May 25, 1937. F. J. CHANDLER 2,081,219

COMPOUND INTRUSIVE POROSITY MACHINE AND METHOD

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FIG. 1.

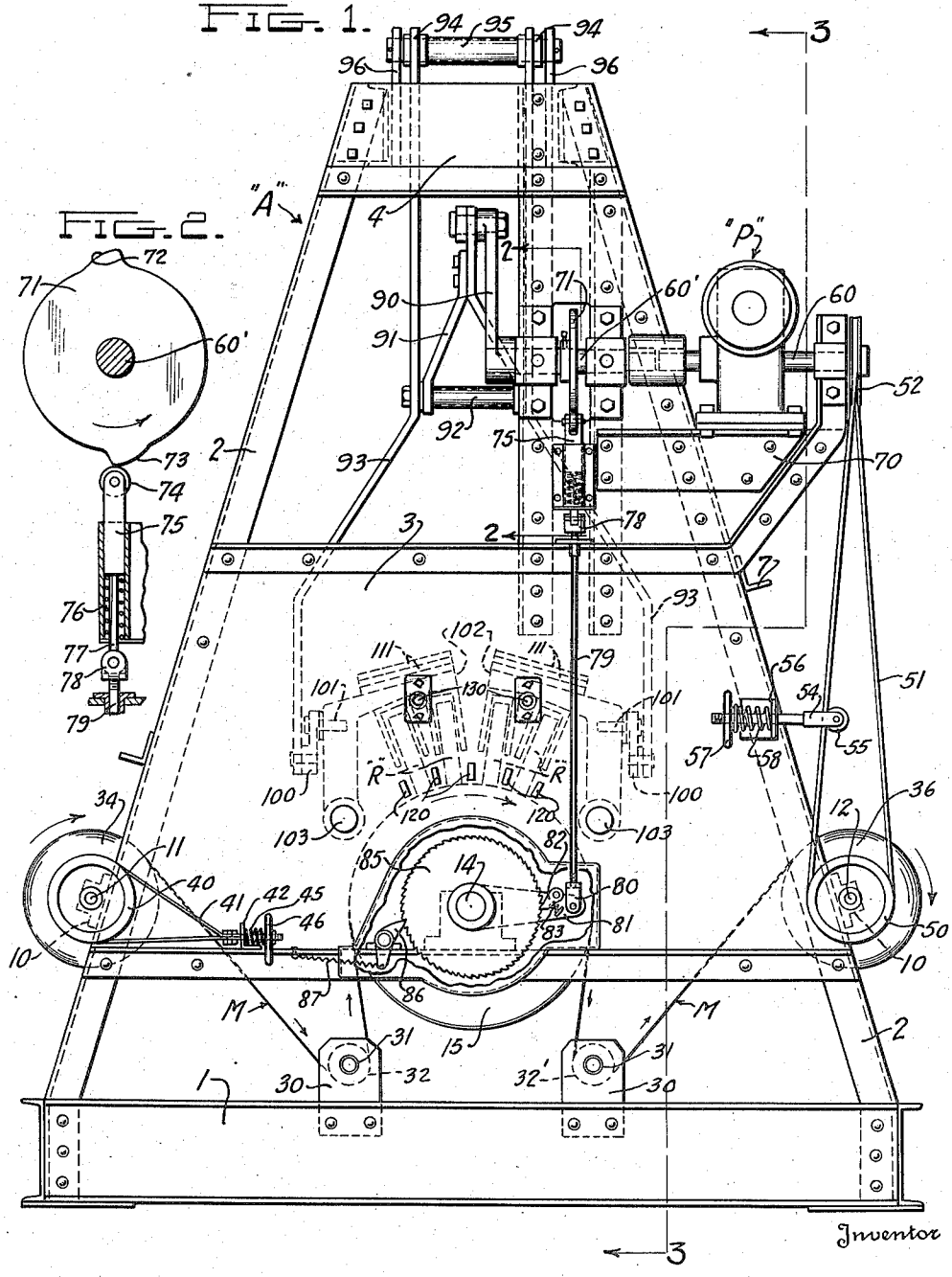


FIG. 2.

Inventor

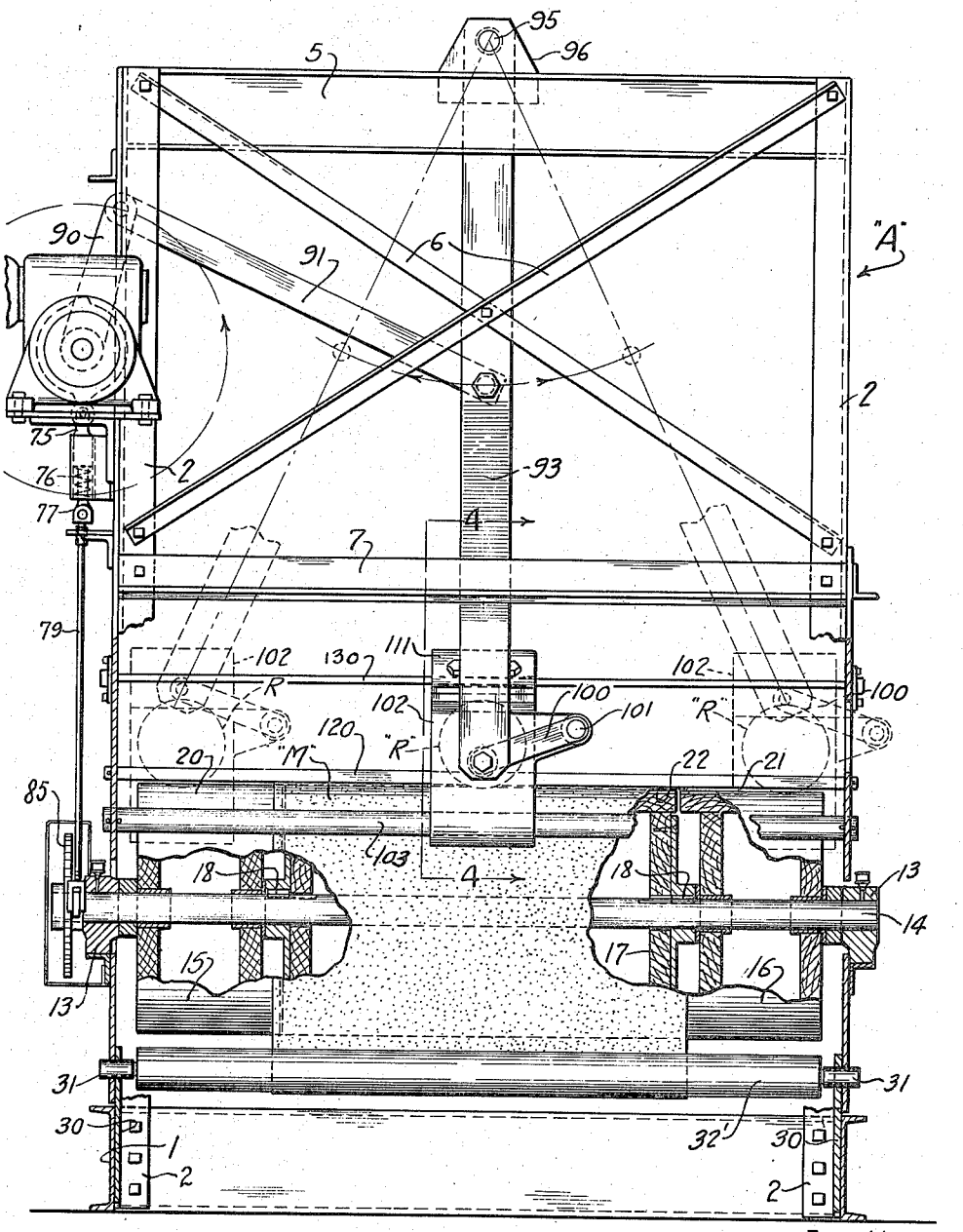
Frank Jermain Chandler

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COMPOUND INTRUSIVE POROSITY MACHINE AND METHOD

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FIG. 3.



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FIG. 4.

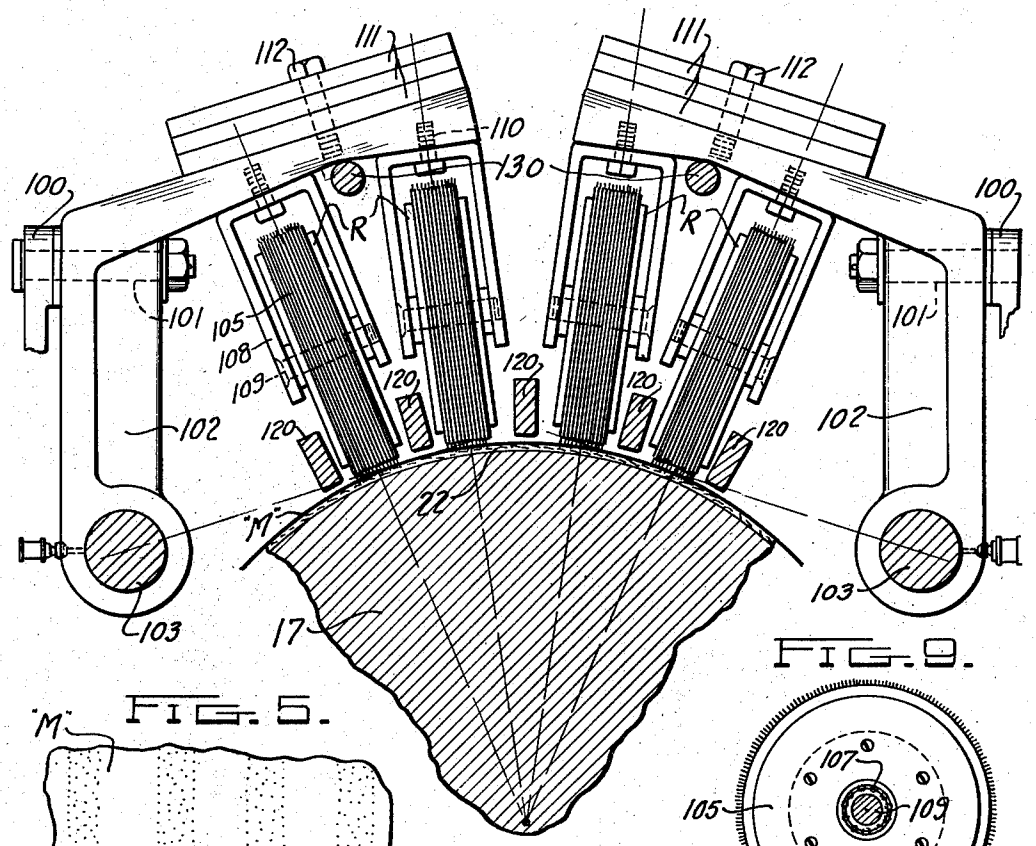


FIG. 5.

FIG. 6.

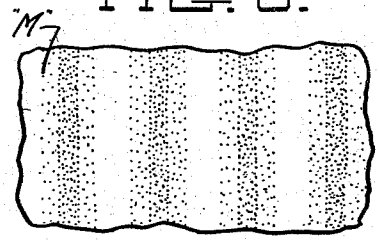


FIG. 7.

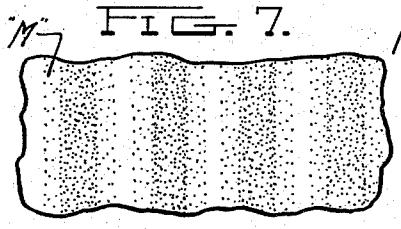


FIG. 9.

FIG. 8.

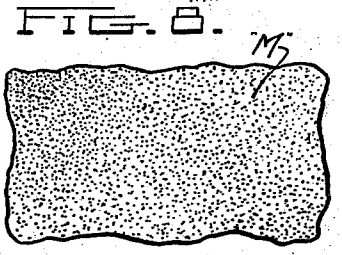
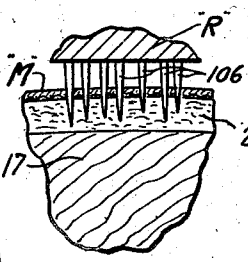


FIG. 10.



Inventor

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Patented May 25, 1937 2,081,219

UNITED STATES PATENT OFFICE

2,081,219

COMPOUND-INTRUSIVE POROSITY MACHINE AND METHOD

Frank Jermain Chandler, Toledo, Ohio, assignor to The Perfotex Company, Toledo, Ohio, a corporation of Ohio

Application November 22, 1934, Serial No. 754,380

12 Claims. (Cl. 164—89)

This machine produces porosity in various materials by the compound intrusive perforation of same. I refer to the action of the intrusive perforating element as compound, because it is passed a plurality of times over the same area, thus greatly increasing the number of perforations in the finished material, over the number of intrusive points in the perforating element.

The necessity for this is apparent when it is known that to produce certain porosity requirements, over 500 intrusive perforations, per square inch, are required, and, it is, of course, impossible to adequately, and substantially, construct an element containing this number of points, to the square inch.

Coated materials, having a fabric base and a pyroxylin, or rubber coating are, normally, non-porous, as they are, at present, manufactured. There are, however, a number of useful purposes, which these coated materials would serve, if they were provided with proper porosity.

The particular feature of my machine is that it provides a very high porosity, by compound action, without essentially altering the strength of the material. It also provides this porosity in such a way as to give the finished material a natural, or rather, "non-mechanical" appearance. This is particularly applicable to the imitation leathers and animal skins, where my novel process closely resembles the natural pores, which would, normally, exist in the skin of the animal.

It is understood that, while the drawings cover a specific construction, that such may be varied, without interfering with the scope of the invention.

Referring to the drawings, Figure 1 is an end elevation of the machine.

Figure 2 is a sectional view, taken, substantially, along the line 2—2, of Figure 1.

Figure 3 is a sectional side elevation taken, substantially, along the line, 3—3, of Figure 1.

Figure 4 is a section along the line, 4—4, of Figure 3.

Figure 5 shows a piece of material, after a single pass of the wheels.

Figure 6 shows the same piece of material as Figure 5, after 2 passes of the wheels.

Figure 7 shows the material after 3 passes and Figure 8 shows the material after all four wheels have traveled over it, requiring 16, or more, passes of the perforating elements.

Figure 9 shows one of the perforating elements.

Figure 10 is an enlarged view showing the engagement of the perforating points on one of the wheels, shown in Figure 4, with the material, and the roller.

Similar numerals refer to similar parts, throughout the several views.

The machine parts are carried on a frame, "A", the principal parts of which are; a base portion, 1, corner posts, 2, and cross members, 3 and 4, top member, 5, and braces, 6 and 7.

The frame, as shown, is of structural steel construction, but other materials, such as castings, could be used, without altering its effective structure.

Carried on the posts, 2, of frame, "A", are bearings, 10, supporting shafts, 11, and 12. Shaft, 11, is adapted to receive a roll of material, "M", to be perforated, and shaft, 12, to receive the perforated material, from the machine. Carried on bearings, 13, is a shaft, 14, adapted to carry rollers, 15, 16, and 17. Rollers, 15 and 16, are free to turn on shaft, 14, while roller, 17, is keyed, or fastened, to shaft, 14, as at 18. In the construction shown, rollers, 15, 16, and 17, are of wooden construction, and carry, on their outer circumferential surfaces, strips of padding material, 20, 21, and 22, which are attached to the surfaces, in some suitable manner.

Carried on the base portion, 1, of the frame, "A", are plates, 30, which, in turn, carry bearings, 31, adapted to support the freely movable rollers, 32 and 32'.

Material, "M", is fed from a roll, 34, carried on shaft, 11, under roller, 32, up, over roller, 17, back, under roller, 32', and to the receiving roller, 36, carried on shaft, 12.

In order to provide proper tension, on the material, and to keep it from becoming slack, during the indexing process, a retarding device is attached to shaft 11. This consists of a pulley wheel, with a flat face, 40, which is keyed to shaft, 11. Bearing, on face, 40, and in semi-circumferential contact, with same, is leather belt, 41, which is attached to frame, "A", as at 42, and is urged into frictional contact with pulley wheel, 40, by spring, 45.

The action of this belt is to retard the movement of shaft, 11, and, adjustment is provided by threaded hand wheel, 46, in action against, 45, to loosen, or tighten, the belt.

Shaft, 12, is provided with pulley wheel, 50, which is keyed to it, and, which, receives belt, 51, which, in turn, is given motion by the action of pulley, 52, attached to the prime mover shaft, 60.

This belt has a slipping contact with pulley,

50, which tends to "spool", or wind up, the material, as fast as it comes off the roller, 17, and which, also, keeps the proper tension on same. The friction of this belt is varied, as required, by adjustment of forked member, 54, carrying pulley, 55, and passing through lug, 56, attached to frame, "A". This adjustment is accomplished by a threaded hand wheel, 57, engaging the threaded portion of forked member, 54, and bearing against spring, 58.

I provide a prime mover, "P", which, in the drawings, is shown as a combination motor and reduction unit. This unit imparts, to the shafts, 60 and 60', a rotative movement, at the rate of 40 rotations, per minute.

Prime mover, "P", is substantially mounted on bracket, 70, attached to main frame, "A".

Keyed to shaft, 60' is a cam plate, 71, having cam surfaces, 72, and 73, at 180 degree intervals, cam roller, 74, carried by fork, 75, and urged, upwardly, by the action of spring, 76, engages the peripheral surface of cam, 71, and, obviously, is given two downward movements, per revolution, of cam, 71, by the action of cam surfaces, 72 and 73.

Fork, 75, is attached to rod, 77, and, through this means, is pinned to fork, 78. A rod, 79, connects fork, 78, to fork, 80, and, right and left, threads, in these forks, and on rod, 79, permit of adjustment of the center of the pins, in these forks.

A lever, 81, carrying a pawl, 82, actuated by a spring, 83, is pin-connected to fork, 80, and, through the cooperating parts, receives two impulses, or movements, for each complete revolution, of cam, 71, and shaft, 60'.

Cooperating with pawl, 82, is a ratchet wheel, 85, keyed to shaft, 14, and, normally, held in a stationary position by pawl, 86, attached to frame, "A", and pulled into engagement by spring, 87.

The parts are so proportioned that each movement of rod, 79 and associated parts, causes ratchet wheel, 85, to advance one, or more, teeth, thus, it will be seen, that, for each complete revolution of cam, 71, two spaced movements will be given to ratchet wheel, 85, and to shaft, 14.

Roller, 17, being keyed to shaft, 14, is, also, moved twice, during one revolution of the prime mover, shaft, 60'.

At the end of shaft 60', is a lever, 90, connected by a forked rod, 91, to shaft, 92, attached to bifurcated pendulum arm, 93.

This arm, 93, is pivotally suspended, as at 94, on shaft, 95, carried on plates, 96, attached to member, 5, of frame, "A".

The lower ends of this bifurcated lever are attached to links, 100, pivotally connected by bolts, 101, to a pair of roller carriages, 102.

Shafts, 103, are fixed, at their ends, to cross members, 3, of frame, "A" and carriages, 102, slide upon these shafts, being capable of both longitudinal and rotative movement, in respect to the shafts.

Carriages, 102, carry roller units, "R", each unit consisting of a freely movable roller, 105, carrying intrusive points, 106, and rotating on ball bearings, 107, such roller being bolted in position, in support, 108, by bolt, 109.

Units, "R", are attached to carriages, 102, by stud bolts, 110.

Upon the top of carriages, 102, and, for the purpose of causing adjustable pressure upon the roller units, "R", counterweight plates, 111, are attached by bolts, 112.

It is evident that the variation in the load upon carriages, 102, will cause a corresponding variation in the pressure of points, 106, upon the material, "M", and will, thus, vary the size of the holes, and the depth of the penetration, into the pad material, 22, carried on roller, 17.

As the points, 106, are of, substantially, conical shape, the size of the holes becomes a function of the depth of penetration.

Due to the rotation of shaft, 61', and lever, 90, a swinging movement is imparted to pendulum arm, 93, and through connections, 100 and 101, carriages, 102, and associated parts, are caused to move, back and forward to positions, shown, dotted, in Figure 3.

Carriages, 102, thus, slide along shafts, 103, and, also, are free to exert pressure upon rollers, "R", due to the fact that they can, also, rotate, about these shafts, as actuated by the counterweights.

Material, "M", passing from roll, 34, to roll, 36, as shown in Figure 1, passes over roller, 17, and laps, slightly, across the gap, between rollers, 15, 16, and roller, 17.

Bars, 120, are carried by cross member, 3, of frame, "A", and pass across the top of rollers, 15, 16, and 17, slightly above the surface of material, "M".

The lower surface of these bars, is smooth, and their function is to prevent the edges of material, "M", from being "picked up", as the rollers, "R", start on their passage across the material.

A very important office is performed by the truss rods; 130, which are located so as to bear, lightly, on the under surfaces of the roller carriages, when same are in perforating engagement with the material being perforated.

The counterweighted roller carriage presses on the rollers and, when these rollers have travelled over the edges of the material, and off of it, upon the unprotected padding, there would be a tendency to "dig in" on the part of the roller points, with consequent injury to the padding material.

Also, when the rollers again begin their travel across the material, they would have to "climb" upon the edge of the same, with consequent wear and damage.

The rods, 130, however, are so located, and adjusted, as to prevent this drop in the roller carriages, due to the fact that the under side of the carriage lightly touches the rod, as shown in Figure 4.

Thus, there is no drop in the carriage, as the rollers leave the material, and no "climb" as they again pass over the edge on their return movement.

Operation

In operation, the material feeds from roll, 34, of unperforated material, under roller, 32, and up, over, roller, 17. Here it is attached, at the start of the perforation, to a piece of waste material, which is rolled, tightly, on shaft, 12. This piece of waste material, which is the same width as the rest of material, "M", passes under roller, 32', and is attached to material, "M", before same has passed under the perforating elements.

The purpose of this piece of waste material is to allow all parts of the roll of material, "M", to be perforated, to the extreme, and, without waste.

Now, prime mover, "P", is started, and carriages, 102, carrying perforating rollers, "R", pass across the material.

The material is moved forward, intermittently, due to the action of cam plate, 71, ratchet wheel,

85, and the associated parts, which impart a movement to roller, 17, keyed to shaft, 14.

This movement must not take place, while the points on rollers, "R", are in engagement, with the material, "M", and, for this purpose, cam surfaces, 72, on cam plates, 71, are so designed that movement is only imparted to roller, 17, after, rollers, "R" have rolled off the material, and are in the positions, as shown, dotted, in Figure 3.

The wheels, in the dotted position, engage the padded surfaces of rollers, 15 and 16. These rollers, being free to revolve, on shaft, 14, remain stationary, while the perforating rollers, "R", engage their surfaces. They will move, with the central roller, 17, however, when the roller, "R", is at the opposite end of its travel, due to the lap of material, "M", onto the surface of the padding, 20 and 21.

Thus, new areas of this padding are exposed to the rollers' action, at each stroke of the machine, and undue wear, on the padding, is eliminated.

As rollers, "R", are freely movable, it is necessary to keep their perforation points, in engagement, with the padding, on the rollers, 15, 16, and 17, as they travel across, in order to slow down their rotation, and to change its direction, at the end of each stroke.

The action of crank, 90, also being harmonic, tends to slow down the motion of the rollers, "R", at the end of each stroke.

When the piece of waste material has pulled the end of material, "M", across roller, 17, under roller, 32' and around shaft, 12, it is disconnected, and the end of material, "M" is rolled around a small paper tube, carried on shaft 12.

From this time, the action of the machine is, entirely, automatic, and, all of the material, "M", is perforated and rolled upon roll, 36, carried on shaft, 12.

When the roll, 36, is complete, it is removed, from shaft, 12, and the process continued, with a new roll of material.

As shown, in Figures 5, 6, 7, and 8, the points, of the rollers, "R", pass over adjacent areas, forming paths, that overlap, as the material is moved forward, over roller, 17. As the motion of 17 is only a fraction of the combined width of all rollers, "R", a high porosity is obtained.

It is important to note, as in Figure 10, that the perforating elements are of irregular length, and, spacing thus, giving the holes variation in size and arrangement.

I claim:

1. A multiple intrusive perforating machine comprising a carrier having a plurality of intrusive perforating points, means operable recurrently to cause said carrier to move across the material and out of contact therewith and concurrently perforate the material, adjustable means for causing said points to enter into perforating engagement with material and means operable to advance the material in step by step manner when the points are out of contact with the material.

2. A multiple intrusive perforating machine comprising a carrier having a plurality of intrusive perforating points, means operable recurrently to cause said carrier to move across the material and concurrently to perforate a portion thereof and means operable with inter-current operation of said first movement to advance the material a predetermined portion of the width of the perforated path.

3. The method of producing multiple intrusive perforations in fabric consisting of progressively perforating a portion of the fabric transversely thereof, moving the fabric intermittently a predetermined portion of the width of the perforated path, and, thereafter perforating an unperforated portion of the material and adding perforations to the portion previously perforated and during transverse movement in the opposite direction.

4. In a machine for the multiple intrusive perforation of material, one or more rollers, padding means mounted on said rollers, means for imparting movement to said roller, or rollers; rotary, intrusive point-carrying means coacting with said roller, or rollers, the points of said last means being in adjustable engagement with the padding means on said roller, or rollers, and means for actuating the movement of material to be perforated, the material being located between the rotary intrusive point-carrying means and the padding means, on said roller, or rollers.

5. In a machine for multiple intrusive perforation of fabrics, an intrusive point-carrying element, or elements, the points of said element, or elements being irregularly spaced and there being a predetermined number of points, per square inch, means to cause said element, or elements, transversely, to traverse the material recurrently, a yieldable member, engageable by said points, and over which the material passes, and adjustable means operating in timed relation to said means to enable perforation of the fabric, per square inch, in excess of said predetermined number.

6. In a machine for multiple intrusive perforation of fabrics, a roller, or rollers, a plurality of intrusive perforating points on said roller, or rollers, a main roller, in juxtaposed relation to said first named roller, or rollers, and over which the fabric extends, the axis of the planes of revolution of said first roller or rollers being sub-radial to the center of the main roller, and means to impart translatory movement to the first roller, or rollers, across the main roller.

7. In a machine for the multiple intrusive perforation of strip material, a roller; padding means mounted on said roller, moving means for imparting movement to said roller, one or more instrusive point-carrying wheels with the planes of their axis of revolution substantially radial to the center of the roller, means for moving the point-carrying wheels in a direction longitudinal to the roller etc.

8. In a machine for multiple intrusive perforation of material, the combination of a rotatable intrusive point-carrying means, actuating means for moving said point-carrying means into perforating engagement with the material to be perforated, and means co-acting with the intrusive points carried by the intrusive point-carrying means to actuate, limit and restrict the rotation of the aforesaid rotatable intrusive point-carrying means.

9. In a machine for the multiple intrusive perforation of material, the combination of a plurality of independently rotatable intrusive perforating, point-carrying elements, mounting means for the aforesaid elements, means for supporting the material to be perforated and means for actuating and controlling the rotation of the independently rotatable intrusive perforating point-carrying elements, by means of the engagement of the intrusive perforating points thereby carried with the material supporting means.

10. In a machine for the multiple intrusive

perforation of material, the combination of a plurality of independently rotatable intrusive perforating, point-carrying elements, mounting means for the aforesaid elements, means for supporting the material to be perforated and means for actuating and controlling the rotation of the independently rotatable intrusive perforating point-carrying elements, by means of the engagement of the intrusive perforating points thereby carried with the material being perforated.

11. In a machine for the multiple intrusive perforation of material, the combination of a plurality of independently rotatable intrusive perforating, point-carrying elements, mounting means for the aforesaid elements, means for supporting the material to be perforated and means for actuating and controlling the rotation of the independently rotatable intrusive perforating point-carrying elements, by means of the engagement of the intrusive perforating points thereby carried with the material being perforated and the material supporting means.

12. The method of producing multiple intrusive perforations in non-porous composite materials, such as rubber coated textile fabrics of limited flexibility, which consists in intrusively perforating a section of the material to produce an irregular pattern of multiple closely spaced perforations, intermittently advancing the material after perforating, intrusively perforating an unperforated section and at the same time perforating between and about the previous perforations, and then repeating the operation.

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