

March 3, 1942.

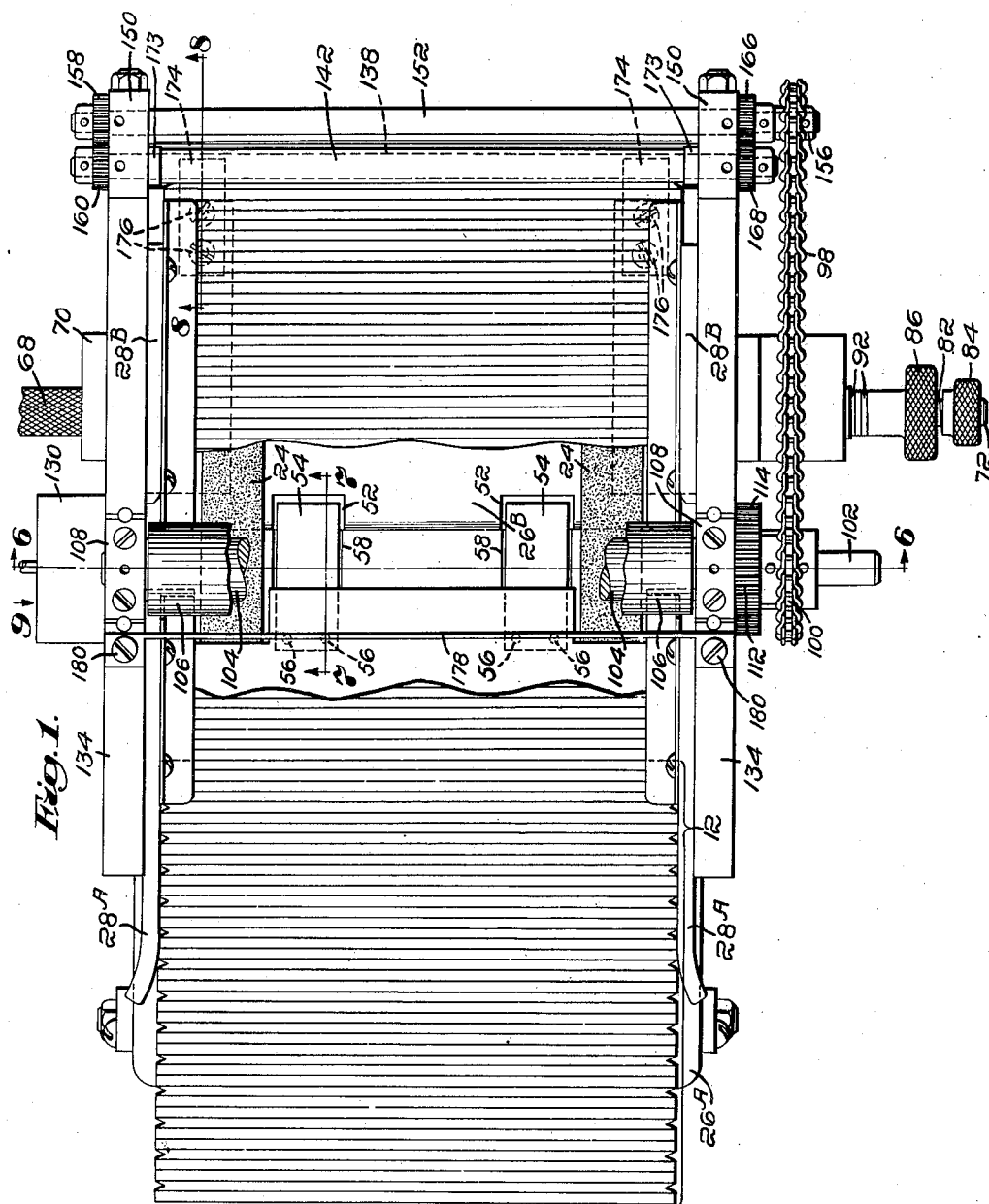
C. E. ATTWOOD

2,275,336

MEANS FOR JOINING SCORED SHEETS AND BREAKING ALONG SCORED LINES

Filed Oct. 22, 1937

5 Sheets-Sheet 1.



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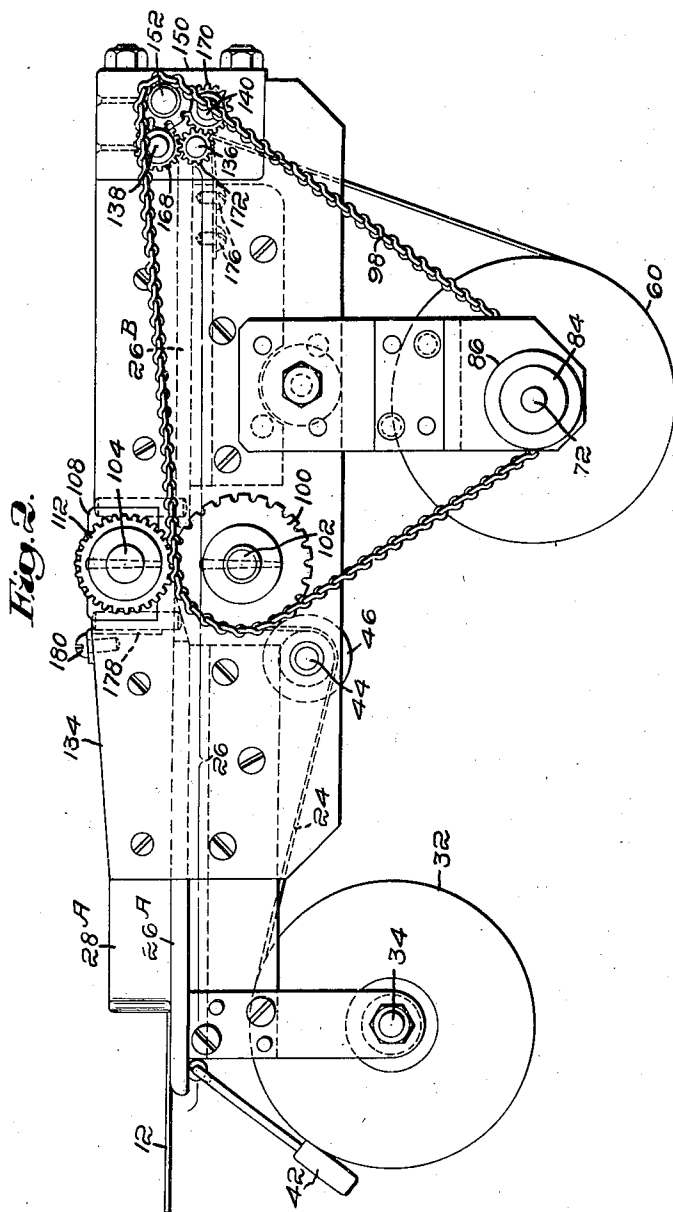
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MEANS FOR JOINING SCORED SHEETS AND BREAKING ALONG SCORED LINES

Filed Oct. 22, 1937

5 Sheets-Sheet 2



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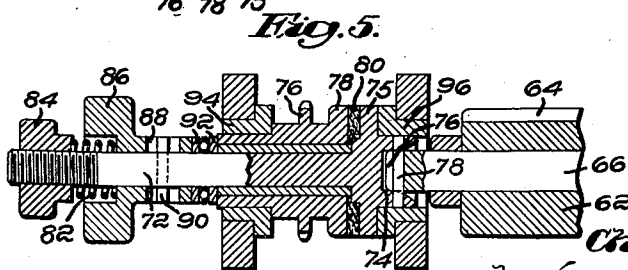
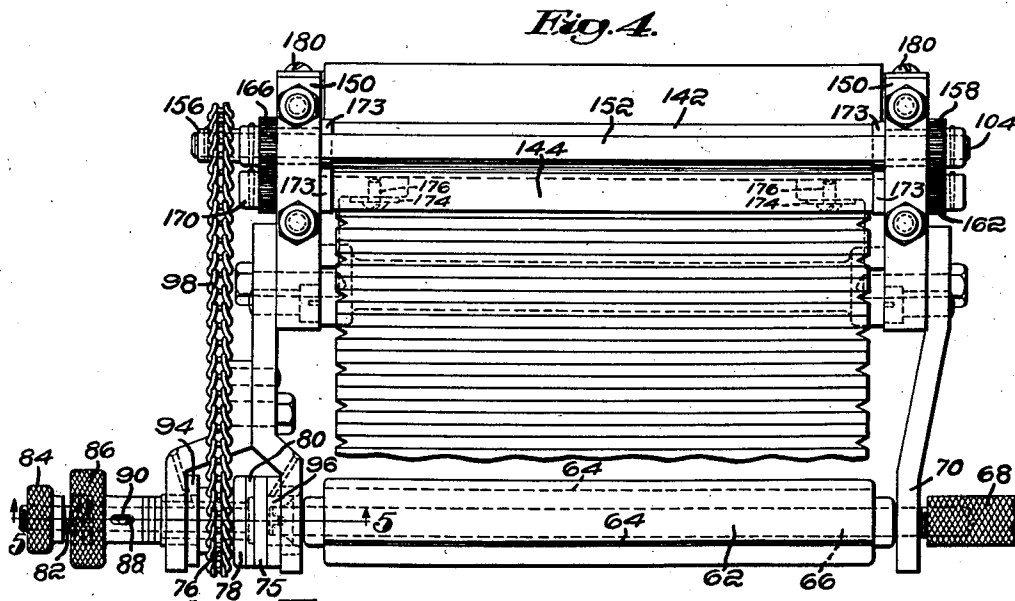
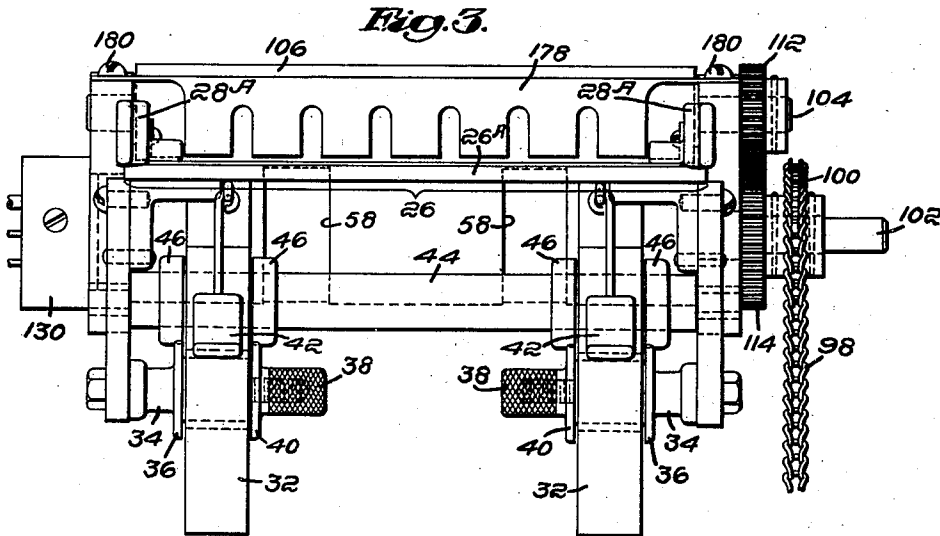
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2,275,336

MEANS FOR JOINING SCORED SHEETS AND BREAKING ALONG SCORED LINES

Filed Oct. 22, 1937

5 Sheets-Sheet 3



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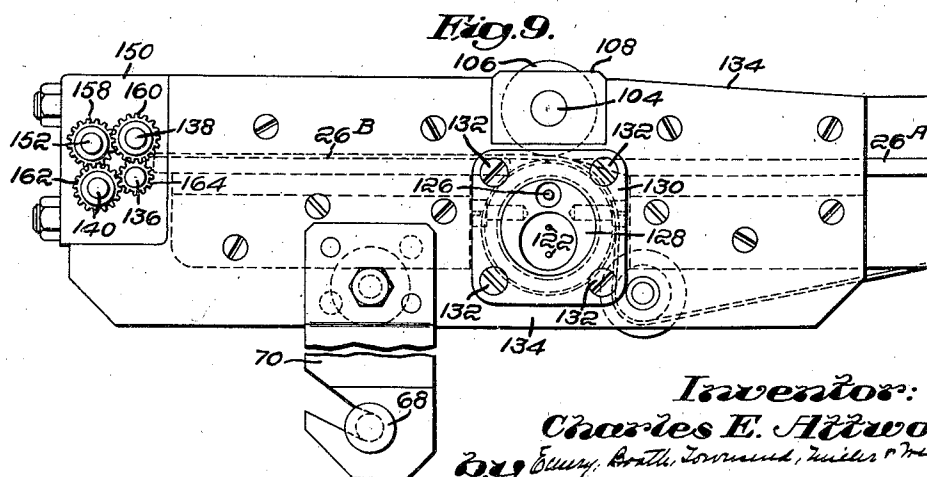
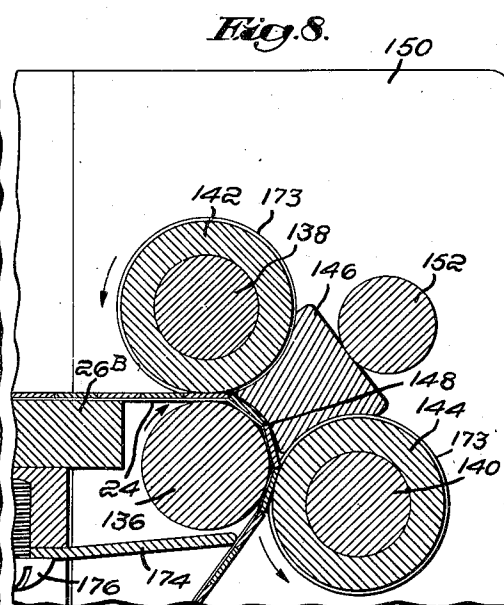
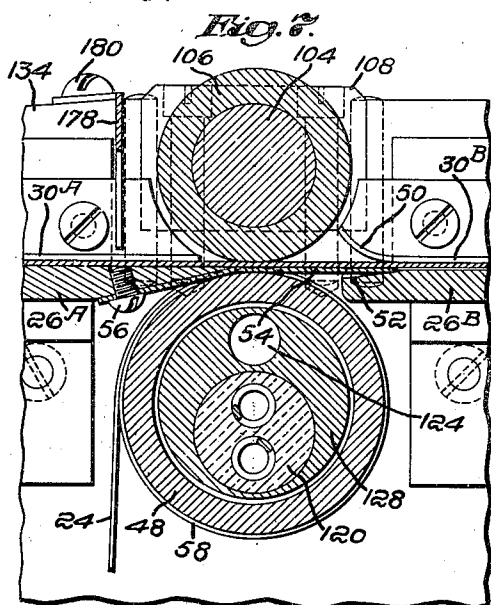
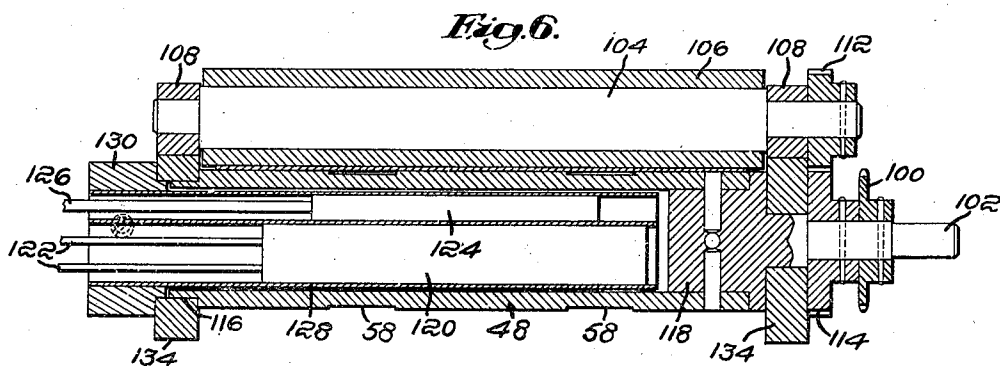
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MEANS FOR JOINING SCORED SHEETS AND BREAKING ALONG SCORED LINES

Filed Oct. 22, 1937

5 Sheets-Sheet 4



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2,275,336

MEANS FOR JOINING SCORED SHEETS AND BREAKING ALONG SCORED LINES

Filed Oct. 22, 1937

5 Sheets-Sheet 5

Fig. 10.

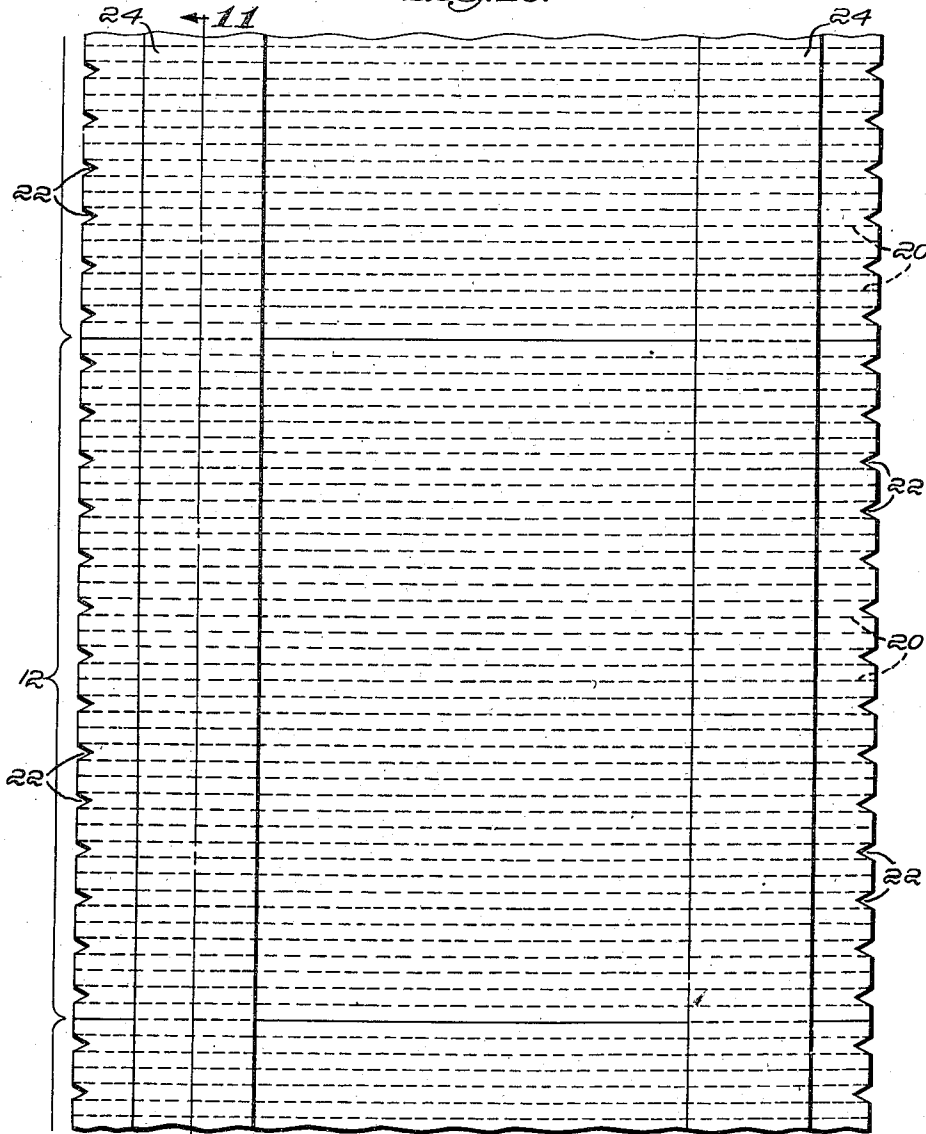
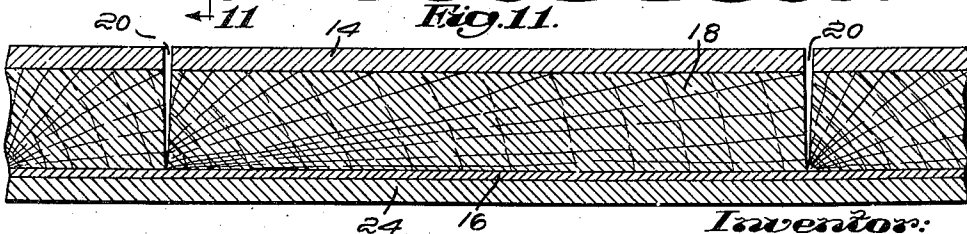


Fig. 11.



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UNITED STATES PATENT OFFICE

2,275,336

MEANS FOR JOINING SCORED SHEETS AND
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Application October 22, 1937, Serial No. 170,379

6 Claims. (Cl. 154—36)

This invention relates to a novel means for preparing a composite web for printing. The invention contemplates assembling edge to edge in series a plurality of sheets having parallel score lines transverse to the longitudinal dimension of the web, and adhesively securing to said sheets one or more strips of flexible material disposed lengthwise of the series. For this purpose, the invention contemplates the use of a strip previously coated with an appropriate adhesive which preferably is heat-activated or thermoplastic, although I have successfully employed for this purpose a tape which is coated with a normally tacky adhesive requiring neither moisture nor water.

The mode of assembling the components is to feed edge to edge in series a plurality of the sheets in a direction transverse to said edges and to feed the strip of adhesive-coated material in the same direction with the adhesive coating in contact with the sheets. When, as in the preferred method, a heat-activated adhesive is employed, the adhesive is heated while in contact with the sheets and pressure is exerted on the sheets and the strip.

The invention contemplates as a next step the abrupt bending of the web along the score lines to render the web sufficiently flexible to enable it to be passed through a printing machine to print lines of characters between the score lines, after which the web is to be ruptured along the score lines to form index strips whose ends may then be inserted in channels of a filing panel.

The invention contemplates the provision of a machine by which these steps may be carried out as a continuous process and the completed web wound upon itself to form a roll in readiness for use in a printing machine.

The invention will best be understood by reference to the following description of the process and a machine by which the process may be carried out, while its scope will be pointed out more particularly in the appended claims.

In the drawings:

Fig. 1 is a plan of the preferred machine;

Fig. 2 is a side elevation of the same;

Fig. 3 is an elevation of the machine as viewed from its front end, i. e., from the left-hand end of Fig. 2;

Fig. 4 is an elevation of the machine as viewed from its rear end, i. e. from the right-hand end of Fig. 2;

Fig. 5 is a vertical sectional view on line 5—5 of Fig. 4;

Fig. 6 is a vertical sectional view on line 6—6 of Fig. 1;

Fig. 7 is a vertical sectional view on line 7—7 of Fig. 1;

Fig. 8 is a vertical sectional view on line 8—8 of Fig. 1;

Fig. 9 is an elevation as viewed in the direction of the arrow 9 in Fig. 1;

Fig. 10 is a plan of the completed web as viewed from the back;

Fig. 11 is a sectional view on a much enlarged scale on line 11—11 of Fig. 10.

The completed web will first be described because it is believed that this will lead to a better understanding of the preferred machine. Referring to Figs. 10 and 11, the web comprises a plurality of sheets 12 each of which, in the present example is composed of two layers 14 and 16 of paper and an intermediate layer 18 of appropriate material such as wood veneer to which the layers 14 and 16 are adhesively secured. In the present example, the layer 14 is relatively thick and substantial because this presents the surface which is to be printed, while the layer 16 is relatively thin and easily ruptured.

The sheet is weakened along parallel lines as by cuts 20 extending through the layer 14 and into the layer 18 but not into the layer 16. The sheet is provided with a series of openings, herein notches 22 along each of two opposite edges, to cooperate with feeding instrumentalities of the printing machine which is to print lines of characters between the lines 20.

The first step is to assemble the sheets edge to edge in series, as shown, with the scored lines extending transversely of the length of the series. This step is conveniently carried out by hand, laying one sheet upon an appropriate support, then laying another sheet upon the support, edge butted against the first sheet, a third against the second, and so on, feeding the sheets along in an edge-butted row.

The sheets, as thus assembled, are secured together by one or more, herein two connecting members such as strips or tapes 24 coated with an appropriate adhesive which, as already stated, may be normally tacky but I prefer to employ thermo-plastic or heat-activated adhesive which is temporarily rendered tacky by the application of heat above normal room temperatures. There are several such adhesives which are commercially available and in common use today.

When, as in the present example, the sheets are fed along in edge-butted series, the strips are also fed along lengthwise in the same direc-

tion and with the adhesive-coated side in contact with the backs (i. e., the layers 16) of the sheets. The adhesive is rendered tacky by heating when in contact with the sheets and pressure is exerted on the strips and on the sheets to bring the adhesive into intimate contact with the sheets. This can be accomplished by squeezing the web and at the same time pushing it along by the same grip, as by pressure and feeding rollers.

The next and final step is to bend the web sharply along the cuts 20 in a direction which will open up the cuts rather widely. This tends to weaken the layer 16 as well as the strips 24 along the cuts and along the abutting edges of the sheets. This may be called "breaking" the web and renders it flexible so that it may be coiled upon itself into a roll convenient for introduction into a printing machine, and so that after the printing has taken place, the layer 16 and the strips 24 may easily be ruptured along the cuts 20 to divide the web into narrow index strips.

The foregoing steps may be carried out conveniently by the use of the machine now to be described, reference being had at first to Fig. 1. The hereinbefore described sheets 12 are placed one by one and edge to edge upon a support, herein a table 26 composed of two parts which, in Fig. 7, are given the further designations A and B, and are separated in a horizontal direction by a space or gap to receive the feed and pressure rollers hereinafter described. The sheets are placed so that the cuts 20 in the sheets extend transversely of the direction in which the sheets are fed. The lateral edges of the sheets are suitably guided at first by lateral guides 28A and later by lateral guides 28B. The lateral margins of the sheets are held down upon the table, at first by top guides 30A and later by top guides 30B. Each sheet is fed downward by hand until it is seized by feed rollers, presently to be described, which continue the feeding, a second sheet is placed with its front edge against the rear edge of the first, until it is seized by the rollers, and so on with a continuous succession of sheets.

As shown in Fig. 3, the hereinbefore described tapes 24 are supplied to the machine in the form of rolls 22 mounted to turn on appropriate supports herein studs 34 having flanges 36, and the rolls are held in place as by knurled nuts 38 threaded onto the studs and provided with flanges 40. While the nuts alone might be relied upon to furnish a frictional resistance to turning of the rolls, in the present example pivoted weights 42 gravitate against the peripheries of the rolls and furnish a slight resistance to prevent the formation of a slack in the tapes as they unwind from the rolls. The tapes lead from the rolls beneath the table section 26A, beneath a roller 44 provided with guide collars 46, thence upwardly to and part way about a roller 48 (see Fig. 7) and thence, coated surfaces uppermost, along the top of the second table section 26B. The top guides 30B are curved upwardly, as at 50 to prevent any possibility of the front edges of the sheets catching on the front ends of the guides. To prevent the advancing edges of the sheets from catching on the front edge of the second table section 26B the latter is recessed at 52 to receive the free ends of thin guides 54 whose other ends are secured, as by screws 56, to the under side of the first table section 26A. The roller 48 is

provided with shallow grooves 53 to receive the guides 54.

After the tapes have been united with the sheets, the web is first "broken," as hereinafter described, and then passes downwardly (see Fig. 2) and is wound upon itself as a roll 60 about a roller 62 (see Fig. 4) provided with a groove 64 in which the edge of the web is inserted. This roller is secured to a shaft 66 having at one end a knurled handle 68 by which it may be turned by hand to start the web upon it. The shaft is supported at one end by an open bearing 70 and at its other end is supported by and coupled to a drive shaft 72 (see Fig. 5) as by providing the latter with a socket 74 which receives the end of the shaft, and the shaft is provided with a notch 76 to receive a pin 78 extending through the socket.

Power is applied to the shaft 72 as by a frictional driving mechanism which tends to drive the shaft faster than the web will allow it to go, thus keeping the web under constant tension. To this end, the shaft 72 is provided with a friction disk 75, a driver, herein a sprocket wheel 75 is provided with a friction disk 78, and there is interposed between these disks a friction disk 80 of appropriate material such as leather. Pressure is applied to the disks as by a spring 82 interposed between a nut 84 threaded onto the shaft 72 and a collar 86 which is free to move lengthwise of the shaft but cannot turn upon it, the collar 86, to this end, being provided with a lengthwise slot 88 which receives a pin 90 passing through and secured to the shaft. The end thrust is taken by an appropriate ball thrust bearing 92. The entire assembly is mounted in bearings 94 and 96. When the web has reached its maximum permissible diameter on the roller 62, the machine is stopped and the roller is removed from its place by grasping the handle 68, lifting that end of the shaft 66 from the open bearing 70 and withdrawing the other end of the shaft from its engagement with the pin 78 in the socket 74. The roll of web is then removed from the roller 62 (or a new roller may be substituted) and when the roller is inserted in its place, a new web is attached to it and the machine restarted.

The sprocket wheel 75 is appropriately driven as by a chain 98 (see Fig. 2) which, in the present example is driven by a sprocket wheel 100 secured to a shaft 102, to which the hereinbefore described roller 48 (see Fig. 6) is also secured. Power from a suitable source is applied to the shaft 102 as by a motor, not shown.

Returning now to Fig. 7, the roller 48 is separated by a slight space (sufficient for the web) from an upper roller 104 which, in the present example, has a soft rubber covering 106 pressing upon the upper surface of the web. As the covering is yielding, there is no need of making the upper roller vertically adjustable. The upper and lower rollers squeeze the tapes against the sheets and feed them forwardly. Power is applied to the upper roller by mechanism presently to be described.

The upper roller 104 (see Fig. 6) is mounted in bearings 108. A gear 112 secured to the roller 104 meshes with and is driven by a gear 114 which is secured to the shaft 102. The lower roller 48 herein is hollow, for a purpose which will presently appear, and is mounted at one end in a bearing 116 (see the left-hand side of Fig. 6) while its other end is disposed about and is suit-

ably secured to an enlarged portion 118 of the shaft 102.

The lower roller 48 is made hollow to receive appropriate heating means such as an electric heating element 120 of the resistance type, of 5 common form, commercially available, the one herein employed being made by General Electric Company. Conductor wires 122 lead from the heating element to the exterior, where they may be connected to a suitable current source, not 10 shown. Also within the lower roller is a commercially available thermostat bulb 124 (the one shown being made by General Electric Company) having a tube 126 for connection to an appropriate thermostat, not shown, for controlling electric current to the heating element to maintain 15 the correct temperature to activate the adhesive on the tapes. One commercially available adhesive, suitable for this purpose, becomes active and tacky at a temperature in the region of 105 degrees F.

The heating element and the thermostat bulb are conveniently mounted within a cylindrical bar 128 disposed within the roller 48 and extending from the latter into a bracket 130 which, as shown in Fig. 9, is secured as by screws 132 to one of 20 two side frame members 134. As the sheets pass along the table section 26A to be seized by the upper and lower rollers 104 and 48 (see Fig. 7) and the tapes are brought into contact with the sheets, the heat furnished by the heating element activates the adhesive on the tapes and the rollers press the sheets onto the tapes and feed the resulting web forward. As the web advances along 25 the second table section 26B, the adhesive is sufficiently cooled at ordinary room temperature by the surrounding air, and becomes inactive.

The next step is to bend the web sharply along the score lines 20 to render the web more flexible so that subsequently it may be ruptured along the score lines to form index strips. The preferred mechanism for performing this operation will now be described, reference being had at first to Fig. 8. As the web leaves the second table section 26B, it passes over a roller 136, against 30 which it is maintained by rollers 138 and 140 which, in the present example, are provided with rubber coverings 142 and 144, and between these rollers is a floating breaker bar 146 having a face 148 which is curved to conform to the surface of the roller 136. The rollers are conveniently 35 mounted in bearing blocks 150, and are driven in the directions of the arrows in Fig. 7 by appropriate mechanism such as that now to be described.

A shaft 152 mounted in bearing blocks 150 is 40 driven by a sprocket wheel 156 (see Fig. 1) which, in turn, is driven by the chain 98. Power is transmitted from the shaft 152 to the rollers 136, 138 and 140 by one or two (herein two) trains of gears, two trains being preferred. One of these trains of gears (see Fig. 9) comprises a gear 158 secured to the shaft 152 and meshing with gears 160 and 162 secured to the shafts 138 45 and 140, respectively, and a gear 164 which is secured to the roller 136 meshes with the gears 160 and 162. The second train is like the first and comprises a gear 166 (see Fig. 1) secured to the shaft 152 and meshing with a gear 168 secured to the roller 138, and as shown in Fig. 2 50 meshing with a gear 170 secured to the roller 140. The gears 168 and 170 mesh with a gear 172 secured to the roller 136. The breaker bar 146 floats between the shaft 152 and collars 173 on the rollers 138 and 140.

The rollers 136, 138 and 140 (see Fig. 8) cooperate to carry the web part way about the roller 136 and past the breaker bar, through a path which has such an abrupt turn that the web is bent sharply, the cuts 20 are opened up widely and the web is "broken" in the sense that it is 5 weakened along the cuts.

As the web leaves the breaking mechanism, the web is stripped from the roller 136 by strippers 10 174 suitably secured as by screws 176 below the table section 26B.

Returning now to Fig. 7, as a means to prevent the operator's fingers from being caught and crushed by the pressure and feeding rollers, a 15 suitable guard 178 is secured as by screws 180 to the side frame members 134 (see also Fig. 3).

The operation of the machine has been described so fully that no review is deemed necessary. The machine is rapid and convenient.

20 Having thus described the method and one means for carrying out the method, but without limiting myself thereto, what I claim and desire by Letters Patent to secure is:

1. In a machine for preparing a composite web from an adhesive coated strip and a series of 25 sheets provided with parallel score lines, the combination of means for applying the sheets edge to edge in series to the adhesive coating of the strip, means for rendering the adhesive temporarily tacky to cause the sheets to adhere thereto, and means for bending the resultant web sharply along the score lines.

2. In a machine for preparing a composite web from an adhesive coated strip and a series of 30 sheets provided with parallel score lines, the combination of means for applying the sheets edge to edge in series to the adhesive coating of the strip, means for rendering the adhesive temporarily tacky to cause the sheets to adhere thereto, a roller over which the resultant web is passed 35 with the strip next to the roller, and means including a breaker bar for causing the web to conform to the surface of said roller.

3. In a machine for preparing a composite web from an adhesive coated strip and a series of 40 sheets provided with parallel score lines, the combination of means for applying the sheets edge to edge in series to the adhesive coating of the strip, means for rendering the adhesive temporarily tacky to cause the sheets to adhere thereto, a roller over which the resultant web is passed 45 with the strip next to the roller, and means including two other rollers for causing the web to conform to the surface of the first-mentioned roller.

4. In a machine for preparing a composite web from an adhesive coated strip and a series of 50 sheets provided with parallel score lines, the combination of means for applying the sheets edge to edge in series to the adhesive coating of the strip, means for rendering the adhesive temporarily tacky to cause the sheets to adhere thereto, a roller over which the resultant web is passed 55 with the strip next to the roller, and means including two other rollers and an intermediate breaker bar for causing the web to conform to the surface of the first-mentioned roller.

5. In a machine for superimposing a series of sheets upon and uniting the same with the upper, adhesive-coated surfaces of two tapes to form a composite web, the combination of a table composed of a first section and a second section separated by a space, a first pair of lateral guides to guide the lateral edges of the sheets before 60 they pass over said space, a second pair of lateral 65 70 75

guides to guide the lateral edges of the sheets later as they pass from said first table section to said second table section, a first pair of top guides to hold the lateral margins of the sheets down upon said first table section, a second pair of top guides to hold the lateral margins of the sheets down upon said second table section, supports on which two rolls of tape are supported beneath said first table section, means to guide said tapes in a path first beneath said first table section, and thence upwardly through said space between said table sections, said means including upper and lower rollers which squeeze the tapes against the superimposed sheets and feed them forwardly along said second table section, said lower roller being provided with grooves, two guides secured to said first table section, extending through said grooves and overlying the front edge of said second table section, a heating element within one of said rollers, and a take-up roller upon which the composite web is wound.

6. In a machine for superimposing a series of sheets upon and uniting the same with the upper, adhesive-coated surface of a tape to form a composite web, the combination of a table composed

of a first section and a second section separated by a space, a first pair of lateral guides to guide the lateral edges of the sheets at first, a second pair of lateral guides to guide the lateral edges of the sheets later as they pass from the first table section to the second table section, a first pair of top guides to hold the lateral margins of the sheets down upon said first table section, a second pair of top guides to hold the lateral margins of the sheets down upon the second table section, a support on which a roll of tape is supported beneath said first table section, means to guide said tape first beneath said first table section, thence upwardly through said space, and thence along the top of said table section, said means including upper and lower rollers which squeeze the tape against the superposed sheets and feed them forwardly along said second table section, said lower roller being provided with a groove, a guide secured to said first table section and extending through said groove and overlying the front edge of said second table section, and a take-up roller on which the composite web is wound.

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