June 28, 1932. S. BERGSTEIN 1,864,632

MACHINE FOR MAKING PAPER BOXES OR THE LIKE

Filed Oct. 11, 1928 5 Sheets-Sheet 1

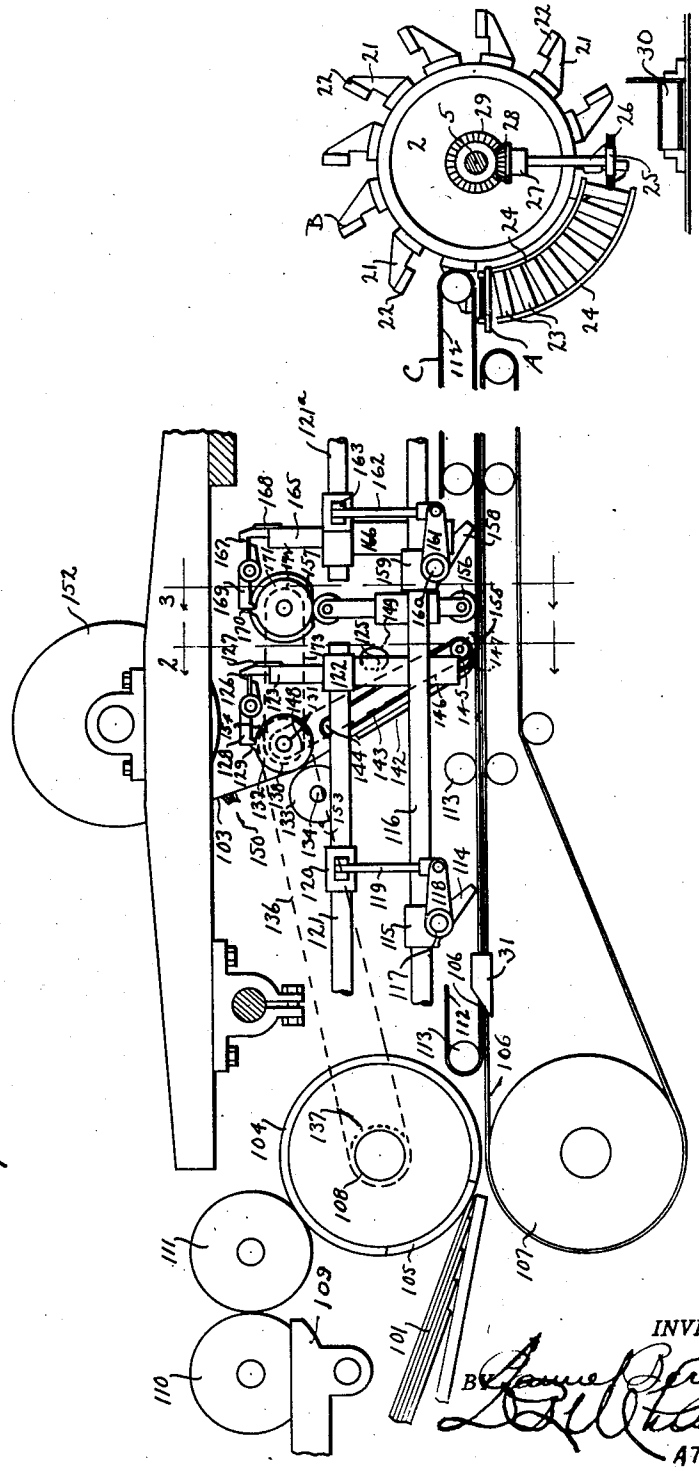

FIG. 1

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MACHINE FOR MAKING PAPER BOXES OR THE LIKE

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Fig. 3

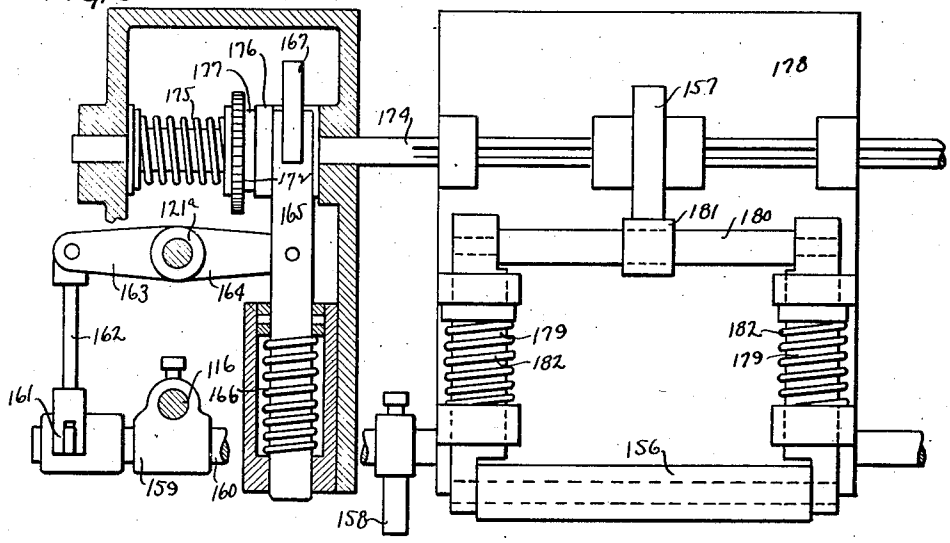
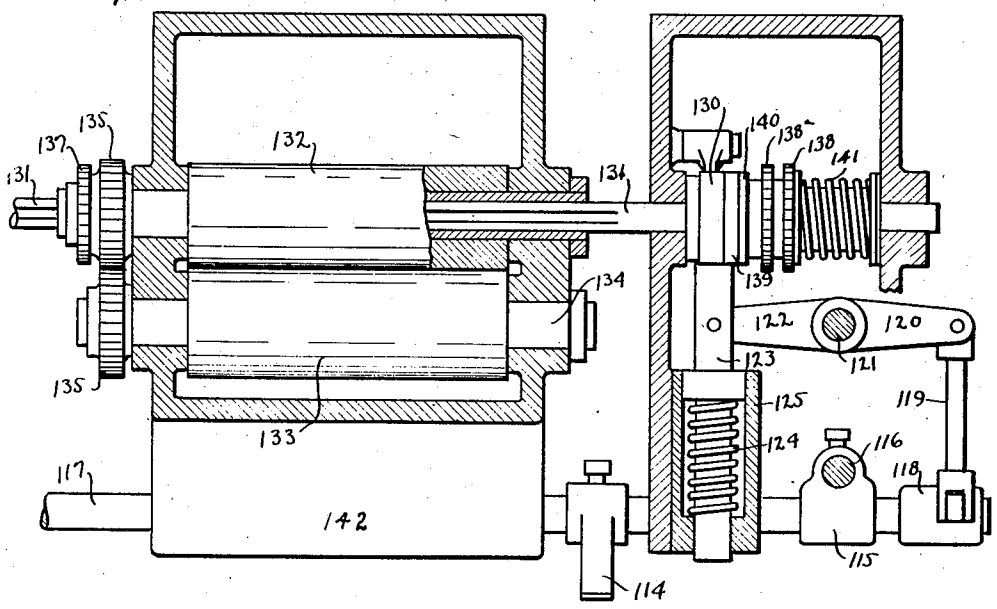


Fig. 2



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MACHINE FOR MAKING PAPER BOXES OR THE LIKE

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Fig. 4

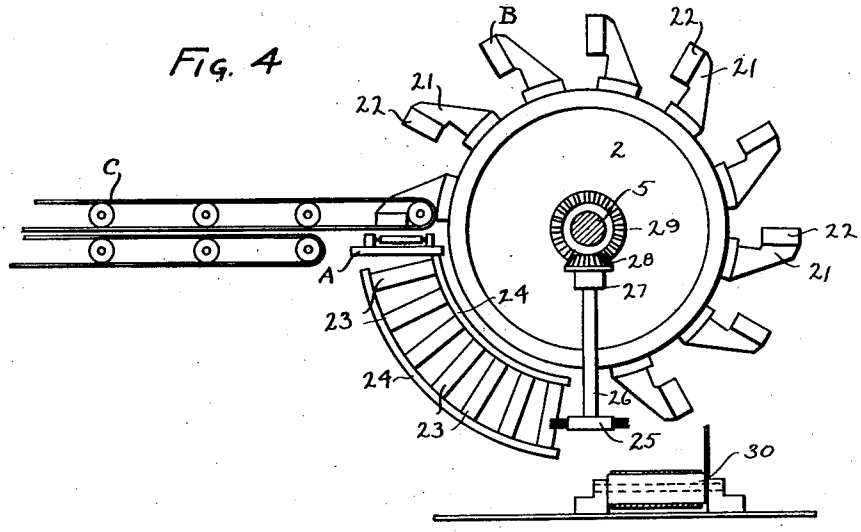

Fig. 5

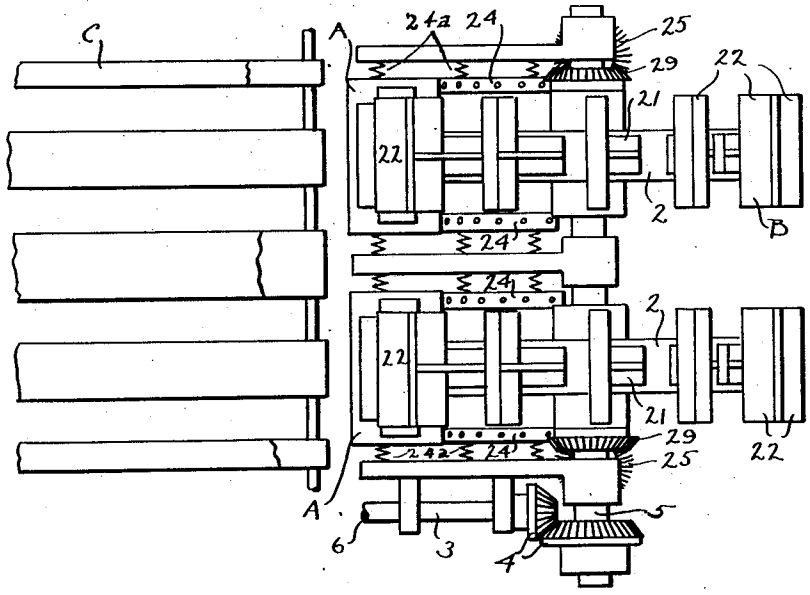

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Fig. 6

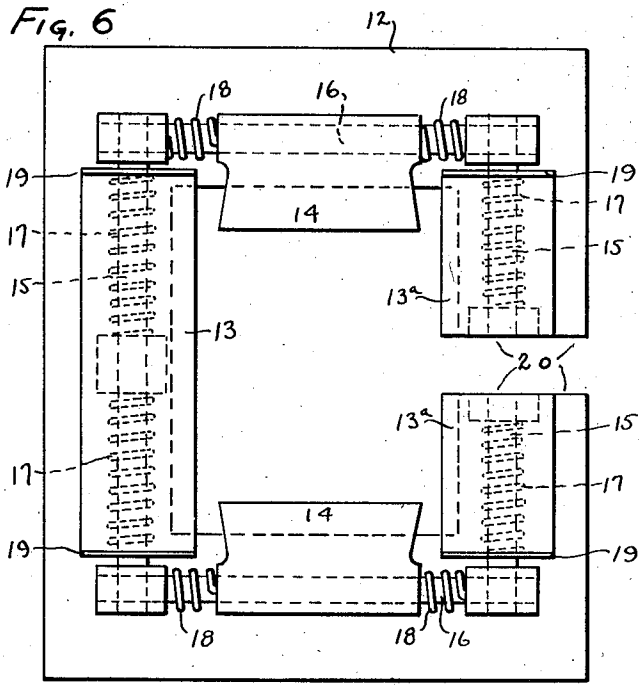


Fig. 7

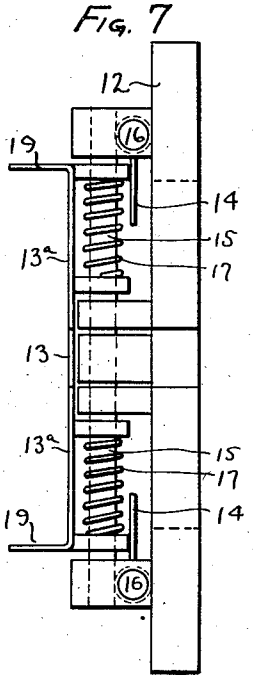


Fig. 8

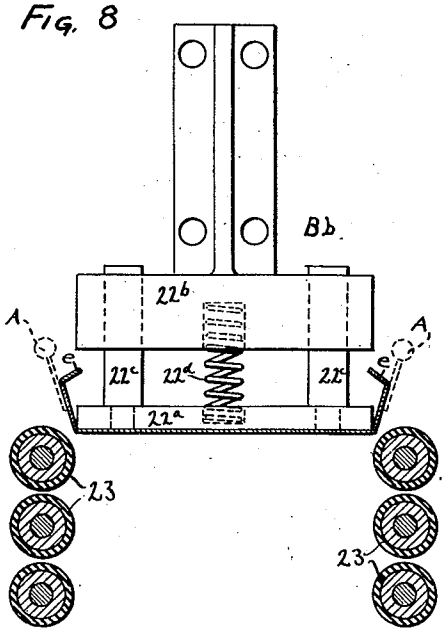
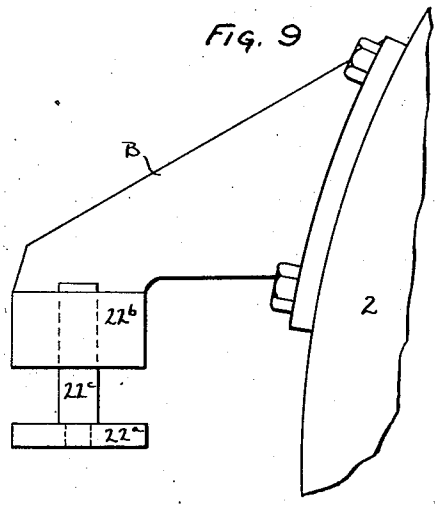


Fig. 9



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MACHINE FOR MAKING PAPER BOXES OR THE LIKE

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Fig. 10

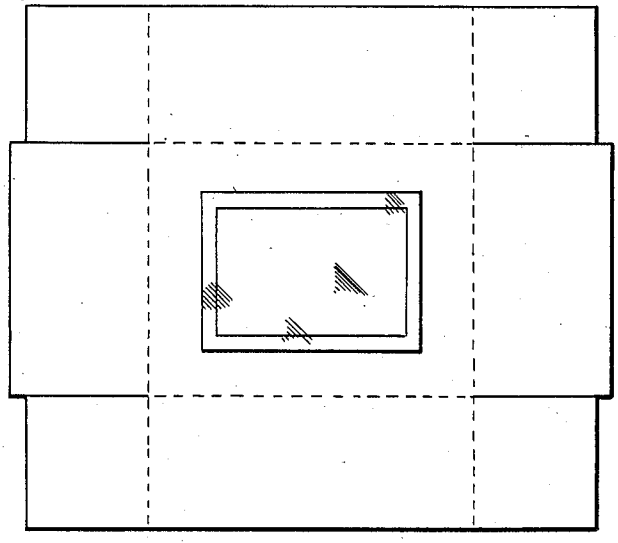


Fig. 11

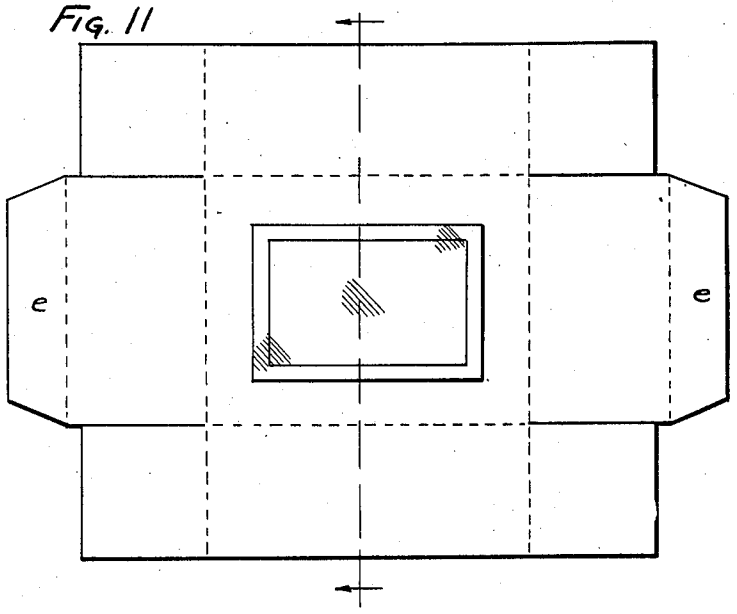
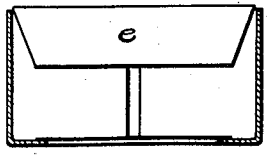


Fig. 12



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Patented June 28, 1932 1,864,632

UNITED STATES PATENT OFFICE

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MACHINE FOR MAKING PAPER BOXES OR THE LIKE

Application filed October 11, 1928. Serial No. 311,859.

This invention relates to a machine and process for making paper boxes.

The invention as here shown is a development of the box making machine set forth in my copending application for patent, Serial No. 282,020, filed May 31, 1928, being a machine for applying a transparency, as Cellophane, to openings of the box blanks before the boxes are formed, the covered openings serving for displaying the contents of sealed boxes.

The practice heretofore in manufacturing such articles, having particular reference to paper boxes, has been to apply the transparent material to the box board by hand methods, involving hand gluing and hand assembling of the two materials, at time and labor cost too high to permit of using the boxes for many products for which they would be desirable.

In the machine herein set forth mechanism for forming the boxes is combined with mechanism for applying the transparent material to the box blanks, in a coordinated machine and process of manufacturing, the movement of the material through the operations of joining the two materials together and for forming the boxes being continuous, or without pause, which makes possible the relatively large output of the machine.

The objects attained in the invention consist in forming the boxes by means of one or more female die members and a rotatable series of male die members for each female die member which coact one with another for forming the boxes progressively, and in gluing the boxes as formed by pressure devices which coact with the male die members, the box blanks being moved to the dies, preferably by automatic feeding mechanism, in the intervals between successive operating relations of the male and female die members.

The invention adapts itself readily to the manufacture of paper boxes from paper blanks prepared in advance with adhesive, for forming the joints, or from blanks to which the adhesive is applied incidental to feeding of the blanks to the box forming dies.

For certain forms of boxes special features of the dies are used, such special features in one form being shown and described herein for illustrative purposes, the principle of the invention being adaptable for producing a wide range of boxes of conventional and special forms.

In the drawings:

Fig. 1 is a detail view in side elevation of the box making machine;

Fig. 2 is a view in cross section of the machine on line 2—2 of Fig. 1;

Fig. 3 is a view in cross section of the machine on line 3—3 of Fig. 1.

Fig. 4 is a view illustrating the box forming mechanism in side elevation;

Fig. 5 is a plan view of the mechanism illustrated in Fig. 4;

Figs. 6–7 are plan and end views respectively of the female die member;

Figs. 8–9 are detail views in end and side elevations respectively of one of the male die members in a modified form;

Figs. 10–11 are views of box blanks for boxes of different forms suitable for production on the machine as herein shown and described;

Fig. 12 is a view of a half section of a box made from the blank shown in Fig. 11.

The means employed for practicing the improvements as herein shown and described consist in combining with a well known type of box blank feeding mechanism, means for assembling adhesively two different kinds of material for the box blanks and in forming the boxes on the same machine, the operations of combining the two unlike materials and forming and gluing the boxes being in a continuous sequence. The construction and operation of the box blank feeding mechanism being well known in the art, only such parts of the mechanism that are directly associated with the improvements applied thereto are shown in the drawings and herein described.

The box material as illustrated in Figs. 10–11 consists of box blanks cut and scored for assembling; also the material may be prepared in advance with adhesive for assembling the box board and the transparent material and for forming and sealing the boxes,

or the adhesive may be applied to the box blanks on the machine. For box stock prepared in advance with adhesive means are provided on the machine for moistening the adhesive, and for stock not prepared in advance with adhesive, means are provided on the machine for applying adhesive to the box blanks before the two materials are brought together.

In Fig. 1 the box blanks 101 are shown as arranged for feeding the blanks singly to the machine, common forms of box blanks being illustrated in Figs. 10–11. The transparent material 103, as here shown is wound in a continuous strip on a roll, the portion required for each box blank being drawn off the roll and severed from the sheet incidental to the operation of assembling one material with the other.

The feeding mechanism for the box blanks, as illustrated in Fig. 1, is of well known construction and, accordingly, is shown more or less conventionally. The structure shown consists of a feed roller 104 mounted on a shaft 108 and provided with a friction pad 105 for engaging the outer sheet of box material and moving the same between the roller and a belt 106 traversing a pulley 107 opposite roller 104.

Any suitable gluing or moistening device may be arranged on shaft 108 for rendering the box material adhesive, accordingly as the paper stock is or is not prepared with adhesive. Such devices are well known in the art and do not require a detail showing in their relation to the improvements herein set forth. A glue moistener is shown conventionally in Fig. 1 in its relation to the feed roller 104. The essential parts of the moistener consist in a container 109 for water and rollers 110—111 for conveying moisture to roller 104 on shaft 108 which acts to transfer the moisture to the box blank prepared with adhesive for assembling the two materials.

As the paper blanks pass from the feed roller 104 the same are held frictionally in engagement with belt 106 by a series of pressure rolls 113, traversed by a belt 112, the forward edge of each blank being moved into engagement with the lower end of a depending arm 114 which is pivoted on a bracket 115 fixed on a rod 116 extended longitudinally of the machine. As the arm 114 is actuated successively by the blanks the movement is transmitted through the pivot shaft 117, and arm 118 secured to the pivot shaft, a link 119 and an arm 120 to a shaft 121 which extends parallel with rod 116 and has limited rotatable movement; from shaft 121 the movement is further transmitted through an arm 122 to a vertically extended, spring-tensioned bolt 123, the lower end of the bolt and the spring 124 for normally holding the bolt in raised position being supported in a housing 125. The upper end of the bolt is provided with a pivoted latch or finger 126 tensioned by a spring 127 for engaging the adjacent end of a pivoted pawl 128 which coacts at its opposite end with a shoulder 129 on a disc 130 secured to a shaft 131 upon which an upper feed roller 132 is mounted, the roller being operably connected with a lower feed roller 133 mounted on a shaft 134 by gears 135. The upper feed roller shaft is connected to the paper blank feed roller shaft 108 by a chain and sprocket connection 136—137—138, sprocket 138 being free rotatably and slidably on shaft 131, the driving connection between the sprocket and the shaft consisting in a friction clutch of well known construction comprising as here shown the disc 130 which is secured to the shaft, a fiber disc 139 interposed between a disc 140 formed integrally with sprocket 138, and a spring 141 arranged telescopically of the shaft and acting to exert pressure on the sprocket for effecting the friction drive between the sprocket and the shaft.

When lever 114 is moved upward by the forward edge of a paper blank, bolt 123 will be forced downward against the resistance of spring 124, and pawl 128 will be moved out of engagement with disc 130; the feed rollers 132—133 will then be rotated through the chain and sprocket connection 136—137—138 and the friction clutch on shaft 131, pawl 128 being again in position under the action of spring 124 to stop the operation of the rollers upon completion of one revolution.

The function of feed rollers 132—133 is to feed a strip of material 103, Cellophane as used in the product herein described, from a roll 152 in timed relation with the movement of the paper blanks on belt 106, the end of the strip of the portion fed forward at each operation being moved into engagement with the adhesive portion of a paper blank by a second feeding mechanism consisting of an inclined guide 142 and a friction belt 143 traversing pulleys 144—145 and coacting with guide 142 for moving the strip of material therebetween, the friction belt being driven by a chain and sprocket connection 146—147—148, an idler roller 149 acting to keep the belt taut. A herring bone brush 150 is lightly tensioned in any suitable manner against the strip of Cellophane for smoothing the surface of the strip before it passes between the feed rollers.

Feed rollers 132—133 are of the required diameter for feeding the Cellophane strip forward to the extent required for presenting an end portion upon each feeding action sufficient to cover the adhesive portion of the paper blank. As the end of the strip contacts with the adhesive on the blank both materials move together in superposed relation under pressure devices which act to effect firm adhesion therebetween.

Partial severing of the strip material is

effected by perforators 153—154 on feed rollers 132—133, complete severing taking place intermediate the ends of the guide 142 by tearing of the strip along the line of perforation after the forward end of the strip has been joined adhesively to the paper blank. The feed rollers 132—133 are so timed with feed roller 104 that the end of the strip material will be protruding from the lower end of guide 142, as indicated at 155, upon arrival of each paper blank at that point. As the length of the strip material applied to each blank is determined by the diameter of the feed rollers 132—133, it will be seen that the portion so applied can be made to approximate closely in size and general outline the portion of the paper blank it is to cover.

As the forward edge of the paper blank advances beyond the lower end of the friction feed guide 142 it moves under a pressure roller 156 which during the movement of the forward edge of the blank thereunder is in raised position above the plane of movement of the blank. As the blank is further advanced the forward edge engages a depending arm 158 and moves the arm upward in the same manner as the upward movement of arm 114. Lever 158 serves for controlling the operation of a cam 157 through an interconnecting mechanism consisting of a bracket 159 on rod 116, a shaft 160 supported in the bracket to which the lever is pivotally connected, an arm 161, link 162 and arm 163 connecting shaft 160 with shaft 121*a* which is axially aligned with shaft 121. From shaft 121*a* the movement is transmitted through an arm 164 to a spring-tensioned bolt 165, comprising a spring 166, latch finger 167 tensioned by a spring 168 for actuating a pawl 169 which coacts with a shoulder 170 of a disc 171 which is mounted on the same shaft with cam 158. The cam shaft is driven with a chain and sprocket connection 138*a*—172—173, sprocket 138*a* being formed integrally with sprocket 138. The driving connection between sprocket 172 and the cam shaft 174 consists of a friction clutch comprising a spring 175 for moving the sprocket axially on the shaft, a disc 176 secured to the shaft and a friction disc 177 interposed between the sprocket and disc 176. Parts 158 to 177 inclusive are substantially the same in construction and operation as parts 114 to 139 inclusive herein described in greater detail.

When the cam shaft 174 is released upon actuation of lever 158, the cam 157 will be actuated one turn through the connection 138*a*—172—173, operation of the cam acting to force roller 156 against the superposed sheets of material 101 and 103, as the same are moved by the blank carrier belt 106 thereunder, with the required pressure for effecting firm adhesion between the sheets. The connection between the cam and the pressure roller consists of a depending frame structure 178 in which a spring-tensioned frame 179—180 is slidably supported, the upper frame member 180 being provided with a roller 181 in operable relation with cam 157, the frame 179—180 together with the pressure roller 156 being held in raised position, when the cam is in neutral relation as indicated in Fig. 1, by opposite springs 182 arranged telescopically of the vertical frame members 179.

The pressure mechanism including the cam releasing arm 158 and the cam 157 are supported for lateral adjustment transversely of the machine, the cam shaft 174 being splined for the purpose and the arm 158 provided with any suitable means as a set screw for securing the same on rod 160. Thus the machine as a whole is readily adaptable, by shifting the position of the pressure mechanism and by interchanging feed rollers of different diameters for the Cellophane material, for applying the material in any predetermined size of the applied sheet over a corresponding portion of the paper blank.

As illustrated in Figs. 4–5, the box forming mechanism is shown in a double unit for a duplex machine, the location of the female die members being indicated at —A in fixed relation on the frame, the male die members —B being supported in fixed relation in series on rotatable actuators 2, being equally spaced one from another in the plane of rotation of the actuators to register successively with the female die members, the operating connection for the actuators as here shown, consisting in a shaft 3, bevel gears 4 and a shaft 5 upon which the actuators are mounted. Shaft 3 is part of the box blank feeding mechanism —C which is of well known construction except for some minor adaptations of the mechanism to the operating requirements of the novel box forming dies. For combining the operation of the forming dies with the feeding mechanism shaft 3 is extended by a suitable coupling for making the driving connection to shaft 5.

The female die members —A as best shown in Figs. 6–7 consist in open, rectangular shaped die housings 12, supported upon the upper faces of which are a series of coacting plates 13, 13*a* and 14, the plates being pivoted on shafts 15—16 and tensioned upward by springs 17—18 which act to return the plates to their normal horizontal position after each box forming operation. Plates 13 and 13*a* are substantially above plates 14 and have upwardly extended flanges 19 which act to effect certain folds of the box blanks as the same are formed in the dies. The die housing 12 and plates 13*a* are split at 20 for providing clearance for the supporting shanks 21 of the forming heads 22 of the male die members —B, to permit the male members to pass through the female mem-

bers incidental to the box forming operations.

The box blanks illustrated in Figs. 10–11 are for conventional forms of boxes. The blank shown in Fig. 10 is suitable for production on the forming dies as illustrated in Figs. 4, 6 and 7, and the blank shown in Fig. 11 for production on the dies illustrated in Figs. 6–7 and 8–9, the machine otherwise, as here shown, being adaptable for producing boxes from either form of blanks.

As a box is formed by the coaction of male and female die members, they are passed through the female die folded over the male die, moving thus into engagement with opposite series of pressure rollers 23 supported in opposite curved frames 24, tensioned by opposing springs 24*a* which act, by exerting pressure on the adjacent faces of the boxes, being the faces upon which the joints of the boxes are formed, to effect adhesion of the folded portions along the joints. The pressure on the boxes is sustained the required interval of time for the glue to set before the boxes pass out of engagement with the pressure rollers. The pressure rollers are supported axially substantially on radii of the center of rotation of the male die support 2, the movement of the boxes in the forming operation being substantially at right angles to the axis of rotation of the rollers. The pressure rollers for the forms of boxes here shown are preferably rubber covered which provides yielding surface contact with the boxes and is more effective for producing uniform sealing of the joints.

Adjacent the end of each series of pressure rollers 23 is a brush 25 rotatable on a shaft 26 also on a radius of the center of the support 2. The brushes are operated by a shaft and gear connection 27, 28—29 and act to remove the boxes from the male die members by frictional engagement therewith, the boxes falling upon a conveyor of any suitable construction, shown conventionally at 30, for removing them from the zone of operation of the machine.

The modified construction of the box forming die illustrated in Figs. 8–9 consists of the female die member —A, a detail of which is shown in dotted outline, and the male die members B*b* one of which is shown. Part —A is the same as the corresponding part illustrated and described in connection with Figs. 4–7. Parts —B*b* are composed of two sections 22*a*—22*b* which are spaced one from the other transversely of the die head, the lower part 22*a* being supported by means of opposite vertical stems 22*c* slidable in part 22*b* for providing relative movement axially of the stems between the parts which are held in their normally spaced relation by a compression spring 22*d* intermediate stems 22*c*.

Spring 22*d* is of the required power for sustaining parts 22*a*—22*b* in their normally spaced relation during the initial box forming operation in the female die —A, the resistance of the spring being overcome upon engagement of part 22*a* with the pressure rollers 23, thus causing relative movement to be effected between parts 22*a*—22*b* for presenting solid side faces of the box forming head opposed to the pressure rollers for forming the adhesive joints. Upon movement of the male die members beyond the zone of the pressure rollers, spring 22*d* acts to restore parts 22*a*—22*b* to normal relation.

The modified construction above described is suitable for boxes illustrated in Figs. 11–12, which differ from boxes made from blanks illustrated in Fig. 10 by the added inner end sealing flaps —*e*, both forms of the boxes illustrated in Figs. 10–11–12 being of a common type.

Incidental to the movement of the box blanks illustrated in Fig. 11 through the blank feeding mechanism —C, flaps —*e* are turned upward at an angle to the body of the blanks which are delivered over the female die with flaps —*e* partially folded as indicated in Fig. 8. The means provided in the blank feeding mechanism for effecting the partial fold of flaps —*e*, consist in opposite fixed guides 31 of the usual construction which engage the flaps as the blanks are moved forward and turn them up. In the box forming operation, as illustrated in Fig. 8 the upper male die members 22*b* act to complete the fold of the flaps before the boxes move between the pressure rollers 23.

It will be apparent from the drawings and the foregoing detailed description that boxes generally suitable for forming by reciprocating dies will also be suitable for forming by the progressive dies —A—B comprised in my invention, the production capacity of the progressive dies being relatively much greater.

While pressure means are employed for sealing the boxes after the same pass from the female die, it will be apparent that certain forms of boxes, having particular reference to light weight boxes, can be sealed by the coaction of the male and female dies. The added pressure devices will be more effective, however, for manufacturing the general run of boxes.

As far as I am aware, my invention as herein set forth is the first of its kind to embody the features of assembling the different box materials, namely, the transparencies and the paper board, and for forming the boxes in a coordinated machine and process of manufacturing.

I claim as my invention:

1. A paper box making machine including a female die, a series of male die members movable progressively into operable relation with the female die for forming the boxes, feeding means for moving the box blanks to the female die, including means for

rendering the blanks adhesive and for effecting an initial fold on the blanks, and pressure means coacting with the male die members for sealing the boxes, each of the male die members comprising a divided box forming head spaced one part from another for adapting the dies to said fold of the box blanks in the forming operation of the boxes, and movable one part relative to another for reducing the said space therebetween for sealing the boxes.

2. A paper box making machine including a female die, a series of male die members movable progressively into operable relation with the female die for forming the boxes, feeding means for moving the box blanks to the female die, including means for rendering the blanks adhesive and for effecting an initial fold on the blanks, and pressure means coacting with the male die members for sealing the boxes, each of the male die members comprising a divided box forming head, spaced and spring-tensioned one part relative to another for adapting the dies to said fold of the box blanks in the forming operation of the boxes, and movable one part relative to another for reducing the said space therebetween for sealing the boxes.

3. A paper box making machine including a female die, a series of male die members movable progressively into operable relation with the female die for forming the boxes, feeding means for moving the box blanks to the female die, including means for rendering the blanks adhesive and for effecting an initial fold on the blanks, and pressure means coacting with the male die members for sealing the boxes, each of the male die members comprising a divided box forming head spaced and spring-tensioned unyieldably one part relative to another for adapting the dies to said fold of the box blanks in the forming operation of the boxes, and yieldable one part relative to another upon engagement thereof with the said pressure means for sealing the boxes.

In testimony whereof I affix my signature.

SAMUEL BERGSTEIN.