

March 23, 1954

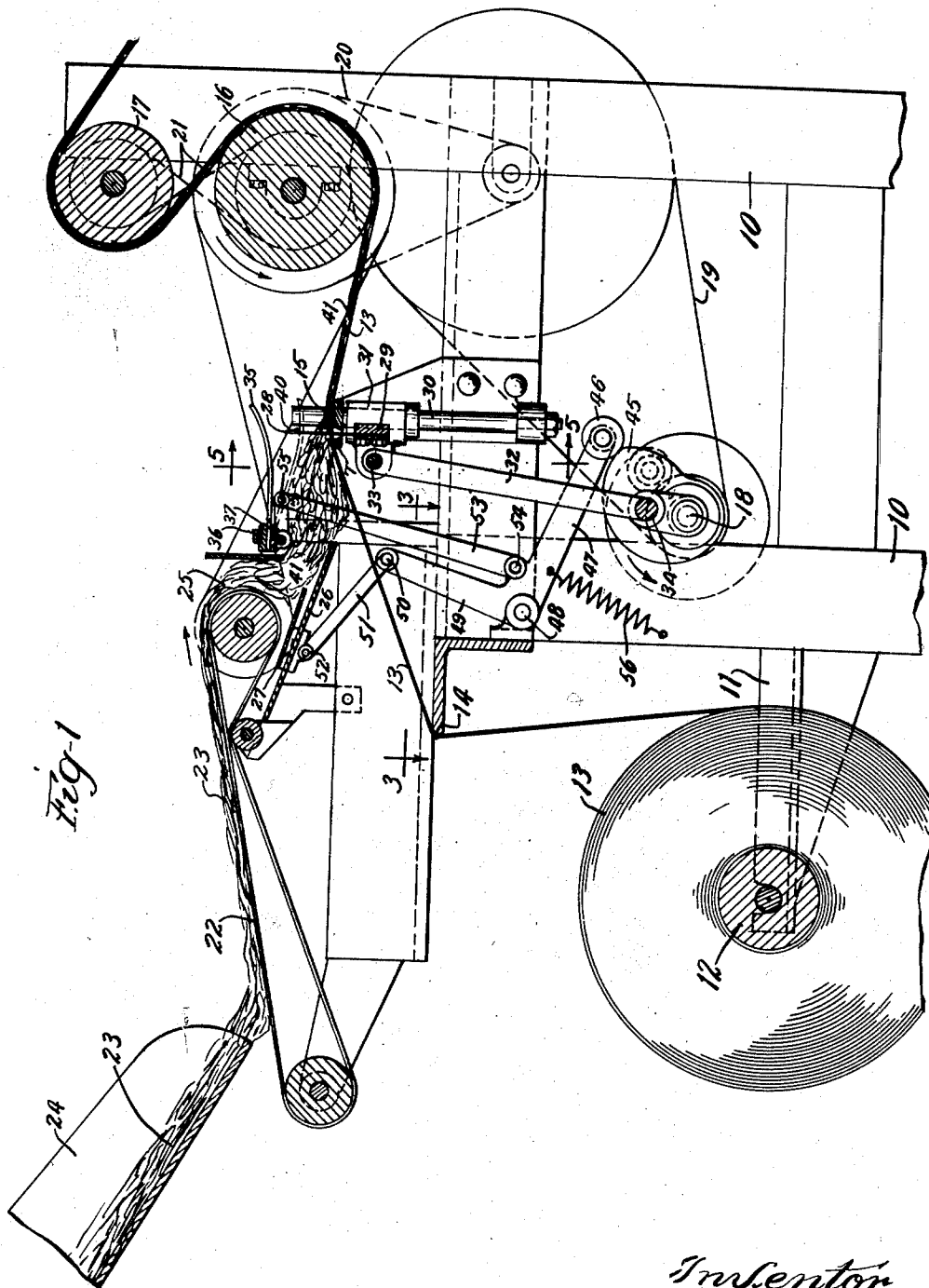
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2,672,674

MANUFACTURE OF FIBROUS MATERIAL IN SHEET FORM

Filed April 2, 1949

3 Sheets-Sheet 1



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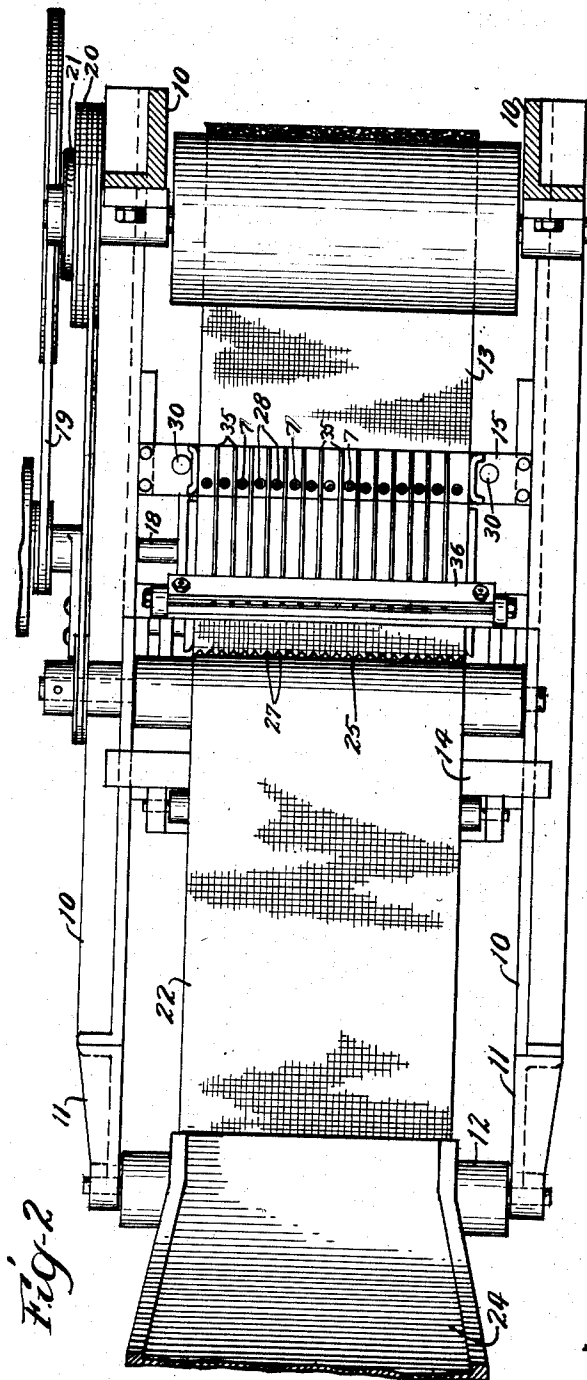
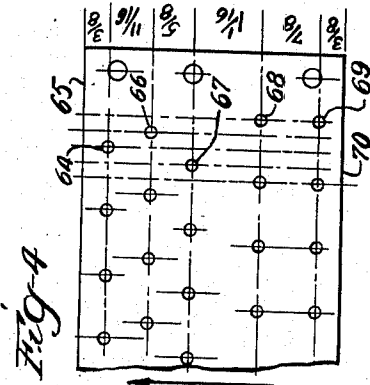
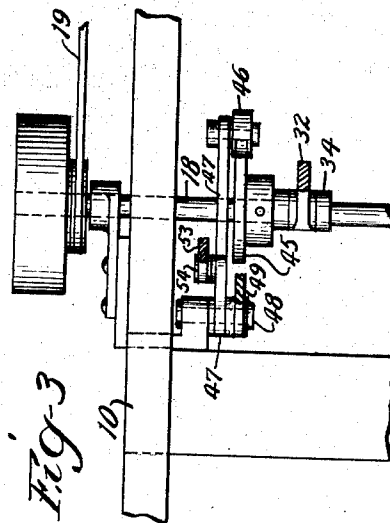
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MANUFACTURE OF FIBROUS MATERIAL IN SHEET FORM

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3 Sheets-Sheet 2



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3 Sheets-Sheet 3

Fig-5

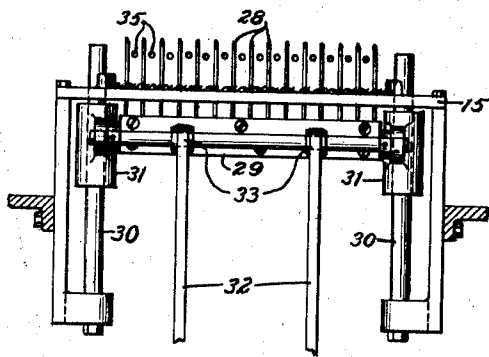


Fig-6

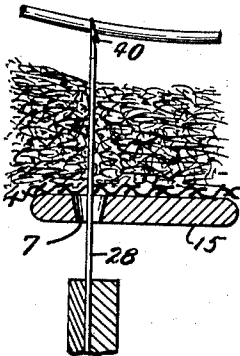


Fig-7

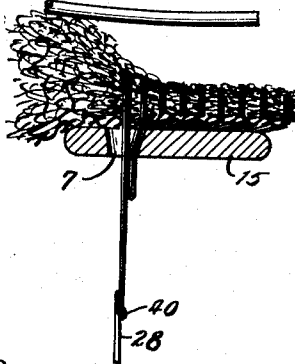
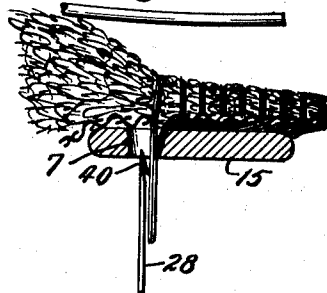
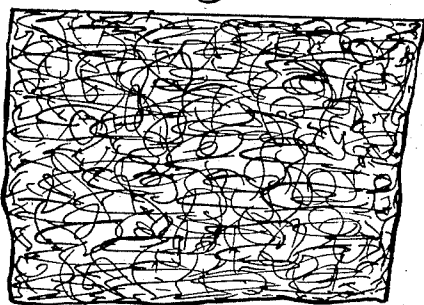


Fig-8



WARP →

Fig-9



WARP →

Fig-10

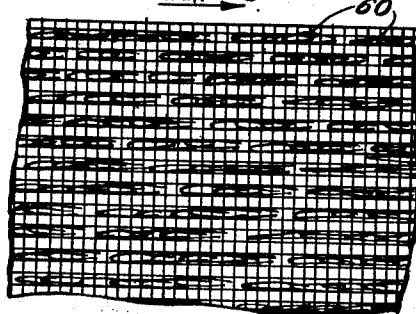
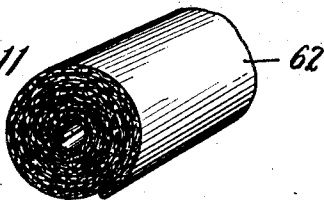


Fig-11



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UNITED STATES PATENT OFFICE

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MANUFACTURE OF FIBROUS MATERIAL
IN SHEET FORM

Ernest C. Shaw, Flossmoor, Ill.

Application April 2, 1949, Serial No. 85,108

7 Claims. (Cl. 28—72.2)

1

This invention relates to fibrous material for oil filter packing, lubricating pads, wiping mitts, and such like, including layers of woven fabric and unwoven fiber fastened together in sheet form adapted to be rolled, folded, piled, or otherwise used where oil and such like are to be filtered, absorbed, fed or wiped.

Generally speaking, the material is made by fastening a layer of unwoven fiber to woven fabric by pulling the threads of the unwoven material through the fabric.

In the drawings:

Fig. 1 is a diagrammatic view of a machine or apparatus for making the material, shown partly in side elevation and partly in section;

Fig. 2 is a plan view of the same;

Fig. 3 is a section on the line 3—3 of Fig. 1;

Fig. 4 is a plan view of a needle bar used in the machine;

Fig. 5 is a section on the line 5—5 of Fig. 1;

Figs. 6, 7, and 8 are diagrams illustrating different steps in the operation;

Fig. 9 is a plan view of the material, the unwoven portion being uppermost;

Fig. 10 is a reverse plan view of the same; and

Fig. 11 is a diagrammatic view of the rolled oil filter packing, including the basic material of this invention.

In Figs. 1, 2, and 5, 10 indicates generally a frame for the machine or apparatus providing bearings 11 for a roll 12 for woven fabric 13 adapted to be drawn over a guide 14 and a hooking bar 15, both secured to the frame 10, and thence about guide rolls 16 and 17 in travel toward a winder or other suitable apparatus.

The roll 16 is driven from a main shaft 18 through belt drives 19 and 20, and the roll 17 is driven by a cross belt drive 21 from the roll 16.

The frame 10 also forms a support for a conveyor 22 receiving unwoven material such as waste 23 from a tapered trough 24, which, in turn, receives from a source of supply such as a carding machine or a feeder.

The conveyor 22 delivers the unwoven material at its right end 25 onto a slide 26, over which a tucker 27 reciprocates in order to bunch or tuck the unwoven material as it approaches the hooker bar 15.

The hooker bar 15 is provided with openings 7 for needles 28 carried by a needle bar 29 adapted to reciprocate up and down on guides 30, to which it is secured by brackets 31.

The needle bar is reciprocated by connecting rods 32 having their upper ends pivoted to the bar at 33, and their lower ends to cranks 34 on the shaft 18.

2

Resilient pressure fingers 35 are mounted on a finger bar 36 pivoted to the frame to rock about an axis 37 between the positions corresponding to those shown in solid and dotted lines in Fig. 1.

The fingers are lifted as the needles rise, and are forced downwardly to force the unwoven material over the needles before they descend and, by the hooks 40 on the upper ends, pull the threads of the unwoven material 41 through the woven fabric 13.

In this preferred form of apparatus, the finger bar 36 and the tucker bar 27 are operated by cams 45 on the shaft 18 running against anti-friction rollers 46 on the free end of one arm 47 of bell crank levers pivoted at 48, the other arm 49 of which is pivoted at 50 to connecting rods 51 pivoted at 52 to the tucker bar 27.

The finger bar 36 is rocked by the same mechanism through connecting rods 53 pivoted to the bell crank at 54 and to the pressure bar at 55. A spring 56 positively urges the finger bar and the tucker bar toward their lowermost positions, from which they are raised by the cam through the levers and links.

By relieving the pressure of the fingers 35 on the unwoven material as the needles rise, that material is permitted to open up so that the needles pass readily through it, which they would not do if it were compacted by pressure. Then, the loose material is readily pressed down over the needles before they start to descend.

In the best form now known, those needles are size No. 8 crochet needles.

In performing the operation described, those needles catch threads of the unwoven material, such as cotton waste, and pull them or hook them down through the fabric 13, and preferably they descend far enough to leave a considerable loop below the sheet. In many instances, those loops will interlace, and this can be fostered by feeding the woven fabric so that the wool threads will be against the back of the needles 28 as they go down. For some purposes, the interlacing of the loops of unwoven fiber with the woven fabric will make a more satisfactory fastening.

The loops are distinguishable in the finished product on the lower side as it appears in the apparatus shown, and are indicated diagrammatically by 60 in Fig. 10, although it is difficult to illustrate them as they actually appear because of their lack of uniformity in character. However, it is to be understood that the actual loops are not indispensable. Threads of the unwoven fiber pulled through the woven fiber will inherently form a fastening.

The tucker assumes greater importance as the

character of the unwoven material nears parallel threads, such as are delivered by a carding machine. In all instances, it is an advantage to bunch the unwoven material, but it is a special advantage when the threads are substantially parallel, because it has the effect of bending them and making them overlap in many directions. It also insures that there will be threads in the path of the crochet needles to be pulled through the woven fabric.

The basic material produced by this invention may be used in sheets, rolls, piles, or folds, and other forms, depending on the nature of the use. One form to which it is especially adapted is a roll 62 (Fig. 11) forming a cartridge or filler for an oil filter. From the nature of the unwoven material formed of waste and passing by the tucker, the threads are well matted, and the operation of the needles is to secure the well matted unwoven material to the fabric. When that composite sheet is rolled to form a filter, it can be made denser at the outer side by increasing the tension as the convolutions of the roll build up, or denser toward the interior by the reverse variation of tension. If the oil is to pass through the roll from the other side, it is often best to have the tension decrease as the roll enlarges, so that the convolutions of the outer portion will be more pervious than the inner, and the solid material in the oil can penetrate a short distance, depending on its size, and increase the filtering ability of the material by building up a bed of the extraneous solids to be removed from the oil.

It is also an important feature of the filter cartridge made of the basic material of this invention that the warp threads continually bind it circumferentially while the woof threads restrain its elongation lengthwise to the cartridge. Hence, the threads of the woven material strongly tend to maintain the size and form of the roll cartridge. To some extent, that is true of folded or piled pads or packages of the basic material.

When used in journal boxes for packing, the fastening between the fabric and the unwoven material aids in preventing waste grab while making the unwoven material fast to the body of the packing.

In this preferred embodiment of the invention, the woven material is what is known as cheese-cloth, and the unwoven material is what is known as carded waste. However, both can be varied to suit the conditions. In some uses, woven metal wire or plastic threads may be used for the fabric, and a variety of loose or loosely felted fibers, vegetable and animal, will be suitable for the unwoven material.

The number of threads to be pulled from the unwoven material through the fabric for fastening is a variable depending somewhat upon the extent of the fastening desired or required. In many instances, a single row of needles reciprocating at a reasonable speed will give sufficient fastening for quantity production. In others, more rows of needles may be advantageously used. For example, in Fig. 4, there is shown a row of needles 64, $\frac{3}{8}$ " from the margin 65 of a needle bar; another row 66, $\frac{1}{8}$ " from the first row; another row 67, $\frac{5}{8}$ " from the last mentioned; another row 68, $1\frac{1}{8}$ " from the last mentioned; and another row 69, $\frac{7}{8}$ " from the last mentioned and $\frac{3}{8}$ " from the margin 70. The spacing of the needles from left to right may be uniform so that there is one needle going through the mass for each $\frac{1}{8}$ " of travel, or $\frac{1}{2}$ " of travel,

to be varied according to the speed of reciprocation.

As these drawings are diagrammatic, Fig. 1 is to be understood as showing one row or many rows of needles uniformly spaced or varied.

The fastening may be increased toward the margin of the sheet to be formed or toward the margin and toward the center, depending on how the sheet is to be cut and handled in making up filter cartridges and the like.

A filter packing or journal box packing, or the like, made of this material will permit the mass to expand and contract with a sort of breathing action under variable pressure without losing its surface, or opening it unduly to a foreign material to be removed from the oil.

After fastening a layer of waste on a woven sheet, it may be turned over and another layer of waste fastened on the opposite side, thus producing a three-layer sheet with the woven fabric in the middle. This is especially good for journal box packing, though it may be used to advantage in filter cartridges. However, there is an advantage in rolling some filter cartridges with the woven fabric inside and wound on the perforated outlet tube, where it forms a final strainer to catch loose threads or fiber, and saves a separate element and operation.

In others, such as large filters for lubricating oil or fuel oil, there is an advantage in rolling the cartridge with the woven fabric outside, where it serves to confine the cartridge, but freely permits yield to pressure from the outside.

I claim:

1. An article of manufacture for use as a packing for filters, journal boxes and the like including a sheet of loosely woven fabric, and a relatively thick, uniform layer of carded cotton thread waste with the threads running lengthwise to the sheet, said sheet and waste fastened together by loops of waste threads extending through the fabric.

2. An article of manufacture for use as a packing for filters, journal boxes and the like including laminae of a thin, loosely woven sheet of fabric, and a relatively thick, uniform layer of carded cotton thread waste with the threads substantially parallel and lengthwise to the sheet, interlaced by threads extending from the relatively thick layer of waste through the woven fabric.

3. An article of manufacture for use as a packing for filters, journal boxes and the like including spiral laminae of loosely woven fabric, and a relatively thick, uniform layer of carded cotton thread waste interlaced by threads of waste extending from the relatively thick layer of waste through the woven fabric.

4. An article of manufacture for use as a packing for filters, journal boxes and the like including spirally convoluted laminae of loosely woven fabric, and a relatively thick, uniform layer of carded cotton thread waste interlaced by threads of waste extending from the relatively thick layer of waste through the woven fabric, the several convolutions of the laminae being under different tension.

5. Filter and analogous packing material comprising a composite sheet of continuous superposed laminae of a relatively loosely woven fabric and a layer of cotton waste threads secured to each other by loops of waste threads extending through openings in the fabric and lying along the outer surface thereof with other loops of cotton waste threads extending through said loops from openings spaced along the fabric from said

first named openings, thus constituting a line of interlaced loops along the outer surface of the composite sheet.

6. Filter and analogous packing material as claimed in claim 5 having a plurality of substantially parallel spaced lines of said interlaced loops. 5

7. Filter and analogous packing material as claimed in claim 5 having a plurality of spaced lines of said interlaced loops and said sheet being disposed in spiral roll form with said lines extending circumferentially of the composite sheet. 10

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