

United States Patent

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[54] **SHEET PERFORATING AND JOINING SYSTEM**
5 Claims, 6 Drawing Figs.

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 29/432, 83/660, 83/678, 93/1 (G), 93/58 (P)

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 B31b 1/14, B26f 1/20

[50] Field of Search 29/432;
 93/1 WZ, 1.1, 58.6, 1 G; 83/660, 678

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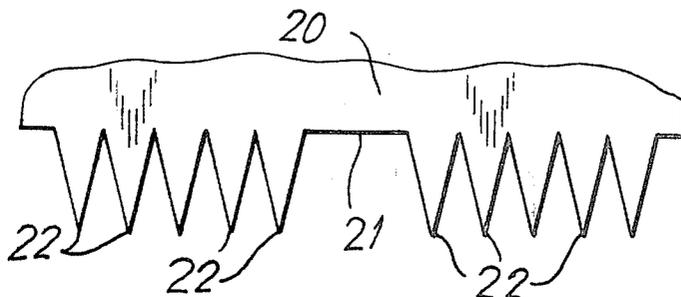
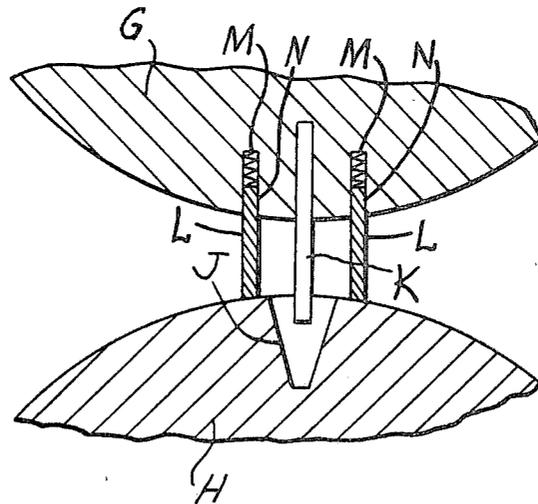
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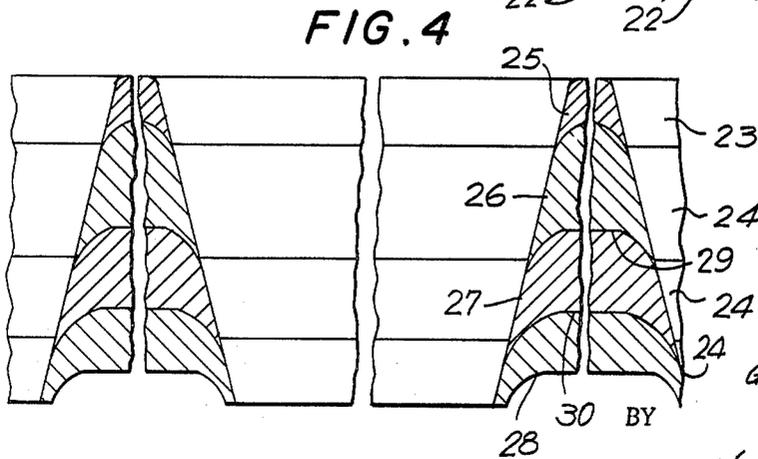
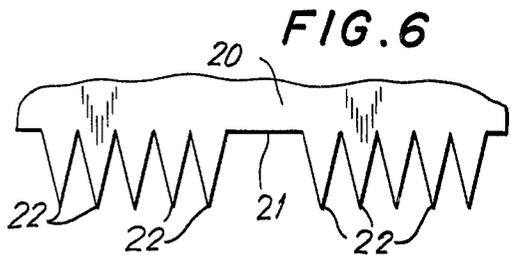
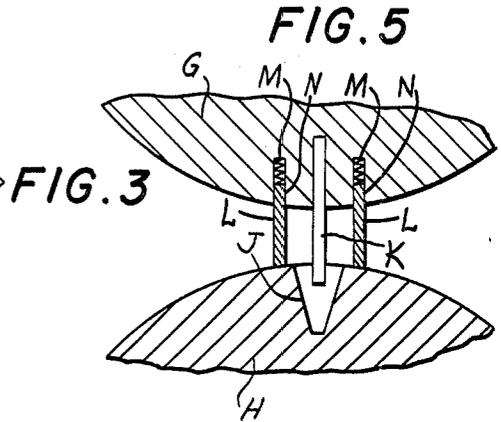
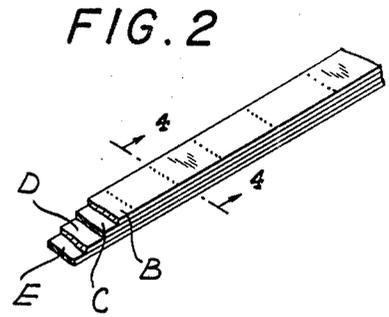
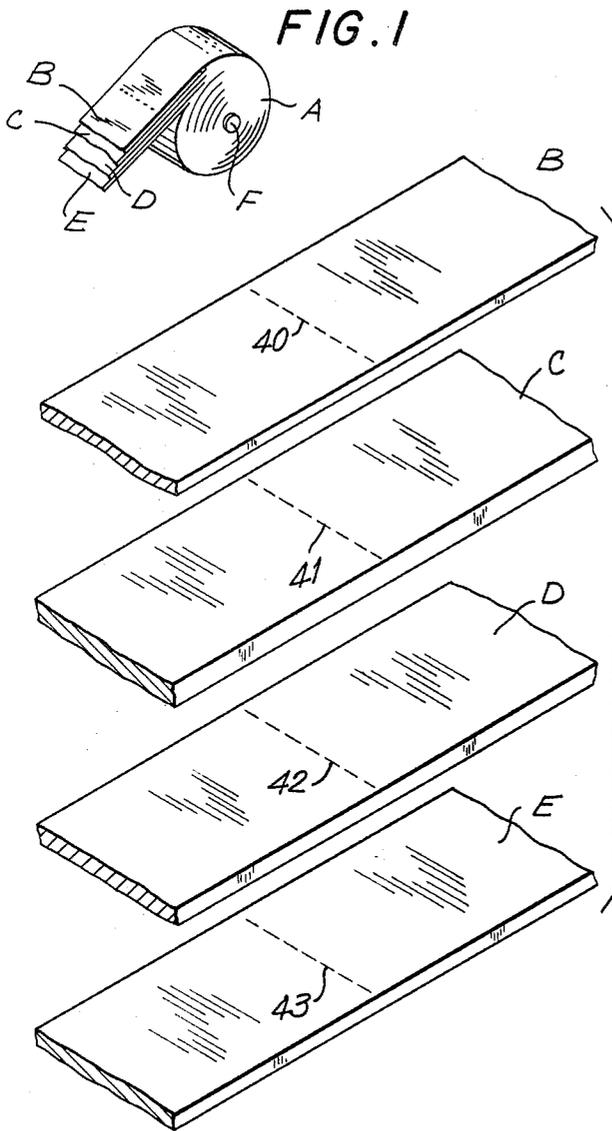
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ABSTRACT: The disclosure relates to perforating and uniting sheets of materials together and particularly paper sheets so that a substantially firm junction is achieved.

This is done by forcing into the material while it is being held in position an interrupted sawtooth or serrated arrangement which will result in a junction between the fibrous structure of the various superimposed layers.

This is done by passing several layers of the paper material between rollers, one of the rollers having an interrupted perforating member extending longitudinally across the roller but transversely of the direction of movement of the laminations. The perforator is provided on each side with spring pressed holder members and the meeting roller has a recess extending transversely of the moving laminations but longitudinally of the roller to receive the perforating interrupted sawtooth arrangement.





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SHEET PERFORATING AND JOINING SYSTEM

SUMMARY OF THE INVENTION

It is among the objects of the present invention to provide a simple system and procedure for joining together sheets of paper.

Another object is to provide a unitary laminated paper structure which has been substantially integrally joined together with the fibers of the various paper sheets substantially interlocked with one another.

Still further objects and advantages will appear in the more detailed description set forth below, it being understood, however, that this more detailed description is given by way of illustration and explanation only and not by way of limitation, since various changes therein may be made by those skilled in the art without departing from the scope of and spirit of the present invention.

In accomplishing the above objects, it has been found most satisfactory to assemble together in three, four, five or more laminations a series of sheets of paper of different textures and of different thicknesses and to form a united laminated structure by perforating the sheets in such a way that they will substantially attach themselves one to the other.

Less preferably, the invention may be applied to other types of sheet material or among the laminates there may be provided plastic sheets which would be joined by adherence of the adjacent fiber sheets.

Preferably, the junction results as a result of passing the laminated or superimposed sheets between two rollers, a male roller containing a transverse serrated or perforating member with interrupted teeth or prongs and with the female member receiving a transverse recess into which the perforating element may be received. This perforating may take place at intervals of 360° where only one perforator blade is employed or at shorter intervals depending upon the angular spacing of the perforating members and also the diameter of the rolls.

It is important that when the perforating takes place the laminated stock be held down by spring fingers against the base female cylinder.

The slight arcuate movement of the perforating blade results in an interlocking of the paper fibers or other fibers of the sheet materials.

BRIEF DESCRIPTION OF THE DRAWINGS

With the foregoing and other objects in view, the invention consists of the novel construction, combination and arrangement of parts as hereinafter more specifically described, and illustrated in the accompanying drawings, wherein is shown an embodiment of the invention, but it is to be understood that changes, variations and modifications can be resorted to which fall within the scope of the claims hereunto appended.

In the drawings, wherein like reference characters denote corresponding parts throughout the several views:

FIG. 1 illustrates a top perspective view of a roll of laminated paper, the laminates of which has been joined.

FIG. 2 represents a top perspective view of a portion of the laminated sheet of FIG. 1.

FIG. 3 is a separated view indicating the separated laminates of FIGS. 1 and 2.

FIG. 4 is a transverse sectional view upon the line 4-4 of FIG. 2 upon an enlarged scale as compared to FIG. 2.

FIG. 5 is a diagrammatic side sectional view showing the perforating rolls without the laminated structure passing therethrough, but in the position in which the perforation will take place.

FIG. 6 is a diagrammatic fragmentary side elevational view showing the interrupted perforating device upon an enlarged scale as compared to FIG. 5.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

Referring to FIGS. 1 to 4 there are four laminations, B, C, D and E shown by way of example, since a greater or lesser number may be used and the laminations may be of any fibrous material with or without plastic or other nonfibrous sheets.

In FIG. 1 these laminations, after the perforated juncture, are joined together in a roll A on the spindle F.

The perforations 40, 41, 42 and 43, which join the sheets B, C, D and E together, may be made by means of a perforating blade such as is indicated in FIG. 6. This perforating blade has a solid portion 20 with downwardly projecting teeth 22 closely spaced together and interrupted at 21.

The perforating blade K of FIG. 6 is on the periphery of the roll of cylinder G and it projects beyond the periphery of the cylinder G. On each side of the blade K there are the presser members L backed by the coil M, which are received in the recesses or cavities N.

Opposite the blade K will be the recess J in the roller H. As indicated by the sides of the recess J the blade K will not only penetrate and perforate but will also have a slight angular motion due to the rotation of the roller G while penetrating the laminations B, C, D, and E.

The result of the lamination is best indicated in FIG. 4. as the teeth 22 are withdrawn, the fibers will spring back into position and will tend to lock into the surface and into the body of the sheets. In FIG. 4 is shown this result diagrammatically with the sheets from bottom to top each having a smaller perforated area and with the fibers of the higher sheet extending into and engaging the fibers in the next adjacent sheet.

It will be noted that the junctions at 29, 30, 31 and 32 will each have about the same depth with a predetermined length of tooth 22 and that the curved sides or conical sides will extend into the next adjacent sheet in the perforating zone.

As indicated, the layers 24 and the topmost layer 23 will be securely lodged together by the resilient fibers in the perforating area indicated at 25, 26, 27 and 28. The rolls G and H may be spaced the desired amount to take care of the laminations and the upper and lower roll may be supported upon resiliently connected trunnions to permit the rolls to accommodate different thicknesses of lamination.

Desirably, the entire paper stock should be substantially unified by the perforation junctions as indicated in FIGS. 1, 2 and 3.

As many changes could be made in the above sheet perforating and joining system, and many widely different embodiments of this invention could be made without departing from the scope of the claims, it is intended that all matter contained in the above description shall be interpreted as illustrative and not in a limiting sense.

It will be noted that the sharp teeth 22 of the edge 20 of the blade in FIG. 6 are at least twice as high as the width of their base and that the space 21 between the closely spaced group of teeth, which may be five in number, is at least equal to or more than the width of two of the teeth 22 at their base. The opening to receive the lower end of the blade K as shown in FIG. 5 rotates without touching the walls of the recess J so as to form the necessary perforations and enlargement of the elevated portion of the paper portions, as indicated in FIG. 4, without penetrating the surface.

The lower penetrations, as indicated in FIG. 4, have rounded upper portions or rounded and flat top portions 29 and 30 projecting into the next upper lamination. There is, therefore, only visible on the outside of the lower face the slightly indented lower face 28, as indicated in FIG. 4.

The knife K, in rotating as it penetrates, will give the unusual configuration of FIG. 4, which results in a direct binding of the sheets together without the teeth penetrating through the entire series of laminations because of the spacing of the tooth edge K from the bottom of the recess J, the sides of which have about the same angle as the sides of the sharp teeth 22.

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Having now particularly described and ascertained the nature of the invention, and in what manner the same is to be performed, what I claim is:

1. A perforating machine for joining together at intervals laminated sheets of fibrous paper strips comprising upper and lower rollers, spaced apart at their most adjacent point where the sheets are passed between the rollers, the upper roller having a thin flat blade mounted transversely therein, perpendicular to the axis of the roller, the outer edge of the blade having spaced groups of sharp triangular teeth, each tooth having a height and projection much greater than the width of each tooth at its base and said teeth being closely spaced in each group and spaces between said group being about twice the width of the width of a tooth and trapezoidal shaped recesses extending transversely across the width of the lower roller and matching and receiving said blade and permitting the blade to

rotate within the recess without touching the sides of the recess, the sides of the recess being divergent outwardly and said blade being positioned so as only to partly penetrate the laminated sheets.

2. The machine of claim 1, said teeth being provided with sharp edges.

3. The machine of claim 1, and means to cause the laminated sheets to pass under a moving perforating blade and means to cause said blade to partake of a slight angular movement to complete a junction of the sheets.

4. The machine of claim 1, said sheets being paper laminations of different textures and thickness.

5. The machine of claim 1, and means to hold said laminated stock against the lower cylinder having the recesses.

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