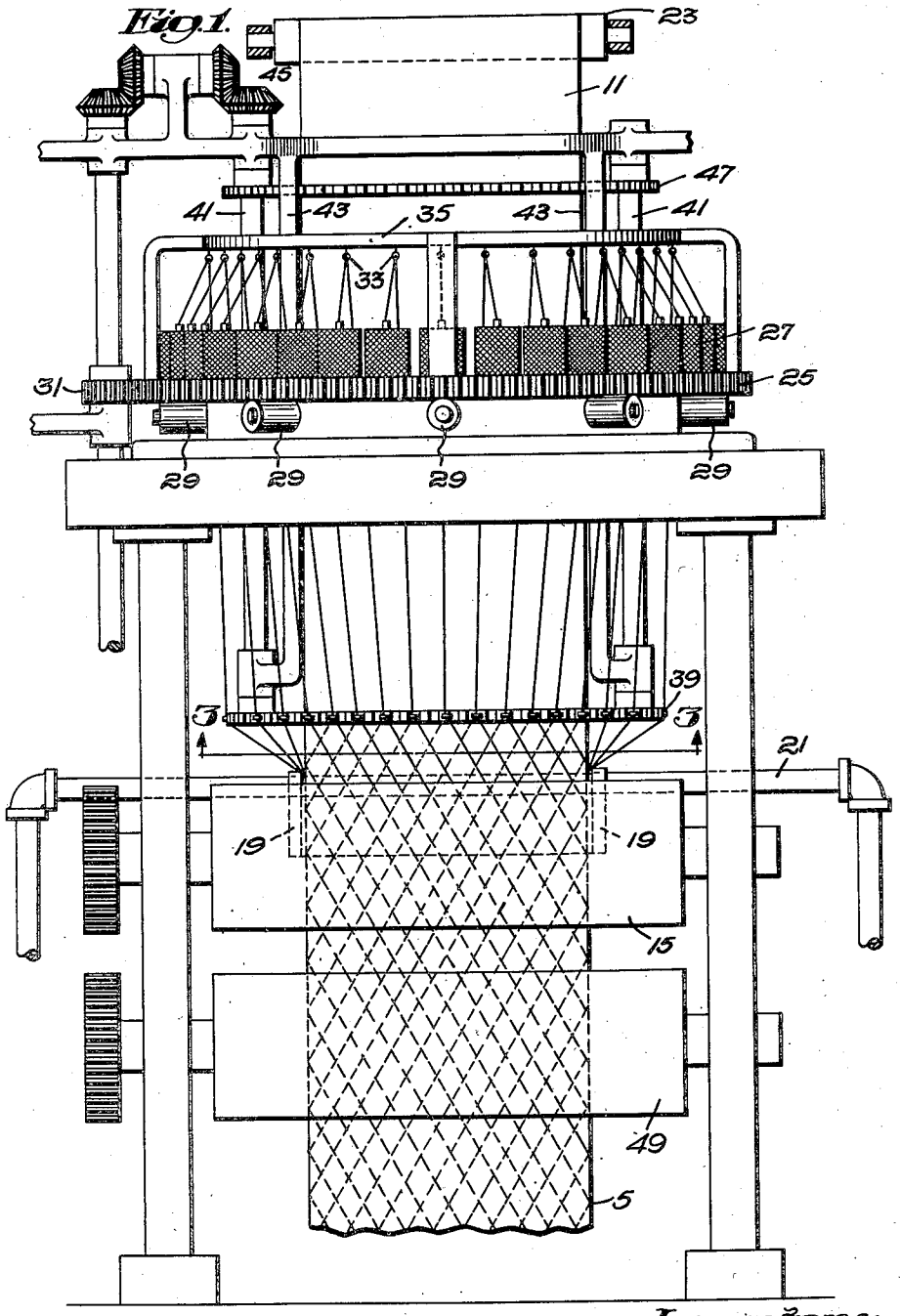
March 13, 1934. E. H. ANGIER ET AL 1,951,301

STRAND INLAYING MACHINE

Filed April 27, 1931 3 Sheets-Sheet 1

Fig. 1.



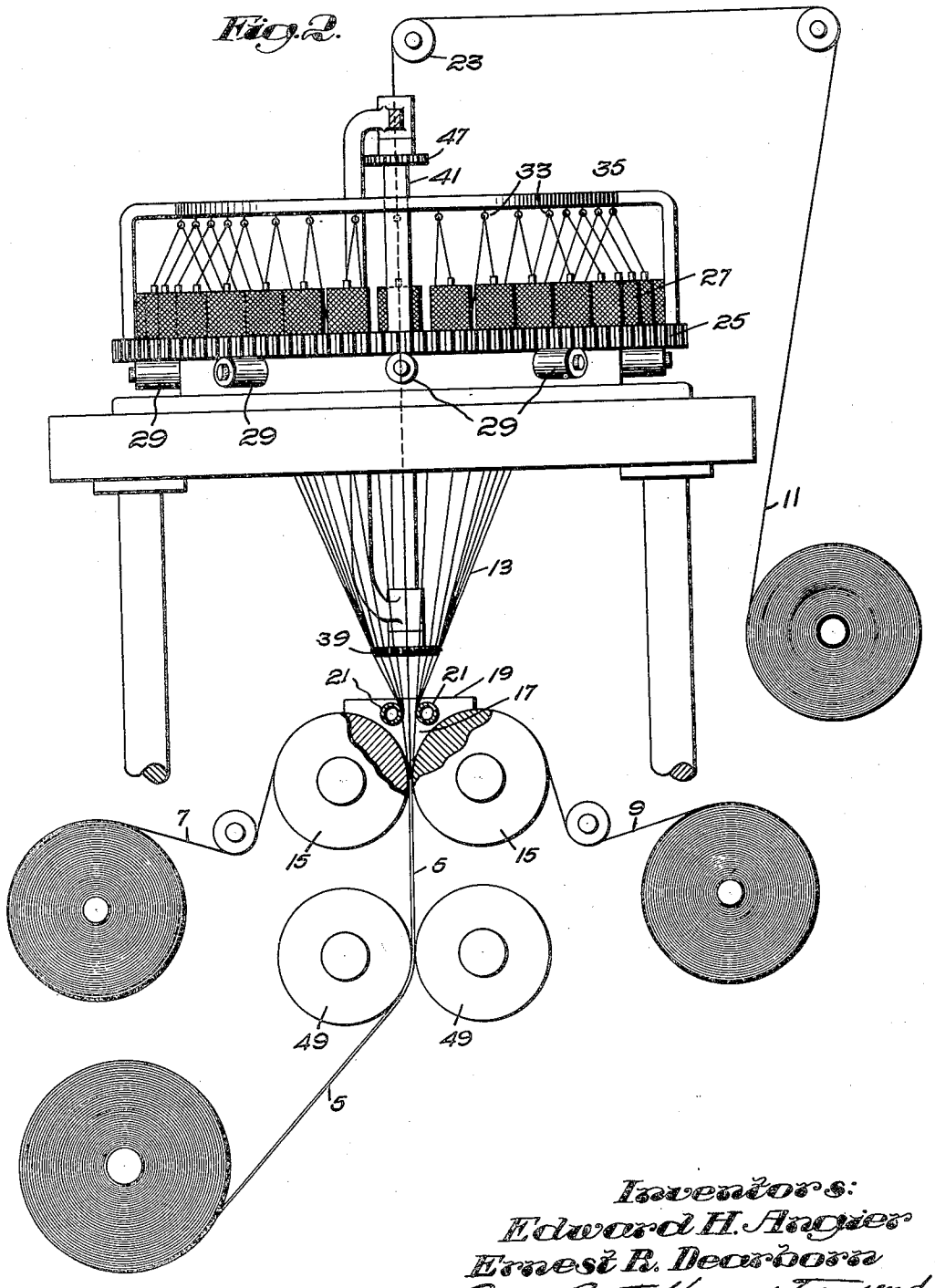
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Filed April 27, 1931 3 Sheets-Sheet 2

Fig. 2.



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Fig. 3.

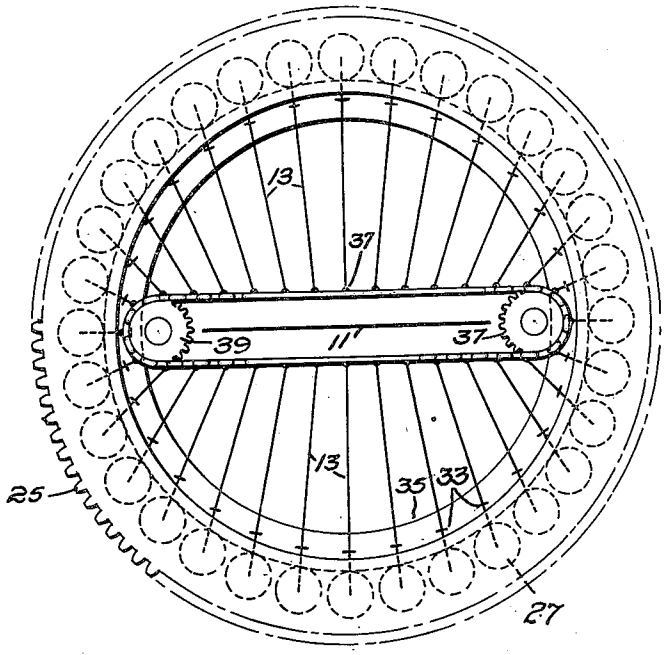
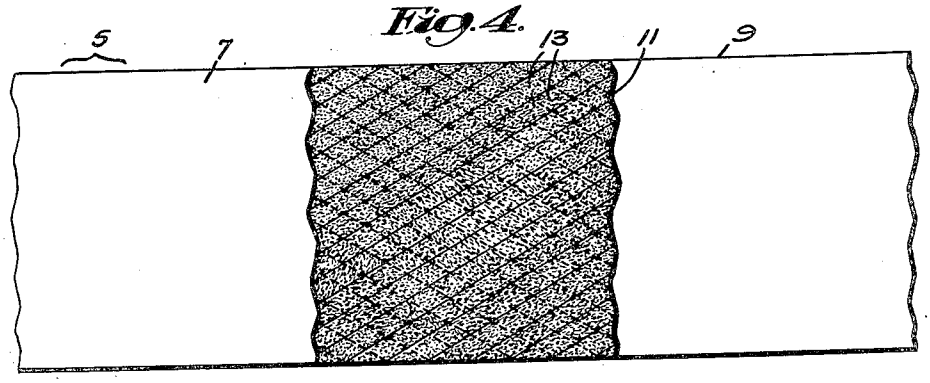


Fig. 4.



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Patented Mar. 13, 1934 1,951,301

UNITED STATES PATENT OFFICE

1,951,301

STRAND INLAYING MACHINE

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Application April 27, 1931, Serial No. 533,155

3 Claims. (Cl. 154—1)

This invention relates to machines for incorporating strand material with sheet material and a primary object is to provide improvements in a machine of this nature whereby a superior product may be produced.

Our invention will be well understood by reference to the following description taken in connection with the accompanying drawings, wherein one illustrative embodiment of such a machine is illustrated. In the drawings:—

Fig. 1 is a fragmentary, partly diagrammatic, end elevation of the machine;

Fig. 2 is a side elevation with parts broken away;

Fig. 3 is a section on the line 3—3 of Fig. 1, looking upwardly, with parts omitted; and

Fig. 4 is a plan of a portion of one product of the machine with parts successively broken away.

Machines for reinforcing paper with yarns or similar strand materials have been devised wherein one or more spools of the strand material are revolved to pay out the strand to a pair of squeeze rolls in such a manner that this movement of revolution in cooperation with the advancing movement given by the rolls causes the strand to be extended in a helical or zigzag form to pass through the rolls to be united with paper webs. Examples of such machines appear in the patents to Wendler 1,169,895, Feb. 1, 1916, Harrison 1,325,091, Dec. 16, 1919, Wheildon 1,338,164, Apr. 27, 1920, and Currier 1,460,949, July 3, 1923.

One difficulty with machines of this type as hitherto constructed lies in the fact that it is mathematically impossible to stretch out taut a physical strand. When it is desired to produce a uniform diagonal criss-cross reinforcement with straight threads, in practice the threads are not straight, the appearance of the material is marred and for some uses the product is inefficient.

In accordance with our invention we provide a machine wherein the strands are moved in substantially vertical planes whereby the catenary sag is much minimized.

Various products may be produced by machines embodying our invention. The particular form of machine shown for purposes of illustration is shown as arranged to form the product shown in Fig. 4 and designated as a whole by the numeral 5. This material embodies the inner and outer paper webs 7 and 9, the inner faces of which are united by means of black asphalt or other suitable adhesive indicated by the stippling with a central web 11 about which are wrapped strands 13 extending diagonally parallel to one another across one face of the web 11 and similarly but on opposite pitch across the other face.

Referring now to Fig. 2 of the drawings, in the form of the invention there shown the webs 7 and 9 are led down between a pair of horizontally aligned rolls 15 which define between them an upwardly opening trough 17, the bite of the rolls forming the bottom of the trough. End plates 19 may complete the trough in which may accumulate a pool of liquid such as molten asphalt fed through perforated pipes 21. A film or layer of asphalt is thus applied to the opposed faces of the webs 7 and 9 as they pass between the rolls. When an intermediate web 11 is utilized as herein, it may be led over suitable guide rolls 23 vertically downwardly through the pool to the bite of the rolls. For revolving the wrapping strands 13 to give them a suitable pitch as they are drawn forwardly through the rolls 15 we may provide a revolving creel 25 carrying spools 27 of strand revolving in a horizontal plane above the rolls. Herein the creel takes the form of a substantial wheel resting on the rollers 29 and formed with gear teeth permitting it to be driven from pinion 31 (Fig. 1). The strands 13 may lead upwardly from the spools through guides 33 on an elevated ring 35 supported above the wheel 25 and thence downwardly through the open center of the wheel toward the rolls.

In the embodiment of the invention here shown the relatively heavy spools 27 are supported by the rigid wheel-shaped creel and have a uniform motion in a circular path. The bights of the strands, that is, the parts intervening between the spools and the rolls, are preferably differentially guided with respect to the spools themselves and in a relatively oblate orbit. Herein (see Fig. 3) the strands lead through suitable guide eyes 37 on a chain trained about the sprockets 39 and disposed closely adjacent to and closely above the bite of the rolls 15, the runs of the chain paralleling the bite of the rolls or the faces of web 11. In the preferred form shown the major axis of the orbit of the chain is parallel to the bite of the rolls and the two define a vertical plane. The sprockets 39 (see Fig. 1) are mounted on shafts 41 journalled in suitable depending arms 43 which extend through the open center of the creel wheel 25. The upper end of one of the shafts 41 may be driven as by means of the gearing 45 and the other shaft may be driven therefrom as by means of the drive chain 47.

As seen in Figs. 1 and 2, we preferably lead the

combined webs 5 issuing from the rolls 15 through a pair of squeeze rolls 49 to press them firmly together.

By the vertical arrangement of the parts described the strands between the eyes 37 and the bite of the rolls 15 move mainly in substantially vertical planes. The sag of the strands which is so marked when they are paid out horizontally is by this arrangement much minimized. The mechanical design made possible is such that the parts will be well supported and move easily. When asphalt or the like is applied as described, the strands 13 are thoroughly impregnated and the sheets thoroughly coated, giving good adhesion of the parts in the completed product.

We are aware that the invention may be embodied in other specific forms without departing from the spirit or essential attributes thereof, and we therefore desire the present embodiment to be considered in all respects as illustrative and not restrictive; reference being had to the appended claims rather than to the foregoing description to indicate the scope of the invention.

We claim:

1. A machine of the class described comprising a pair of rolls, means cooperating with the rolls to provide between them an upwardly opening trough of which the bite of the rolls defines the bottom, means to supply fluid to the trough and means to pay out strand material to said rolls to pass through fluid in the trough and to be united by the rolls to sheet material comprising means for orbitally revolving a supply of strand material, the orbit of revolution lying substantially directly above said rolls in such manner that the lengths of strand intervening between supply and rolls move mainly in substantially vertical planes.

2. A machine of the class described comprising a pair of rolls, means cooperating with the rolls to provide between them an upwardly opening trough of which the bite of the rolls defines the bottom, means to supply fluid to the trough and means to pay out strand material to said rolls to pass through fluid in the trough and to be united by the rolls to sheet material comprising means above the rolls for revolving a supply of strand material to be payed out to said rolls and means for guiding the strand bights in an oblate orbit, the line of contact of the rolls and the major axis of the orbit being substantially parallel and defining a substantially vertical plane.

3. A machine of the class described comprising a pair of rolls, means cooperating with the rolls to provide for maintaining a pool of liquid between the same, means for leading a material in sheet form downwardly through said pool to the bite of the rolls, and means for guiding a strand in a substantially horizontal orbit about the said material to be payed out to the bite of said rolls.

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