April 1, 1958 F. W. HARTSTEIN 2,828,795

APPARATUS FOR MAKING NON-WOVEN CLOTH

Filed Oct. 5, 1955 2 Sheets-Sheet 1

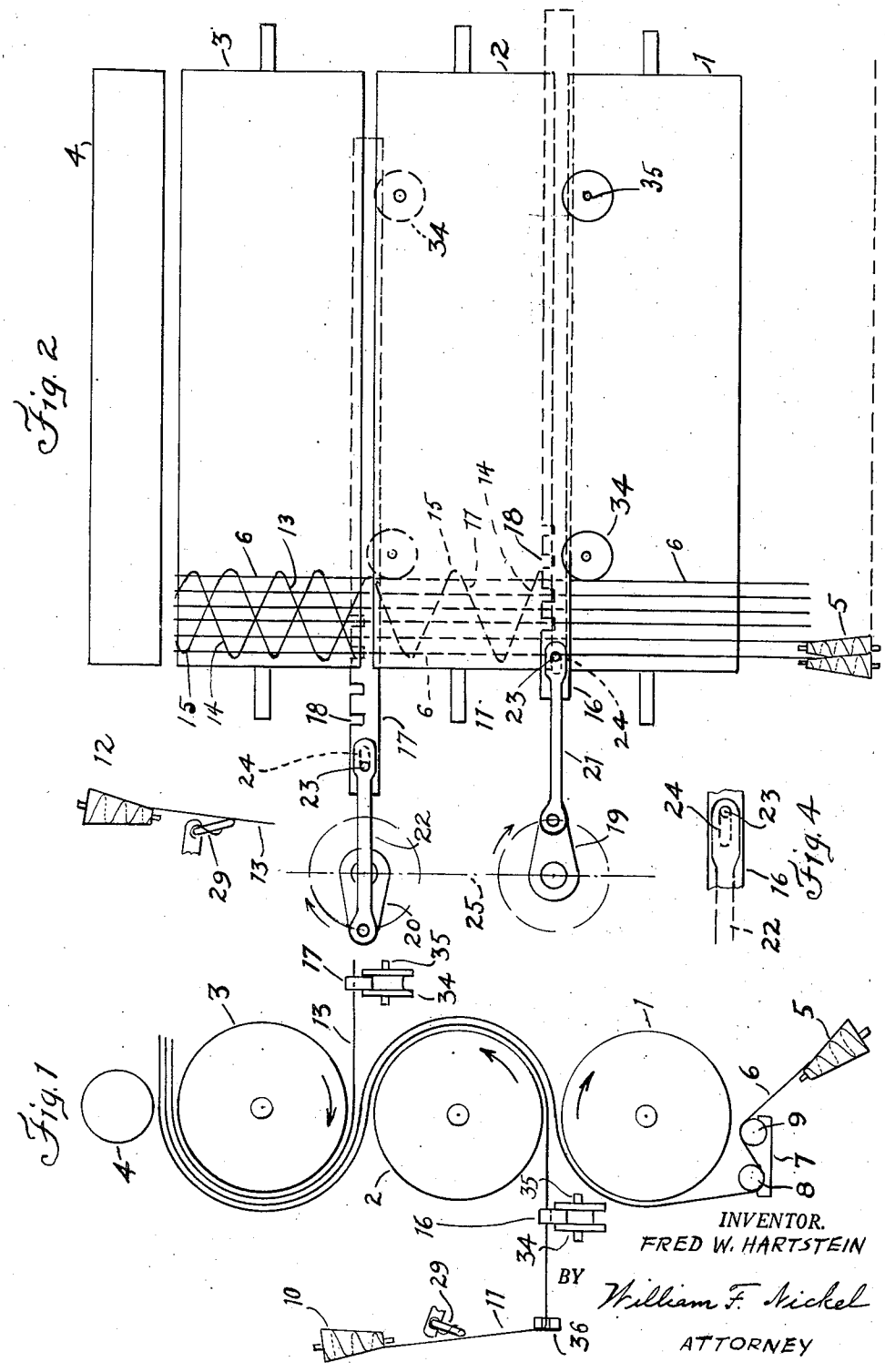


Fig. 2

Fig. 4

Fig. 1

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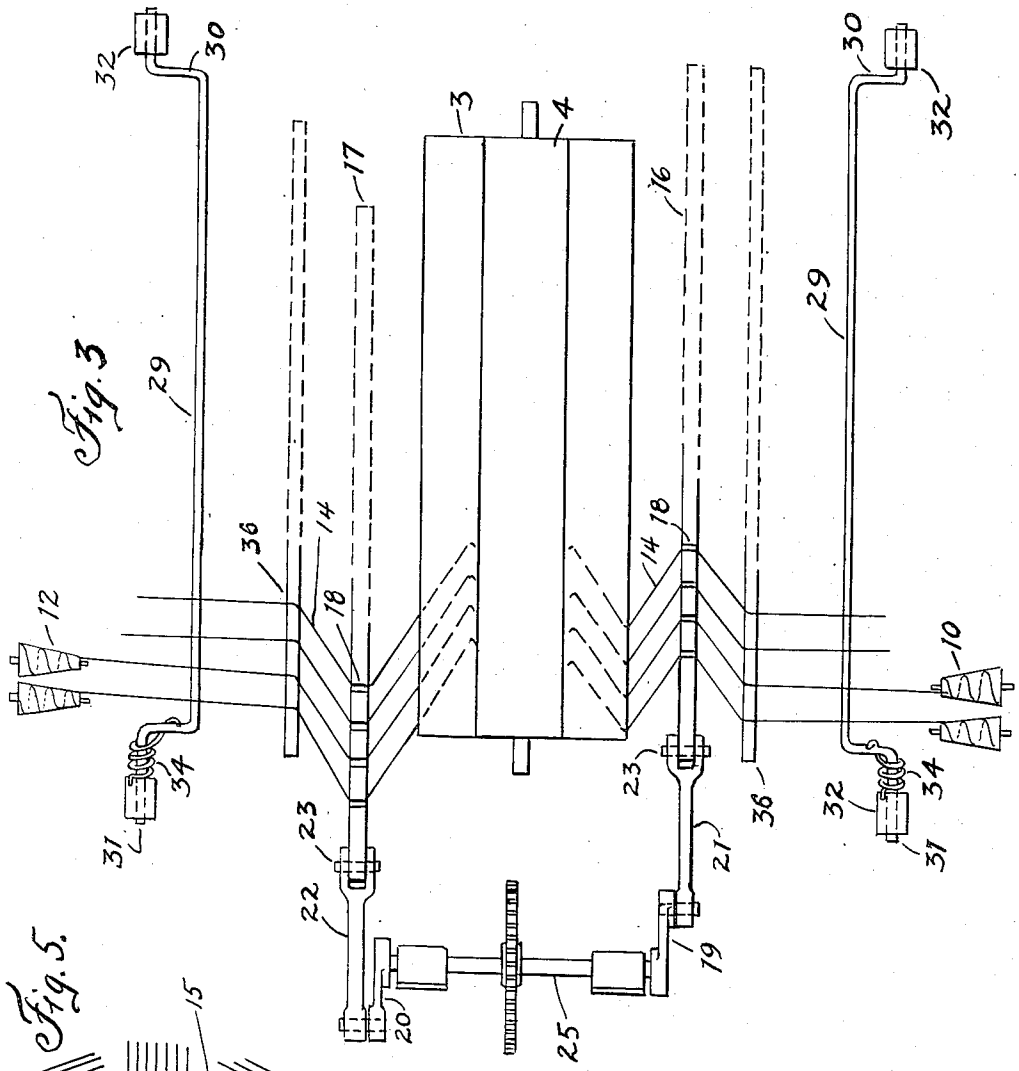


Fig. 3

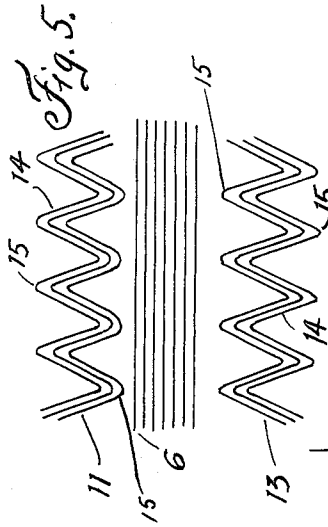


Fig. 5.

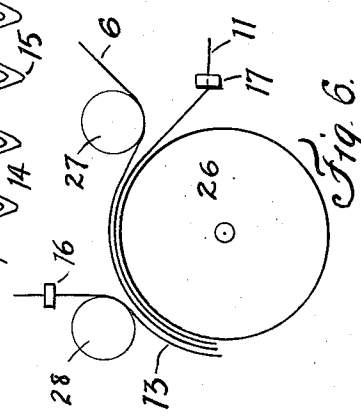


Fig. 6.

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APPARATUS FOR MAKING NON-WOVEN CLOTH

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3 Claims. (Cl. 154—1.7)

My invention is an apparatus for producing cloth that can be used for a variety of purposes; for example, in making a floor rug comprising a body or piece of textile material having piles or tufts of yarn on the upper or wearing surface thereof. Such rugs are commonly known as "chenille" rugs.

The chief object of this invention is to provide an apparatus for making a sheet of cloth that is less costly than fabric woven on a loom and having warp and weft threads crossing and interlaced with one another throughout.

Another object is to provide means by which a sheet of cloth can be wrought with layers of cord or yarn that are not interwoven, but superposed instead; the layers being firmly secured to one another, and the lines of yarn, cord or thread occupying the entire area of the sheet; so that the sheet is continuous over its whole extent, and virtually without interstices or crevices opening through both faces of the cloth.

A further object is to devise means for turning out a sheet of cloth having the above mentioned design and capable of being formed and finished far more rapidly than cloth obtained from a loom with a shuttle operating in the usual well-known manner.

An additional object is to provide a mechanical unit for manufacturing a sheet of cloth, at a rate of production that is independent of the width of the cloth, so that perfectly made cloth of relatively great width can be obtained as quickly and easily as cloth having smaller widths.

Still another object is to provide a means for manufacturing cloth with the above-mentioned characteristics that will engage and securely hold piles or tufts of yarn when the cloth is employed in rug making and serves as the body thereof.

It is also an object to provide apparatus for making cloth which contains yarn or cord in layers that are superposed and securely joined together and not interwoven, and which is well adapted for bagging and wrapping uses.

The foregoing and other objects and advantages are made clear in the following specification and the novel features of the invention are defined in the claims. On the drawings, some embodiments of the invention are illustrated, but numerous changes can be adopted in details of shape, size and arrangement of parts without deviation from the general plan in which the invention resides.

In the drawings:

Figure 1 is an end elevation of apparatus in which my invention is incorporated;

Figure 2 is a side elevation, viewed from the left in Figure 1;

Figure 3 is a top plan thereof;

Figure 4 presents a structural detail;

Figure 5 shows diagrammatically the structure of the cloth as it is wrought in accordance with my invention;

Figure 6 is an end view of another form of the invention.

Figures 1 and 2 show a combination of rollers 1, 2, 3 and 4 disposed to draw and press cloth between them. The rollers are mounted in any suitable framework or supports and one or more, such as rollers 2 and 3, can be rotated by connections to a source of power. From a number of cops 5 lines of yarn 6 are pulled between rollers 1 and 2, passing first into a tank 7 containing adhesive and mounting properly located idle rolls 8 and 9 which guide the threads into the tank. From other cops 10, lines of yarn 11 are drawn between the rollers 1 and 2, and from a third set of cops 12 additional lines of thread 13 are pulled between the rollers 2 and 3. The threads or yarn 11 and 13 are superposed upon opposite faces of the yarn 6, and the three layers of yarn are finally passed between the rollers 3 and 4 and delivered by the apparatus as a finished sheet. The threads 6 are all of the same size and so are threads 11 and 13, but if desired the uniform threads 11 may be of a thickness different from the thickness of the threads 13, and the threads 11 and 13 may be of a thickness different from the thickness of the threads 6.

The cops 5, 10 and 12 are the usual conical balls, mounted on fixed studs and presenting their smaller ends towards the rollers, and spirally wound so that the yarn can easily be pulled off. In textile machinery such cops are usually on frames which support a large number of cops in tiers or rows.

The rolls are heated during the operation to a temperature of, say, 250 degrees F., for example, and the heating connections (not shown) are of the usual type employed for heating rollers in such machines. But heating under all conditions is not necessary. The lines of yarn 6 each pass through the apparatus in a single plane and are straight, except as they are curved in passing over the cylindrical surfaces of the rollers, but the lines of yarn 11 and 13 are repeatedly bent from side to side in an undulatory or zigzag pattern, and cross the lines 6 and make contact at a multitude of points. All three layers of yarn are pressed together by the rollers, and are joined at all points of contact by the adhesive on the lines of yarn 6. The zigzag portions are indicated at 14, connected by bends 15.

The lines of yarn 11 and 13 are pulled sidewise in one direction and then in the opposite direction by guide bars 16 and 17, parallel to the rollers and having guide slots 18 in the upper edge. These two layers of yarn lie, each layer in the slots 18 of one of the guide bars, which are moved first to the right and then reversely by suitable means such as cranks 19 and 20 and connecting rods pinned to the bars 16 and 17, and as the bars are reciprocated and in shuttle-wise movement, the yarns 11 and 13 are pulled to one end and then to the other end of their direction of travel. The guide bars are placed at the correct distance from the rolls, and the slots 18 have the necessary outline and depth to give the desired result. When the bars are at one end of their range of movement, the lines of yarn 11 and 13 are so held that they travel diagonally in one direction as they are drawn between the rollers, and when the bars are at the opposite end of their range, the same yarns are held by the guide slots 18 so that they are drawn into the rollers in a diagonal direction that crosses the aforesaid diagonal direction. The bends 15 in the zigzag pattern of the yarns 11 and 13 are thus imposed on these yarns as the bars reach each end of their respective movements and the bends are placed in the portions of said yarns which happen to be between the rolls at the instant when the bars reverse their motion.

In order to effect the required movement of the bars 16 and 17, they are connected to rotary cranks 19 and 20, respectively, by rods 21 and 22, respectively. These

rods are joined to the pins of the cranks at one end and to the bars 16 and 17 at the other end by pins 23 in slots 24 in the adjacent extremities of the bars 16 and 17. As the cranks revolve and the bar 16 is pushed to the right, for example, with the parts in the positions shown in Figure 2, the connecting bar 21 thrusts against one end of the slot 24 in the bar 16 till this bar reaches the end of its travel and is about to move in the opposite direction. But the crank 19 must first pull the rod 21 back far enough for its pin 23 to engage the bar 16 at the other end of the slot 24 therein; and thus for a brief interval the bar 16 is motionless. Then the crank 19 and rod 21 begin to pull the bar 16 on its return movement, and during said interval the bends 15 joining the zigzag portions 14 are formed. As soon as the pin 23 on the rod 21 reaches the other end of the slot 24 in the bar 16, said bar is actuated to reverse the diagonal direction of the threads 11 passing to rollers from the slots 18 of the bar 16. A similar operation is performed by the other crank 20 in the movement of the bar 17. The cranks, connecting rods and slots 23 are so dimensioned and the cranks are rotated at such speed that the diagonal direction of the threads 11 and 13 is changed as quickly as is necessary between the momentary stops of the bars 16 and 17 at each end of their range of travel.

The two cranks are mounted on the same shaft as indicated at 25 on Figure 3, or they may be on different shafts connected to turn at the same speeds, and the cranks will be angularly adjusted with reference to their common axis of rotation so that the bars 17 for the yarn 13 will cause the bends 15 in the zigzag lines of yarn 13 on the layer of yarn 6 to fall always in the spaces between the bends 15 of the yarn 11 on the opposite face of the middle layer of yarn 6. The bars 16 and 17 being parallel to the rollers, these bars 16 and 17 are always at the same distance from the points at which the yarns 11 and 13 meet the yarn 6 between the rollers 1 and 2 and 2 and 3. The bends 15 may be rounded or peaked and the length of the diagonal portions 14 between the bends will vary according to the speed of rotation of the rollers 2 and 3, for a given speed of the shaft 25. Other connections to obtain proper reciprocation of the bars 16 and 17 may be used.

Figure 5 shows the relative positions of the yarn 6, 11 and 13 in the three layers of the completed sheet. The yarn 6 runs lengthwise through the cloth without being bent from side to side, and the layer 11 on one face of the layer of yarn 6 has the undulatory or diagonal portions 14 with bends 15 along and over the whole layer, from side to side and end to end, and the yarn 13 on the other face of the middle layer has the similar portions 14 with bends 15 that lie between the bends of the yarn 11. The three layers of threads cross one another at so many places and the threads in the two outer layers are so close together over the entire extent of the cloth sheet that the cloth has no orifices through it, and any spaces in the yarn 11 between bends 15 thereof are overlaid by the yarn 13 and the bends 15 therein.

The threads 11 and 13 must be kept taut at all times and means for keeping them under constant tension are disposed between the bars 16 and 17 and the cops 10 and 12. Such means can have the form of a bar 29 extending across each set of threads 11 and 13 and pressing thereon. Each bar has transversely bent portions 30 at its ends and terminal portions 31 parallel to the length of the bar, and the portions 31 are mounted in fixed bearings 32 adjacent the lines of threads 11 and 13. Springs 33 affixed to the bearings at one end engage the portions 30 so as to exert pressure on the bars, and hold the threads 11 and 13 taut. The length of the diagonal portions 14 of these threads between the adjacent bends 15 is greater than the distance of the bars 16 and 17 from the points where the threads 11 and 13 make contact with the rolls 2 and 3. Hence, if the tension members 29 were omitted, the portions 14 of the yarn 11 and 13 between

the bars 16 and 17 and the rollers would be slackened as the bars go through the mid-points of their travel and portions of the threads 11 between the bends 15 and similar portions of the threads 13 would overlap and make cloth uneven and lumpy in many places. The devices 29 prevent slackness in the yarn 11 and 13 and the cloth is smooth and flat throughout.

The bars 16 and 17 are supported, for instance, by grooved wheels 34 loosely mounted on fixed journals 35 under the bars. Thus friction is avoided. The number of threads 11 and 13 in each outer layer is not more than half the number of threads 6, and the slots 18 in the guide bars are spaced at intervals of about twice the distance between adjacent threads 6. Stationary guide members may be mounted for the threads 11 and 13 between the tension bars 29 and the guide bars 16 and 17, as indicated at 36.

The apparatus can be operated many times faster than the operation of a loom, because of the short range of travel of the guide bars 16 and 17. In a loom, the shuttle carrying warp threads must travel from the one side of a loom to the other, and the wider the cloth the more time is required. In the making of rugs, a single machine according to the apparatus described above can be run as fast as a chenille rug-making machine and deliver all the cloth that the rug-making machine requires; but when woven cloth is used in chenille rugs, a loom cannot be operated fast enough and a number of looms must be depended upon for enough cloth to supply a single rug-making unit. The cost of equipment and material is therefore much greater.

Figure 6 shows apparatus comprising three rollers only, but the process is the same and the final product is no different from the sheeting above described. The roller 26 has a pair of rollers 27 and 28 cooperating therewith and the lines of yarn 6 are passed under the roller 27 and between it and the roller 26. The lines of yarn 11 are drawn between rollers 26 and 27 and laid against one face of the layer of the threads 6, and the lines of yarn 13 are passed between the rollers 26 and 28 and laid on the opposite face of the middle layer of yarn 6. The layers of yarn 11 and 13 are put on in a zigzag or undulatory pattern as before, and guide bars with slots are employed in the mechanism to guide the yarn 11 and 13 diagonally in one direction and then diagonally in another direction to be laid on the middle layer 6 as explained in connection with Figure 3. The cranks 19 and 20, guide members 35 and tension members 29 are also included. The yarn 6 is passed from the cops bearing it through adhesive in a tank 7.

As already stated, a sheet of cloth turned out in accordance with this invention can be utilized for many purposes and a single apparatus will operate much faster and deliver an output equal to the yardage of many looms, thus cutting down greatly on the cost of equipment and the material yielded by it.

Another advantage gained in making cloth as above described is that cloth of greater or less width can be made with ease and at the same rate of speed for the rollers, and on the same apparatus, and in all widths, the tension on all threads being uniform. In contrast, a loom must operate more or less slowly when turning out very wide cloth, because the shuttle must travel farther, and at the same time the tension on the transverse weft threads is increased.

The apparatus herein set forth can also be used to produce cloth in two layers only for any of the uses above mentioned. This kind of cloth may contain only two groups of lines of yarn, both having zigzag portions, or one with zigzag portions and the other group or layer containing lines of yarn without such portions and bends. The apparatus will operate efficiently to superpose lines of yarn in two layers or groups as well as with yarn for three layers as above set forth; as one set of cops 10 or 12 will then simply be omitted.

The cranks 19 and 20 may also be mounted so as to operate at different speeds, depending on the nature of the yarn. In such a case the bars 16 and 17 will cause the diagonal portions 14 of the lines of yarn 11, for example, to be longer or shorter than the portions 14 of the lines of yarn 13 in the layer on the other face of the middle layer containing the lines of yarn 6.

Also, with fewer lines of yarn 11 and 13, cloth can be made with spaces between the diagonal portions 14 of the zigzag yarn of each outer layer. The cloth will then be like mesh cloth with open spaces, and can be utilized as netting and as cloth for stiffening or reinforcing. Cloth of this kind with two layers only can be made and delivered as above described.

With reference to Figure 5, it is to be understood that the two layers made up of the yarns 11 and 13 are shown as if displaced sidewise in opposite directions from the middle layer of the cords 6. In the finished cloth the zigzag yarns 11 lie on one face of the middle layer and the zigzag yarns 13 lie on the opposite face of the middle layer as indicated in Figure 2.

Having described my invention, what I believe to be new is:

1. Apparatus for making cloth comprising a roller, and a pair of additional roller members spaced apart and in cooperating relation with the first-named member and parallel thereto, and means for guiding threads between each additional roller and the first-named roller, said means including a guide bar adjacent each additional roller, and parallel thereto, and means for reciprocating said bars in alternation.

2. Apparatus for making cloth comprising a roller, and a pair of additional roller members spaced apart and in cooperating relation with the first-named member and parallel thereto, and means for guiding threads between each additional roller and the first-named roller, said means including a guide bar adjacent each additional roller, and parallel thereto, and means for reciprocating said bars in alternation, said apparatus including means for preventing slackening of yarn moving between the first-named rollers and the additional rollers.

3. Apparatus for making cloth comprising a roller and a pair of additional roller members all located in cooperative parallel relation, said rollers being arranged one above another in a vertical tier, means for guiding threads between the first-named roller and each additional roller, means for guiding additional threads in one direction between the first-named roller and the adjacent additional roller, and means for guiding additional threads in the opposite direction between said additional rollers, said means including a guide bar for each set of additional threads, said bars being located at opposite sides of said rollers, and parallel thereto.

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