June 19, 1951 C. W. BRENN 2,557,723

SHEET ASSEMBLY METHOD

Filed July 17, 1946

2 Sheets-Sheet 1

Fig. 1

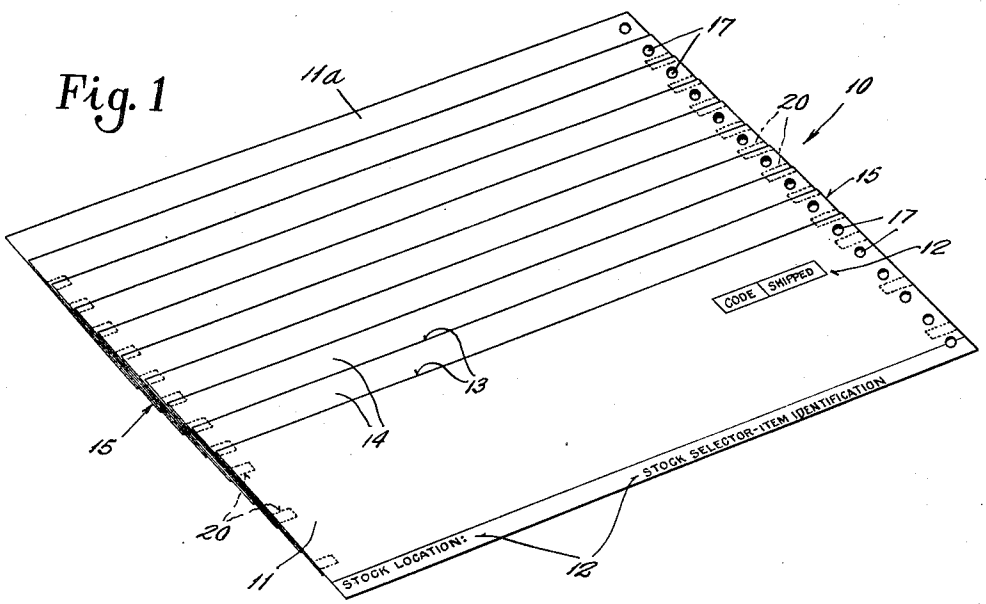
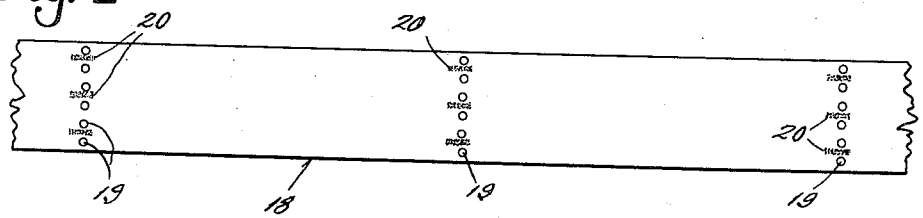


Fig. 2



INVENTOR.
Carl W. Brenn
BY
Johnson, Kline and Hensel
ATTORNEYS

June 19, 1951

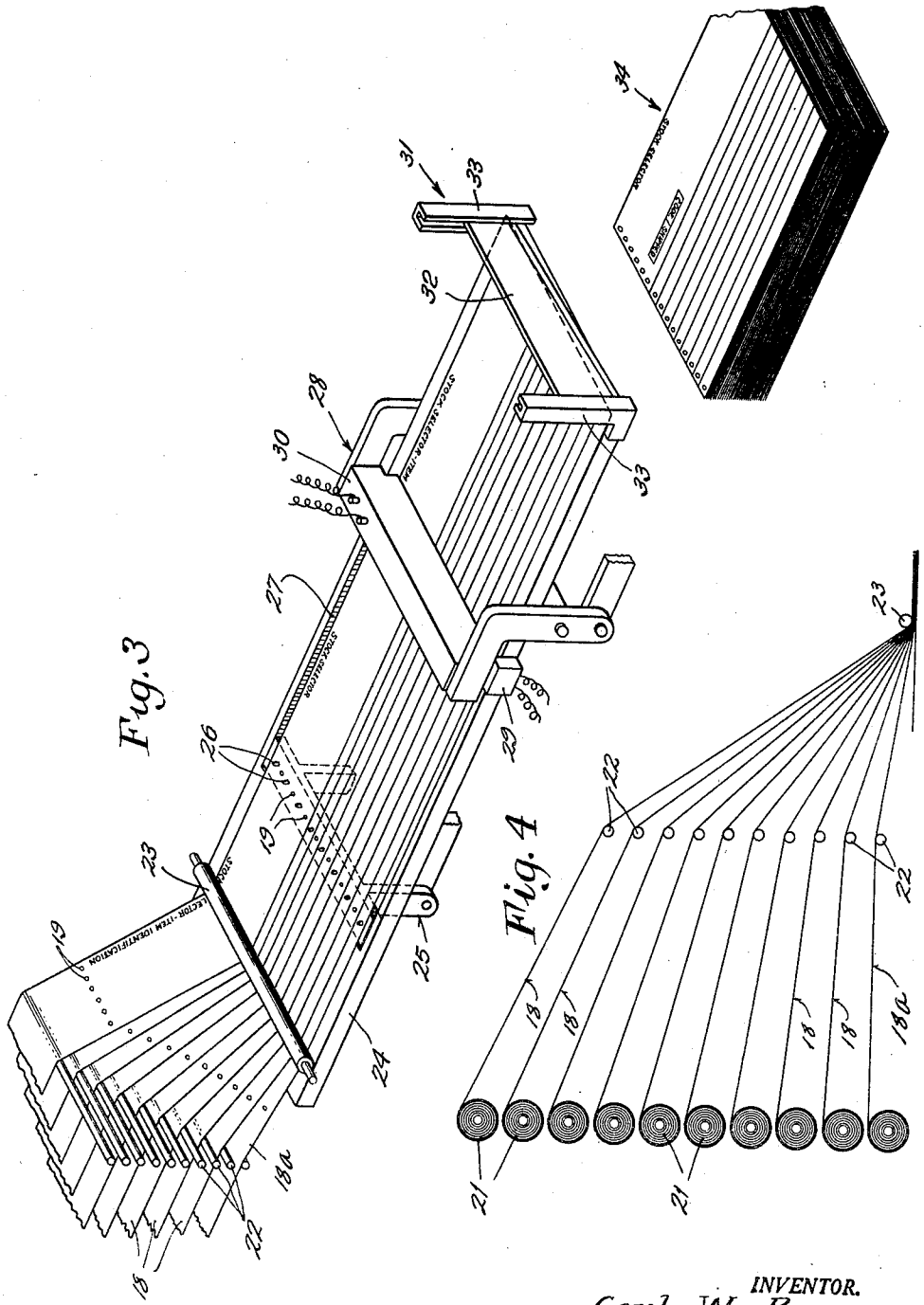
C. W. BRENN

2,557,723

SHEET ASSEMBLY METHOD

Filed July 17, 1946

2 Sheets-Sheet 2



INVENTOR.
Carl W. Brenn
BY
Johnson, Kline and Hensel
ATTORNEYS

Patented June 19, 1951

2,557,723

UNITED STATES PATENT OFFICE

2,557,723

SHEET ASSEMBLY METHOD

Carl W. Brenn, Montclair, N. J., assignor to Autographic Register Company, Hoboken, N. J., a corporation of New Jersey

Application July 17, 1946, Serial No. 684,315

8 Claims. (Cl. 270—52)

1

This invention relates to improvements in the manufacture of sheet assemblies made up of a plurality of sheets secured together in overlapping shingled relation.

Such assemblies or books are useful when it is desired to provide for simultaneous inscription of correlated or similar legends as a heading on the exposed surface portions of a plurality of sheets while the sheets are joined in an assembly, said sheets being readily separated from each other for inscription with other data on the remaining surface of the sheets.

It has been proposed heretofore to make such assemblies from a plurality of continuous webs or strips by supporting and guiding the strips in spaced relation such that the strips can be brought together in transversely overlapping relation, i. e. with a marginal portion of each web exposed toward one surface of the assembly, progressively applying spots of adhesive at form width intervals along the webs as they are advanced so that when the webs are brought together, the spots of adhesive will be aligned transversely of the assembly, bringing the webs together in the desired relation, and shearing the resulting assembly transversely at form width intervals adjacent the transversely aligned spots of adhesive, to form a series of shingled forms.

In carrying out the procedure heretofore proposed, relatively complicated and expensive apparatus is required to insure guiding the individual strips into the desired overlapping relation, and to apply the spots of adhesive at such intervals that the spots on the various strips will be transversely aligned when the strips are collated. Such apparatus is further complicated by the necessity of correlating operation of the adhesive-applying mechanism with the operation of the shearing mechanism, so that the spots of adhesive will be located in the desired portion of the severed forms.

It is an object of this invention to provide a method for manufacturing shingled record sheet assemblies of the aforesaid type, wherein the adhesive can be applied to the strips at any time prior to collation thereof, thereby avoiding the difficulty encountered when attempting to apply adhesive in the collating machine. It is also an object to provide for simultaneously advancing the strips and for aligning the strips in the desired overlapping relation, while at the same time insuring transverse alignment of the adhesive previously applied to the strips.

A further object is to produce assemblies of the aforesaid type wherein the component sheets

2

are secured together by adhesive at both lateral margins of the assembly so that the strips are firmly held against displacement during inscription of the exposed margins thereof.

In a preferred embodiment of my invention, a plurality of continuous strips of stationery are provided having feeding and aligning pin-engaging apertures formed therein at sheet-width intervals, preferably in transverse rows, so that when the strips are brought together with their lateral margins in overlapping shingled relation, corresponding to the relation desired in the finished assemblies, apertures of the respective strips will be brought into mutual registration. Moreover, the strips are provided at sheet-width intervals, preferably adjacent the aforesaid apertures, with spots of an adhesive in inactive condition, said spots being formed on a strip surface in contact with an adjacent strip but preferably not on any surface which is exposed in the overlapped assembly, and said spots of adhesive being brought into alignment transversely of the assembled strips when the apertures therein are brought into mutual registration. The several strips prepared in the aforesaid manner are withdrawn, for example, from a series of spools, and superposed in the desired transversely overlapping shingled relation on a collating table. A set of apertures in each of the respective strips is brought into registration by engagement thereof with a transverse set of aligning pins movable with the strips as they advance across the table. These pins progressively engage and disengage successive sets of apertures during the strip-feeding operation, and positively align the strips longitudinally and transversely in the desired relation. The pins can also constitute the means for advancing the strips. In such collated and aligned position the adhesive on the strips is activated and the superposed strips are pressed together to bond them together at sheet-width intervals. The resulting assembly is advanced toward a severing device preferably a shearing knife, at which the shingled strips held together by the adhesive are severed into assemblies or books. The shearing knife is preferably arranged so that it severs the assembled strips through the transversely disposed spots of adhesive, so that a portion of the adhesive between each pair of strips remains on each side of the line of severance. In this way, the sheets composing the resulting assemblies are secured to adjacent sheets by spots of adhesive at both lateral margins of the resulting sheet assembly, thus holding the sheets against casual displacement during feed-

ing or inscription of the assembly, e. g. in a business machine.

Coordination of operation of the aligning and pin-feeding mechanism with operation of the adhesive-activating means, and with operation of the shearing mechanism can be readily arranged. If desired, the strips can be preformed from one or more relatively wider webs of stationery, such webs being printed with any desired form matter and adhesive applied thereto at sheet-width intervals transversely of the entire web, whereupon the latter is slit lengthwise into strips of desired width. Similarly, perforations can be formed in such webs, before they are slit, at the required sheet-width intervals and having the transverse spacing required for registration thereof in the assembly of the resulting strips in the desired shingled relation.

Preferably the adhesive employed is thermoplastic, and the strips are secured together merely by applying heat and pressure thereto, at the adhesive-bearing portions thereof, after they have been brought together and aligned on the collating table by engagement of the apertures therein with the feeding and aligning pins.

My invention will be more fully understood in the light of the following description of a preferred embodiment thereof, taken in connection with the accompanying drawings, wherein:

Figure 1 is a perspective view of a shingled form or book prepared in accordance with my invention.

Fig. 2 is a rear elevation of a section of continuous strip stationery employed in making a shingled form of the type shown in Fig. 1.

Fig. 3 is a perspective view of an apparatus for making the shingled forms.

Fig. 4 is a diagrammatic view of the manner in which strips are collated in the apparatus shown in Fig. 3.

Referring to the drawings, a shingled assembly **10** made in accordance with my invention, comprises a plurality of sheets **11** which may be provided with preprinted form matter **12** on a surface thereof, said sheets being arranged in shingled relation with their upper edges **13** offset one from the other so as to expose a marginal portion **14** of each of the underlying sheets, the lateral edges **15** of the sheets being aligned at the lateral edges of the assembly. The sheets **11** are held together by areas of adhesive **16** extending a short distance inward from the lateral edges of the assembly. Adjacent one of its lateral margins, the assembly **10** is provided with a series of apertures **17**, which can be spaced, if desired, for engagement of feeding or positioning devices on a business machine.

According to my invention, the assembly **10** is made from a plurality of continuous strips **18**, illustrated in Fig. 2, having therein at sheet-width intervals, transverse rows of apertures **19**, and likewise transverse series of adhesive-coated areas **20**, the areas of adhesive being preferably located adjacent the transverse rows of apertures **19**. The adhesive-coated areas **20** preferably extend a short distance longitudinally of the strips across the line along which said strips are to be severed so as to yield a shingled assembly as shown in Fig. 1, so that the component strips will be fastened together by the adhesive at both sides of the assembly. For this purpose the adhesive-coated areas are advantageously formed by short stripes extending longitudinally of the strips **18**.

The strips **18** can be be formed by longitudinally slitting a relatively wide web of stationery, preprinted with the form matter **12** for several strips, and having the transverse rows of apertures **19** and adhesive-coated areas **20** formed therein before cutting the web into longitudinal strips. The adhesive employed in forming the spots **20** is normally inactive, so that the strips can be formed into spools to serve as a source of supply in collating the strips in shingled or overlapping relation.

Since adhesive is required only on surfaces of the overlapped strips which are in contact with adjacent strip surfaces in order to bond the superposed strips together, and since the adhesive, if deposited on exposed surfaces of the overlapped strips, often proves objectionable in that it may cause the strips to stick to surrounding objects during the assembling and bonding operation, the exposed surfaces of the assembly of strips have no adhesive thereon. For example, strips **18** as illustrated are provided with adhesive spots **20** only on their rear surface, while the lowermost strip **18***a* which is assembled therewith, and which is otherwise similar to strips **18**, has no adhesive thereon. However, if desired, the intermediate strips may have adhesive spots on both surfaces, and the topmost and lowermost strips may be devoid of adhesive or can have such spots on their rear and front surfaces, respectively, without having adhesive on any part of the exposed surfaces of the strips when assembled in overlapping relation.

In manufacturing the assemblies **10**, the strips **18** are drawn from a source of supply such as a series of spools **21**, transversely spaced so as to position the strips approximately in the desired shingled overlapping relation. The lowermost strip **18***a*, while similar to the other strips **18** in other respects, is, as stated above, made without adhesive on its rear surface. Strips **18** and **18***a* are threaded over a plurality of guide bars **22** and then brought together under a roller **23** on the upper surface of a collating table **24**.

The strips are advanced across the collating table, and aligned transversely in the desired overlapping relation, as well as longitudinally to bring successive sheet-widths of the severed strips into registration, by bringing apertures of successive sets in the strips into mutual registration. For this purpose, a pin-feeding and aligning device is provided on the collating table **24** beyond the roller **23**, comprising a carriage **25** having thereon a row of pins **26** extending transversely across the table, said carriage being movable at right angles to the plane of the table to move the pins between strip-engaging and strip-releasing position, and also movable longitudinally of the table during the strip-feeding operation. Strips **18** and **18***a* are drawn forward under the roller **23** across the table **24** until a transverse series of apertures **19** in each of the strips is positioned to engage pins **26** of the pin-feeding and aligning device, the strips being arranged in the desired shingled overlapping relation. The pin-feeding device is moved to strip-engaging position, and apertures of one set in each of the respective strips are impaled upon the pins **26**, engagement of the apertures with the pins aligning the strips transversely in the desired shingled relation, and aligning the successive sets of apertures as well as the spots of the adhesive on the several strips longitudinally of the strips.

Operation of the strip-feeding device involves reciprocating movement of the carriage **25** lengthwise of the table in an aperture **27**, the carriage being raised and lowered at the begin-

ning and end of its stroke in strip-feeding direction, to move the pins to strip-engaging and then to strip-releasing position. Thus, pins 26 are projected into a strip-engaging position at the beginning of the forward stroke and after the carriage 25 has moved forward a distance equal to a sheet-width (i. e. the distance between a pair of transverse series of pin-engaging apertures in the strips 18 or 18*a*), the carriage and pins are retracted to strip-releasing position. The pins projecting through apertures 19 during the forward stroke move the collated strips forward across the table, a distance equal to a sheet-width, while maintaining the strips in the desired overlapping position, and in the desired transverse and longitudinal alignment. When the carriage 25 reaches the end of its forward stroke, it is lowered to disengage the pins 26 from the strips 18 and 18*a* on the table, and is then moved rearwardly to its initial position for engagement with the next transverse series of apertures 19 in the strips 18 and 18*a*. The carriage 25 is thereupon raised so that the pins 26 engage the next transverse series of apertures 19 and the strip-advancing and aligning operation is repeated.

Means is provided in accordance with the invention for securing the strips together, said means comprising in the embodiment illustrated in the drawings, a presser device 28 adapted to engage the assembled strips along the transversely aligned spots of adhesive at successive sheet-width intervals as the strips are advanced. The presser device 28 is advantageously located beyond the pins 26 and carriage 25, so as to engage the strips 18 and 18*a* after they have been positively aligned longitudinally and transversely by engagement with pins 26. When a thermoplastic adhesive is used, the presser device 28 comprises a pair of heating elements 29 and 30 between which the collated strips pass, and adapted to be clamped against the strips so as to heat the adhesive, thereby activating it to form a bond between the contiguous surfaces of the strips.

The presser device 28 can be reciprocated longitudinally of the strips, in unison with strip-feeding carriage 25, the distance between the row of pins 26 and presser device 28 being about equal to a sheet-width or multiple thereof, so that the presser device will coincide during strip advancement with a row of spots of adhesive adjacent a transverse series of pin-feeding apertures 19. In this case the members 29 and 30 compress the strips during the forward movement thereof, and release the strips during the return stroke of the presser device 28.

Preferably, however, the presser 28 remains stationary, and is spaced from the initial strip-engaging position of pins 26 by a distance substantially equal to a sheet-width or multiple thereof. With this arrangement, presser members 29 and 30 engage the strip only during rearward movement of the carriage 25 and pins 26, the strips being stationary during this operation, and release the strip during strip-advancing operation of the carriage and pins.

After the strips are secured together in the desired shingled relation, they are severed into assemblies or books at sheet-width intervals. For this purpose, a severing device 31 is provided at the delivery end of the table 24, comprising a knife 32 for cutting the strips transversely to the direction of strip feed and movable in a pair of vertical guides 33 at opposite sides

of the table. The shearing device 31 is located relative to the strip-feeding stroke of pins 26, such that the strips come to rest at the end of each sheet-width feeding operation of said pins with a transverse row of spots of adhesive in alignment with the knife 32. The knife descends while the strips are at rest, severing an assembly or book from the strips, the severed assemblies being collected, for example, in a stack 34. The line of severance preferably traverses the spots of adhesive so that part of the adhesive holding the sheets together remains at both margins of the severed assemblies. In this way, the sheets in each assembly are secured together at both lateral edges, and are held against casual displacement during inscription, feeding or handling of the assembly. Preferably, the line of severance is adjacent a transverse row of feed-pin-engaging apertures 19 so that the row of apertures is adjacent a lateral margin of each of the assembled forms after severance thereof. Thus, the series of apertures in the form can be conveniently used for positioning or feeding the assembly in a business machine.

The adhesive employed as stated above is preferably a thermoplastic composition which can be applied to the strips in the form of a solution in a volatile solvent or vehicle, so that upon evaporation of the vehicle the adhesive is left on the strips in inactive form. However, other kinds of normally inactive adhesives can be employed; for example, an adhesive which is adapted to adhere only to a complementary adhesive-coated surface upon contact therewith, of the type employed on self-sealing envelopes. When such an adhesive is used, the complementary compositions are applied to both surfaces of each of the interposed strips and to one surface of each of the outer strips, the spots being located so as to register with complementary spots on contiguous strips, when all of the strips are brought together in the desired shingled relation, and with their pin-engaging apertures 19 in transverse alignment. The adhesive used can also be a kind activated by application of a solvent or swelling agent, the latter being applied to the strips before they pass under roller 23 at the receiving end of the collating table 24.

Shingled assemblies produced in accordance with this invention have their component strips or sheets accurately positioned in the desired shingled relation, and held together at opposite sides of the assembly so as to avoid casual displacement thereof during its use. The herein described method for making such assemblies can be readily and conveniently carried out without the use of expensive or complicated guiding and feeding devices, of which operation must be correlated with an adhesive-applying mechanism, required in methods heretofore proposed. Instead, the device employed according to my invention involves a single strip-feeding and aligning mechanism which aligns the strips in the desired manner, transversely and longitudinally, during each feeding operation; and in conjunction therewith, a simple presser or heating device to secure the sheets together.

Variations and modifications may be made within the scope of this invention and portions of the improvements may be used without others.

I claim:

1. The herein described method of making sheet assemblies, having a plurality of sheets secured together in overlapping shingled rela-

tion, which comprises collating a plurality of continuous strips with their lateral margins in overlapping shingled relation, said strips each having a plurality of advancing and aligning apertures at sheet-width intervals therein, the apertures in respective strips being spaced transversely of the strips so as to register with similar apertures in the other strips when collated in the aforesaid manner; engaging a plurality of apertures in each strip and progressively advancing said strips, and simultaneously aligning them in longitudinal and transverse directions by bringing apertures of successive sets into registration; securing said strips together at sheet-width intervals as so collated and aligned; and severing the resulting secured strips at sheet-width intervals transversely of the strips to form sheet assemblies.

2. The herein described method of making sheet assemblies, having a plurality of sheets secured together in overlapping shingled relation, which comprises collating a plurality of continuous strips with their lateral margins in overlapping shingled relation, said strips each having a plurality of advancing and aligning apertures therein at sheet-width intervals, the apertures in the respective strips being spaced transversely of the strips so as to register with similar apertures in the other strips when the latter are collated in the aforesaid manner, said strips having areas of inactive adhesive on their strip-contacting surfaces at sheet-width intervals; progressively engaging a plurality of apertures in each strip and advancing said strips, and simultaneously aligning them in longitudinal and transverse directions by bringing apertures of successive sets into registration; activating said adhesive and pressing the strips together to secure the strips together; and severing the resulting secured strips at sheet-width intervals transversely of the strips to form sheet assemblies.

3. The herein described method of making sheet assemblies, having a plurality of sheets secured together in overlapping shingled relation, which comprises collating a plurality of continuous strips with their lateral margins in overlapping shingled relation, said strips each having a plurality of advancing and aligning apertures therein at sheet-width intervals, the apertures in the respective strips being spaced transversely of the strips so as to register with similar apertures in the other strips when the latter are collated in the aforesaid manner, said strips having areas of thermoplastic adhesive on their strip-contacting surfaces at sheet-width intervals; engaging a plurality of apertures in each strip and progressively advancing said strips, and simultaneously aligning them in longitudinal and transverse directions by bringing apertures of successive sets into registration; heating the strips, and pressing them together at the adhesive-bearing portions thereof to secure the strips together; and severing the resulting secured strips at sheet-width intervals transversely of the strips to form sheet assemblies.

4. The herein described method of making sheet assemblies, having a plurality of sheets secured together in overlapping shingled relation, which comprises collating a plurality of continuous strips with their lateral margins in overlapping shingled relation, said strips each having a plurality of feeding and aligning pin-engaging apertures therein at sheet-width intervals, the apertures in the respective strips being spaced transversely of the strips so as to register with similar apertures in the other strips when the latter are collated in the aforesaid manner; progressively advancing said strips and simultaneously aligning them in longitudinal and transverse directions by engagement of a plurality of transversely spaced apertures in each strip with a set of transversely spaced feeding and aligning pins movable in strip-feeding direction; securing said strips together as so collated and aligned; and severing the resulting assembly at sheet-width intervals transversely of the strips to form sheet assemblies.

5. The herein described method of making sheet assemblies, having a plurality of sheets secured together in overlapping shingled relation, which comprises collating a plurality of continuous strips with their lateral margins in overlapping shingled relation, said strips each having a plurality of pin-engaging apertures therein at sheet-width intervals, the apertures in the respective strips being spaced transversely of the strips so as to register with similar apertures in the other strips when the latter are collated in the aforesaid manner, said strips having areas of inactive adhesive on their strip-contacting surfaces at sheet-width intervals adjacent said apertures; progressively advancing said strips and simultaneously aligning them in longitudinal and transverse direction by progressive engagement of a plurality of apertures in each strip with a set of transversely spaced feeding pins movable in strip-feeding direction; securing said strips together by activating said adhesive and pressing the strips together after engagement with said feeding pins; and severing the resulting secured strips at sheet-width intervals transversely of the strips to form sheet assemblies.

6. The herein described method of making sheet assemblies having a plurality of sheets secured together in overlapping shingled relation, which comprises collating a plurality of continuous strips with their lateral margins in overlapping shingled relation, said strips each having a plurality of advancing and aligning apertures therein at sheet width intervals, the apertures in the respective strips being spaced transversely of the strips so as to register with similar apertures in the other strips when the latter are collated in the aforesaid manner, and the strips overlying the lowermost strip having areas of inactive adhesive solely on the strip-containing portions of their rear surfaces, at sheet-width intervals; engaging a plurality of apertures in each strip and progressively advancing said strips, and simultaneously aligning them in longitudinal and transverse directions by bringing apertures of successive sets into registration; activating said adhesive and pressing the aligned strips together to secure the strips together; and severing the resulting secured strips at sheet-width intervals transversely of the strips to form sheet assemblies.

7. The method of making sheet assemblies having a plurality of sheets secured together in overlapping shingled relation which comprises the steps of forming a plurality of continuous strips, each with transverse rows of pin-receiving apertures at sheet-width intervals; applying spots of adhesive to the strips in predetermined relation to the said apertures; collating a plurality of said continuous strips in superposed relation with their lateral margins in overlapping shingled relation; inserting transversely spaced pins in the transversely extending apertures of each strip to align the strips; adhering the aligned strips in as-

sembled relation; advancing the pins to feed the strips; and actuating a severing means in predetermined relation with the advancing of the strips to sever the same at sheet-width intervals.

8. The method of making sheet assemblies having a plurality of sheets secured together in overlapping shingled relation which comprises the steps of forming a plurality of continuous strips, each with transverse rows of pin-receiving apertures at sheet-width intervals; applying spots of thermoplastic adhesive to the strips in predetermined relation to the said apertures; collating a plurality of said continuous strips in superposed relation with their lateral margins in overlapping shingled relation; inserting transversely spaced pins in the transversely extending apertures of each strip to align the strips; applying heat and pressure to the aligned strips in assembled relation to cause the adhesive to secure the strips together; advancing the pins to feed the strips; and severing the assembled strips at sheet-width intervals.

CARL W. BRENN.

REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

Number	Name	Date
1,670,787	Sherman	May 22, 1928
2,103,339	Salfisberg	Dec. 28, 1937
2,125,758	Waters	Aug. 2, 1938
2,140,599	Salfisberg	Dec. 20, 1938
2,238,356	Williams	Apr. 15, 1941
2,260,601	Brenn	Oct. 28, 1941
2,283,221	Michaels	May 19, 1942

Certificate of Correction

Patent No. 2,557,723 June 19, 1951

CARL W. BRENN

It is hereby certified that error appears in the printed specification of the above numbered patent requiring correction as follows:

Column 7, lines 32 and 33, strike out "progressively" and insert the same before "advancing" in line 34; column 8, line 51, for "strip-containing" read *strip-contacting*;

and that the said Letters Patent should be read as corrected above, so that the same may conform to the record of the case in the Patent Office.

Signed and sealed this 18th day of September, A. D. 1951.

[SEAL]

THOMAS F. MURPHY,
Assistant Commissioner of Patents.