ready-to-use boxes from the factory has led to the practice of using box blank pressing machines in the plants where the articles to be boxed are made.

The uniform spreading of the glue by the progressive application of pressure is also important because the elimination of any surplus and the proper distribution of the glue to avoid dry spots both tend to eliminate the production of insecurely glued boxes which have to be discarded.

I claim:

1. A device for sealing under high pressure the folded glued flaps of box blanks comprising, in combination, spaced pressure resisting members, a carriage reciprocally movable between the members, a rotary press mounted on the carriage, means for preventing the carriage from deviating from a rectilinear course between said spaced members, gears secured to the press, gear racks secured to one of the pressure resisting members, a platen mounted on one of said spaced members and guides on said platen for admitting the folded glued box blank to the platen with one side of the blank held flat against the pressure receiving surface of the platen, and means for reciprocally moving the carriage, said press having an arcuate surface with a diameter slightly greater than the pitch diameter of the gears, so that the gears rotate the press with a peripheral speed slightly greater than that needed to move it the amount otherwise required by the movement of the carriage, causing portions of the periphery of the press to exert an ironing effect on the flaps.

2. A device for sealing under pressure the folded glued flaps of box blanks comprising, in combination, spaced pressure resisting members, a carriage reciprocally movable between the members, a rotary press mounted in the carriage, means for preventing the press from deviating from a rectilinear course between said spaced members, gears secured to the press, gear racks secured to one of the pressure resisting members, means for reciprocally moving the carriage, a platen mounted on one of said members, and guides on said platen for admitting the folded glued box blank to the platen with one side of the blank held flat against the top surface of the platen, said press having an arcuate surface with a diameter different from the pitch diameter of the gears, the difference in diameter being approximately three-sixteenths of an inch when the pitch diameter of the gears is about six inches, so that the gears rotate the press with a peripheral speed slightly different from that required by movement of the carriage, causing portions of the periphery of the press to exert a constant ironing effect on the flaps.

3. A device for sealing under high pressure the

folded glued flaps of box blanks comprising, in combination, spaced pressure resisting members, a carriage reciprocally movable between the members, a segmental drum having an arcuate pressing surface rotatably mounted in the carriage, means for causing said segmental drum to move in an undeviating rectilinear path, gears secured to the drum, gear racks secured to one of the pressure resisting members, means for reciprocally moving the carriage, and guides on said platen for admitting the folded glued box blank to the platen with one side thereof held flat against the top surface of the platen in position to receive pressure from the drum, said drum having a diameter approximately three-sixteenths of an inch greater than the pitch diameter of the gears when the pitch diameter is approximately six inches, so that the gears rotate the drum with a peripheral speed slightly greater than that needed to move it the amount otherwise required by the movement of the carriage, causing portions of the periphery of the drum to exert an ironing effect on the flaps.

4. In a device for sealing folded glued box blanks under pressure which has spaced pressure resisting members, a box holding platen held on one of said members, a press with an arcuate pressing surface, and means for imparting a rotary movement to the press along an undeviating rectilinear path between the spaced pressure resisting members and over the platen, said press and said platen being spaced apart a distance less than the normal thickness of a folded blank to be pressed therebetween, in combination, gears on said press, and gear racks on one of said spaced members, the press having a diameter which is greater than the pitched diameter of the gears.

5. In a device for sealing folded glued box blanks under pressure which has spaced pressure resisting members, a box holding platen held on one of said members, a press with an arcuate pressing surface, and means for imparting a rotary movement to the press along an undeviating rectilinear path between the spaced pressure resisting members and over the platen, said press and said platen being spaced apart a distance less than the normal thickness of a folded blank to be pressed therebetween, in combination, gears on said press, and gear racks on one of said spaced members, the press having a diameter which is different from the pitch diameter of the gears by approximately three-sixteenths of an inch when the pitch diameter of the gears is about six inches.

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