June 24, 1930. E. L. BENEDICT 1,766,096.

SHEET MATERIAL AND METHOD OF MAKING THE SAME

Filed Aug. 15, 1928

Fig. 1.

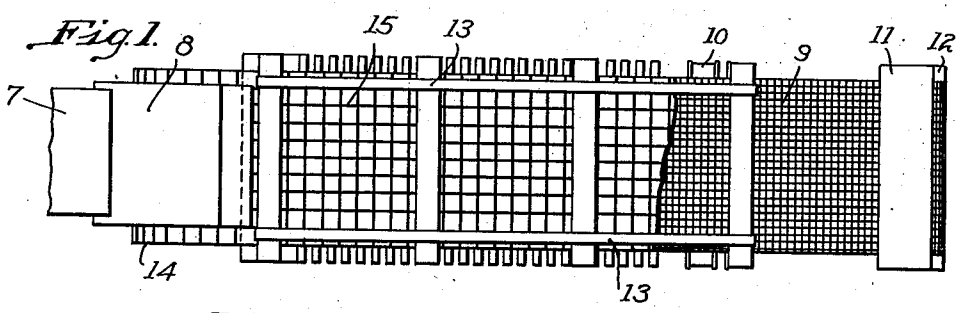
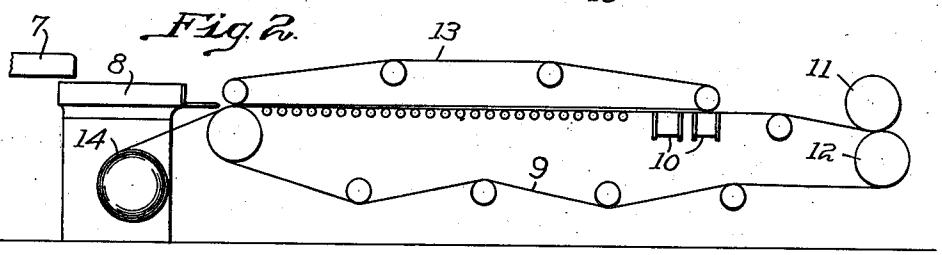


Fig. 2.



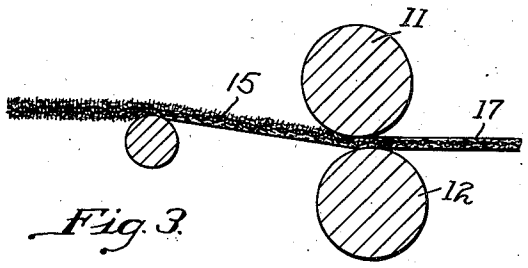


Fig. 3.

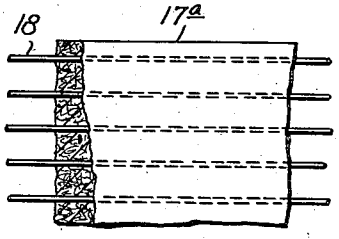
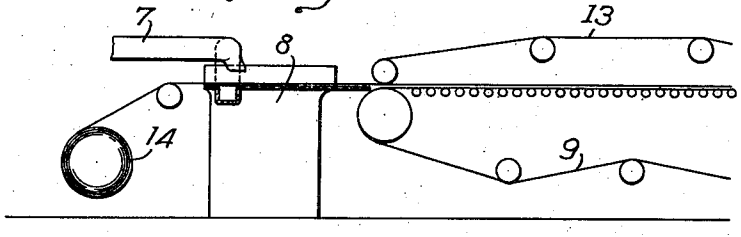


Fig. 4.

Fig. 5.



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Patented June 24, 1930 1,766,096

UNITED STATES PATENT OFFICE

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SHEET MATERIAL AND METHOD OF MAKING THE SAME

Application filed August 15, 1928. Serial No. 299,773.

My invention relates to reinforced sheet material, such as paper, and the method of making the same.

One object of my invention is to provide a paper sheet or the like having reinforcing elements formed integrally therewith.

Another object of my invention is to provide a means and a method for introducing reinforcing cords or fabric into a paper sheet.

Some of the ways in which my invention may be practised are shown in the accompanying drawing, wherein Figure 1 is a fragmentary plan view of a portion of a paper-making machine, showing a way in which the reinforcing material may be introduced into the body of the paper sheet; Fig. 2 is a side elevational view of the structure of Fig. 1; Fig. 3 is an enlarged sectional view of a portion of the structure of Fig. 2; Fig. 4 shows a portion of a sheet of somewhat different form than the sheets of Figs. 1 and 3, and Fig. 5 is a fragmentary view showing a method in which the reinforcing material may be introduced into the body of a paper sheet, wherein the stream of paper forming material contacts both sides of the reinforcing material.

Referring to Figs. 1 to 3, I have shown somewhat schematically certain parts of a standard paper-making machine. The paper pulp in a fluid condition is fed from a trough 7 to a breast box 8 from whence it flows upon a screen or wire cloth 9 which carries it over the usual suction boxes 10 and between the couch rolls 11 and 12, and thence to the driers and calendars in the usual manner. The usual guide straps 13 serve to guide and confine the edges of the sheet during the process of its formation.

Beneath the breast box 8, I mount a roll of gauze or other mesh-like material 14 which is composed of longitudinal and transverse strands 15 that are suitably spaced as shown more clearly in Fig. 1. These strands may be of any suitable fibrous or flexible material, such as cords formed from paper stock, twine, etc.

Strands composed of paper stock or pulp are particularly suitable for use as the reinforcement, because they have substantially the same coefficient of expansion and contraction as the body of the paper sheet, with the result that a firmer and more integral structure is possible.

The method of incorporating the reinforcing strands or mesh into the body of the sheet of paper is as follows: A sufficient amount of reinforcement 14 is withdrawn from its roll, so that its forward end portion will lie upon the wire cloth 9. The traveling movement of the wire cloth will tend to carry with it the reinforcement, and the roll may be rotated at the rate of speed necessary to properly feed the reinforcement to the wire cloth. Of course when the forward end of the reinforcement has reached the couch rolls 11 and 12, these rolls will exert the necessary pulling force thereon.

Simultaneously with the introduction of reinforcement on the wire cloth, a stream of pulp material is supplied from the breast box 8 to the wire cloth 9. The pulp fibers will thus be deposited upon the reinforcement and will partially surround the same, this intermeshing of the pulp fibers with the reinforcement being more pronounced at the suction boxes 10 where the fibers will be drawn through the reinforcement mesh. At the couch rolls 11 and 12, the pulp fibers which protrude below the reinforcement will be compressed against the underside thereof, a mat-like surface of pulp or partially formed paper being therefore formed against both the upper and lower surfaces of the reinforcement, as shown in Fig. 3. The completed sheet 17, having the reinforcement constituting an integral part thereof is then continued through the usual drying machine.

Paper thus reinforced is of much greater strength and also much less expansive than those sheet structures wherein reinforcement is applied by gluing or otherwise to one side of a sheet or wherein reinforcement is placed intermediate two sheets that are glued together. This is particularly true where the paper is subjected to bending or flexing, since the laminations of composite

or built-up sheets tend to break apart upon flexure thereof.

In Fig. 4, I show a reinforced sheet 17ª that is formed similarly to the sheet 17, but wherein the reinforcement consists simply of longitudinally-extending strands 18, instead of having also transverse strands or threads as in Fig. 1.

It will be understood that the reinforcement may be supplied from above the pulp discharge opening and the breast box 8, instead of from beneath the same as in Fig. 2, the reinforcement, however, not then being so completely imbedded in the pulp as when fed from below.

In Fig. 5, I show the reinforcement supplied from a point below the trough 7 and passing over the breast box 8, an additional stream of pulp being fed from below the reinforcement, thus causing the reinforcement to be advanced between two streams of pulp which are consolidated by the couch rolls, etc., to form an integral reinforced sheet structure.

Paper formed as above-described cannot readily be torn and, even if the reinforcement strands be widely spaced, any breaking or tearing at points intermediate the strands will be localized and prevented from spreading, by the strands.

I claim as my invention:—

A paper sheet containing reinforcing strands composed of paper pulp imbedded therein and disposed between the exposed surfaces thereof.

In testimony whereof I, the said EDWARD L. BENEDICT, have hereunto set my hand.

EDWARD L. BENEDICT.