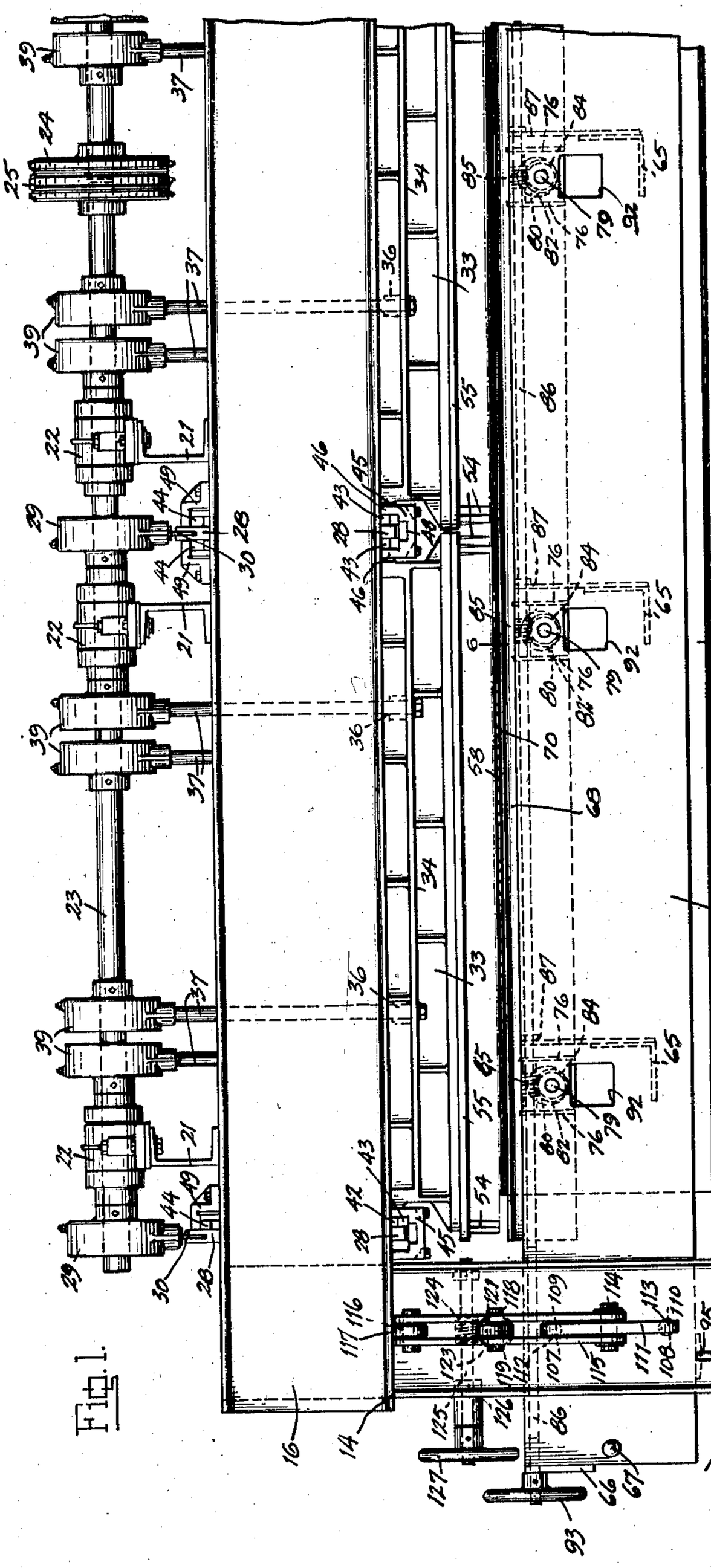
Feb. 28, 1939. H. G. SPECHT ET AL 2,148,511

FELT NEEDLING MACHINE

Filed July 30, 1937

3 Sheets-Sheet 1



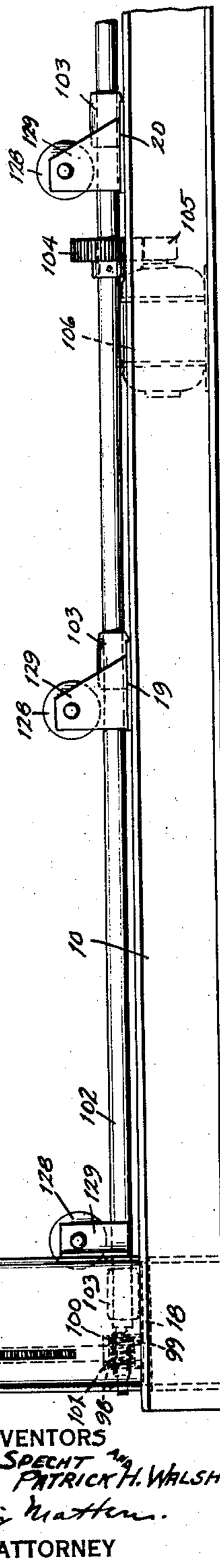


Fig. 1.

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Fig. 2.

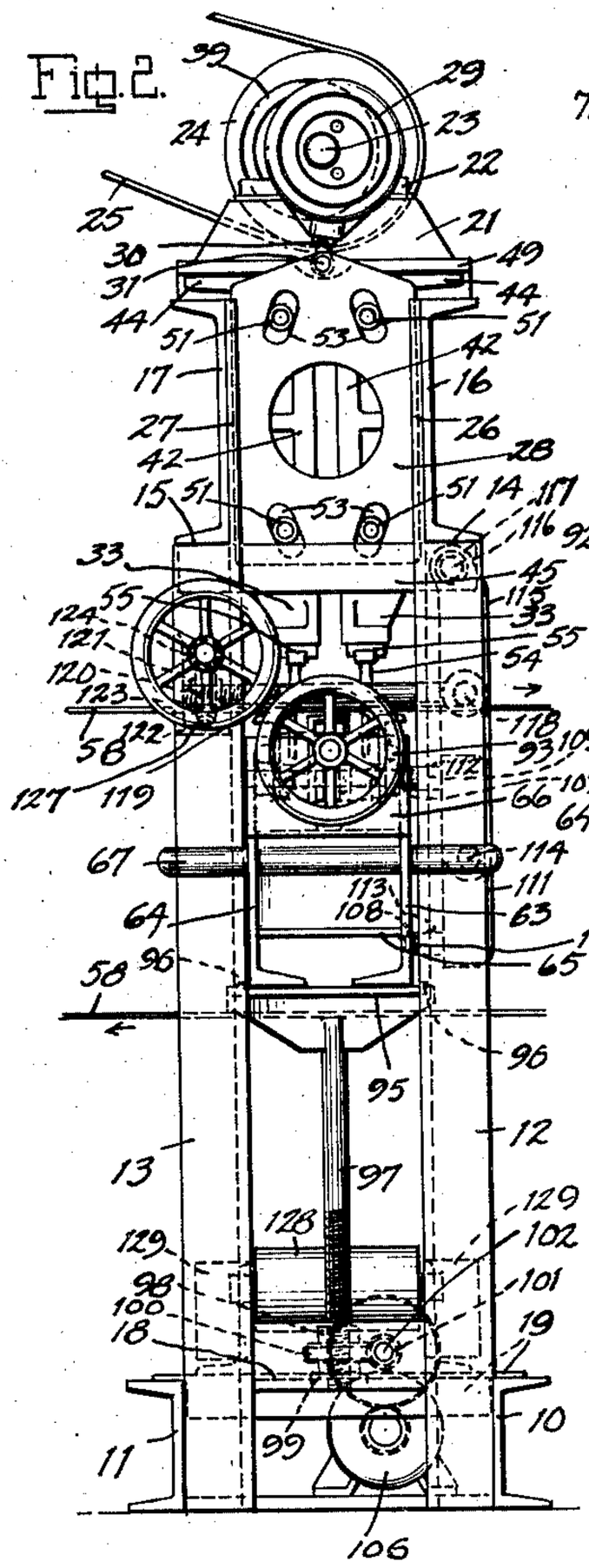


Fig. 6.

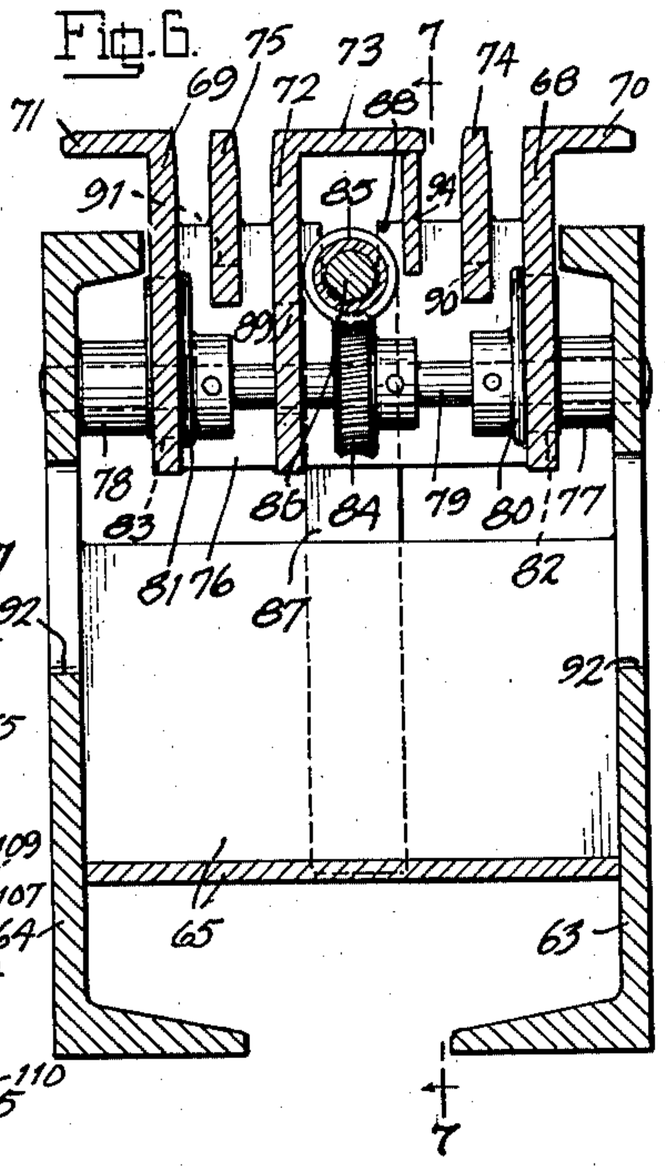


Fig. 7.

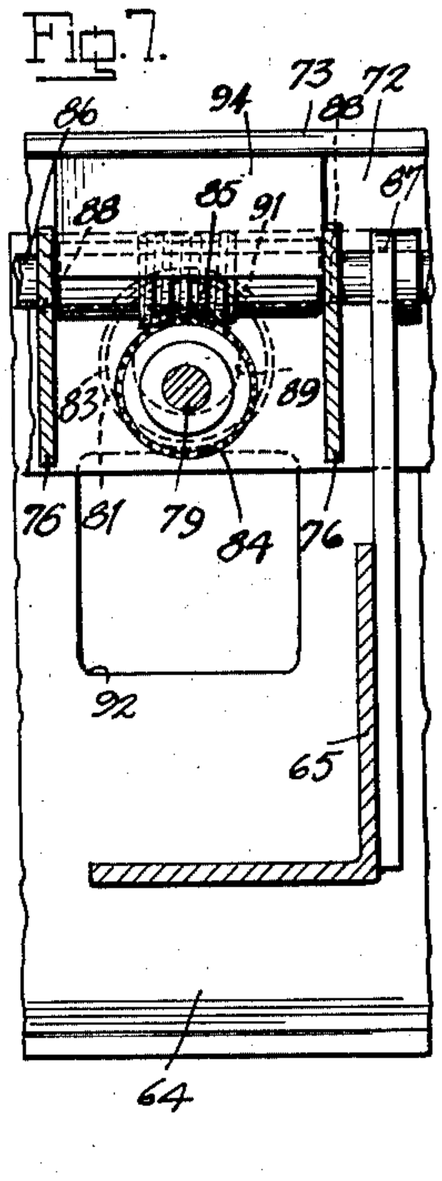


Fig. 8.

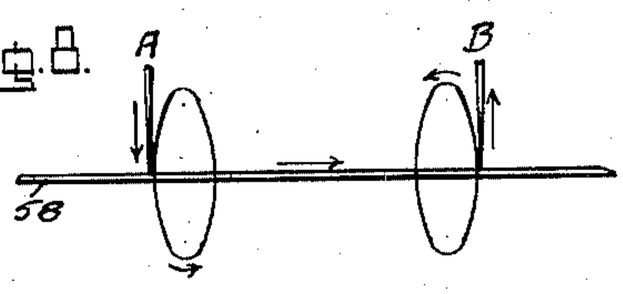
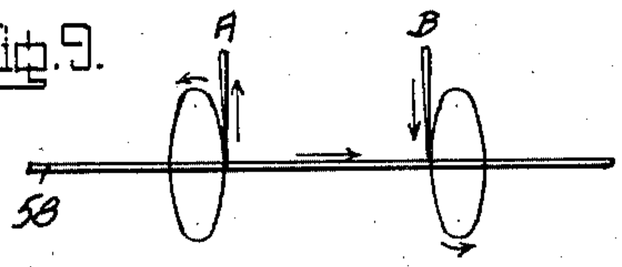


Fig. 9.



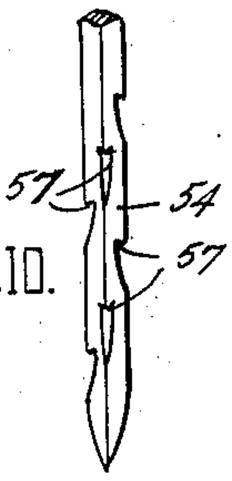
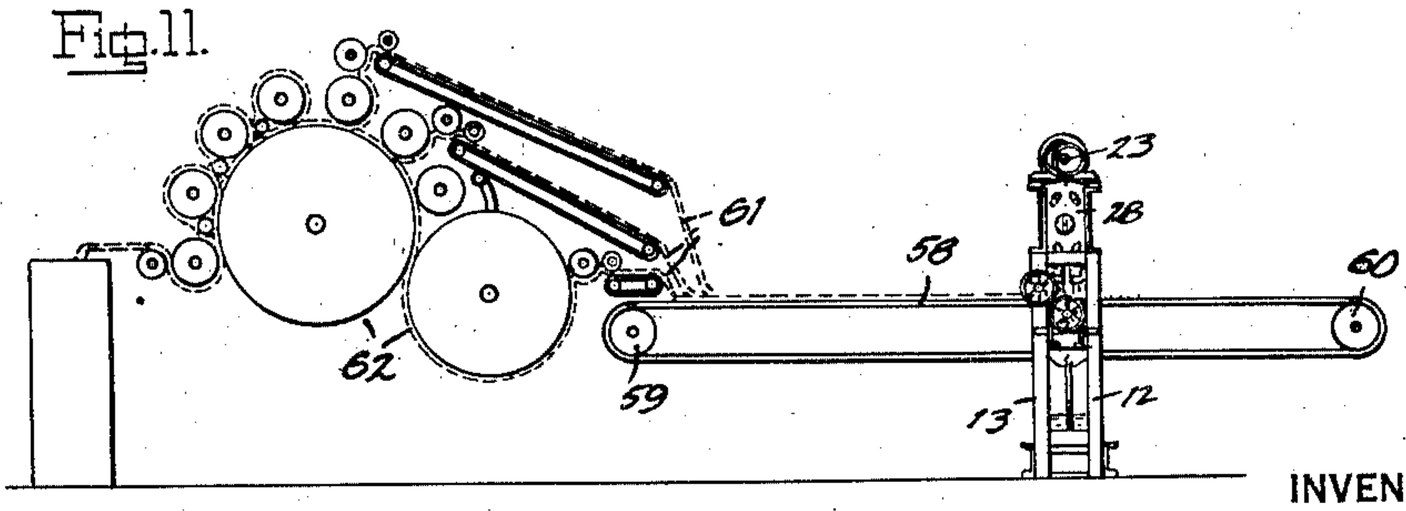


Fig. 10.

Fig. 11.



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FELT NEEDLING MACHINE

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Fig. 3.

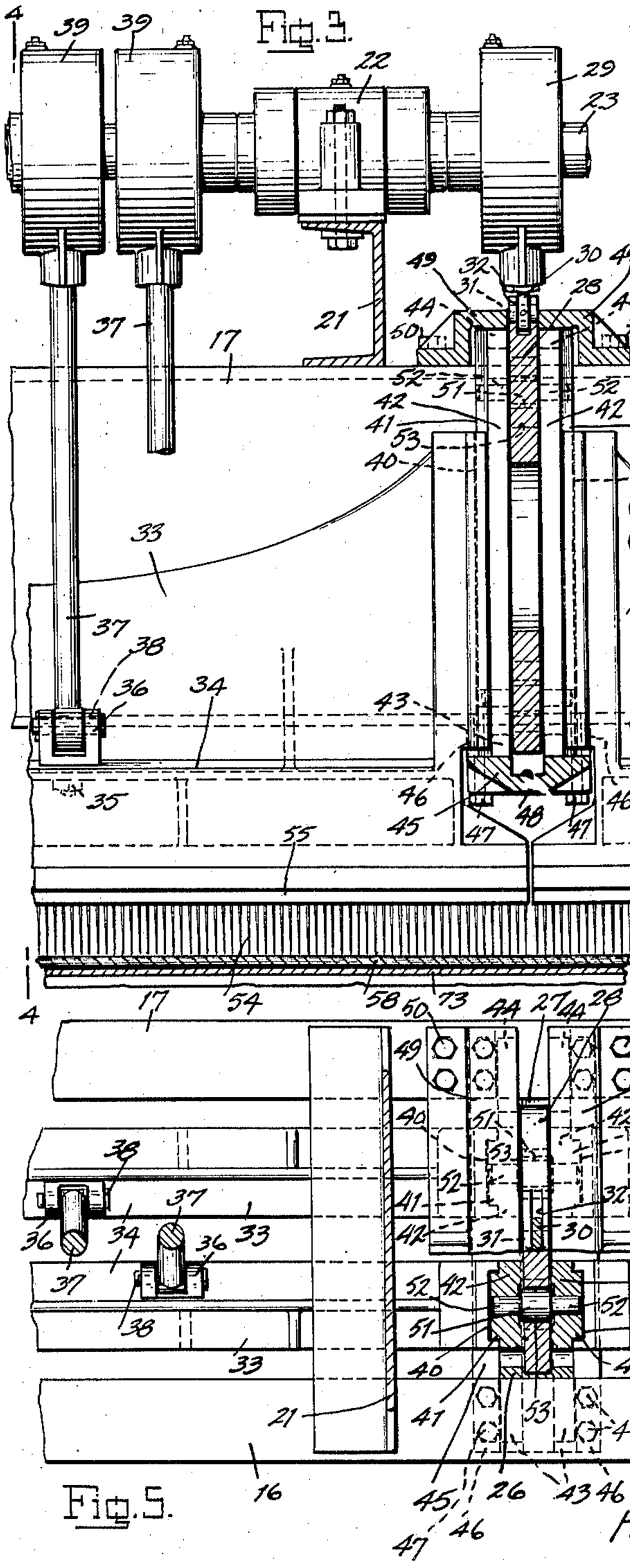

Fig. 4.

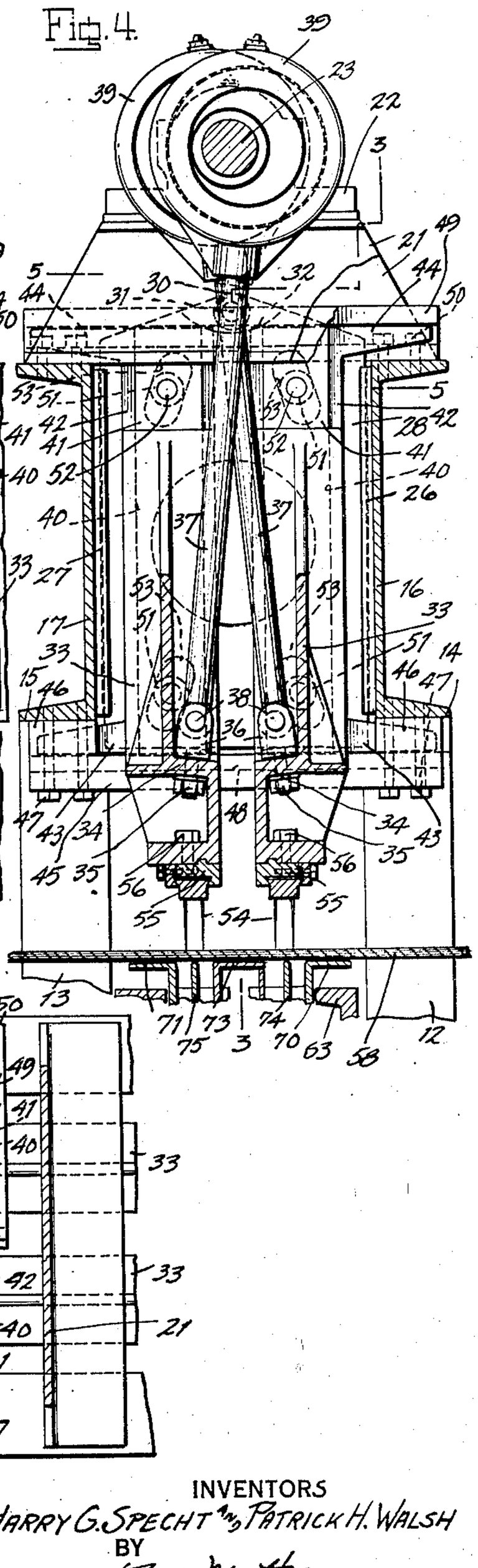

Fig. 5.

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Patented Feb. 28, 1939

UNITED STATES PATENT OFFICE

2,148,511

FELT NEEDLING MACHINE

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Application July 30, 1937, Serial No. 156,446

9 Claims. (Cl. 28—4)

The present invention relates to an improved felt needling machine, particularly of the type adapted to incorporate textile fibres of a bat or web produced in a carding machine with a base fabric by needling the fibres of such bat or web into the base fabric, the needling operation being performed by reciprocating banks of needles which push the fibres into the base fabric through the down stroke of the needles. The present invention is an improvement over the methods and machines shown for example in the patents to Patrick H. Walsh 1,620,307, dated March 8, 1927; 1,683,182, dated September 11, 1928; 1,843,068, dated January 7, 1930; 1,934,649, dated November 7, 1933, the patent to Aldo Curioni 1,853,961, dated April 12, 1932, and the patents to Charles H. Chase 1,742,133, dated December 31, 1929, and 1,745,739, dated February 4, 1930.

It is an object of the invention to provide a needling machine which may be conveniently built in various widths simply by employing a greater or less number of needle bank units and operating means thereof. The units will be of a size corresponding to the smallest type of machine that it may be desired to build, say 60", and by employing the desired number of these units, machines of a width which will be multiples of each unit may be produced, that is, with 60" units machines of 120", 180", 240" etc. may be produced.

Another object is to provide a machine which may be operated at relatively greater speed than has heretofore been possible, and to this end the mechanism for reciprocating and shifting the needle bank units consists of a drive shaft carrying eccentric cam members for reciprocating the needle bank units and of fixed cam members with which the needle bank units cooperate to shift them laterally as they are reciprocated, the arrangement being such that excessive vibration present in other types of machine is eliminated, and consequently the machine may be operated at great speed.

A further object is to provide a needling bed carrier which may be conveniently raised and lowered with respect to the needle bank units and may be withdrawn from operative position in order to conveniently place the cloth in the machine and remove it. A still further object is to provide an adjustably mounted needle bed carrier and a needling bed adjustably mounted therein, with improved means for adjusting the position of the needling bed with respect to the carrier and the needle bank units.

With the above and other objects in view, an embodiment of the invention is shown in the accompanying drawings, and this embodiment will be hereinafter more fully described with reference thereto, and the invention will be finally pointed out in the claims.

In the drawings:

Fig. 1 is a front elevation of a needling machine according to the invention, and showing the left hand half of the machine and a portion of the right hand half, the right hand half is substantially identical with the left hand half.

Fig. 2 is an end elevation.

Fig. 3 is a vertical sectional view taken along the line 3—3 of Fig. 4, and showing the adjacent ends of two needle bank unit sections, and the means for vertically reciprocating and laterally shifting the same.

Fig. 4 is a vertical sectional view taken along the line 4—4 of Fig. 3.

Fig. 5 is a horizontal sectional view partially broken away, taken along the line 5—5 of Fig. 4.

Fig. 6 is a vertical sectional view of the needling bed and carrier, taken along the line 6—6 of Fig. 1.

Fig. 7 is a vertical sectional view, taken along the line 7—7 of Fig. 6.

Fig. 8 is a diagrammatic view showing the path of the needles in one phase of the needling operation.

Fig. 9 is a similar view showing the path of the needles in another phase of the needling operation.

Fig. 10 is a perspective fragmentary view of one of the needles employed.

Fig. 11 is a side elevation of the needling machine according to the invention in relation to the carding machine for supplying the carded bat or web thereto, this latter mechanism being in accordance with the disclosure of the patent to Walsh 1,743,068.

Similar reference characters indicate corresponding parts throughout the several figures of the drawings.

Referring to the drawings the frame of the needling machine, according to the invention, is formed mainly from sections of channel iron beams which are of standard form and of sizes and lengths suitable for their particular use and arrangement in the machine. As these channel iron beams can be purchased in the open market the machine may be conveniently built to the desired length simply by employing longitudinal beams of suitable length, and without the expense of special castings such as has been necessary with needling machines of the prior art.

In the illustrated embodiment the machine is designed for needling material 180'' in width, and therefore the frame is built of suitable length to accommodate three 60'' needling bank unit sections which are of identical construction and are mounted contiguously in longitudinal alignment in the machine. Thus standardized needling machines of any length which is a multiple of the length of the individual sections may be produced with economy and facility simply by the length of the frame, and as above pointed out this only necessitates varying the use of the proper length channel beams longitudinally of the machine.

The frame consists of a pair of channel beam base members 10 and 11 arranged in spaced parallel relation and having their flanges extending outwardly, a pair of upright channel beam end members 12 and 13 at each end of the frame, only the left hand end being shown in the illustration, these upright members being rigidly secured to the base members by welding or other suitable means. The upper end portions of the uprights 12 and 13 have the flanges removed providing supporting shoulders 14 and 15 upon which the ends of the upper longitudinally extending channel beams 16 and 17 are supported and secured by welding or other suitable means, the flanges of these beams facing outwardly and the inner surface being engaged against the transverse portions of the upper ends of the upright beams 12 and 13.

A channel beam section 18 having its flanges facing upwardly is secured by welding or other suitable means to the lower end portions of the upright members 12 and 13 at each end of the machine, and serves as a support for the mechanism for raising and lowering the needling bed carrier, as will hereinafter more fully appear. Channel beam sections 19 and 20 having the end portions of their downwardly facing flanges removed, are secured at their ends by welding or the like to the upper flanges of the channel beam base members 10 and 11, and with the members 18 transversely brace the base members and at the same time provide platform supports for bearings and rollers for the needling bed raising and lowering mechanism, as will hereinafter more fully appear. The upper end of the frame is braced by transverse channel beam sections 21 disposed at suitable intervals and which serve as supports for the drive shaft bearings, as will presently more fully appear.

Upon the frame members 21 there are secured bearing members 22 in which the drive shaft 23 is journaled, this shaft being provided midway between its ends with a sprocket gear 24 by means of which the shaft is motor driven through chain drive 25. Upon the shaft 23 there are also mounted the cam means for operating the needling heads, as will presently more fully appear.

At each end of the machine between each of the needling head unit sections there are secured upon the inner faces of the upper frame members 16 and 17 vertically disposed channeled guide members 26 and 27 in which the vertical edge portions of a vertically reciprocating cam plate member 28 are engaged. This member is for the purpose of imparting lateral movement to the needling heads as they are moved up and down, the cam plate at the end of the machine as shown in Fig. 1 cooperating with the left hand ends of the first needling head units and the cam plate between the first and second needling head units cooperating with the right hand ends of the first units and the left hand ends of the second units. As these cam members are identical except for the fact that the end ones are only engaged at one side with the needling head units the details of the means cooperating with the cam plate will be described with reference to the cam plate disposed between the first and second needling unit sections, and which is illustrated in detail in Figs. 3 to 5.

Vertical reciprocatory movement is imparted to the cam member 28 by means of an eccentric drive unit 29 mounted upon the drive shaft 23, and connected to the cam member by means of a shaft 30 pivotally connected at 31 within a recess 32 formed in the upper end of the cam member.

The needling head frames 33 are arranged in pairs, that is, each needling unit section consists of a forward and a rearward needling head, which are of identical construction, except that they are reversely arranged to each other. These frames are in the form of castings, and each has secured upon the inner ledge portion 34 by means of bolts 35 a plurality of yoke bracket members 36 to which connecting rods 37 are connected by wrist pins 38, these connecting rods being connected at their upper ends to eccentric drive units 39 mounted upon the drive shaft 23. These eccentric drive units 39 are so arranged that the needle head frames are reciprocated in opposite directions, that is, the forward frame will move upwardly as the rearward frame moves downwardly. During this vertical reciprocatory movement lateral movement in opposite directions is also imparted to the needle head frames by the action of the cam member 28, as will now appear.

At each end of each needle head frame 33 there is provided a vertical channel 40, each of these channels being slidably engaged for relative vertical movement upon one of the vertical guide ribs 41 provided upon the outer faces of pairs of slide members 42 disposed at the respective sides of the cam member 28 and which are provided at their upper and lower ends with foot extensions 43 and 44. The lower foot extensions 43 are slidably mounted in a slide bracket member 45 having projections 46 upon its upper side at each end which are secured to the lower flanges of the upper frame members 16 and 17 by means of bolts 47, the projection 46 at each end providing guide spaces between them and the side surfaces of the cam member 38 in which the foot portions of the slide members are engaged. The member 45 is provided at its upper surface with a recess 48 within which the lower end of the cam member 28 moves as it is reciprocated downwardly. The upper foot portions 44 of the slide members are guided in angular guide members 49 disposed at each side of the upper end of the cam member 28 and secured to the upper flanges of the upper frame members 16 and 17 by means of bolts 50.

The slide members 42 are connected to the cam member 28 by means of cam rollers 51 mounted upon pins 52 engaged at their ends in the slide members at each side of the cam member and extending between them where each of the cam rollers is engaged in one of the inclined cam slots 53 provided in the cam member 28, there being four of these slots in each cam member, two at the upper end and two at the lower ends, and these slots being oppositely inclined at each side. It will thus be seen as the cam member 38 is vertically reciprocated the slide members 42 are laterally moved inwardly and outwardly, and this lateral movement is imparted to the needle head

frames, which latter are at the same time being vertically reciprocated.

The needles 54, which are carried by the needle head frame upon suitable needle bars 55 secured to the frame by bolts 56, describe closed paths of movement in the same direction, with the needles of the forward frame, however, being raised and moving above the cloth, while the needles of the rearward frame are lowered, so that they are engaged with the cloth and move with it, it being understood that the cloth is fed continuously by suitable mechanism timed with the needling machine so that its movement corresponds to that of the forward movement of the needles. As shown in Fig. 8 the needle A is about to enter the cloth as the needle B leaves the cloth, while in Fig. 9 the needle B is about to enter the cloth as the needle A leaves it.

The needle 54 as shown in detail in Fig. 10 is of the type as disclosed in the patent to Chase 1,745,739, being provided with barbs 57, so arranged that the fibres are pushed into the cloth as the needles move downwardly, and free themselves from the fibres as the needles move upwardly, thus leaving the fibres in the cloth.

The cloth 58 being needled is in the form of an endless bent supported upon feed rolls 59 and 60, as shown in Fig. 11, the upper traverse of the cloth moving over a needling bed, presently to be more fully described. At one end of the upper traverse of the cloth fibres 61 are fed thereon from a carding unit 62, which is similar to that disclosed in the patent to Walsh, 1,743,068.

The needling bed carrier consists of a pair of spaced channel beams 63 and 64 having their flanges facing toward each other, and secured together at suitable intervals by angle members 65 welded or otherwise secured to the beams. The beams are further secured at each end by a plate 66 welded in place, and which further serves as a bearing for the worm shaft of the height adjustment means for the needling bed, presently to be more fully referred to. The needling bed carrier is identical at each end, except that at the left hand end, as shown in Fig. 1, a handle bar 67 is provided for the purpose of withdrawing and engaging the needling bed carrier, as will presently more fully appear.

The needling bed consists of forward and rearward rail members 68 and 69, provided at their upper ends with outwardly extending flange portions 70 and 71 respectively, which form the outer portions of the top surface of the bed, an intermediate rail member 72 having a flange 73 at its upper end disposed centrally in spaced relation between the rail members 68 and 69, and flat rail members 74 and 75 disposed in spaced relation between the intermediate and the forward and rearward rail members, the spaces between these flat rail members and the angular rail members being the needling spaces through which the needles move as they are engaged through the cloth. The rail members 68, 69, 72, 74 and 75 are rigidly connected together as a unit by a series of transverse plates 76 welded to the rails.

The needling bed is mounted in the needling bed carrier for vertical adjustment and for this purpose the beams 63 and 64 are provided at suitable intervals with opposed bearings 77 and 78, in which the ends of a cam shaft 79 are journaled, this cam shaft being provided with eccentric cam members 80 and 81 engaged in circular openings 82 and 83, respectively provided in the rails 68 and 69. The shaft 79 is also provided with a worm gear 84 which meshes with one of the series of worms 85 provided upon the worm shaft 86, which shaft is journaled in the end plates 66 and in bearing supports 87 secured to the angle plates 65. The transverse plates 76 are provided with cut-outs 88 to clear the shaft 86, the rail 72 is provided with an eccentrically disposed circular opening 89 to clear the cam face 79 during adjustment movement of the needling bed, and the rail members 84 and 85 are provided with arcuate cut-outs 90 and 91 to clear the hubs of the eccentrics 80 and 81.

Hand holes 92 are provided in the beams 63 and 64 in relation to the cam shaft for the purpose of convenient access to them. The shaft 86 is provided at each of its ends with a hand wheel 93 by which it may be turned, causing the cam shaft 79 to be rotated through the worm and worm gear connection, so that the eccentric cams raise or lower the needling bed with respect to the needling bed carrier to any desired position of adjustment. The worm and worm gear connections provide a self-lock for this adjustment. A guard plate 94 is secured to the flange 73 of the rail member 72 to prevent fibres from reaching the gearing.

At each end the needling bed carrier is supported upon a jack mechanism by means of which it may be raised and lowered, this jack mechanism consisting of a head 95, having its ends engaged in vertical slots 96 in the beams 12 and 13, the head being secured to the upper end of a jack shaft 97 which is threaded at its lower portion and engaged in a nut 98 supported in a bearing 99 mounted upon the transverse channel plate member 18 between the beams 12 and 13. This nut is provided with a worm gear 100 engaged by a worm 101 carried upon the end of a shaft 102 journaled in bearing supports 103 mounted upon the channel plate 18 and the channel plates 19 and 20 secured upon the beams 10 and 11. The shaft 102 is provided with a gear 104 engaging the pinion 105 of an electric motor 106. It will be understood that the shaft 102 is provided at each of its ends with a worm drive 101, so that the jacks at the respective ends are raised and lowered evenly upon rotation of the shaft.

In the normal raised position of the needling bed carrier it is locked with respect to the frame and for this purpose the beam 63 is provided at each end in relation to the upright frame beam 12 with holes 107 and 108 engaged by locking pins 109 and 110 carried upon the ends of a locking bar 111, these pins having sliding movement in holes 112 and 113 in the beam 12. The bar 111 is pivotally connected intermediate its ends by a pin 114 to a lever 115 pivotally connected at its upper end by a pin 116 to a bracket 117. Intermediate the ends of the lever there is pivotally connected at 118 a rod 119 which extends transversely of the machine and is provided at its end with screw threads 120 engaged in a nut 121 supported in an angle iron bracket 122 secured to the beam 13, and which nut is provided with a worm gear 123 meshing with the worm 124 provided upon a shaft 125, journaled in a bearing member 126 secured to the beam 13 and provided at its outer end with a hand wheel 127. Upon turning of this hand wheel the rod 119 is moved inwardly and outwardly through the worm gear connection, causing the lever 116 to be swung inwardly and outwardly to engage or disengage the locking bar pins with respect to the needling bed carrier.

Upon unlocking the needle bed carrier it may be lowered through operation of the jacks and in the lower position it rests upon a series of rollers

128 mounted in brackets 129 secured to the frame beams 12 and 13 and to the channel plates 19 and 20. The purpose of raising and lowering the needling bed carrier is to permit of convenient removal and engagement of the cloth which is in the form of an endless belt.

When it is desired to remove the cloth upon completion of the needling operation the needling bed carrier is lowered sufficiently to bring the upper traverse of the cloth away from the needles, whereupon the cloth at the left hand side of the machine is pushed toward the right to a point where it is vertically clear of the rollers 128, these rollers being only provided at the left hand side of the machine. Thereupon the needling bed carrier is lowered upon the roller 128. By means of the handle bar 67 the carrier is then drawn out of the machine toward the left, as seen in Fig. 1, so that it is completely disengaged from the cloth, the disengagement occurring when the right hand end of the carrier reaches the innermost rollers 128 at which point the cloth is free of the carrier and may be removed from the machine. A new piece of cloth is inserted simply by placing it in relation to the inner end of the withdrawn needling bar carrier and then pushing the carrier into place with the cloth engaged about it. By raising the carrier from the supporting rollers 128 to a point short of its fully raised operative position in relation to the needles, the cloth may be drawn over the left hand side of the carrier. When the cloth is properly positioned as shown in Fig. 1, the carrier is brought into its fully raised operation position in relation with the needles, and the machine is ready to operate.

We have illustrated a preferred and satisfactory embodiment of the invention, but it will be understood that changes may be made therein, within the spirit and scope thereof, as defined in the appended claims.

Having thus described our invention, what we claim and desire to secure by Letters Patent is:

1. In a needling machine, a frame, a needling bed mounted in said frame, a needling head above said needling bed, and means for imparting orbital movement to said needling head, comprising a horizontally reciprocating slide member, vertical guide means cooperating between said slide member and said needling head to permit vertical movement of said head relatively to said slide member, a vertically reciprocating cam member operatively engaged with said slide member to impart horizontal movement to said slide member, and means to impart vertical reciprocating movement simultaneously to said needling head and said cam member.

2. In a needling machine, a frame, a needling bed mounted in said frame, a needling head above said needling bed having vertical track means at each end, and means for imparting orbital movement to said needling head, comprising a horizontally reciprocating slide member at each end of said head having vertical track means engaged with said track means of said head to permit vertical movement of said head relatively to said slide member, a vertically reciprocating cam member operatively engaged with said slide members to impart horizontal movement to said slide members, and means to impart vertical reciprocating movement simultaneously to said needling head and said cam member.

3. In a needling machine, a frame, a needling bed mounted in said frame, a needling head above said needling bed, and means for imparting orbital movement to said needling head, comprising a horizontally reciprocating slide member, vertical guide means cooperating between said slide member and said head to permit vertical movement of said head relatively to said slide member, a vertically reciprocating cam member operatively engaged with said slide member to impart horizontal movement to said slide member, a drive shaft arranged horizontally above said needling head and cam member, an eccentric crank means on said shaft for imparting vertical reciprocatory movement to said needling head, and an eccentric crank means on said shaft for imparting vertical reciprocatory movement to said cam member.

4. In a needling machine, a frame, a needling bed mounted in said frame, a pair of opposed needling heads above said needling head, and means for imparting orbital movement to said needling heads, comprising a pair of horizontally reciprocating slide members each having vertical guide means cooperating between it and one of said needling heads to permit vertical movement of said head relatively to said slide member, a vertically reciprocated cam member having oppositely arranged cam means respectively engaged with said slide members to impart horizontal movement to said slide members in opposed directions, and means to impart reciprocatory movement simultaneously to said needling heads in opposed directions, and means for imparting vertical reciprocatory movement simultaneously to said cam member.

5. In a needling machine, a frame, a needling bed mounted in said frame, a plurality of needling heads arranged in longitudinal alignment, means for imparting vertical reciprocatory movement to said needling heads, and means for simultaneously imparting horizontal reciprocatory movement thereto comprising vertically reciprocating cam members respectively in relation to the outer ends of the plurality of needling heads, and a vertically reciprocating cam member arranged between the adjacent ends of said plurality of needling heads and connected to said adjacent ends as a common actuating means therefor.

6. In a needling machine, a frame, needling head means at the upper corner of said frame mounted for vertical and horizontal reciprocatory movement whereby said needling head means has an orbital movement, a needling bed carrier arranged in the lower part of said frame beneath said needling head, an adjustable needling bed mounted in said carrier, and worm-gear operated cam means to adjust said needling bed relatively to said carrier.

7. In a needling machine, a frame, needling head means in the upper corner of said frame mounted for vertical and horizontal reciprocatory movement whereby said needling head means has an orbital movement, a needling bed arranged in the lower part of said frame beneath said needling head, vertically adjustable jack means supporting said needling bed whereby it may be raised and lowered, and means disposed in said frame beneath said bed to support said bed at spaced points for longitudinal movement when lowered, said material adapted to be gathered transversely of itself upon said bed between said spaced points, said needling bed being longitudinally movable when engaged with said last means beneath said needling head whereby said gathered material disposed about said needling bed may be disengaged through said longitudinal movement of said needling bed.

8. In a needling machine, a frame, a needling

head means in the upper part of said frame mounted for vertical and horizontal reciprocatory movement whereby said needling head means moves about an orbital movement, a needling bed carrier arranged in the lower part of said frame beneath said needling head, vertically adjustable means for raising and lowering said needling bed carrier with respect to said needling head, an adjustable needling bed mounted in said carrier, and means to adjust said needling bed relatively to said carrier.

9. In a needling machine, a frame, a needling head means in the upper part of said frame mounted for vertical and horizontal reciprocatory movement whereby said needling head means moves about an orbital movement, a needling bed arranged in the lower part of said frame beneath said needling head, vertically adjustable jack means supporting said needling bed whereby it may be raised and lowered, spaced rollers disposed in said frame beneath said bed to support it for longitudinal movement when lowered, said material adapted to be gathered transversely of itself upon said bed between said spaced rollers, said needling bed being longitudinally movable when engaged with said rollers beneath said needling head whereby said gathered material disposed about said needling bed may be disengaged through said longitudinal movement of said needling bed.

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