March 13, 1945. J. C. MENDES 2,371,179

COLLATING MACHINE AND METHOD OF ASSEMBLING SHEETS

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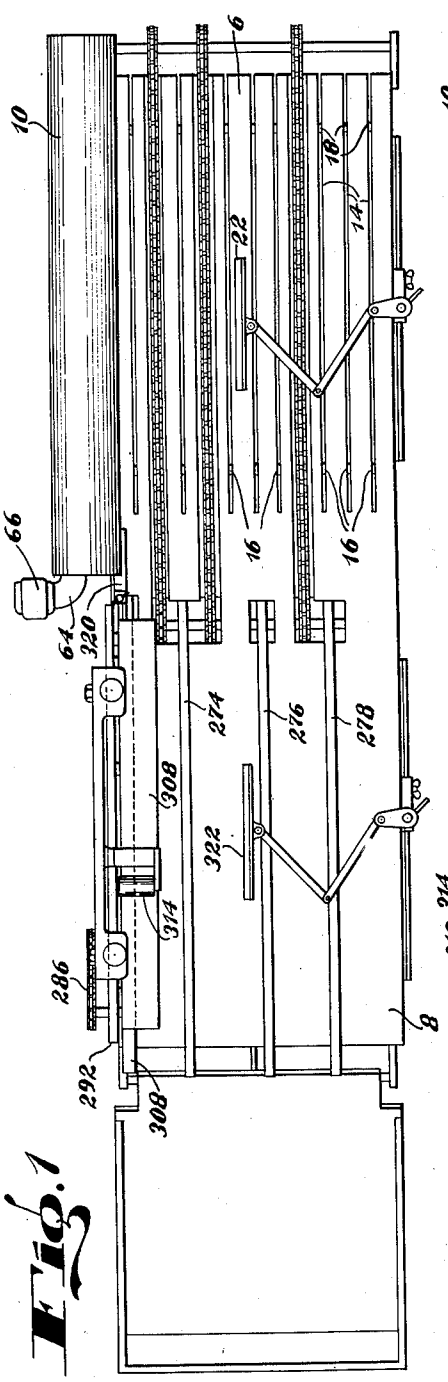


Fig. 1

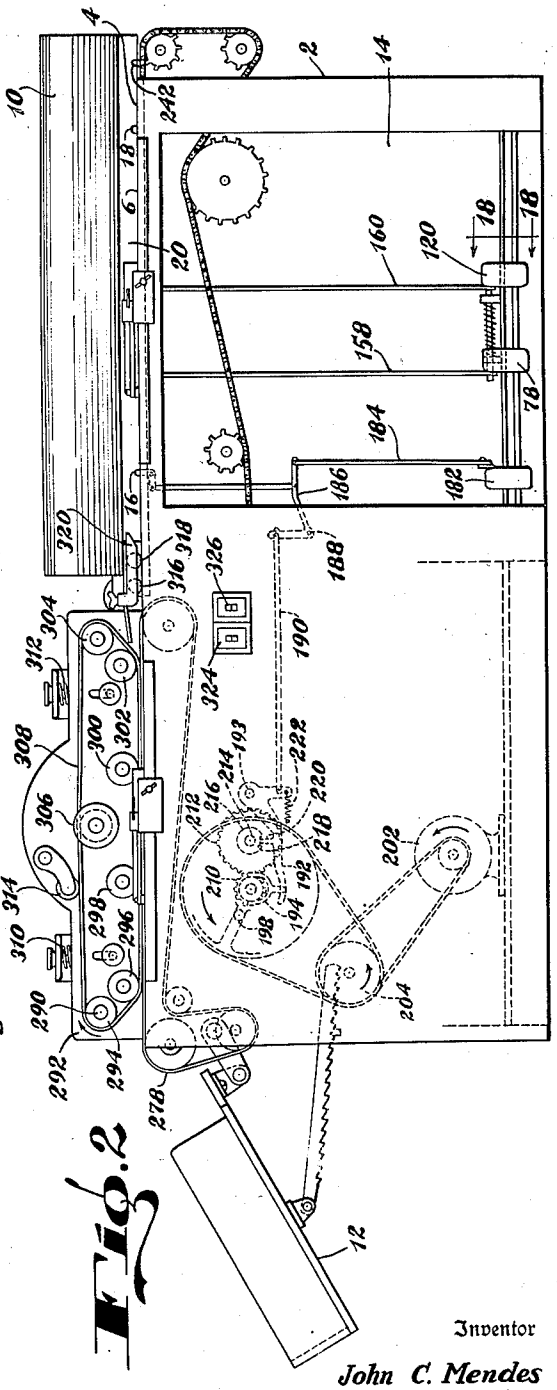


Fig. 2

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COLLATING MACHINE AND METHOD OF ASSEMBLING SHEETS

Filed Aug. 11, 1941 5 Sheets-Sheet 2

Fig. 4

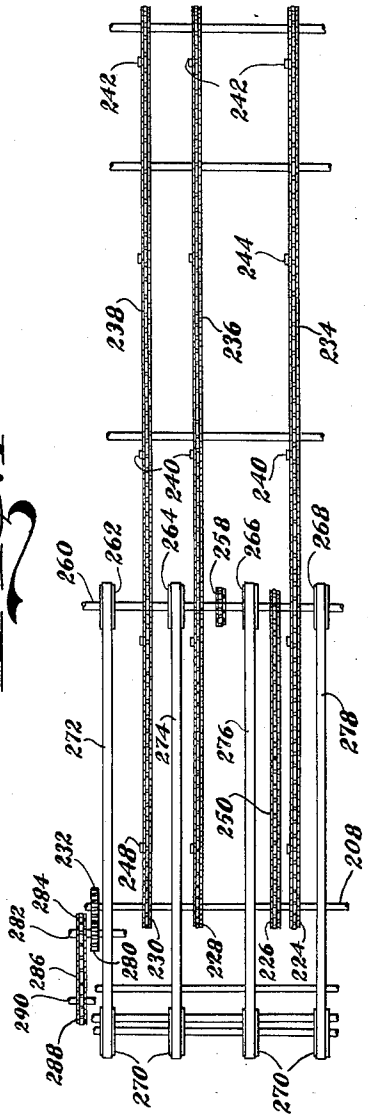


Fig. 5

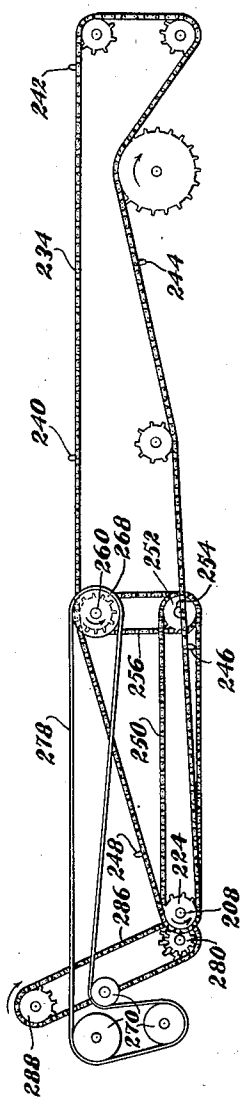
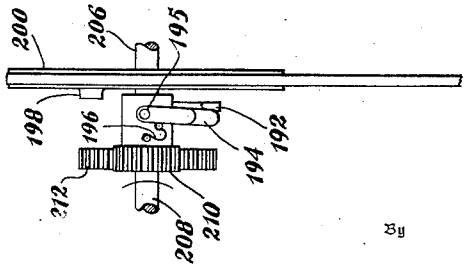


Fig. 3



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COLLATING MACHINE AND METHOD OF ASSEMBLING SHEETS

Filed Aug. 11, 1941 5 Sheets-Sheet 3

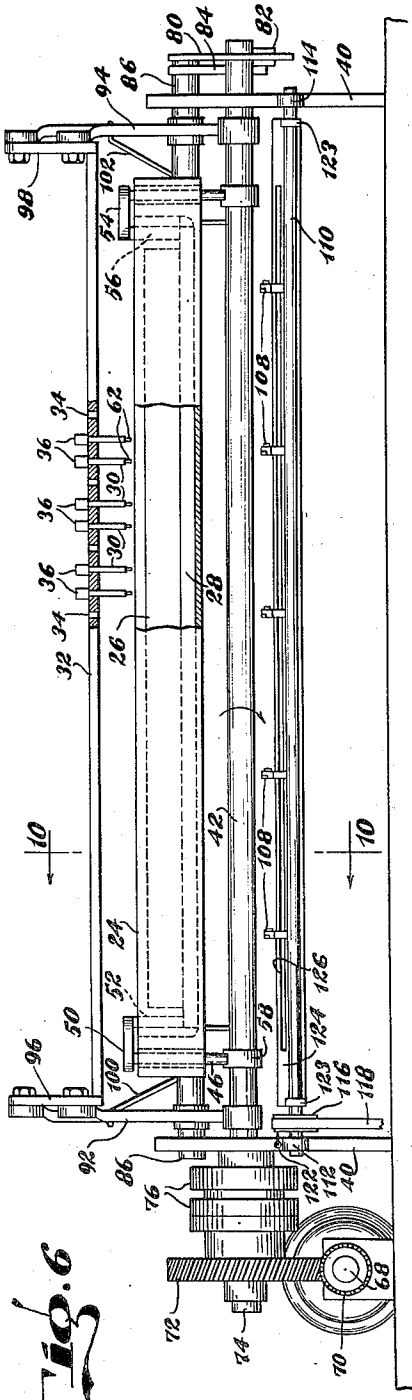


Fig. 6

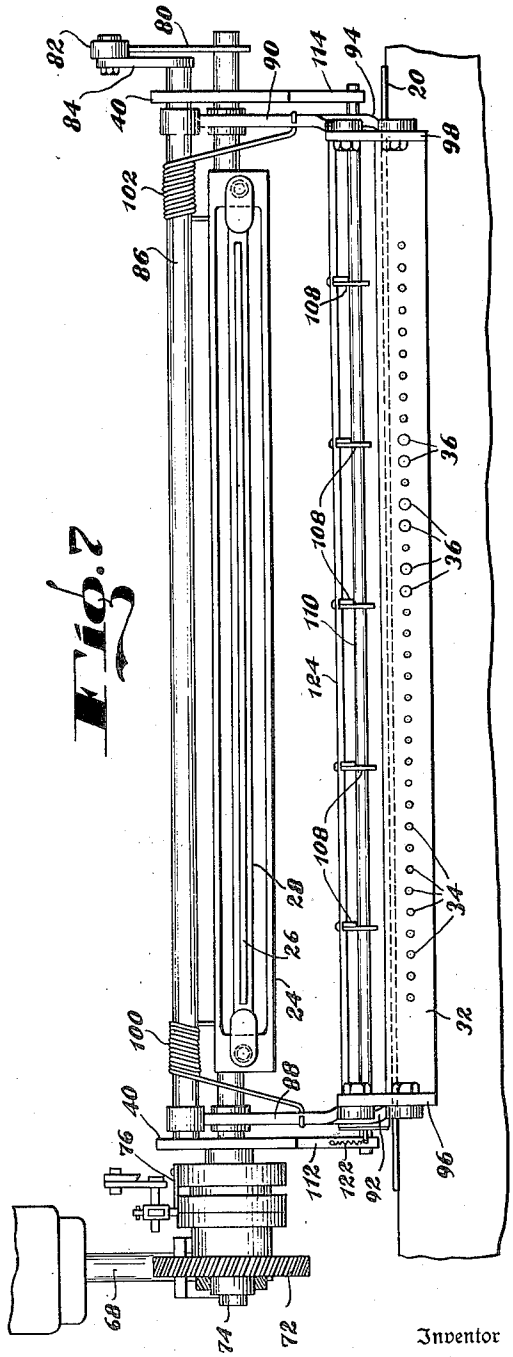


Fig. 7

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COLLATING MACHINE AND METHOD OF ASSEMBLING SHEETS

Filed Aug. 11, 1941 5 Sheets-Sheet 4

Fig. 8

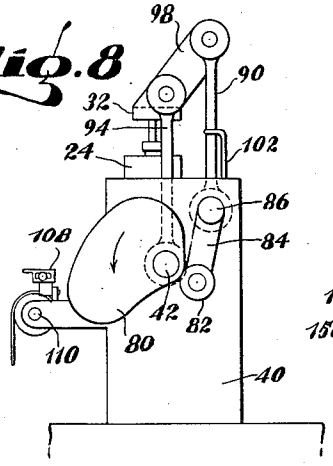


Fig. 10

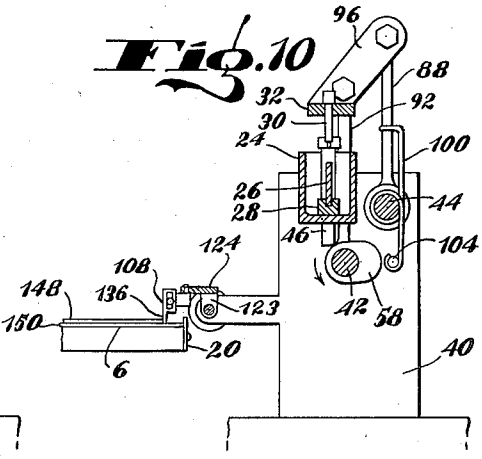


Fig. 9

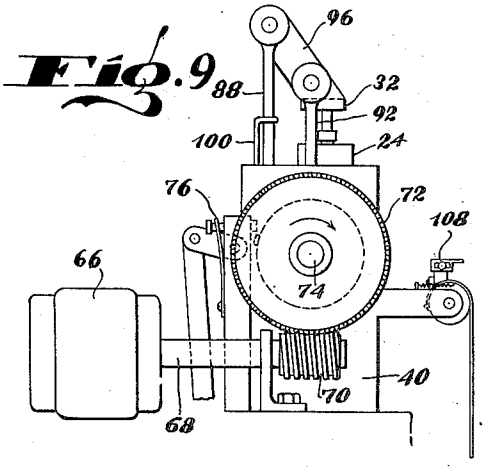


Fig. 11

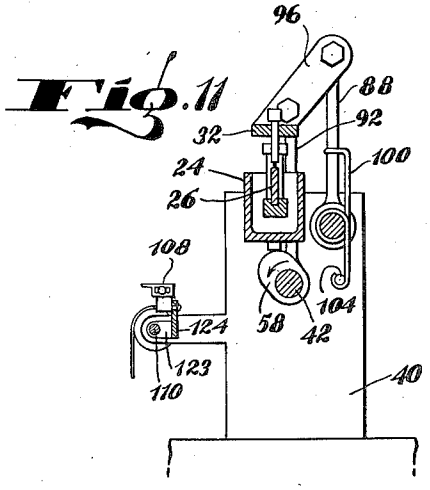
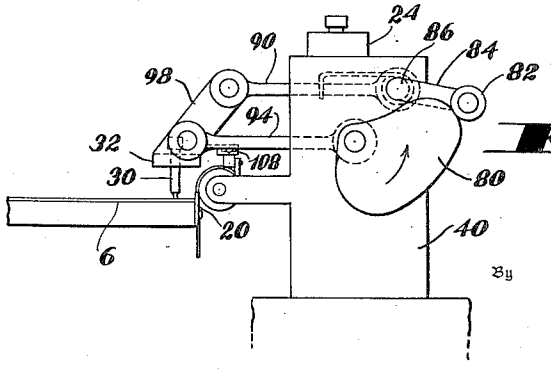


Fig. 12



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COLLATING MACHINE AND METHOD OF ASSEMBLING SHEETS

Filed Aug. 11, 1941 5 Sheets-Sheet 5

Fig. 13

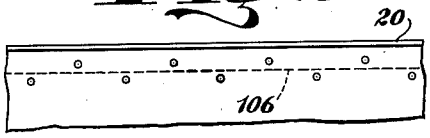


Fig. 14

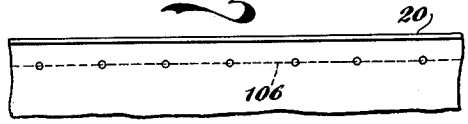


Fig. 15

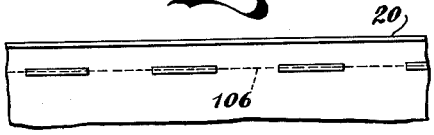


Fig. 16

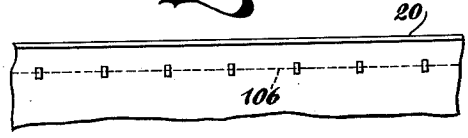


Fig. 17

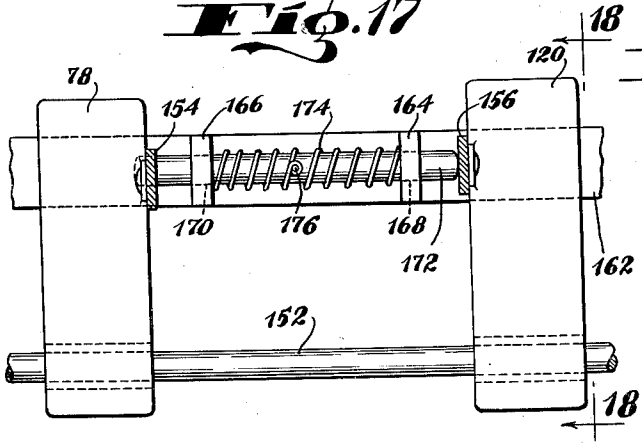


Fig. 18

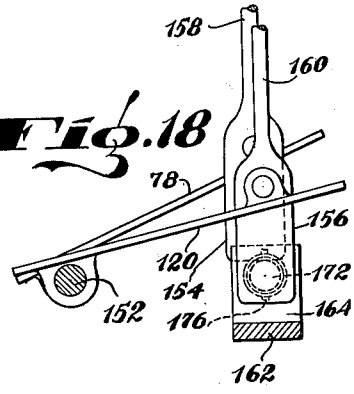


Fig. 19

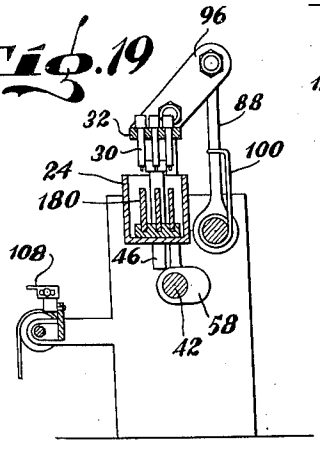


Fig. 20

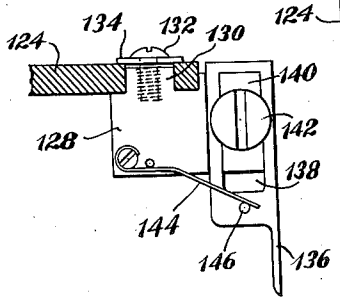
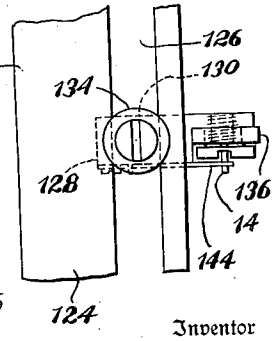


Fig. 21



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Patented Mar. 13, 1945 2,371,179

UNITED STATES PATENT OFFICE

2,371,179

COLLATING MACHINE AND METHOD OF ASSEMBLING SHEETS

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Application August 11, 1941, Serial No. 406,327

22 Claims. (Cl. 270—58)

This invention relates to a means and a method of assembling a plurality of sheets of paper in fixed relationship.

One of the principal objects of the invention is the assembling of printed business forms having positioned therebetween sheets of carbon paper. The assembling of a plurality of sheets in this fashion is commonly called collating, and an individual package of sheets consisting of the printed sheets with or without carbon papers are called collated forms.

Another of the objects of the invention is to provide a machine on which may be presented the proper sheet for insertion and gluing at that stage, automatic means for the application of glue to the previous sheet, means for positioning the sheet in proper relation to those previously assembled, and means for removing the collated pack to a collecting location.

A further object of the invention is to provide novel gluing means operable automatically or under the control of an attendant whereby a desired quantity of glue may be transferred from a glue source to the paper at desired locations and in desired formations. That is to say, the glue may be applied to the paper in spot form of any convenient diameter or it may be applied in the form of a continuous line or dot-and-dash, or otherwise, as may be most appropriate for the work to be accomplished.

A further object of the invention is to provide a machine which performs the method of the invention which is suitable for economically assembling in collated form small quantities of sheets. Heretofore, in the manufacture of collated forms, it has been necessary to utilize machines which required an expensive "make ready," therefore necessitating a large run if the price to the user was to be brought within a reasonable figure. Through the use of the present invention, the expensive "make ready" is eliminated, and as a result, short runs are made as cheaply as longer runs.

Another object of the invention is to provide specific gluing mechanism which is capable of applying glue at selected spots or in selected formations to a sheet, the construction of the mechanism insuring that the character of the glue applications will not vary during long runs of the machine. This is of great importance, as heretofore the glue areas tend to enlarge as glue builds up on the applying mechanism.

A further object of the invention is to provide a specific gluing mechanism in which the means that applies the glue to the sheet receives its supply in limited quantities from other mechanism that transfers the glue from the glue supply to the final applying means.

A further object of the invention is to provide a collating machine which may be used either in connection with the assembling of a plurality of individual sheets or may be used with sheets coming into the machine from continuous forms. In the latter case, the sheets are collated while still part of the continuous form, and then, after all are assembled, they are severed to form a completed individual pack.

In general, it may be said that the object of the invention is to provide cheap, economical and efficient means of making a collated form or pack in which the sheets will be accurately aligned, securely glued and in proper condition for immediate use thereafter.

One of the principal types of collated forms is the so-called "snap-out" form, in which the printed sheets have weakened tear lines across the top whereby all the interleaved carbons may be "snapped out" from the sheets, the latter separating from the header at the tear lines. The invention is particularly adapted for the assembly of this type of collated pack.

These and other objects of the invention will hereinafter appear as the description proceeds with the air of the accompanying drawings, in which:

Fig. 1 is a plan view of the entire machine.

Fig. 2 is a front elevation of the machine shown in Fig. 1.

Fig. 3 is an end elevation of the clutch used to operate the paper conveying mechanism.

Fig. 4 is a plan view of the paper conveying mechanism that is set in operation by the clutch shown in Fig. 3.

Fig. 5 is a front elevation of the paper conveying mechanism shown in Fig. 4.

Fig. 6 is a front elevation of the gluing head with the paper supporting table removed.

Fig. 7 is a plan view of the gluing head in glue applying position.

Fig. 8 is a side elevation of the gluing head looking from the right of Fig. 6.

Fig. 9 is a side elevation of the gluing head looking from the left of Fig. 6.

Fig. 10 is a sectional elevation on the line 10—10 of Fig. 6 but with the carbon stops shown in down position on the paper table.

Fig. 11 is a sectional elevation on the line 10—10 of Fig. 6 just after the gluing head has been set in operation and with the carbon stops in up position.

Fig. 12 is a side elevation of the gluing head looking from the right of Fig. 7.

Figs. 13, 14, 15 and 16 show some of the glue formations that may be applied to the sheets.

Fig. 17 is an enlarged front elevation of the foot control mechanism shown in Fig. 2 that initiates operation of the gluing head and carbon stops.

Fig. 18 is a sectional elevation of the foot control mechanism on the line 18—18 of Fig. 2.

Fig. 19 is a sectional elevation of the gluing head corresponding to Fig. 10 but which utilizes a plurality of glue applying bars and corresponding rows of gluing fingers.

Fig. 20 is a side elevational detail of a carbon stop.

Fig. 21 is a plan view of Fig. 20.

The machine comprises broadly two parts, first, the gluing mechanism proper, which includes the table on which the paper sheets are positioned and the means for applying the glue to the paper, and operable under the control of the operator; and secondly, means for removing the collated sheets from the gluing mechanism, which means may be related to the controls of the gluing mechanism so that the sheets may be taken away from the gluing table at the proper time.

Referring to Figs. 1 and 2, the machine consists essentially of a supporting frame 2, which carries a bed or table 4 extending the full length of the machine. The right-hand part of the bed, as at 6, is the area on which the sheets are collected, while the left-hand area 8 is the surface over which the sheets are carried by the paper removal mechanism.

The mechanism which applies the glue to the paper is known as the gluing head and is referred to generally as at 10 in Figs. 1 and 2, where it is covered with a hood to protect the mechanism. The details of the gluing head construction are shown in Figs. 6 to 12 inclusive and will be referred to more particularly hereafter. The paper removal means consists of a number of chain and belt conveyors, which are shown generally in Figs. 1 and 2 and in detail in Figs. 3, 4 and 5.

The general scheme of operation is to place successive sheets on table 6, applying glue to each sheet in turn so that each subsequent sheet will adhere to the previous sheet whereby a collated set of forms may be prepared. The completed form, through the operation of mechanisms under the control of the operator, is then carried to the left over the table portion 8 to be deposited in a collecting bin 12 at the left of the machine.

It will be noted in Fig. 2 that the front of the machine at the right is open, as at 14, so that the operator may sit in front of table 6, where it will be convenient to deposit by hand or otherwise the successive sheets on the table and at the same time to operate the foot controls that cause the actuations of the machine.

Reference will be made hereafter to the details of the gluing mechanism and then to the details of the paper removal mechanism.

Gluing mechanism

The gluing mechanism is shown at the right of Figs. 1 and 2, and the gluing head 10 is shown in detail in Figs. 6 to 12.

Bed or table 6, on which the sheets to be glued are successively placed, may be in any convenient form. As shown, it has a series of longitudinal slots 14, through which extend stops 16, which are fixed longitudinally, but which may be moved downwardly through the slots below the surface so that the assembled pack may subsequently be passed thereover. To the right are the longitudinally adjustable stops 18, which may be set to confine accurately the paper between the two sets. At the rear is stop 20, shown in Figs. 2, 10 and 12, while at the front is the stop 22, which may be adjusted both laterally and longitudinally. Accordingly, paper sheets of any size may be accurately positioned on the table 6.

As shown in Figs. 6 to 12, the glue applying mechanism or gluing head consists generally of a trough 24 filled with glue or other suitable adhesive to a normal level close to the top, a submerged blade 26 carried by a bar 28 extending substantially the length of the trough, and a plurality of pins 30 positioned directly above blade 26 in a longitudinally extending perforated frame 32. Pins 30 are free to move upwardly through the holes 34 in frame 32, in which they are positioned, the downward movement being limited, however, by the heads 36.

The mechanism that will hereinafter be described accomplishes the following result; namely, that the blade 26 is raised from its normal submerged position through the glue to carry upwardly on its upper edge a limited amount of glue which is transferred to pins 30 by contact therewith, after which blade 26 drops to its submerged position, while pins 30 are swung in a downward arc of approximately 90 degrees to engagement with a sheet or sheets of paper that may have been previously placed on bed 6.

In this way, glue is transferred from the pins 30 to the paper, and after the pins have returned to their position, as in Fig. 6, a next sheet of paper, positioned on top of that to which the glue has previously been applied, may be affixed thereon. In this manner a succession of sheets may be secured together quickly, accurately, and at a low cost.

Before proceeding with further specific discussion of the gluing mechanism, it should be pointed out that the nature of the glue formation applied to the paper may be varied by changing the shape of the glue receiving pins 30. That is to say, pins 30 might be changed, for example, to deposit glue in the form of a longitudinally extending bar, or in dash form, as shown in Fig. 15.. This may be readily accomplished by substituting for bar 32 another bar carrying glue applying means of the form desired.

Referring now more specifically to Figs. 6 to 12, there are at either end vertical supports 40 between which extend cam shaft 42 and rock shaft 44. Trough 24 is mounted in any convenient manner in the position shown so as to permit easy removal for cleaning or changing of glue applying blade.

As can be seen in Figs. 6 and 7, space is provided between the inner and outer ends of the trough 24 to permit the vertical passage therethrough of cam followers 46 and 48, which are connected by members 50, 52, and 54, 56 to bar 28. Followers 46, 48 rest on cams 58 and 60 respectively, which are carried for rotation by cam shaft 42. Rotation of cam shaft 42 in the direction indicated will cause followers 46 and 48 to rise and fall, thus intermittently raising blade 26 from its submerged position in the glue to a height sufficient to cause engagement with pins 30, whereby glue carried by the top edge of blade 26 will be transferred to the bottom ends of pins 30.

At this point it should be noted that in the

construction shown, pins 30 have ends 62 smaller than the shank diameters. The purpose of this is to make the pins themselves of sufficient size and strength to withstand long usage, but to present a bottom end small enough to place a spot of glue of the desired diameter on the paper. For different applications the bottom ends of the pins may be varied if more or less glue in varying formations is desired.

The mechanism for causing rotation of cam shaft 42 is indicated generally at 64 in Fig. 1, at the left of Figs. 6 and 7, and in elevation in Fig. 9.

In Fig. 1 is shown a motor 66 mounted for convenience at the rear of the machine. The motor drives shaft 68 carrying worm 70, which in turn drives gear 72, mounted on shaft 74. A clutch 76 is mounted on shaft 74, and when in engagement causes rotation of cam shaft 42. The clutch 76 is of the conventional one-revolution type and is set in operation through a pivoted foot treadle 78, which, when depressed, causes the clutch to engage for one revolution, at the end of which automatic disengagement takes place. This clutch construction is conventional and well known, and any suitable one-revolution clutch may be used in connection herewith.

On the remote end of cam shaft 42 is a large cam 80 which controls the downward swinging movement of pins 30 to their position against the paper resting on bed 6. The cam constructions are such that glue will be applied to the bottom of pins 30 by blade 26 prior to any movement by pins 30 away from their normal position as shown in Figs. 6 to 11. That is to say, cams 58 and 60, when rotated from the position shown in Fig. 10 to the position shown in Fig. 11, will cause blade 26 to rise into contact with pins 30 prior to any actuation of the pin frame 32 under the influence of cam 80. This can be seen from an inspection of the cam shown in Figs. 8 and 12. Cam 80 operates against a follower roller 82 carried by lever arm 84 secured to rock shaft 86.

Rigidly attached to rock shaft 86 are upstanding arms 88 and 90, while a similar pair of arms 92 and 94 are rotatably mounted on cam shaft 42. The upper ends of arms 88 and 92 and 90 and 94 are connected by members 96 and 98 respectively, which latter members carry between them pin supporting frame 32, previously referred to. This provides a parallelogram construction whereby movement of arms 88 and 90 through 90 degrees to the left (see Fig. 12) under the influence of rotation of cam 80 results in a corresponding movement of arms 92 and 94 to move members 96 and 98, bar 32 and pins 30 to a glue applying position against sheets positioned on bed 6.

In this way, through a single rotation of cam shaft 42 under the control of the one-revolution clutch, glue is transferred from the trough to the pins 30, which pins are thereafter swung downwardly to apply the glue to the paper at desired locations. As shown in Fig. 12, the pins may slide upwardly a short distance through frame 32 as the downward movement of the pins is stopped by engagement with the sheet. This eliminates the problem of adjustment, as the pins always engage the paper with uniform force. Upon completion of the rotation of cam 80, pins 30 are returned to their original position above the glue trough under the influence of coil springs 100 and 102 mounted on rock shaft 86, with one end of each spring anchored on pins 104 affixed to the frame 40 and with the other ends exerting an upward force against arms 88 and 90.

In the ordinary procedure of assembling a pack of sheets interleaved with carbons, it is customary for the operator to sit in front of table 6 at a position within reach of a quantity of sheets which may be stored to the right of the machine, from which position they may be easily moved to gluing position. The carbon sheets may also be stored at the right of the machine, but a more convenient position has been found to be over the table portion 8 just to the left of the gluing position.

The trays that hold the sheets and carbons, or any other means that may be used to bring the sheets and carbons to the gluing position on the table 6, constitute no part of the present invention and hence are not shown in the drawings. Mention is made merely for the purpose of a better understanding of the nature of the operations involved.

In order to speed the assembly of a pack of sheets interleaved with carbons, it has been found convenient to apply the glue to a sheet in the form of a series of dots arranged in a row or in the form of two rows of dots, one closer to the back edge of the sheet than the other, or in the form of a continuous line of glue, all of which forms are controlled by the arrangement and form of the glue receiving pins 30 and corresponding submerged blades for conveying the glue to the pins.

When the glue has been applied to the sheet, a carbon sheet is placed thereon with its top edge somewhat removed from the top edge of the underlying sheet, as shown by the dotted line 106 in Figs. 13 to 16, so that only a portion of the applied glue is covered by the carbon. By so doing, it is then possible to position the next sheet on top of the previously positioned sheet and carbon without performing a second gluing operation. Thus, a single operation of the machine applies the glue in such positions that a succeeding carbon sheet and paper sheet may be secured in position. If desired, more than two sheets could be secured through a single glue application, but ordinarily every other sheet is a paper sheet, of which the top edges are to be aligned so that in the typical formation a carbon and following sheet are all that are secured through a single gluing operation.

In order to facilitate the positioning of the carbon sheets, it has been found convenient to provide special carbon stops, which are shown at 108 in Figs. 6 to 12 and 20, 21. When the principal sheets are positioned, they engage against stop 20. Following the positioning of such sheets, the carbon stops 108 are rotated forwardly until they reach the line 106, indicated in Figs. 13 to 16. They are positioned firmly enough against the previous sheet so that when a carbon sheet is brought thereagainst, it will not pass underneath. After the carbon sheet is in place and secured by the glue previously applied, the carbon stops are rotated rearwardly so that the next paper sheet may be put in place against stop 20.

The construction of the carbon stops is as follows: A shaft 110 extends transversely in front of the gluing head and is supported at its ends by a pair of arms 112 and 114 that extend forwardly from supports 40. At the left-hand end of shaft 110, as viewed in Fig. 6, is a small pulley 116 over which runs a flexible metal band 118.

This band is connected in any convenient manner to foot pedal 120 in such a way that when the foot pedal is depressed, band 118 will be drawn downwardly to rotate the pulley and shaft in a counterclockwise direction as viewed in Figs. 8, 10, 11 and 12. A small spring 122 (Figs. 6 and 7) affixed to the periphery of the pulley 116 and to arm 112 urges the pulley and shaft 110 in a clockwise direction so that when pressure on foot pedal 120 is released, the shaft and pulley will return to the position shown in Figs. 6, 7, 8, 11 and 12.

Fixedly mounted on and near the ends of shaft 110 are a pair of arms 123 carrying a carbon stop supporting frame 124, shown in Figs. 6, 7, 10 and 11. This frame consists of a bar extending substantially the entire length of shaft 110, slotted as at 126 to receive the carbon stops in the manner shown in detail in Figs. 20 and 21.

The carbon stops are mounted on frame 124 in such manner as to be adjustable longitudinally so that there will be available a suitable number of stops to engage the carbon paper regardless of the size of the latter.

Referring to Figs. 20 and 21, it will be seen that each carbon stop consists of a body portion 128 having a reduced end portion 130 adapted to fit within slot 126. A headed screw 132 and washer 134 maintain the body portion in position with respect to frame 124. On the extended end of body portion 128 is a rectangular part 140, carrying in slidable relation a finger member 136. The latter has a rectangular opening 138 therethrough into which fits part 140. Opening 138 is longer than part 140 so relative longitudinal movement may take place. The finger member is held in position by the headed screw 142 and is urged downwardly by a small steel spring 144 that engages a lug 146 on the finger member.

The purpose of having finger member 136 slidable with respect to body portion 128 is so that when the finger engages the previously deposited sheet of paper, it may slide upwardly as much as necessary with respect to body member 128, while still maintaining a suitable amount of pressure on the paper.

The normal position of the carbon stops is as shown in Figs. 6, 7, 8, 11 and 12. After the glue has been applied to a previously positioned sheet, as illustrated in Fig. 12, the operator presses pedal 120 downwardly, whereupon the carbon stops will be moved to the position shown in Fig. 10, with the finger 136 a distance in front of stop 20 and at the line 106, shown in Figs. 13 to 16.

When in this position, a sheet of paper 148, which in the typical assembly would be carbon paper, (see Fig. 10) may then be placed in position, accurately spaced with respect to the previously positioned sheet 150 by carbon stop fingers 146 and the other stops 16, 18 and 22. Upon release of pedal 120, carbon stops 108 will return to their normal position out of the way so that another sheet of paper may be positioned on top of the previously deposited sheets, with the back edge against stop 20. At this point, pedal 78 may be operated again to set the gluing head mechanism in operation, causing additional glue spots to be placed on the last positioned sheet.

If the carbon stops 108 were in down position, as in Fig. 10, operation of the gluing head would cause interference between the pins 30 and carbon stops 108. Therefore, there has been provided a mechanism which renders it impossible to press pedals 78 and 120 downwardly simultaneously, and as a result, the gluing head and carbon stops cannot be operated at the same time. When one pedal is down, the other cannot be depressed. This construction is shown in detail in Figs. 17 and 18. Pedals 78 and 120 are pivotally mounted on a shaft 152 in such manner that they will remain a fixed distance apart. Connected to the forward end of each pedal are vertical plates 154 and 156. Plate 154 is connected to a rod 158 which operates in turn clutch 76, previously referred to, and plate 156 is connected to a tension member 160 which is attached in turn to flexible band 118 that operates the carbon stops.

Underneath the toe portions of pedals 78 and 120 is a frame 162 having vertically extending supports 164 and 166 in which are aligned apertures 168 and 170. Through these apertures extends a bar 172 the length of which is greater than the distance between plates 154 and 156.

A spring 174 surrounds bar 172 and extends between the supports 164 and 166. A pin 176, piercing bar 172, extends transversely beyond the sides sufficiently to engage spring 174, thereby insuring that if the bar is moved to the right or to the left, it will be returned to intermediate position by the spring upon the release of the disturbing pressure. Any convenient means for preventing rotation of the spring about the bar may be used so that the pin will remain in position with respect to the number of spring convolutions.

The ends of the bar 172 are rounded or beveled so that if pedal 120 and connected plate 156 are depressed, the beveled end of bar 172 will be engaged in such manner as to cause the bar to slide a limited distance to the left so that the left-hand end of the bar will be directly under plate 154. Thus, as long as pedal 120 is in down position, it will be impossible for pedal 78 to be depressed.

On the contrary, if pedal 78 were depressed first, the bar would have been caused to slide to the right so that the right-hand end would be under plate 156 in such a position that pedal 120 could not be depressed. Thus it is apparent that, if the operator sets the gluing head in operation through depression of pedal 78, it will be impossible to move the carbon stops to operating position until foot pedal 78 has been allowed to return to up position and the gluing head is out of operation. Conversely, if the carbon stops have been moved to down position through depression of pedal 120, it will be impossible to set the gluing head in operation until the carbon stops have been returned to normal retracted position.

Fig. 18, which is a sectional elevation on the line 18—18 of Figs. 2 and 17, shows the manner in which the plate 156 has descended to cover the end of bar 172 to drive it to the left, as in Fig. 17, so that the other end will be under plate 154 of pedal 78.

In Fig. 19 is shown a modified form of glue applying mechanism. This differs from the construction heretofore described in that the glue trough 24 is somewhat wider so as to have room for a plurality of longitudinally extending blades 180. The supporting bar 32 has been correspondingly widened to carry as many rows of gluing pins 30 as there are blades. By this construction glue may be deposited on the paper in varying formations according to the disposition of the pins.

Paper removal means

After the sheets have been assembled on the table 6, the collated pack should be removed before the assembly of the next pack can commence. The pack may be removed by hand, but mechanical disposition is preferred.

The paper removal means is shown generally in Figs. 1 and 2 and in more detail in Figs. 3, 4 and 5.

The removal means is set in operation through actuation of foot treadle 182, which is to the left of treadles 78 and 120, preferably far enough away so that accidental operation will not be likely to occur. The mechanism set in operation by treadle 182 will carry the paper from table 6 to the collecting bin 12. As soon as the pack has been removed from the table, the mechanism stops automatically and remains motionless until set in operation again following completion of the subsequent pack.

The constructional details are as follows. Treadle 182, on being depressed, draws downwardly link 184, which in turn causes lever 186 to pivot about its support at 188. This in turn moves link 190 to the right to move latch 192 downwardly as it pivots about 193. As can be seen in Fig. 3, downward movement of latch 192 will permit the swinging of yoke 194, pivoted at 195, to the right under the influence of spring 196. Yoke 194 in this manner is put in the path of lug 198, which is attached to a continuously revolving pulley 200 actuated by any source of continuous rotary power such as motor 202 through suitable belts, chains, gears, or otherwise, as indicated at 204.

Pulley 200 is mounted on a shaft 206 directly in line with a separate shaft 208 which supports gear 210 and the yoke 194. Engagement of lug 198 with yoke 194 causes rotation of shaft 208 and gear 210 in the direction indicated and rotation in the opposite direction of gear 212 with which it is in mesh. Gear 212 is mounted on a shaft 214 which also carries a collar 216 having a notch 218 in its periphery (see Fig. 2). A finger 220, extending from the upper side of latch 192, is positioned to move into notch 218 when collar 216 has rotated to the position shown in Fig. 2.

Thus, by this construction, if the ratio of gears 210 and 212 is, for example, 1 to 3, as soon as gear 212 has made three revolutions, collar 216 will have made one revolution and finger 220 will then move into notch 218 under the influence of tension spring 222, thus raising the outer end of latch 192, which picks up the end of rotating yoke 194, moving it out of the path of lug 198, thereby stopping the rotation of shaft 208.

The foregoing clutch construction therefore provides means whereby a continuous source of rotational power such as motor 202 may be used to cause intermittent action of shaft 208 under the control of the operator. The extent of this intermittent action is sufficient to remove the sheets from table 6 through mechanism that will now be explained.

Shaft 208 extends laterally of the machine, as can be seen in Figs. 4 and 5, and when set in operation, rotates counterclockwise when viewed in Fig. 5. Mounted on shaft 208 are a plurality of sprockets 224, 226, 228, 230 and 232. Sprockets 224, 228 and 230 drive chains 234, 236 and 238, each of which travels over a series of idler sprockets in the manner disclosed by the set of sprockets carrying chain 234 in Fig. 5. Spaced at suitable distances along each of the chains are fingers such as at 240, 242, 244, 246 and 248, shown on chain 234 in Fig. 5. There are corresponding fingers on each of the other chains, all aligned laterally. The space between the fingers is somewhat greater than the available paper depositing space on table 6. Chains 234, 236 and 238 travel in suitable longitudinal grooves in table 6, as shown in Fig. 1, and are positioned just below the surface so that when moving only the fingers on the chains will come into contact with the paper.

Sprocket 226, through chain 250 drives sprocket 252, shaft 254 and in turn chain 256, and the overhead sprocket 258. Sprocket 258 is mounted on shaft 260, which carries a plurality of pulleys 262, 264, 266 and 268. Over these pulleys and the group of corresponding idler pulleys 270 extend the conveying belts 272, 274, 276 and 278.

As can be seen in Figs. 1 and 2, the belts lie over the left-hand table surface 8 so that papers deposited thereon will ultimately be carried by the belts to the collecting bin 12.

The movement of chains 234, 236 and 238 and belts 272, 274, 276 and 278 are synchronized through the clutch control mechanism heretofore described. That is, when the chains are set in operation, the belts likewise move and the gearing is such that the linear rate of travel is the same.

Gear 232 on shaft 208 meshes with gear 280 mounted on shaft 282 which carries in turn sprocket 284, driving chain 286 and sprocket 288.

This latter sprocket is mounted on shaft 290, which extends through a back plate 292 and carries on the face thereof a pulley 294, which, when rotating, moves clockwise, as shown in Fig. 2. A series of other pulleys 296, 298, 300, 302, 304 and 306 are provided to carry and guide a belt 308 which is positioned directly over belt 272 and in engagement therewith. Back plate 292 is urged downwardly by adjustable springs 310 and 312 so that belt 308 may be made to exert greater or less pressure on belt 272. The gearing is such that the linear speed of belt 272 is the same as that of belt 308, and the purpose of this arrangement is to grip and press the papers together as they come from the gluing position, thereby causing better adherence of the glue as well as to insure positive movement of the sheets to the collecting bin 12.

In order to keep belt 308 at suitable tension, an idler 314 is provided to exert downward pressure on the belt at the point indicated.

Just to the left of table 6 (see Figs. 1 and 2), at the rear edge, are a pair of fairly large-sized steel balls 316 and 318, maintained in position by a housing 320 in which they are free to lift slightly and rotate upon the passage of paper therebeneath. The purpose of this is to give to the sheets which have just been glued a slight initial pressure along the glued areas as they commence their movement from the gluing position to the carrier belts.

Having described the construction of the paper removal means, the operation is as follows. It will be assumed that the pack of sheets has been completely assembled at the gluing position where the sheets have been located between stops 16, 18, 20 and 22. At this stage it is desirable to remove the completed pack before assembling the next pack. The operator thereupon depresses foot treadle 182, which, through

the clutch mechanism, sets in operation the chains and belt conveyors. Fingers 242 on the several chains, which are located at this instant to the right of stops 18, commence to move to the left, as viewed in Figs. 1 and 2. Stops 16, through the linkage shown in Fig. 2, have been caused to swing beneath the surface of table 6, thereby permitting movement of the pack to the left along table 6.

Fingers 242, moving to the left, engage the right-hand edge of the pack, causing it to move to the left, with the back glued edges passing under balls 316 and 318, which apply a slight pressure that helps the setting of the glue. The paper continues to the left under the influence of fingers 242 until it is picked up by belts 272, 274, 276 and 278. Thereafter the glued edges enter between belts 272 and 308 where they are firmly gripped and positively carried along.

After the pack has reached approximately the middle of table area 8, the clutch mechanism will have operated to disengage itself so that movement of the chains and belts ceases. At this point fingers 244 will have advanced to the position originally occupied by fingers 242, shown in Figs. 1 and 2, where they will be ready to pick up the next set of collated sheets upon subsequent operation of foot treadle 182.

When the next pack has been completed and foot treadle 182 is again operated, the first pack, which has been resting on table area 8, will be advanced further to the left, to be expelled by the belts 272, 274, 276 and 278 into collecting bin 12. The period that the pack remains on the table area 8 with the glued areas under pressure from the belts 272 and 308 is sufficient to cause sufficient setting of the glue so that when the pack is subsequently discharged there will be no tendency for the sheets to come apart.

An adjustable stop 322 similar to stop 22 is provided to assist in guiding the sheets across the table area 8.

For convenience in setting the prime movers in operation, a pair of switches 324 and 326 are placed on the front of the machine within easy reach of the operator.

Summary of operation

Having described the detailed operation and construction of the gluing head and the paper removing means, the following is a summary of the steps employed in the assembly of a collated pack.

The operator, sitting in front of the machine, has within reach the sheets that are to be assembled. The first sheet is placed on table 6, located by the stops 16, 18, 20 and 22. Treadle 78 is depressed, causing the gluing head to swing downwardly, thereby depositing glue on the sheet in the manner illustrated by the glue spots appearing in Figs. 13, 14, 15 and 16, or in any other desired form or arrangement as may be determined by the arrangement and form of the pins 30. Upon release of treadle 78, treadle 120 may then be depressed, which will cause the carbon stop fingers 136 to swing downwardly to rest on the previously positioned sheet along the line 106 shown in Figs. 13 to 16. A second sheet, ordinarily carbon paper, may then be placed on top of the first sheet, accurately located in position by stops 16, 18, 22 and 136. In this manner, only part of the deposited glue will be served by the second sheet.

Treadle 120 is then released, causing the carbon stops to swing back to their original position, whereupon a third sheet may be deposited on the second sheet, to be secured by the glue that was not covered by the second sheet. Thus far three sheets have been assembled. The gluing head is then called into play through operation of treadle 78 and the series of operations just described is then repeated. In this way a pack of sheets may be built up to any extent desired, all sheets being in accurate alignment and securely fastened together.

It will be appreciated, of course, that it is not necessary that alternate sheets in all cases be set back along the line 106. They could if desired have their back edges coinciding with the back edges of the principal sheets. If this result is desired, the use of the carbon stops may be eliminated, but in such case, operation of the gluing head will be necessary following the disposition of each sheet.

When the pack has been completed, it may be removed from the table 6 through operation of treadle 182 which sets the conveyor chains and belts in operation to move the pack to the left to table area 8 and finally into collecting bin 12.

It is intended that the invention covers not only the specific form disclosed, but also such modifications as are the equivalent thereof and which might be devised after a study of the present construction.

What is claimed is:

1. A machine for assembling a plurality of sheets positioned one on the other and secured together by adhesive, comprising a table fixed against vertical movement on which a succession of sheets may be stacked at a fixed position, means for applying adhesive to individual stationary sheets that may be positioned on said surface and on each other, means for removing said assembled sheets from said adhesive applying position, and control means initiating the operation of said adhesive applying means and said sheet removing means.

2. An adhesive applying mechanism comprising a table on which a sheet may be positioned, stops for accurately locating a sheet on said table, means for applying adhesive to predetermined areas on a positioned sheet, movable stops adapted to move over and rest on a previously positioned sheet at determinable positions, said movable stops acting to determine the location of a subsequently positioned sheet, said areas at which adhesive is applied being located part on one side and part on the other of the line of said movable stops when in operative position whereby a sheet positioned according to said movable stops will engage only part of said previously applied adhesive.

3. An adhesive applying mechanism as set forth in claim 2, having in addition means for moving the stops on one side of said sheet to an inoperative position, and means for moving said sheet from said table.

4. A machine for assembling a plurality of sheets, comprising a table, primary stops extending above the surface of said table for locating said sheets, a source of adhesive, an adhesive carrier positioned in said adhesive source and movable thereoutof, adhesive transferring means including a plurality of depending elements normally positioned to be engaged by said carrier after the latter has been moved from said adhesive source, means for moving said elements to a position against a located sheet, auxiliary stops normally out of engagement with said table, means for moving said auxiliary stops to a posi-

tion on and over a sheet located by the primary stops, controls for setting said adhesive carrier and adhesive transferring means in sequential operation whereby adhesive may be deposited first on said elements by said carrier and then by said elements on a sheet positioned by said stops, controls for moving said auxiliary stops to operative position in overlying engagement with a sheet previously positioned according to said primary stops, and means for preventing simultaneous operation of the adhesive transferring means and said auxiliary stops.

5. A machine as set forth in claim 4, and having in addition slots in said table, means for rendering inoperative such primary stops as might impede the movement of said sheets in the direction of said slots and the stops that have been rendered inoperative, and means for removing said sheets from said table comprising a finger extending upwardly through one of said slots on one side of the sheet, and means for moving said finger against said sheets to force the latter from the table space delineated by said primary stops.

6. A machine for assembling a plurality of sheets and for subsequently removing said sheets to a collecting point, comprising a table with a slotted surface, primary stops for locating a sheet on said table, means for applying adhesive to a sheet so located, conveyor means for moving said sheet laterally in the direction of said slots, said conveyor means comprising an endless flexible member having connected thereto a finger extending through a slot far enough to engage said sheet when moved along said slot, and intermittently operable means for causing sufficient travel of said flexible member and said finger after movement is first initiated to propel said sheet from its stop located position.

7. A machine for assembling a plurality of sheets, comprising a table, primary stops extending above the surface of said table for locating said sheets, a source of adhesive, an adhesive carrier positioned in said adhesive source and movable thereoutof, adhesive transferring means including a plurality of depending elements normally positioned to be engaged by said carrier after the latter has been moved from said adhesive source, means for moving said elements to a position against a located sheet, auxiliary stops normally out of engagement with said table, means for moving said auxiliary stops to a position on and over a sheet located by the primary stops, controls for setting said adhesive carrier and adhesive transferring means in sequential operation whereby adhesive may be deposited first on said elements by said carrier and then by said elements on a sheet positioned by said stops, controls for moving said auxiliary stops to operative position in overlying engagement with a sheet previously positioned according to said primary stops, means for preventing simultaneous operation of the adhesive transferring means and said auxiliary stops, said table having slots in its surface, conveyor means for moving said sheet laterally in the direction of said slots, said conveyor means comprising an endless flexible member having connected thereto a finger extending through a slot far enough to engage said sheet when moved along said slot, and intermittently operable means for causing sufficient travel of said flexible member and said finger after movement is first initiated to propel said sheet from its stop located position.

8. A machine for assembling a plurality of sheets, comprising a table, primary stops extending above the surface of said table for locating said sheets, a source of adhesive, adhesive transferring means including a plurality of depending elements, means for applying limited quantities of said adhesive to said elements, means for moving said elements to a position against a located sheet, auxiliary stops normally out of engagement with said table, means for moving said auxiliary stops to a position on and over a sheet located by the primary stops, and means for controlling the movement of said adhesive transferring means and said auxiliary stops in such manner that only one may be operated at a time.

9. A machine for assembling a plurality of sheets, comprising a table, primary stops extending above the surface of said table for locating said sheets, a source of adhesive, adhesive transferring means including a plurality of depending elements, means for applying limited quantities of said adhesive to said elements, means for moving said elements to a position against a located sheet, auxiliary stops normally out of engagement with said table, and means for moving said auxiliary stops to a position on and over a sheet located by the primary stops.

10. A machine for assembling a plurality of sheets, comprising a table on which a sheet may be positioned, means for applying adhesive to selected areas of a sheet so positioned, auxiliary stops movable to a position against said sheet whereby a subsequently positioned sheet may be indented from the first sheet along a predetermined line, and means for controlling the operation of said adhesive transferring means and said auxiliary stops.

11. The method of assembling a pack of sheets, comprising the steps of positioning a first sheet on a table in accordance with a group of primary stops, applying adhesive to selected areas adjacent one edge of said sheet, positioning an auxiliary stop over said first sheet along a line so located that some of said adhesive will be on one side of said line and some on the other, positioning a second sheet against said auxiliary stop so that said second sheet will be secured only by that part of the adhesive on one side of said line, removing said auxiliary stop and finally positioning another sheet on top of said first and second sheets to be secured to said first sheet by adhesive remaining unengaged by said second sheet.

12. An adhesive applying mechanism comprising a table on which sheets may be positioned, a plurality of stops for locating a sheet thereon, means for applying adhesive to a sheet while it is located by said stops on said table, an additional stop normally inoperative but movable to a position on top of a sheet that has already been positioned on said table to assist in the positioning of a subsequently deposited sheet at an indented position with respect to the previous sheet.

13. An adhesive applying mechanism comprising a table on which sheets may be positioned, a plurality of stops for locating a sheet thereon, the stops on one side of said sheet movable out of position whereby a sheet may be moved along said table without interference from said movable stops, means for applying adhesive to a sheet while it is located by said stops on said table, an additional stop normally inoperative but movable to a position on top of a sheet that

has already been positioned on said table to assist in the positioning of a subsequently deposited sheet at an idented position with respect to the previous sheet.

14. An adhesive applying mechanism comprising a table on which a sheet may be positioned, stops for accurately locating a sheet on said table, a source of adhesive, adhesive transferring means, means for placing said adhesive on said transferring means, means for moving said transferring means to a position against a sheet on said table, and an additional stop normally inoperative but movable to a position on top of a sheet previously positioned against said stops whereby a subsequent sheet may be located at an indented position with respect to said previously positioned sheet.

15. A machine for assembling a plurality of sheets positioned one on the other and secured together by adhesive material comprising a table fixed against vertical movement, means for locating and maintaining a plurality of superimposed sheets in fixed position on said table, means for applying adhesive to a stationary individual sheet at selected areas after said individual sheet has been positioned on said table whereby a subsequently disposed sheet may be connected thereto in stacked relation, and an auxiliary stop normally inoperative but movable to a more forward position against said table to locate sheets placed thereagainst so that said selected areas will be closer to the edge of said sheet.

16. An adhesive applying mechanism comprising a table fixed against vertical movement on which sheets may be stacked in fixed position, a source of adhesive, adhesive transferring means comprising a frame and gluing member supported thereby, means for moving a limited quantity of said adhesive to said member while said frame and member are stationary, means for moving said frame and member to a position where said member is positioned against the topmost of said sheets and an auxiliary stop normally inoperative but movable to a position against said table to change the position of sheets placed thereagainst with respect to sheets previously located in said fixed position.

17. An adhesive applying mechanism comprising a table on which sheets may be stacked in fixed position, a source of adhesive, adhesive transferring means comprising a frame and a member supported thereby movable upwardly with respect to said frame, means for moving a limited quantity of said adhesive to said member while said frame is stationary, means for moving said frame to a position where said member is positioned against the topmost of said sheets thereby stopping the movement of said member without limiting the movement of said frame and an auxiliary stop normally inoperative but movable to a position against said table so that sheets positioned against said auxiliary stop will be out of register along one edge with sheets which have been stacked in said fixed position but within a position to receive adhesive from said adhesive transferring means.

18. An adhesive applying mechanism comprising a table on which sheets may be stacked in fixed position, a source of adhesive comprising a container with adhesive therein, adhesive transferring means comprising a supporting frame and gravitationally held members depending therefrom and movable upwardly with respect thereto, means for conveying limited quantities of said adhesive from said container to said transferring means and means for moving said transferring means to a position against a sheet on said table while maintaining said members continuously in vertical position, the downward pressure of said members against said sheet being the same regardless of movement of said frame beyond the point at which said members engage said sheet.

19. Means for transferring a limited quantity of adhesive from a source of supply to predetermined locations on a stationary sheet, comprising a supporting frame carrying a plurality of substantially vertically depending members movable independently upwardly from their normal positions with respect to said frame, means for carrying adhesive from said source to a position slightly beyond the normal position of the lower ends of said elements thereby causing upward movement of said elements with respect to said frame, means for causing determinable movement of said supporting frame and said elements, a surface on which a sheet may be fixedly positioned, means for locating said sheet on said surface so that when said elements are moved thereagainst they will engage said sheet at the predetermined locations and the adhesive on said elements will be transferred to said sheet to make corresponding adhesive formations thereon and said frame will move downwardly after movement of said elements has ceased.

20. Means for transferring a limited quantity of adhesive from a source of supply to predetermined locations on a sheet, comprising parallel arms, connecting links between the ends of each pair of arms, a supporting frame carried by said connecting links, said arms and links forming a parallelogram whereby swinging movement of the arms will cause said links and supporting frame to maintain the same angular position, a table on which a sheet may be positioned, a source of adhesive, a plurality of depending members carried by said supporting frame and movable independently upwardly with respect thereto, means for lifting a limited amount of adhesive from said source and bringing it into engagement with the lower ends of said depending members and in so doing moving said members independently upwardly with respect to said frame, and means for swinging said arms in the direction of said sheet through an angle sufficient to cause said members to touch said sheet whereby adhesive may be transferred from said members to said sheet.

21. For use in an adhesive applying mechanism, a container for liquid adhesive, an adhesive carrier positioned in said adhesive and means for moving said carrier upwardly out of said adhesive, adhesive transferring means comprising a supporting frame and a plurality of independent depending elements independently supported by said frame and normally positioned to be engaged and moved upwardly by said carrier after the latter has been moved from said adhesive.

22. For use in an adhesive applying mechanism, the combination set forth in claim 21 and having said depending elements freely slideable vertically in said frame and held in position under the influence of a constant downward force.

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