Dec. 4, 1956 H. V. BRAY ET AL 2,772,609

BOX MACHINE

Filed Sept. 30, 1953

FIG. 1.

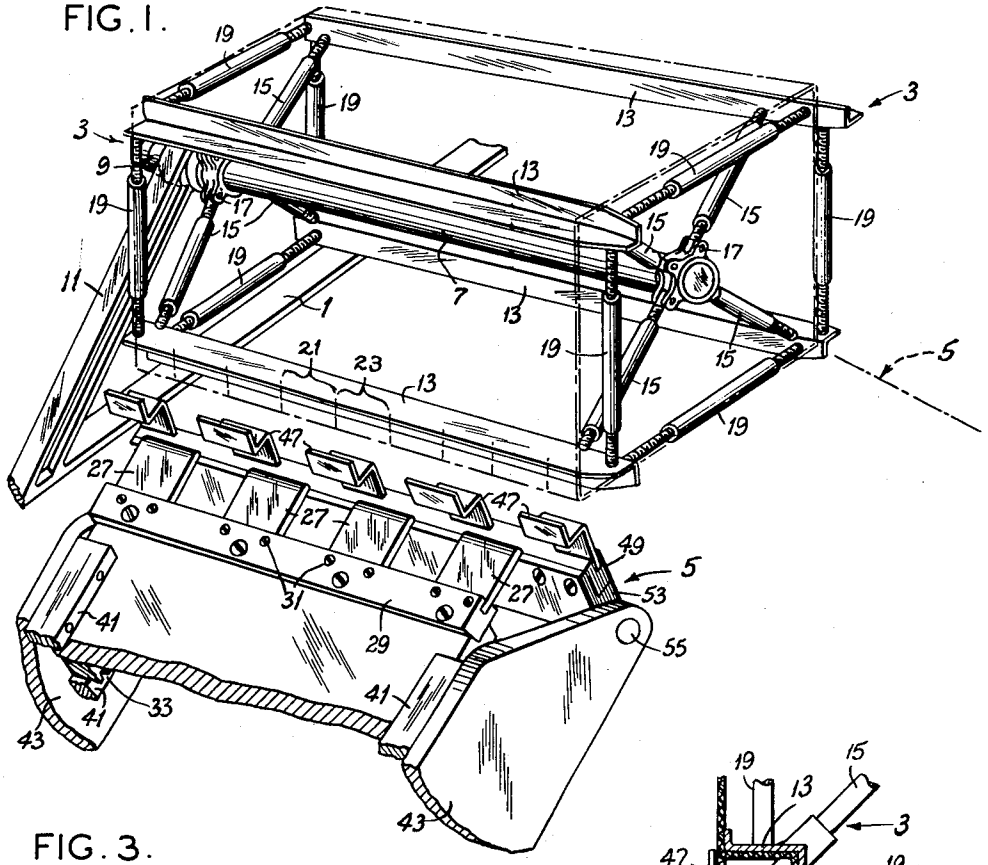


FIG. 3.

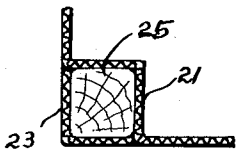


FIG. 2.

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BOX MACHINE

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1 Claim. (Cl. 93—36)

This invention relates to box machinery, and more particularly, to apparatus for forming re-entrant pockets along the corner portions of a paperboard box.

The copending application of Herschel Victor Bray for Reinforced Paperboard Containers, Serial No. 342,376, filed March 16, 1953, discloses a paperboard box reinforced with cleats seated within the corners thereof. In manufacture, a paperboard tube is transversely slit at spaced intervals along the corner portions and longitudinally creased along lines offset from the corner fold, so as to define spaced corner sections which may be pushed inwardly to form cleat-receiving pockets.

This box has various advantages, among which may be mentioned the savings in manpower and time required for setup (there being no nailing or assembly about the contained article). One difficulty is encountered, however, and that is the formation of the cleat-receiving pockets. In order to achieve savings resulting from collapsed shipping and storing, these pockets should be formed at the time of use, that is on the premises of the user. Although it is a simple matter to open the tube into its rectangular shape and to insert the cleats into the pockets previously provided, the actual formation of such pockets is likely to prove troublesome if done entirely by hand, even though the tube has been previously cut and scored. Considerable force is required in the pocket-punching operation and since the punching means must be somewhat pointed, there is a tendency for the punching implement to slip off to one side or the other of the corner apex.

It is accordingly an object of the present invention to provide apparatus whereby such cleat-forming pockets may be readily formed in a rectangular paperboard tube, and with assurance that the punching implement will be properly guided against the apex at a corner of the tube. Among the other objects of the invention may be noted the provision of apparatus for shaping one or more corners simultaneously and for supporting the tube in a position for conveniently inserting reinforcing cleats within the pockets.

Briefly, the machine herein disclosed comprises a mandril-like support for an open paperboard tube, said support being made up with angle sections opening outwardly at four corners. In conjunction therewith, there is provided certain punching and corner-holding mechanism. In operation, corner-clamping means are moved against a corner of the paperboard tube to secure the tube against movement, and the punches are then actuated.

Other features of the invention will be in part apparent from and in part pointed out in the following detail description taken in connection with the accompanying drawings, in which:

Fig. 1 is an oblique view illustrating the apparatus of this invention;

Fig. 2 is an end elevation of the apparatus used to drive the mechanism shown in Fig. 1;

Fig. 3 is a sectional view of a paperboard tube showing completed pocket with reinforcing cleat inserted.

Reinforced boxes of the type previously described are

especially suited as containers for such large items as refrigerators and other household appliances. Customarily, an appliance factory will have an assembly-line type of packing operation at the end of the manufacturing assembly line and both must be operated at approximately the same speed. In order to maintain the packaging speed at proper levels, it is generally necessary to employ a half dozen or more men in the packing line, which fact makes the packaging a substantial expense of the complete item.

According to prior practice, wooden cleats were stapled to panels at the box factory and the panels were then erected about the appliance and fastened together. Such an operation requires a number of men to hold the panels, and the process of nailing them together tends to be slow. With the box described in the aforesaid application, a complete rectangular tube is provided by the box factory, the cleats being subsequently inserted within pockets punched from the corner portions of an open tube. As such, panel holding and nailing operations are eliminated, but this type of package does present difficulties in the formation of the cleat-receiving pockets. This invention, accordingly, contemplates the use of apparatus for punching the cleat-forming pockets and for supporting the tube while the cleats are inserted therewithin, thereby improving the entire packaging operation.

Referring now to the drawings, the apparatus of this invention is shown to comprise a base **1**, which carries a spider **3** rotatable about a horizontal axis and certain corner punching and holding apparatus generally designated **5**. A cylindric member **7** is cantilevered outwardly from a bearing **9** which is mounted upon legs **11** projecting from the base **1**. The spider **3** is made up of four angle members **13** carried by adjustable supports **15**, such as turn buckles. These supports are loosely connected at **17** to the axial member **7** in order to permit the angle members **13** to be prepared for receiving oblong as well as square rectangular tubes. The general configuration of angle members **13** is otherwise determined by struts **19** extending between their ends. It will be understood that the members **15** and **19** are adjustable to vary the spacing between the angle members in accordance with the size and shape of the rectangular tubes to be used with the apparatus. Where a machine is to be used only with a predetermined size of blank, the supporting framework for the angle members may be rigid or welded. In either case, the angle members **13** are preferably bent inward at one end of the machine in order to facilitate application of an opened tube thereover.

The spider **3**, while acting as a support for the open rectangular tube, also functions as a rotary anvil cooperable with certain punching mechanism **5**. Each of the corner members **13** of the spider faces outwardly so as to provide a recess beneath the corner of the tube for accommodating the re-entrant pocket sections to be punched therefrom. Referring to the dotted lines of Fig. 1, pocket-forming sections **21** and intervening sections **23** are defined by die cuts across the corner of a tube. The tube may also have longitudinal score lines to facilitate inward punching of the pocket sections, although this may not be necessary with the anvil-type arrangement herein disclosed.

The punching mechanism, in the disclosed example, comprises a series of blades **27** mounted opposite the pocket-forming sections **21** of the tube. These blades are secured within a holder **29**, as by set screws **31**. The blade holder, in turn, is mounted at the forward end of a rack **33**, which is guided by rails **41** on a frame **43** for reciprocating movement toward and away from the spider. A pinion **35** fixed on a shaft **45** is journaled in the frame **43** for engagement with the rack **33**. The pinion is driven from a pneumatic unit **37** by means of a crank **39**.

Operating in association with the punching mechanism is a clamping device, which is also mounted upon the frame 43. Stepped clamping elements 47 are secured in spaced relationship along a holder 49, as by set screws 51, opposite the sections 23 of the tube blank. The clamp holder 49 is carried by a bracket 53, which is pivotally mounted at 55 for swinging movement with respect to the frame 43. A crank 57 fixed to the bracket 53 is driven from a second pneumatic unit 59 so as to advance the clamping elements 47 against the corner portions 23 of the paperboard tube (as shown in Fig. 2). Thereafter, the clamping elements are retracted (Fig. 1) to permit rotation of the spider 3 or withdrawal of the punched tube blank.

In operation, the two pneumatic units 37 and 59 would be operated in timed sequence through suitable control valves or the like so that the clamps are advanced ahead of the punch. These clamps not only assure accurate alignment of the corner portions of the tube blank with respect to the punches, but also prevent undesired movement of the tube as a result of the forces applied thereto during the punching operation. The control valves and timing mechanism are not shown herein, such mechanism being well known in the art.

In a typical installation, the valves would be under control of a foot pedal located adjacent one end of the machine. The operator would remove a flattened paperboard tube from a supply, open the tube and push it onto the spider 3. The spider would be rotated to a position wherein one of the anvil or angle members 13 is opposite the punching mechanism 5. If desired, the mechanism may include detent locking means cooperable with the rotary pipe for so positioning the spider. The foot pedal would then be manipulated to initiate advance of the clamping elements and punches, followed by their retraction, whereupon the spider would be rotated to a new position. Each machine may include one or more punching and clamping units, a preferred arrangement having a pair of such units, one on each side of the base 1, as suggested by the dot and dash line on the right side of the spider in Fig. 1, so that the spider would need to be repositioned only once. After completion of the punching operation, the cleats 25 would then be inserted into the tube (Fig. 3) while it remains supported upon the spider, the angle sections 13 serving to guide a cleat through the pockets.

The invention contemplates that only one operator will

be required to prepare the tube for application over appliances or the like, hence the number of punching units may be increased if a faster rate of packaging is required. In some instances, where the packaging operation may proceed at a relatively low rate, the rotating spider may be replaced with a single fixed anvil. The tube would then be manually rotated with respect to said anvil between punching operations.

From the foregoing description, it is apparent that those skilled in the art will understand the structure, function and mode of operation of the invention herein disclosed, and appreciate the advantages thereof. Although one embodiment has been disclosed in detail, it is to be understood that the invention is not limited thereto, but the drawings and description thereof are to be understood as being merely illustrative. It is realized that many modifications and variations will present themselves to those skilled in the art without departing from the spirit of this invention or the scope thereof as set forth in the appended claim.

Having thus described the invention, what is claimed and desired to be secured by Letters Patent is:

Apparatus for forming a cleat-reinforced container from a paperboard tube, comprising an elongate anvil of angualr cross section, said anvil having a forming recess extending substantially the entire length of its vertex, clamping means movable toward and away from said anvil to secure portions of the tube adjacent a corner fold, a longitudinal forming element reciprocally mounted opposite the vertex of said anvil for movement into and from said forming recess, said forming element being of a length substantially less than that of said recess to deform a previously-severed corner portion of the tube inwardly as a re-entrant cleat-receiving pocket, and means for moving said clamping means toward the anvil prior to advance of the forming element and to move said clamp means clear of the anvil after retraction of said forming element, thereby permitting lengthwise insertion of a reinforcing cleat while the tube is secured with the forming element clear of said pocket and permitting the tube to be cleared from the machine after insertion of said cleat.

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