Oct. 31, 1950

R. L. SELF

2,528,392

TUFTING MACHINE

Filed Aug. 10, 1948

7 Sheets-Sheet 1

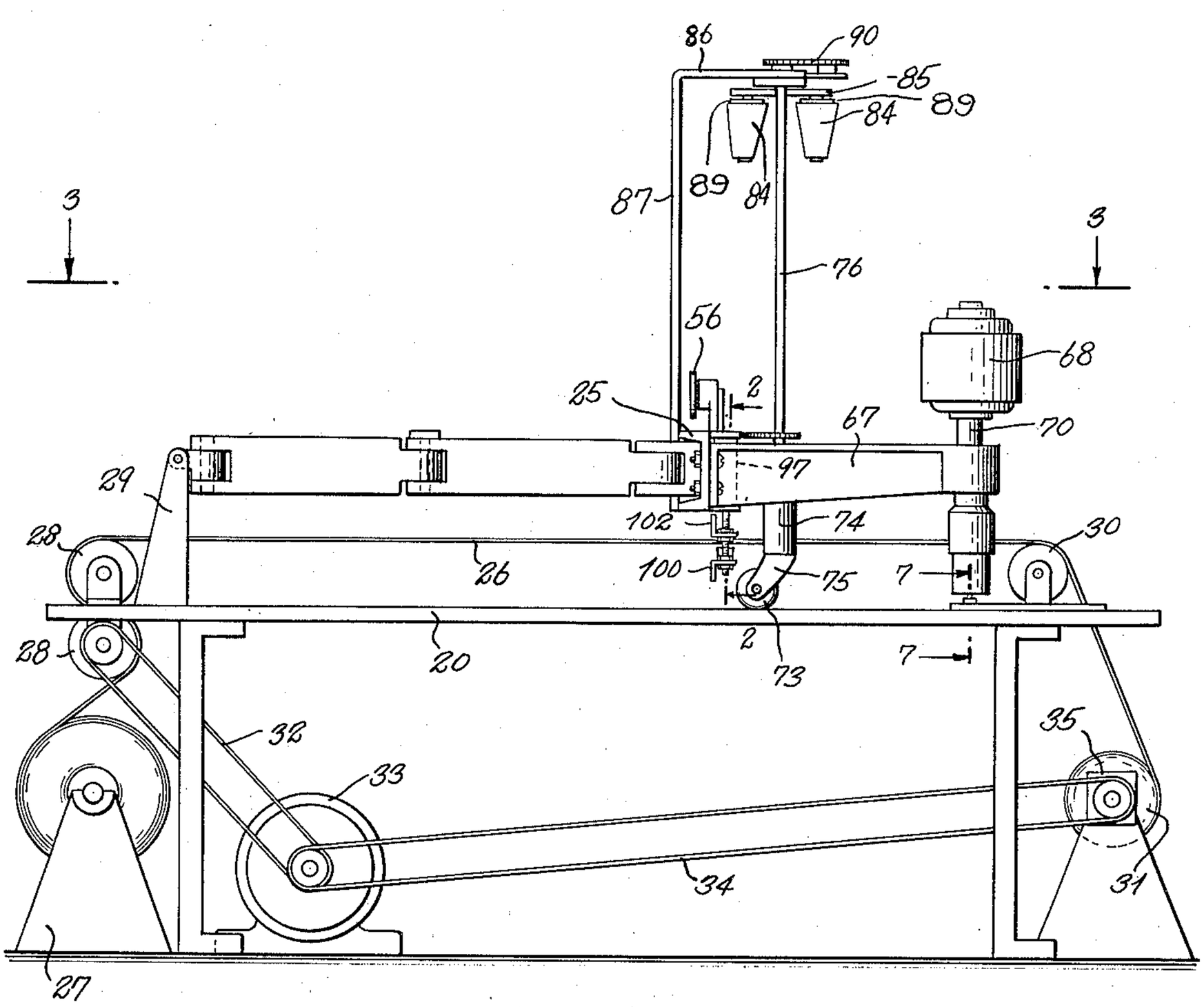

Fig. 1.

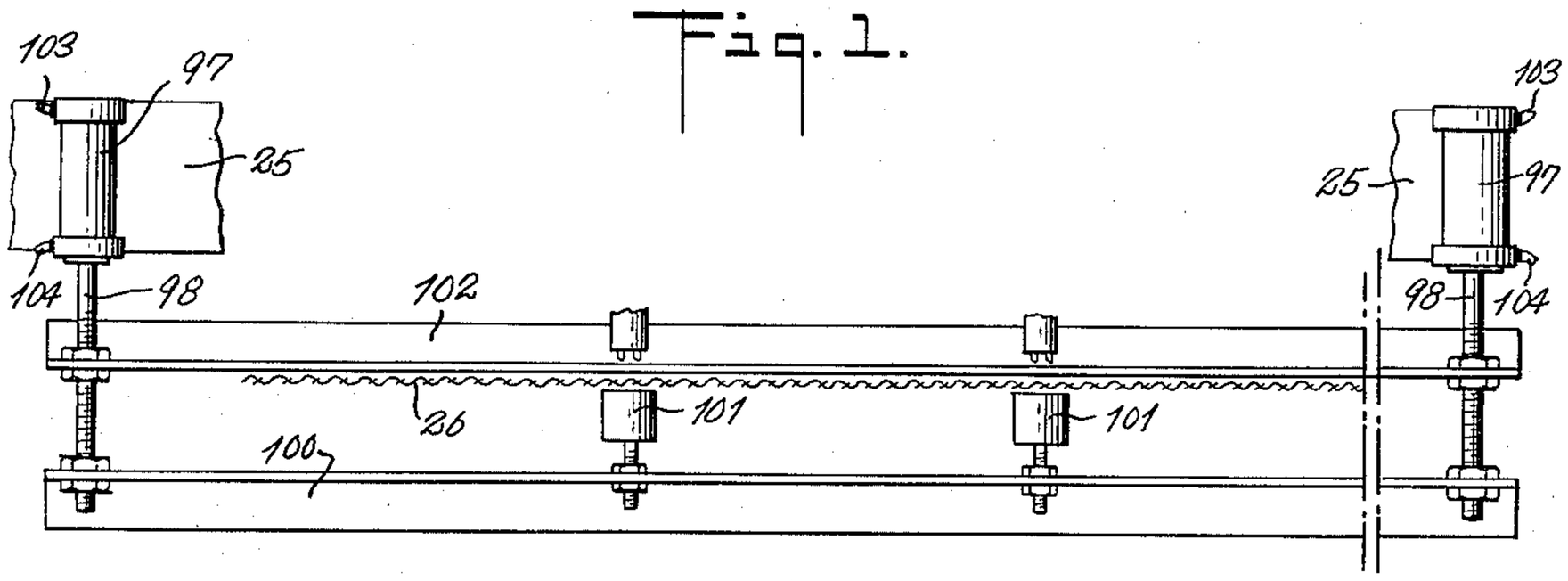

Fig. 2.

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Oct. 31, 1950 R. L. SELF 2,528,392

TUFTING MACHINE

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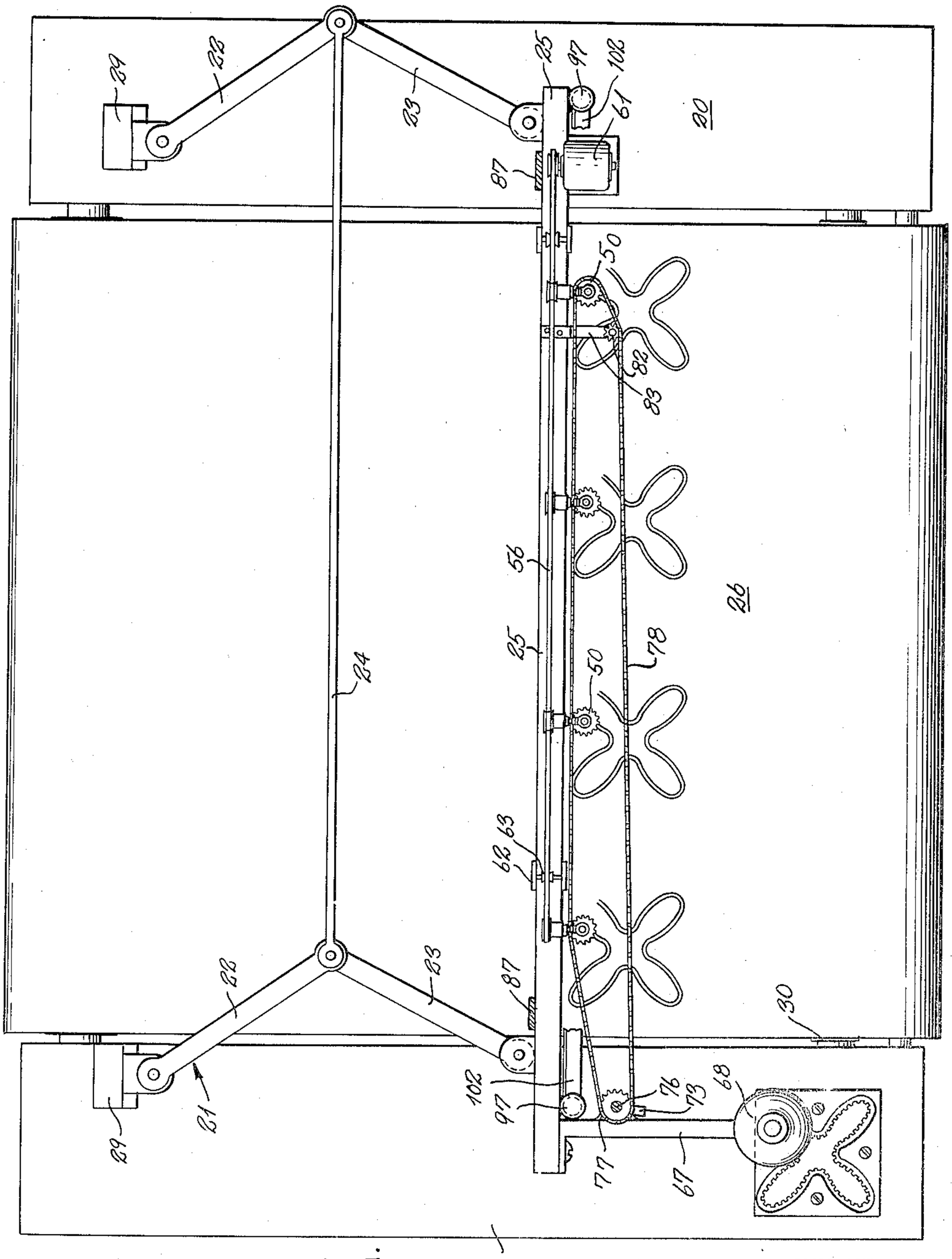

Fig. 1.

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Oct. 31, 1950 R. L. SELF 2,528,392

TUFTING MACHINE

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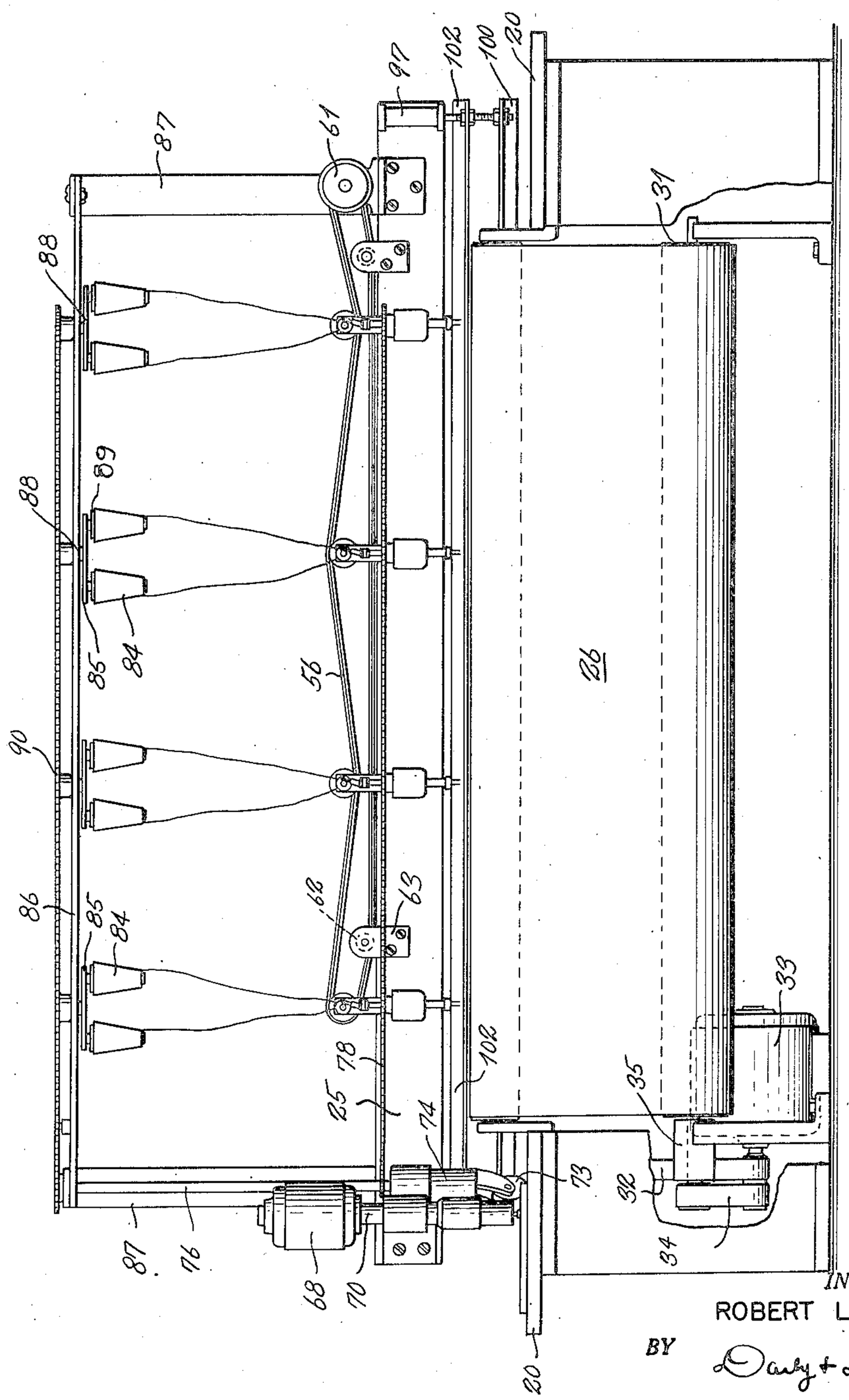

Fig. 4.

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2,528,392

TUFTING MACHINE

Filed Aug. 10, 1948

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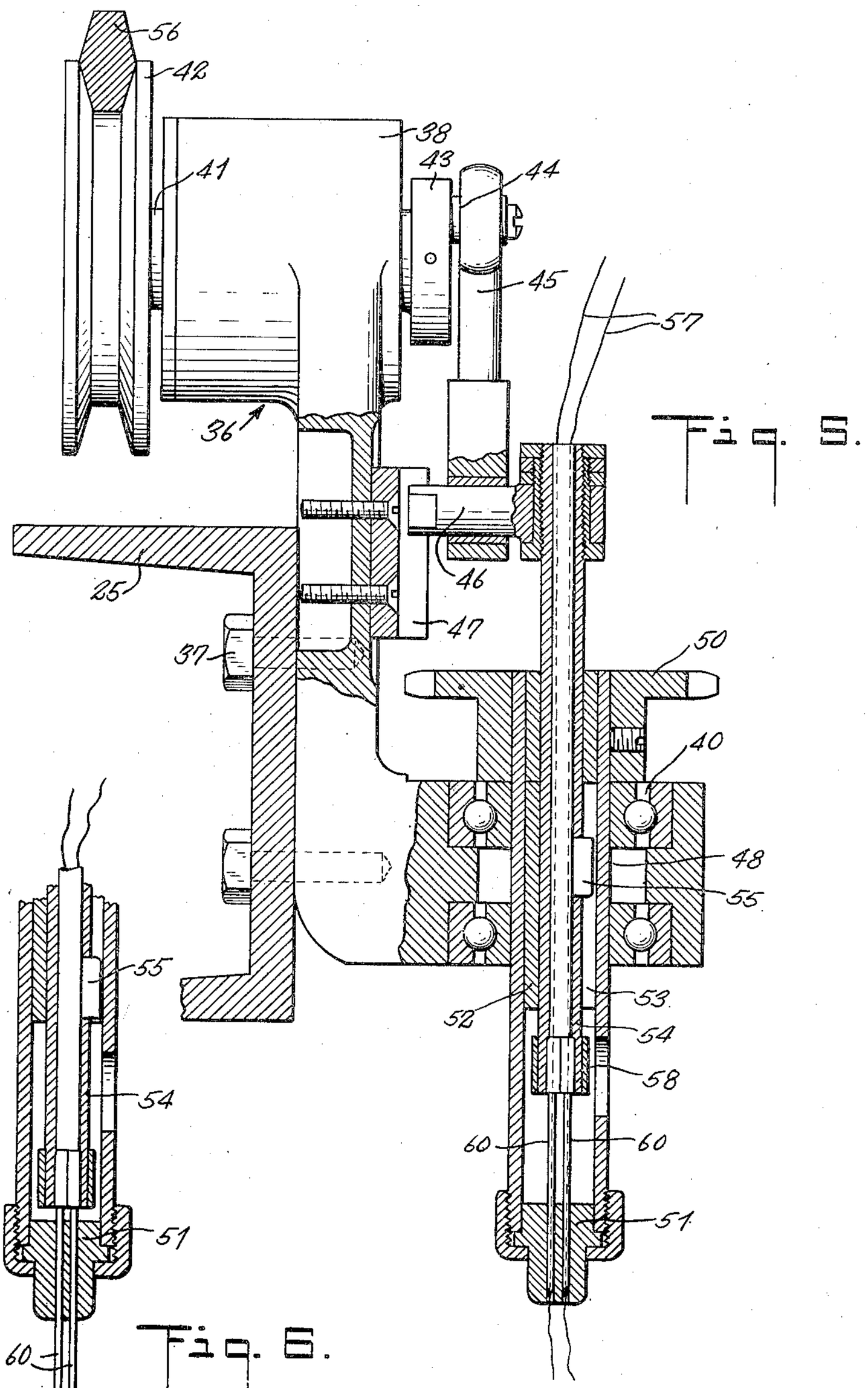

Fig. 5.

Fig. 6.

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TUFTING MACHINE

Filed Aug. 10, 1948

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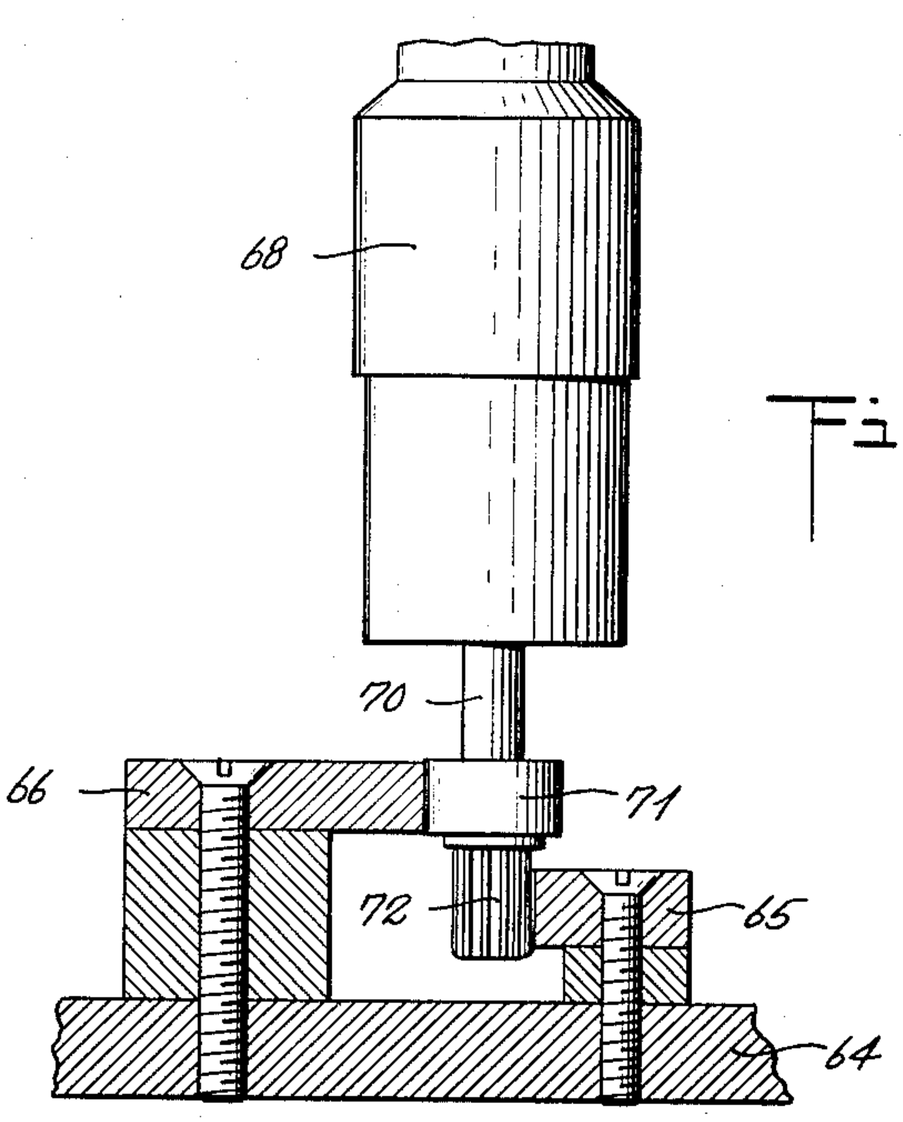

Fig. 7.

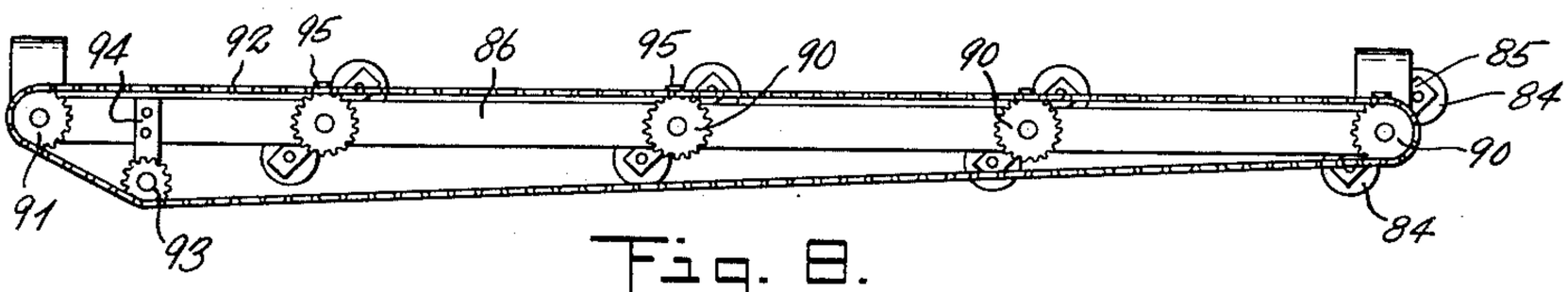

Fig. 8.

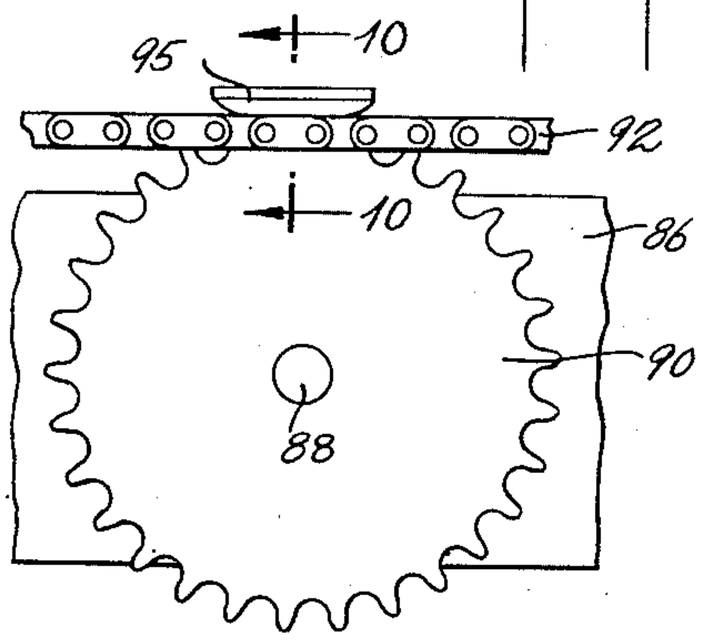

Fig. 9.

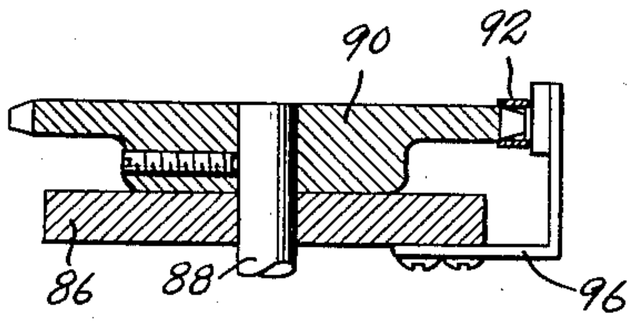

Fig. 10.

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TUFTING MACHINE

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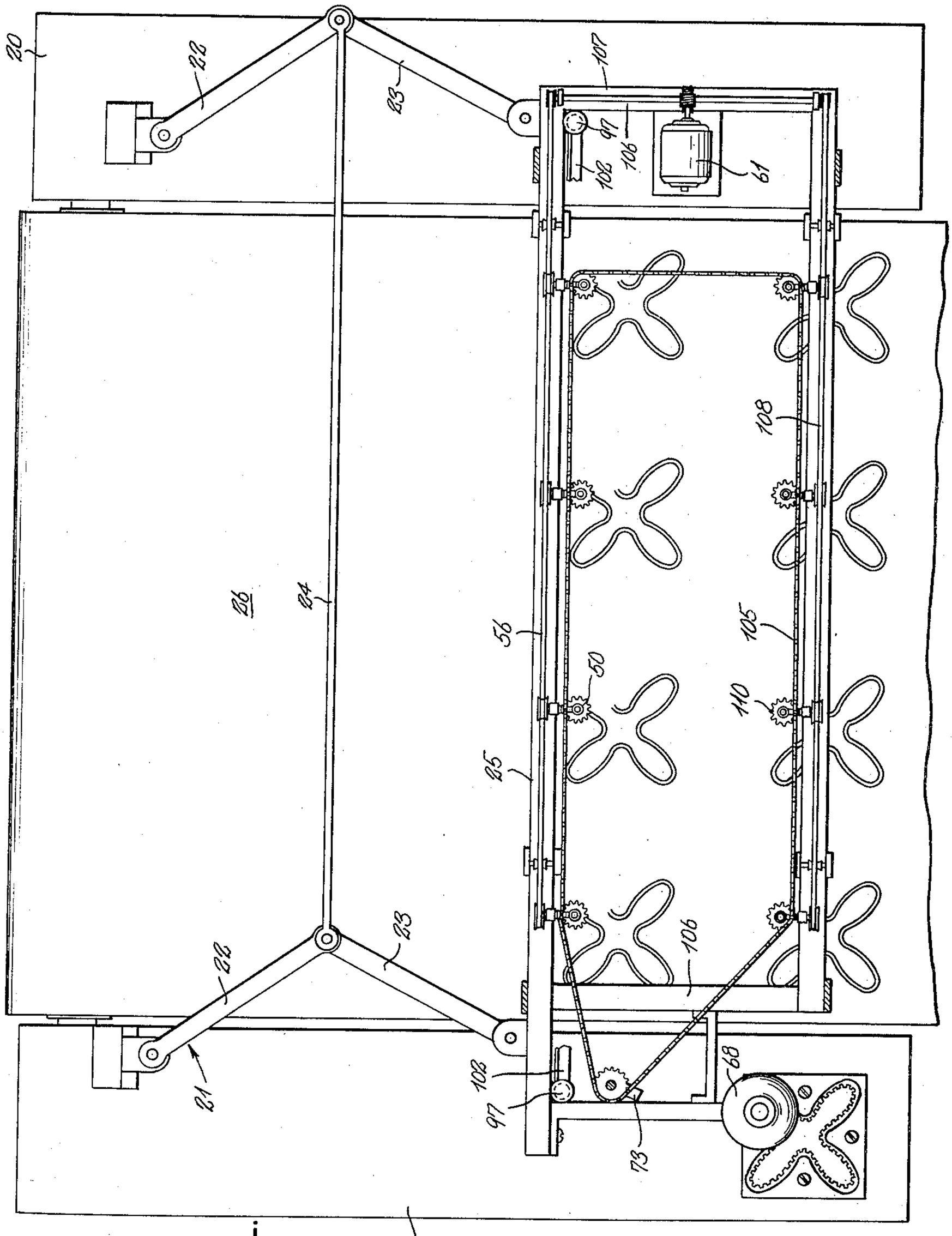

Fig. 11

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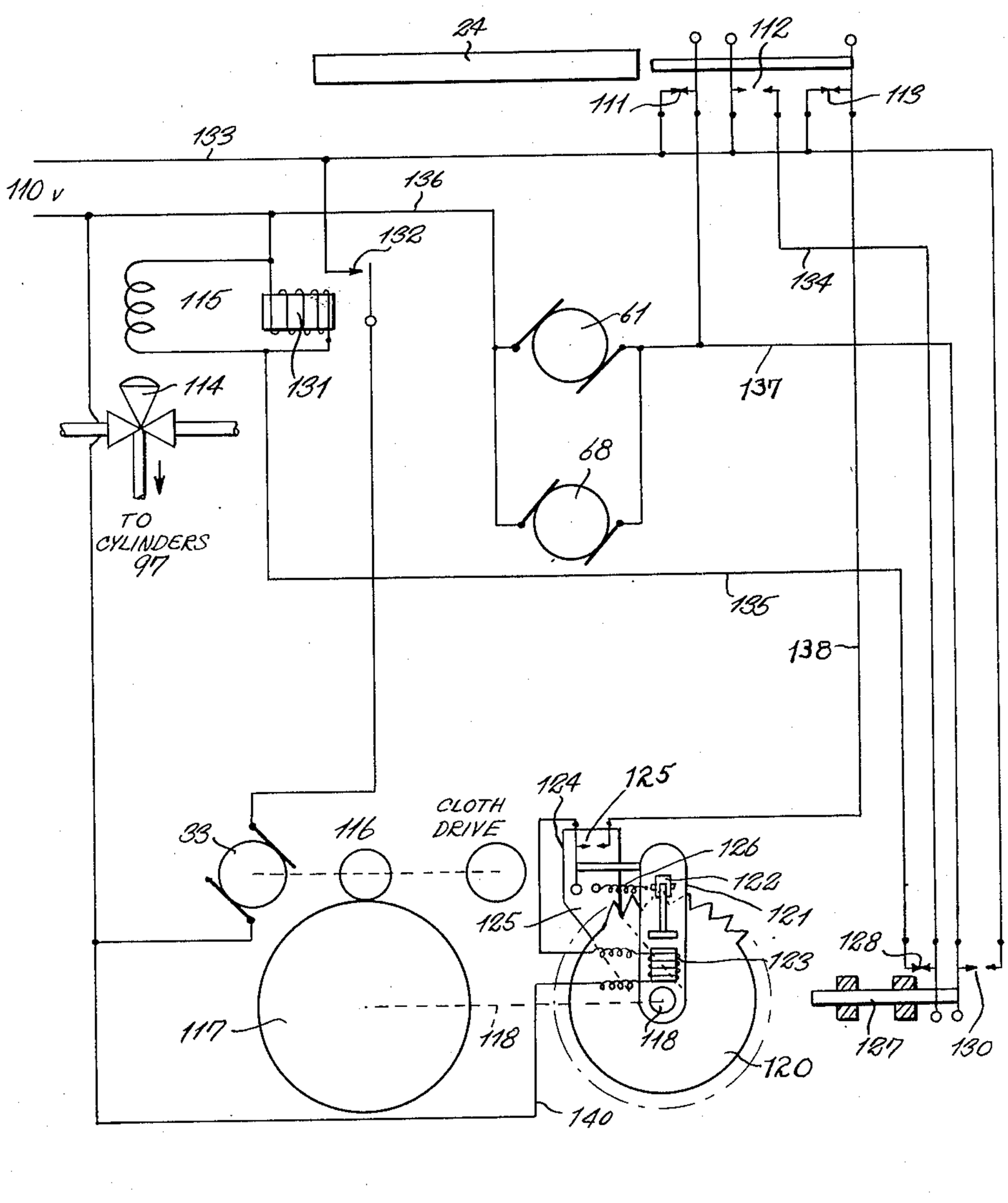

Fig. 12.

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Patented Oct. 31, 1950

2,528,392

UNITED STATES PATENT OFFICE

2,528,392

TUFTING MACHINE

Robert Lee Self, Leaksville, N. C., assignor to Marshall Field & Company Inc., Chicago, Ill., a corporation of Illinois

Application August 10, 1948, Serial No. 43,417

12 Claims. (Cl. 112—79)

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The present invention relates to tufting machines such as are used for example for the production of candlewick and chenille work.

More particularly still the invention relates to a tufting machine in which a plurality of like patterns are simultaneously produced on the base fabric.

In the past it has been customary to produce candlewick work such, for example, as candlewick bedspreads by printing the pattern upon a base fabric and then following the pattern with a hand tool, either manually or motor driven, capable of producing a single stitch at a time. Frequently candlewick work is made in which a complete bedspread, for example, comprises a plurality of like patterns reproduced over the area of the bedspread. When this is the case it is uneconomical to produce each pattern separately. However, as far as is known this has been the method which has been followed. Further, in making such candlewick or chenille a hollow needle is utilized and the end thereof ground to a slope, the forward edge being sharpened and the rear edge being smooth so that a thread or yarn which passes through the needle may be inserted in a hole made in the cloth by the leading edge of the needle but is not cut by that leading edge. This mode of operation necessitates that the sharpened point of the needle follow the line of the pattern in order to prevent this sharpened edge from cutting the yarn. This manner of operation also permits a smooth and tight back on the fabric being embroidered or tufted. If the sharp edge of the needle trails an undesired product is produced having uneven tufts on both sides of the fabric. By my present invention, the pattern which is followed need not be printed on the cloth but is rather delineated by means of a metal pattern or a drawing or tracing and in following this pattern the machine operates to so orient the needles that the forward sharpened edge thereof is always in the direction in which the pattern is produced.

It is an object of the invention to provide a tufting machine which can produce a plurality of like patterns simultaneously.

It is another object of the invention to provide such a machine in which the pattern to be followed governs the action of the machine eliminating the necessity of printing the pattern upon the base fabric prior to the initiation of the process of tufting either to produce chenille or candlewick work.

It is another object of the invention to produce a machine of the type described in which all the needles are constantly so oriented as to assure that the point of the needle leads as the pattern is followed.

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It is a further object of the invention to provide means for holding the cloth or fabric base in position beneath the needles so that the cloth will not yield thus assuring proper penetration of the needle.

It is a further object of the invention to provide a means of lowering the cloth supporting members and stripping the cloth from the needles when it is desired to advance the cloth into a new position.

It is a still further object of the invention to provide means for preventing the twisting of the threads or yarns about each other in the course of following the pattern.

It is a still further object of the invention to provide simple means for reciprocating the needles and for adjustably mounting the reciprocable needles upon the machine to locate the various patterns at desired positions.

Other objects and features of the invention will become apparent when the following description is considered in connection with the annexed drawings in which—

Figure 1 is a side elevation of the machine of my invention;

Figure 2 is a fragmentary cross-sectional view of the machine, the section being taken on the plane of the line 2—2 of Figure 1;

Figure 3 is a top plan view of the mechanism illustrating particularly the repetition of the same pattern in a number of locations on the base cloth;

Figure 4 is a front elevation of the machine showing the pattern following mechanism as well as the general arrangement of the elements of the machine;

Figure 5 is a side elevation partly in section of one of the reciprocating needle mechanisms showing the mechanism in place on the pantograph;

Figure 6 is an enlarged sectional view of the lower portion of the needle mechanism of Figure 5;

Figure 7 is a sectional view taken on the line 7—7 of Figure 1 and showing particularly the construction of a pattern for use with the machine;

Figure 8 is a top plan view of a drive for rotating the bobbins with the needles to assure that there will be no twisting of the yarns when two needles are used in each needle unit;

Figure 9 is a detailed view of a portion of the mechanism delineated in Figure 8 showing par-

ticularly the mode by which a drive chain is held in engagement with one of the sprocket wheels;

Figure 10 is a cross-sectional view of the mechanism of Figure 9, the view being taken on the plane of the line 10—10 of Figure 9;

Figure 11 is a top plan view similar to Figure 3 but showing the machine provided with two main frame members each of which carries a plurality of needle units; and

Figure 12 is a schematic circuit diagram which illustrates one mode of rendering the machine automatic in its operation.

Referring now to the drawings and particularly to Figures 1 and 3, the device comprises two tables 20 one at either side of the main operating portions of the machine. Pivotally supported on the tables by means of the upstanding brackets 29 is a pantograph 21 which is composed of the hinged arms 22 and 23 joined by a cross-link 24 in the usual manner. Likewise extending between the forward ends of the arms 23 of the pantograph is a cross-member 25 which carries the needles and their operating mechanisms, each such needle and operating mechanism being adjustably positioned laterally of the member 25. If desirable the parallel movement of the cross member 25 may be procured by the utilization of two carriages, one of which gives longitudinal and the other transverse movement. However, the pantograph is the best mode of procuring parallel movement presently known.

As is best seen in Figures 1 and 2, the cloth or base fabric 26 which is to have the tufted patterns placed thereon passes beneath the pantograph member 25 and the needles carried thereby in position to be operated upon by those needles. A roll of cloth is supported in the usual stand 27 at the rear of the machine and passes between the feed rollers 28 and thence forward over an idler roller 30 to a take-up reel 31 which is suitably supported at the forward side of the machine. The lower one of the rollers 28 is driven by means of a belt 32 from a motor 33. The take-up reel 31 is similarly driven from the motor 33 by means of a belt 34, the drive to the take-up reel 31 being effected through a slip clutch 35. It may at times be desirable to utilize a tenter chain to support the fabric. Such an arrangement would hold the fabric tightly from side to side and would prevent the fabric from moving or creeping as the tufting is performed. Such a chain could be attached to the journals of rollers 28 and 30.

As has been stated, a plurality of needles and their operating mechanisms are mounted on the forward cross-member 25 of the pantograph 21. One of these mechanisms is shown in detail in Figures 5 and 6. Each such member comprises a bracket 36 which is fastened at a desired location to the pantograph cross-member 25 by means of the screws 37. The bracket 36 has a horizontal bearing 38 therein and a bearing 40 for a vertical shaft. In the horizontal bearing there is mounted a shaft 41 carrying a pulley 42 at its lefthand end and a crank 43 at its righthand end. The crank 43 carries a crank pin 44 on which is mounted a connecting rod 45. At its lower end the connecting rod 45 is pivotally connected to a reciprocating member 46 which is guided for vertical movement in a slotted block 47 fixed to the bracket 37.

Rotatably mounted in the lower horizontal bearings 40 is a sleeve 48 to which at its upper end is fastened a sprocket wheel 50 and at its lower end a presser foot 51. Within the sleeve 48 and fixed thereto is a sleeve 52 which is slotted as shown at 53. Within the sleeve 52 is an additional sleeve 54 which carries a key 55 operating in the slot 53. Thus the inner sleeve 54 may reciprocate vertically but is forced to turn with the outer sleeve 48 and the intermediate sleeve 52. Sleeve 54 is fastened at its upper end into the righthand extension of the member 46. Thus the sleeve is caused to reciprocate as the pulley 42 is rotated under drive of the double V belt shown at 56. The sleeve 54 is provided with two bores therethrough through each of which a thread or yarn 57 extends. At its lower end the sleeve 54 is provided with a clamping ring 58 which clamps a hollow needle 60 into each of the bores of the sleeve. The needles 60 extend downwardly through bores in the presser foot 51 and terminate in inclined lower edges, as illustrated particularly in Figure 6. The lowermost pointed end of the hollow needle 60 is sharpened while the higher edge is rounded so that the needle may penetrate the cloth and carry the yarn through the cloth while assuring that the yarn will not be cut by the sharpened point and also assuring a smooth and tight back on the fabric as hereinabove mentioned. The result above mentioned occurs only if the pointed edge of the needle leads in following the pattern and it is for this reason that the mechanism for rotating the needle carrier comprising the various sleeves above described is provided.

The various units above described are driven by means of the double V belt 56, this belt, as is clearly shown in Figure 4, being in turn driven by a motor 61 which is mounted on the righthand end of the pantograph cross-member 25. The belt 56 passes alternately above and below the pulleys 42 so that the alternate needle mechanisms are driven in opposite directions, this, of course, being immaterial since the rotary motion imparted to the various shafts 41 is converted to reciprocatory movement, as above described. The belt 56 is an endless one and its return reach is guided by means of idler pulleys 62 supported in brackets 63 mounted on the forward side of the pantograph cross-member 25. Obviously a flat belt or a roller chain can be substituted for the double V belt 56.

The pantograph mechanism is guided in order to cause the needles to form tufts in the cloth in a desired pattern. This guiding is shown as being accomplished by means of a metal template although other mechanisms might readily be substituted. For example, electrical and electronic tracing followers are available which are suitable for this purpose. In the present instance the pattern is illustrated as being a metal template having the general form of a stylized four-leaf clover (see Figure 3). The template is mounted on the forward portion of the lefthand one of the two tables 20 and comprises a base member 64 together with a four-leaf clover design 65 spaced above the base member 64, the member 65 being toothed on its outer periphery. Likewise spaced above the member 64 is a member 66 which has an internal configuration similar to but slightly larger than the external configuration of the member 65.

Fixed to the lefthand end of the pantograph cross-member 25 is a bracket 67 on which there is mounted a motor 68. On the shaft 70 of motor 68 there is fixed a roller 71 and a pinion 72. The roller 71 rolls against the interior surface of the member 66 while the pinion 72 meshes with the exterior toothed surface of the member 65. Consequently, as the shaft 70 is rotated the

motor is caused to move about the outlines of the design expressed in the template. Since the motor is firmly fixed by means of the bracket **67** to the pantograph member **25**, this member is caused to follow the movements of the motor about the template or pattern and thus the needles **60** will likewise follow this pattern.

The forward portion of the pantograph **21** is supported by means of castors **73** which rest upon the tables **20**. As the motor causes the pantograph to move about in following the pattern these castors swivel in their mounting. This swiveling movement is utilized in a manner shortly to be described to cause the needles to face with their pionts always in the direction of the succeeding pattern portion. If the electronic or electrical tracing followers mentioned hereinabove are utilized they will directly steer the castor wheels since they control a steering motor. In this event the castor wheels cause the pantograph to follow the pattern.

Referring now to Figures 1 and 3, it will be seen that the forward end of the pantograph is supported upon castors **73** which are mounted for swiveling movement in the bearings **74** which bearings are fixed to the pantograph cross-member **25**. The castors **73** are mounted in the usual forked member **75** to which a shaft **76** is fastened, this shaft extending upwardly for a considerable distance. Mounted upon the shaft **76** just above the bearing **74** is a sprocket wheel **77**. A chain **78** is driven by sprocket wheel **77** and drives the sprocket wheels **50** of the various needle operating mechanisms. As is clearly shown in Figure 3, this chain passes to the rear of the sprocket wheels **50** and in contact therewith. The return reach of the chain passes over the idler sprocket **82** which is in a like manner fastened to the pantograph cross-member **25** by means of the bracket **83**. Thus as the castors swivel the sprocket wheels **50** follow their movement and the needles **60** are caused likewise to partake in the swivelling movement.

Although it is entirely possible to utilize a single needle **60** in each needle operating mechanism, it is often desirable to utilize a pair of needles, as has been illustrated. When this is done, the two needles are supplied with yarn from separate cops or bobbins **84**. In order to prevent the two yarns from becoming twisted about each other as the needles rotate in following the pattern, as above described, I have provided a means for rotating the cop holders. Referring now to Figures 1, 4 and 8 through 10, it will be seen that the cop holders **89** are mounted on bars **85** which are in turn pivotally mounted upon a horizontally extending frame **86** supported from the pantograph cross-member **25** by means of the upright supports **87**. The bars **85** are provided with stub shafts **88** which carry at their upper ends the sprocket wheels **90**.

The castor shaft **76** extends upwardly and has its upper end journalled in the frame **86**. This shaft is provided at its upper end with a sprocket wheel **91** and a chain **92** extends from the sprocket wheel and in engagement with the various sprocket wheels **90**. The chain is kept out of engagement with the forward peripheries of the sprocket wheels **90** by virtue of passing over the idler sprocket **93** supported from the frame **86** by means of the bracket **94**.

As shown in Figures 9 and 10, the chain **92** is maintained in engagement with the sprockets **90** by a shoe **95** which is supported from the frame **86** by means of the angles **96**.

In order to support the cloth beneath the needles, there is mounted at each end of the pantograph cross-member **25** a pneumatic cylinder, the pistons **98** of which extend upwardly as seen particularly in Figure 2. Extending between the two pistons **98** is an angle bar **100** on which are mounted a number of cups **101** equal to the number of needle units. The upper surface of the angle bar **100** is drilled at a plurality of points so that the cups **101** may be adjusted with the needle units to desired positions. Additionally, an angle bar **102** extends between the piston rods **98** above the bar **100** and in such a position that the cloth **26** is threaded beneath it. Connections are made through the inlet and outlet tubes **103** and **104** to the pneumatic cylinders and at the termination of each pattern making operation the unit comprising the bars **100** and **102** and the cups **101** is lowered making it possible to then energize the motor **33** and advance the base fabric. If the needles should have been stopped in their lowermost position the lowering of bar **102** will strip the fabric from the needles and prevent any tearing and likewise the lowering of the cups **101** will permit this stripping of the cloth from the needles.

The foregoing has described the mechanism which is utilized to produce a row of patterns across the cloth. It is, of course, possible by utilizing auxiliary cross-members on the pantograph, such as the member **25**, to do two or even three pattern rows simultaneously. Thus in Figure 11 there is shown at **105** a second pantograph cross-member which is supported by means of the rigid brackets **106** from the cross-member **25**. In this instance, the driving motor **61** is relocated and through a shaft **107** drives two belts **56** and **108**. In a similar manner the chain for rotating the needle units operates not only the sprocket wheels **50** but, in addition, the similar sprocket wheels **110**. In addition, if double yarns and double needles are utilized, the bobbin or cup supporting framework may be extended forwardly and the chain **92** caused to operate the additional plurality of cop holders.

It will, of course, be clear that a timing mechanism may be provided to cause the pantograph mechanism and its cooperating pattern tracing means to go through a cycle making a plurality of patterns to then deenergize the pattern tracing means and the needle drive, to operate the pneumatic means **97** to strip the cloth from the needles and energize the feed motor **33** to advance the cloth a predetermined distance, to then deenergize the cloth advancing motor to again operate the pneumatic means **97** but in the opposite direction to thereby raise the cups **101** and the cloth into position and reenergize the needle driving motor **61** and the pattern tracing means, such as the motor **68**, and start another group of patterns, etc.

Referring now to Figure 12, there is shown therein a schematic line diagram and schematic showings of switching mechanisms which provide for the cycle of operations set forth above. In this figure a set of contacts which may be, for example, a microswitch or a plurality of microswitches, is provided and positioned to be operated by the pantograph cross-link **24**. The contacts, which have been designated as **111**, **112** and **113**, are adjusted so that when the pantograph is in its most rearward and righthand position as seen in Figure 3, the contacts will be operated to open the contact pair **111**, close the contact pair **112** and open the contact pair **113**.

The pneumatic hydraulic cylinders 97 are controlled by means of a three-way valve, indicated on Figure 12 at 114, this valve being controlled in turn by means of an operating solenoid 115.

The cloth advancing motor 33 is arranged to drive a gear 116 which in turn drives a gear 117. Mounted on the shaft 118 on which gear 117 is mounted, and fixed for rotation therewith, is a ratchet wheel 120. Rotatably mounted on the shaft 118 is an arm 121 which carries a pawl 122 which cooperates with the teeth of ratchet wheel 120. The pawl 122 may be moved to disengage from the teeth of the ratchet wheel 120 by means of a magnet 123 fixed to the arm 121. Rotatably mounted for movement about the shaft 118 is a bracket 124 which supports a contact pair 125 and forms a stop for the arm 121 in its reverse movement. Bracket 124 is suitably supported in an adjusted position about the periphery of ratchet wheel 120 thus making it possible to determine the initial position of the arm 121. The arm 121 is joined by a spring 126 to the bracket 124 so that the arm is normally urged into the position illustrated in Figure 12.

Cooperating with the arm 121 is a switch operator 127 which is supported in any suitable manner in a fixed position with respect to the ratchet wheel 120. The member 127 operates the switch contacts 128 and 130, the former pair being normally closed and the latter normally open. Connected in parallel with the solenoid 115 is a relay 131, the contacts 132 of which are normally open and control the flow of current to motor 33. The pattern drive motor 68 and the needle drive motor 61 are connected in the circuit, as shown in Figure 12.

With the above description of the various elements in mind, a description of the operation of the circuit will best describe the remainder thereof.

Let it be assumed that the machine is operating and is about to complete a group of patterns on the cloth. At this time the pantograph link 24 will be moving towards the right, as seen in Figure 12, and shortly thereafter switch contacts 111, 112 and 113 will be operated. Due to opening of contacts 111, power will be removed from the pattern drive motor 68 and the needle drive motor 61 and these two motors will stop. At the same time contacts 112 will close thus completing a circuit from conductor 133, through contacts 112, conductor 134, contacts 128, conductor 135, solenoid 115 and relay 131 in parallel and back to the other side of the line at conductor 136. Solenoid 115 and relay 131 will then energize causing, respectively, operation of the three-way valve 114 and closure of contacts 132. The valve 114 will cause the pneumatic cylinders 97 to operate and lower the cloth supporting members or cups 101 and the needle stripping bar 102. Closure of contacts 132 energizes the motor 33 which then causes the cloth to advance. As the cloth advances the arm 121 is driven clockwise in a manner previously described and to a predetermined extent dependent upon the size and desired location of the next row of patterns. When the arm 121 strikes the switch operating member 127, contacts 128 are opened and contacts 130 are closed. The opening of contacts 128 causes deenergization of solenoid 115 and relay 132 in a manner which is obvious from the diagram, this in turn causing the motor 33 to stop and the stripper bar 102 and cloth supports to be elevated. At the same time closure of contacts 130 establishes a connection from

conductor 133 to conductor 137 and thence through the pattern drive and needle drive motors 68 and 61 to the other side of the line 136. The energization of the pattern drive motor causes the pantograph link to move to the left and thus causes contacts 111 and 113 to close and 112 to open. Closure of contacts 111 establishes a second connection from conductor 133 to conductor 137 thus assuring continued operation of motor 61 and 68. Opening of contacts 112 is without effect since the circuit extending from these contacts over conductor 134 is at this time open at contacts 128. Closure of contacts 113 establishes a circuit from conductor 133 over conductor 138 to contacts 125, thence through the magnet 123 and over conductor 140 to conductor 136. The energization of magnet 123 operates the pawl 122 and arm 121 which then returns to its normal position under urge of spring 126. This return permits contacts 128 to again close and contacts 130 to open but both of these actions are ineffective since the motors 61 and 68 are now receiving power through contacts 111 and the circuit to motor 33 is already broken at contacts 112. The pattern and needle drive motors will now continue to operate forming a new row of patterns across the cloth until such time as the pantograph link returns to its far righthand position at which time the patterns will be complete and the circuit operation just hereinabove described will recur.

While I have described preferred embodiments of my invention, it will be understood that the description is solely for purposes of illustration and, therefore, I wish to be limited not by that description but solely by the claims granted me.

What is claimed is:

1. In a tufting machine, in combination, a pair of spaced tables, a pantograph mechanism pivotally supported at one end on said tables, said mechanism being supported at its other end on a castor resting upon each table, means for supporting a base fabric to be worked upon between said tables and beneath a portion of said pantograph mechanism, a plurality of reciprocatory tufting needles mounted on said portion of said pantograph mechanism, common means for reciprocating said needles, a pattern on one of said tables, pattern tracing means mounted on said pantograph to cause said portion of said pantograph to move in accordance with said pattern, said pantograph being supported on said castors causing said castors to rotate in accordance with the pattern traced, and means for rotating said tufting needles in accordance with the rotation of said castors.

2. In a tufting machine, in combination, a pair of tables, a pantograph mechanism pivotally supported at one end on said tables, said mechanism being supported at its other end on a castor resting upon each table, means for supporting a base fabric to be worked upon between said tables and beneath a portion of said pantograph mechanism, a plurality of tufting needle units mounted on said portion of said pantograph mechanism, each said needle unit comprising a reciprocably mounted needle and rotatable means for reciprocating said needles, means for rotating said rotatable means, a pattern on one of said tables, pattern tracing means mounted on said pantograph to cause said portion of said pantograph to move in accordance with said pattern, said pantograph being supported on said castors causing said castors to rotate in accordance with the pattern traced, and means for

rotating said tufting needles in accordance with the rotation of said castors.

3. In a tufting machine, in combination a pair of tables, a pantograph mechanism pivotally supported at one end on said tables, said mechanism being supported at its other end on a castor resting upon each table, means for supporting a base fabric to be worked upon between said tables and beneath a portion of said pantograph mechanism, a plurality of tufting needle units mounted on said portion of said pantograph mechanism, each said needle unit comprising a reciprocably mounted needle and rotatable means for reciprocating said needles, said needles being hollow and being sharpened to a point, means for rotating said rotatable means, a pattern on one of said tables, pattern tracing means mounted on said pantograph to cause said portion of said pantograph to move in accordance with said pattern, said pantograph being supported on said castors causing said castors to rotate in accordance with the pattern traced, and means for rotating said tufting needles in accordance with the rotation of said castors to cause the points of said needles to face in the direction of movement of said portion of said pantograph mechanism as the pattern is traced.

4. A tufting machine in accordance with claim 1 characterized in that supporting means for the cloth are provided beneath the cloth in vertical alignment with each needle unit.

5. A tufting machine in accordance with claim 1 characterized in that supporting means is provided for the cloth, said supporting means lying beneath the cloth in vertical alignment with the needle unit, said supporting means being fixed to said portion of said pantograph mechanism for horizontal movement therewith and being further characterized in that said cloth supporting means are movable vertically to permit relocation of the cloth for operating upon a new area thereof.

6. A tufting machine in accordance with claim 2 characterized in that yarn is fed to said hollow needles from cops, said cops being mounted in pairs on rotatable arms, said arms being rotated by said castors.

7. In a tufting machine, in combination, a pair of tables, a pantograph mechanism pivotally supported at one end on said tables, said mechanism being supported at its other end on a castor resting upon each table, means for supporting a base fabric to be worked upon between said tables and beneath a portion of said pantograph mechanism, a plurality of tufting needle units mounted on said portion of said pantograph mechanism, each said needle unit comprising a reciprocably mounted needle and rotatable means for reciprocating said needles, means for rotating said rotatable means, a pattern on one of said tables, pattern tracing means mounted on said pantograph to cause said portion of said pantograph to move in accordance with said pattern, said pantograph being supported on said castors causing said castors to rotate in accordance with the pattern traced, means for rotating said tufting needles in accordance with the rotation of said castors, a plurality of cloth supports mounted beneath said cloth and in vertical alignment with said needles, said cloth supports being fixed to said portion of said pantograph mechanism for horizontal movement therewith, a stripper bar extending above said cloth adjacent said needles, said stripper bar being fastened to said portion of said pantograph mechanism for horizontal

movement therewith, and means for moving said cloth supports and stripper bar simultaneously vertically with respect to said needles to cause disengagement of the cloth from the needles and thus permit advancing of the cloth to position for tufting designs thereon in an unworked area thereof.

8. In a tufting machine having a plurality of tufting needles supported upon a portion of a pantograph, in combination, means for driving the pantograph to form a desired pattern, means mounting said tufting needles on a portion of the pantograph for both vertical reciprocation and rotation, and means under control of the movements of said pantograph for causing rotation of said needles.

9. In a tufting machine having a plurality of tufting needles supported upon a portion of a pantograph, in combination, means for driving the pantograph to form a desired pattern, means mounting said tufting needles on a portion of the pantograph for both vertical reciprocation and rotation, a sprocket wheel fixed to each needle for rotating the needle, a castor supporting a portion of the pantograph, said castor being mounted for swivelling movement about a vertical axis in accordance with the movements of said pantograph, a sprocket wheel fixed to the castor shaft, and a chain passing from said castor sprocket wheel to said needle sprocket wheels to thereby rotate the needles.

10. In a tufting machine having a plurality of tufting needles supported upon a portion of a pantograph, in combination, means for driving the pantograph to form a desired pattern, means mounting said tufting needles on a portion of the pantograph for both vertical reciprocation and rotation, said needles being arranged in pairs, a sprocket wheel fixed to each needle for rotating the needle, a castor supporting a portion of the pantograph, said castor being mounted for swivelling movement about a vertical axis in accordance with the movements of said pantograph, a sprocket wheel fixed to the castor shaft, a chain passing from said castor sprocket wheel to said needle sprocket wheels to thereby rotate the pairs of needles, a plurality of pairs of cops corresponding to the pairs of needles, the yarn from each cop passing to one of the needles of the pair, means mounting each pair of cops on a holder, means mounting said holders above said needle pairs, a sprocket wheel fixed to each asid holder, a sprocket wheel on said castor shaft, and a second chain passing from said last mentioned sprocket wheel to said cop holder sprocket wheels, to thereby rotate said cop holders as said needle pairs are rotated to prevent twisting of the yarns leading to any pair of needles.

11. In a tufting machine, in combination, means for supporting a fabric to be tufted, said means comprising a pair of feeding rollers, an idler roller and a take-up roller, a pantograph mechanism comprising a member extending across said cloth between said idler roller and said feed rollers, means for operating said pantograph in accordance with the desired pattern, a plurality of tufting needles adjustably mounted on said cross member, means for causing vertical reciprocation of said tufting needles, a plurality of fabric supporting members one located beneath the fabric in alignment with each tufting needle, said fabric supporting means being fixed to said pantograph cross-member for movement therewith, a stripper bar extending above said fabric, said stripper bar being fixed to said pantograph cross-member

for movement therewith, means for raising and lowering said stripper bar and fabric supporting members, means for driving said cloth feeding rollers, means for operating said fabric supporting members and stripper bar upon completion of a pattern to lower the fabric away from said needles, switch members actuated by said pantograph mechanism to energize said cloth feeding means upon completion of a pattern, means for predetermining the amount of feeding of said fabric, means under control of said predetermined means for deenergizing said fabric feeding means, for elevating said fabric supporting means and said stripper bar, and for energizing said pantograph operating means and said needle operating means to commence a new pattern.

12. In a tufting machine, in combination, a pivotally supported pantograph, means for driving the free end of said pantograph for motion in a predetermined pattern path, a plurality of

rotatable and reciprocably mounted tufting needles on said free end of said pantograph, common means for reciprocating said needles, means for supporting a base fabric in position to be operated upon by said needles, and automatic means for rotating said needles as said free end of said pantograph moves to always face said needles in the line of travel of said pantograph free end.

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REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

Number	Name	Date
514,138	Spengler	Feb. 6, 1894
854,105	O'Neil	May 21, 1907
2,264,779	Tillet	Dec. 2, 1941