Oct. 29, 1957 R. F. HOLLIS 2,811,086

BOX MACHINES

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FIG. 1.

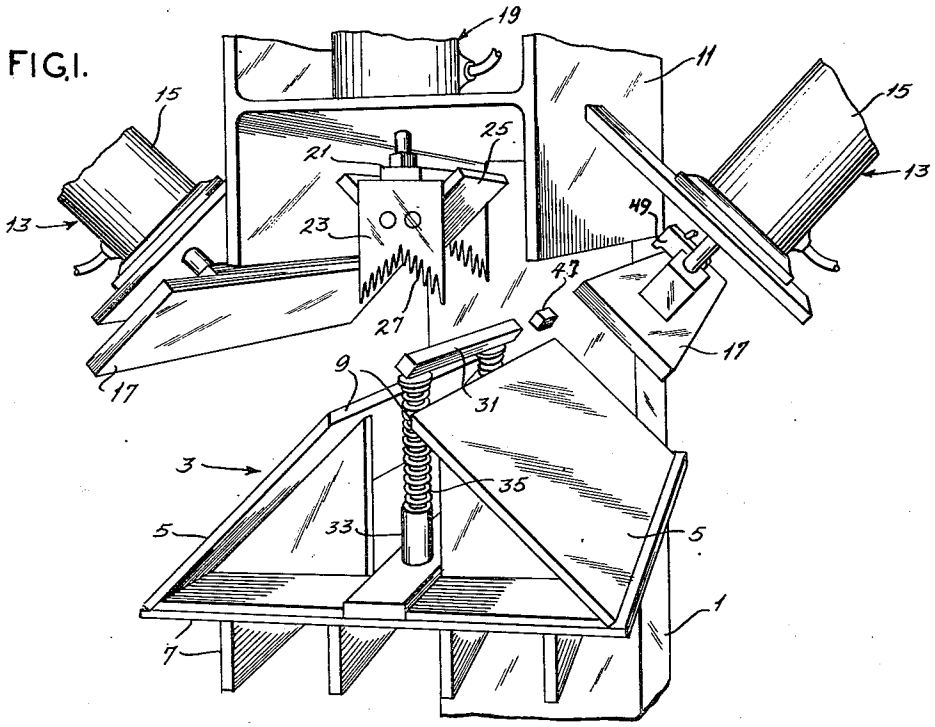



FIG. 3.

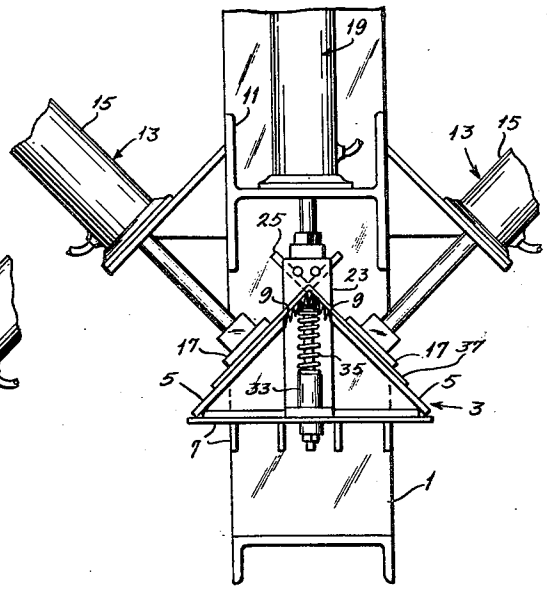
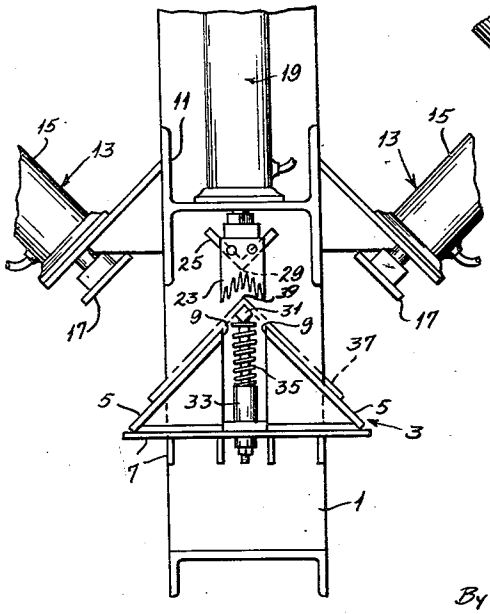



FIG. 2.




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FIG. 4.

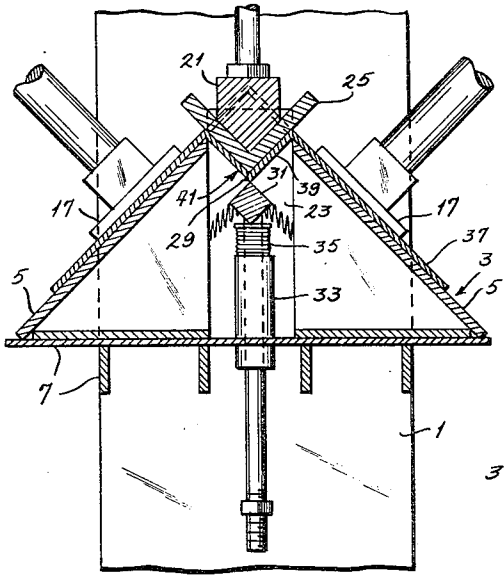



FIG. 5.

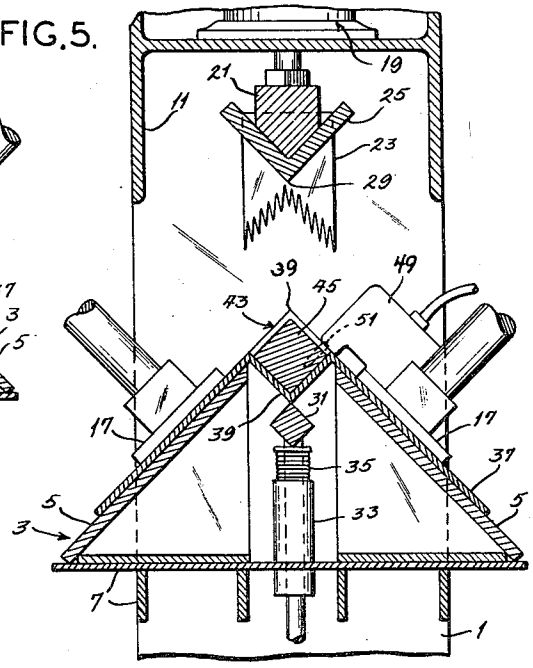



FIG. 6.

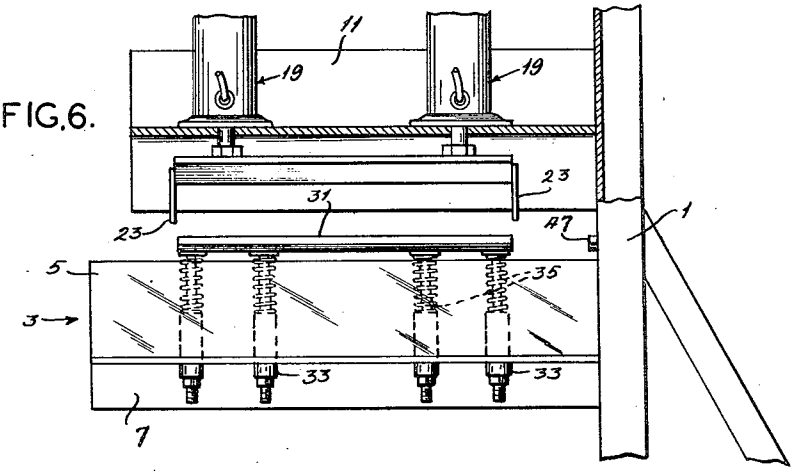
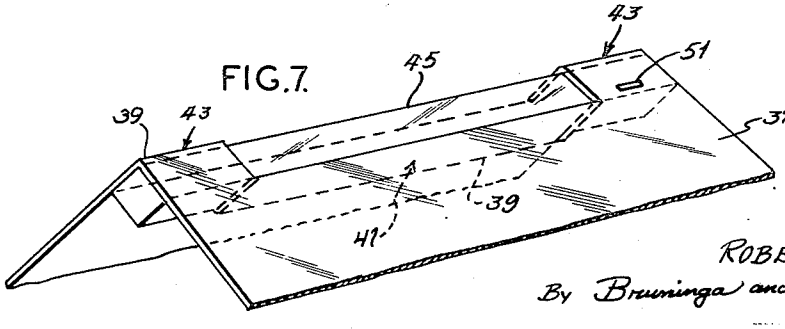



FIG. 7.




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# BOX MACHINES

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Application December 29, 1954, Serial No. 478,377

6 Claims. (Cl. 93—36)

This invention relates to box machines, and more particularly, to apparatus for forming pockets along the corners of a paperboard box and securing reinforcing cleats within such pockets.

In the copending application of H. Victor Bray et al., for Box Machine (Serial No. 383,362, filed September 30, 1953, now Patent No. 2,772,609), there is shown such a machine, but with that machine, the cleat-receiving pockets were to be die cut by the box manufacturer. In other words, a sheet of paperboard was die cut and scored to define corner folds and pocket-forming sections, and the sheet was then formed into a tube for shipment to the user. Thereafter, the die-cut pockets were pressed out by the user on the machine described in the above patent application.

It is an object of this invention to eliminate such die cutting operations, insofar as they relate to the cleat-receiving pockets, by providing a machine which both cuts and shapes the pockets in substantially one operation. Among the several other objects of the invention may be noted the provision of a machine of the character described that permits insertion of cleats while the work remains clamped on the machine; and the provision of a machine that provides for convenient securement of a cleat against longitudinal displacement prior to removal of the box from the machine.

Briefly, in the machine herein disclosed, a pair of transverse cutting knives and a longitudinal bending die cooperate with an angular anvil having a comparatively long forming recess. The cutting knives and bending die may be secured upon a common ram-head, but the knives should project beyond the bending die. Also, the cutting blades preferably have a serrated edge in the shape of a notch, so as to engage the sides of the paperboard box simultaneously with or prior to engagement with the corner fold thereof. The anvil preferably includes a spring-biased pad mounted at the vertex of the anvil opposite the bending die to support the corner fold of the paperboard box during the cutting operation, and which thereafter yields under the advance of the bending die, when a pocket is formed. The spring-bias for this pad is insufficient, however, to return the pocket-forming sections upon retraction of the die; hence a cleat may be inserted within the pocket while the paperboard box remains clamped upon the anvil after retraction of the die. The invention further contemplates that the machine may be equipped with a fastener-driving device, so that a staple may be driven through the corner of the paperboard tube to secure the cleat against lengthwise displacement during subsequent handling operations.

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 of certain apparatus embodying the invention;

Fig. 2 is a reduced end view of the machine shown in Fig. 1;



Fig. 3 is a view similar to that of Fig. 2, but with the cutting knives advanced;

Fig. 4 is a sectional view similar to that of Fig. 2, but with the bending die in its advanced position;

Fig. 5 is a view similar to that of Fig. 4, but with the bending die in its retracted position and showing a cleat inserted within a pocket previously formed;

Fig. 6 is a side elevation of the machine, parts being broken away; and

Fig. 7 is an oblique view of the corner portion of a tube after insertion of the cleat.

It will be understood that cleat-reinforced paperboard containers are frequently utilized in packaging refrigerators and other somewhat bulky items. Usually, wooden cleats are attached to paperboard panels by staples or glue, but another procedure is that of forming re-entrant cleat-receiving pockets along the corners of a paperboard box-forming tube and inserting the cleats lengthwise through these pockets. Heretofore, a paperboard blank has been die cut and scored to define both the corner folds and pocket-forming sections. The blank was then formed into a tube, which was shipped to the user; the pockets being pressed inwardly and cleats inserted by the user. Because of the difficulty encountered in shaping the pockets, it is preferable to equip the user with apparatus of the type described in the aforesaid application. The apparatus disclosed herein is of a type which permits the formation of such cleat-receiving pockets without previous die cutting or scoring.

Referring now to the drawings, the machine is shown to comprise a frame having a column **1**, upon which is supported an elongate anvil **3** of angular cross section, the angle being approximately 45°. The anvil may be constituted by a pair of plates **5** secured in right angular relationship upon a table **7**, which is cantilevered from the column **1**, but the plates terminate short of the vertex of their angle. As such, the inner edges **9** of the blades define a forming recess for cooperation with certain cutting and bending elements mounted opposite this recess.

The frame also includes an arm **11** cantilevered over the anvil in spaced relationship therewith, which arm carries a pair of clamping devices generally designated **13**. Each such clamping device comprises a platen **17** adapted to be moved toward and away from one side **5** of the anvil by means of a power unit **15**, such as a pneumatically operated cylinder and piston. An additional power unit **19** is mounted on the arm **11** between the clamping devices over the recess **9** in the anvil. This power unit **19**, in turn, operates a ram-head **21** after advance of the clamping device **13** and retracts the ram-head prior to release of the clamping device. Cutting knives **23** and a bending die **25** depend beneath the ram-head.

In particular, each knife has a serrated edge **27** generally in the shape of a notch, the angle of the notch preferably being equal to or less than 45° so that the outer portions thereof engage the sides of the work simultaneously with or prior to engagement with the corner vertex. The bending die **25** may be right angular shaped, the vertex **29** thereof extending downwardly but being located above the cutting edges **27** of the knives. The knives otherwise are of a width such as to pass through the recess **9** in the anvil, and the bending die **25** partially enters this recess, although it may also engage upon the edges **9** of the anvil.

It will also be noted that the anvil includes a pad **31** disposed within the recess **9** of the anvil at the vertex. This pad is located opposite the die **25** and terminates short of the cutting knives **23**, so as to permit these knives to pass thereby. The pad otherwise is supported upon plungers **33** biased upwardly by springs **35**, which permit movement of the pad from its advanced position of Figs. 1–3 to a retracted position shown in Figs. 4 and 5. The springs **35** supply a bias which is sufficient to resist in-

ward collapse of the work upon advance of the knives while permitting such collapse when the bending die **25** engages the corner fold of the work.

In operation, a paperboard box or tube having side walls **37** and a corner fold **39** is placed upon the anvil so as to lie flat upon the sides **5**, the corner fold **39** being supported upon the pad **31**. The clamping devices **13** are then actuated to advance their platens **17** against the side walls **37** of the tube and secure them on the anvil. The power unit **19** is then actuated to advance the ram-head **21**.

As illustrated in Fig. 3, the blades **23** first cut across the corner of the work while the corner thereof remains supported upon the pad **31**. As such, the corner portion of the paperboard tube is divided into a plurality of longitudinal sections. The bending die **25**, in following the cutting blades **23**, then presses the center sections inwardly to form a re-entrant pocket, as shown at **41** in Fig. 4. This section **41** necessarily is of a length substantially less than that of the box-forming tube, so as to leave sections **43** for forming the corners of the box.

It will be noted that the pad **31** opposite the bending die **25** is moved downwardly by the die, and that the pad remains in its lower position upon retraction of the die, as illustrated in Fig. 5, so as to permit insertion of the cleat. In bending the portion **41** inwardly, an overcentering effect is achieved, which effect is sufficient to resist return of the spring-biased pad **31**. In other words, the bias of the springs **35** should not be such as to rebend the pocket **41** upon retraction of the bending die.

After retraction of the die, a cleat **45** may be readily inserted from one end of the machine, the cleat passing beneath the corner-defining sections **43** and above the pocket-forming section **41**. Inward movement of the cleat may be limited by engagement with a stop **47** located to align the cleat longitudinally with the box. This stop, in turn, might operate a power-driven stapler **49**, disposed to drive a fastener **51** through one of the sections **41** or **43** into the cleat. This fastener is helpful in preventing longitudinal displacement of the cleat when the tube is removed from the machine. Although the fastener-driving device is shown mounted upon one of the platens **17** to drive a fastener through an unformed end section **43**, it might be located beneath the anvil to drive the fastener through the formed center-section **41**.

Finally, the platens **17** are retracted to clear the work. The box-forming tube would normally be rotated about the anvil, until all four corners have received reinforcing cleats. In order to permit such movement of the work after insertion of a cleat, however, the forming recess **9** must be open the length of the box, and if the anvil is longer than the box, the recess is accordingly longer than the die **25**.

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 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 illustrative. For example, the cutting knives **23** and bending die **25** might be operated by separate power units; or if desired, the clamps **17** and ram-head **21** could be operated by a common power unit, as by providing springs which permit the clamping devices to yield as the knives and bending die are fully advanced. Other modifications will occur to those skilled in the art.

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

1. Box-forming apparatus of the character disclosed comprising an elongate anvil of generally angular cross section, said anvil having a forming recess extending the length of its vertex, a relatively short bending die mounted opposite said anvil for transverse movement into said forming recess, a pair of cutting blades mounted opposite said anvil at the ends of said bending die for movement toward said anvil, means for moving said blades toward said anvil in advance of said die, and means for clamping work upon the anvil prior to advance of said cutting blades.

2. Box-forming appartus as set forth in claim 1, further including a work-supporting pad mounted within the recess of said anvil opposite said bending die, said pad terminating short of said cutting blades and being supported to resist inward collapse of the work upon advance of the cutting blades and to retract upon advance of the die within said recess.

3. Box-forming apparatus as set forth in claim 2, wherein said pad is spring-biased to an advanced position at the vertex of the anvil, the bias being insufficient, however, to return a formed portion of the work to its original position after retraction of the bending die.

4. Box-forming apparatus as set forth in claim 1, wherein said cutting blades have a serrated cutting edge generally in shape of a notch.

5. Box-forming apparatus as set forth in claim 1, further including a fastener-driving device located adjacent the vertex of the anvil to drive a fastener through the work.

6. Box-forming apparatus of a character for forming a pocket along the corner of a box for receiving a cleat, comprising an anvil of right angular cross section, said anvil having a forming recess extending the length of its vertex, clamping platens mounted opposite the sides of the anvil for movement toward and away from the anvil, a ram-head mounted opposite the vertex of the anvil for movement toward and away from the anvil, a bending die projecting from said ram-head for movement into the forming recess, and a pair of cutting blades projecting from said ram-head at the ends of said die and beyond said die for movement toward said anvil in advance of the bending die.

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