

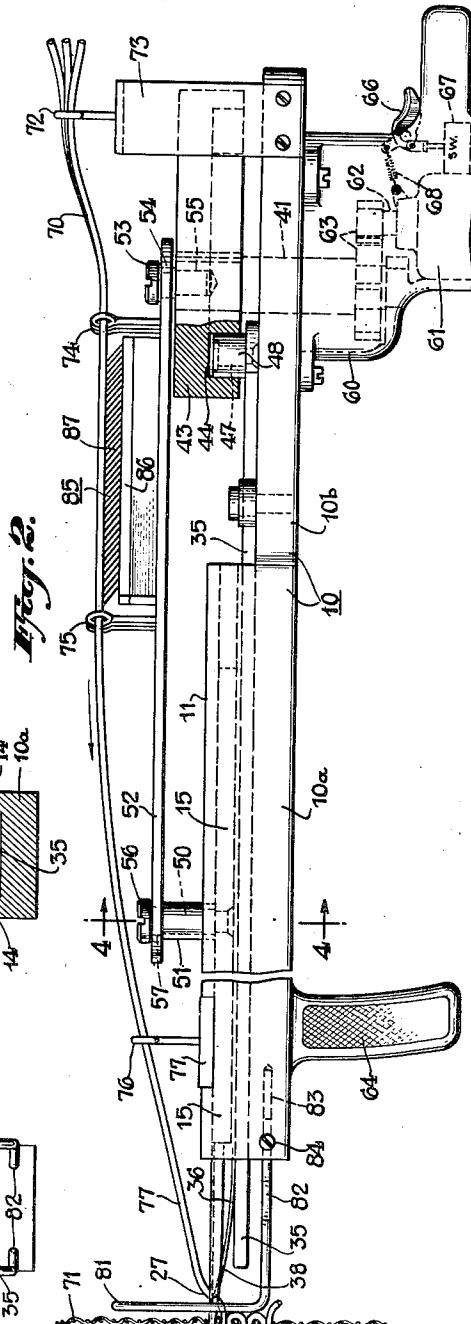
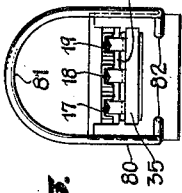
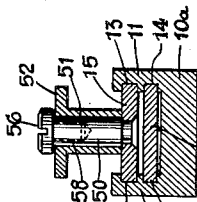
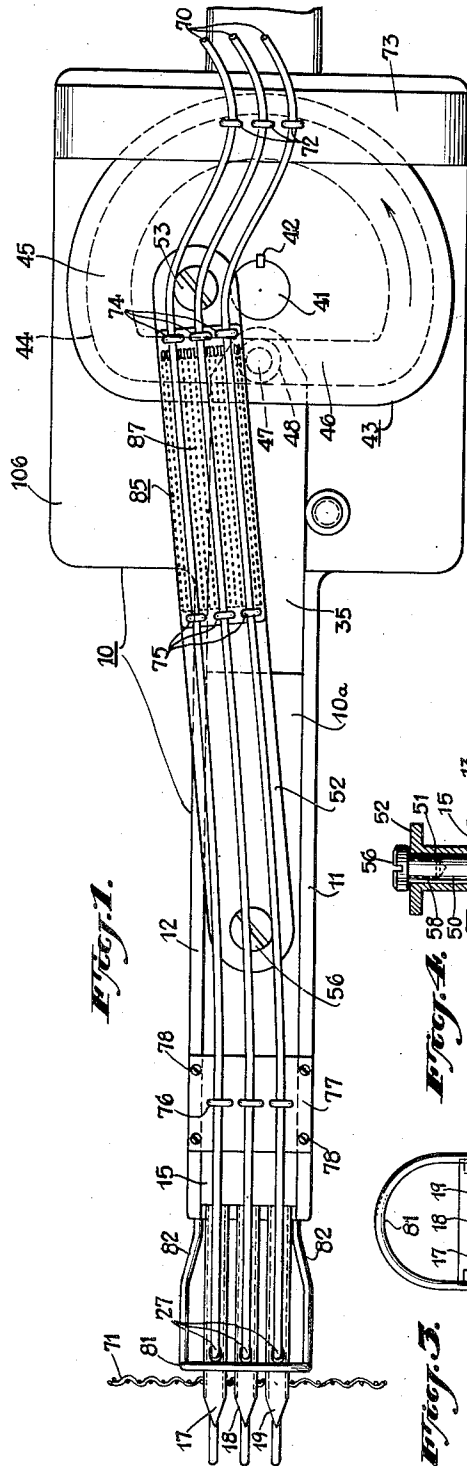
June 17, 1952

R. C. KLINE ET AL
CARPET TUFTING MACHINE

2,600,993

Filed Nov. 19, 1949

5 Sheets-Sheet 1



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Fig. 5.

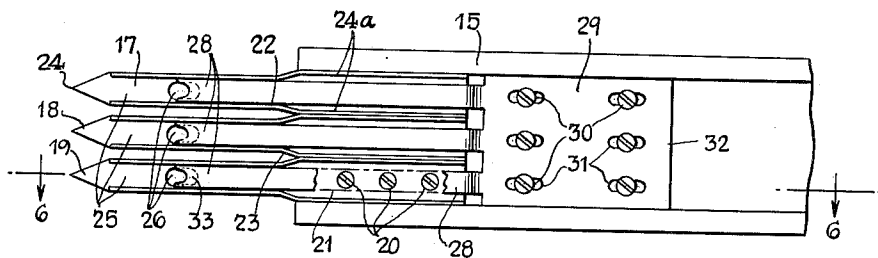


Fig. 6.

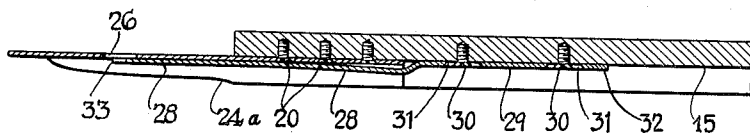


Fig. 7.

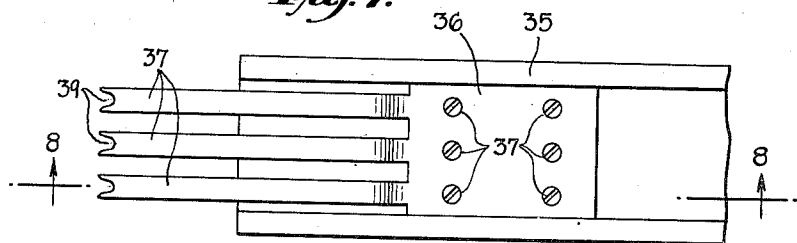
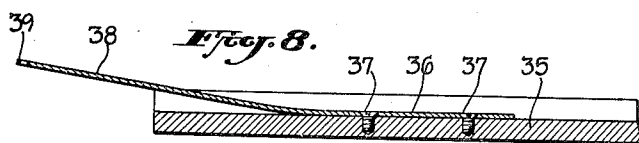


Fig. 8.



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Fig. 9.

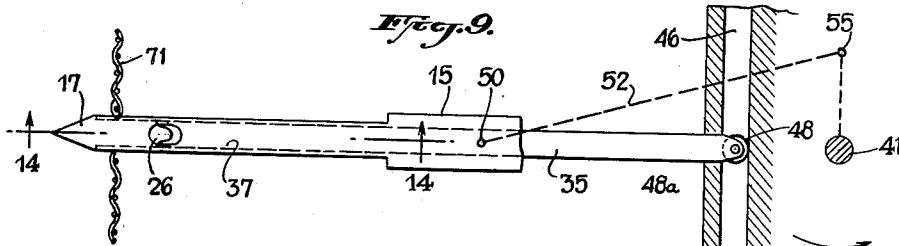


Fig. 10.

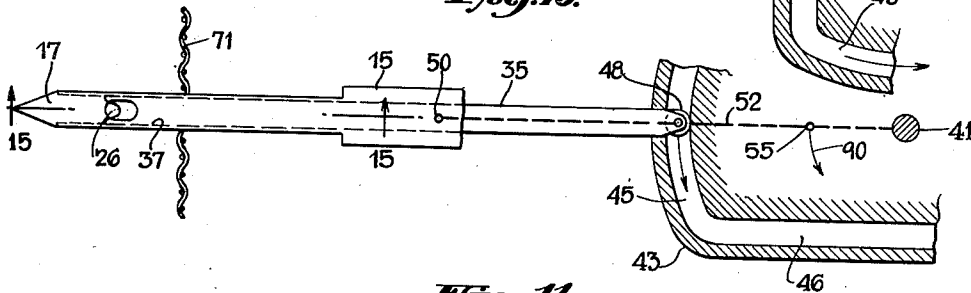


Fig. 11.

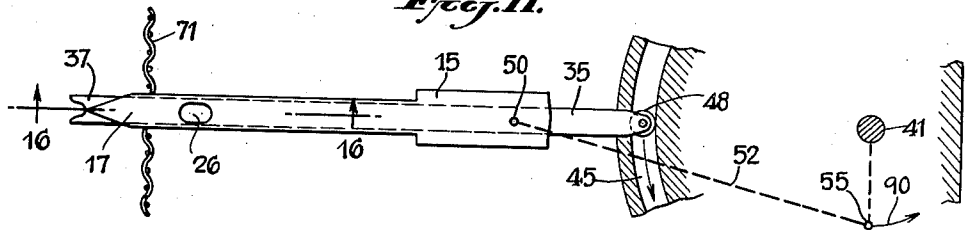


Fig. 12.

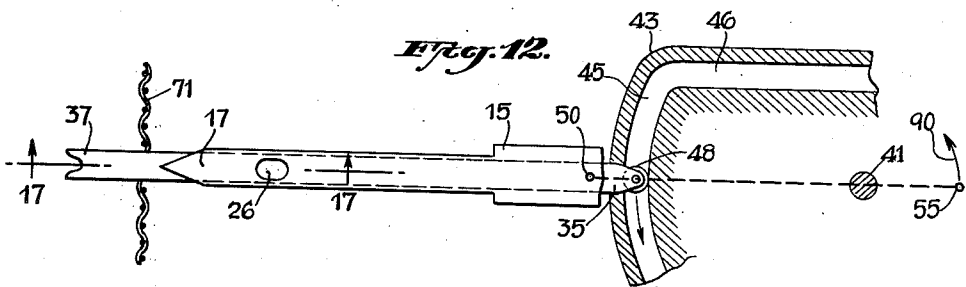
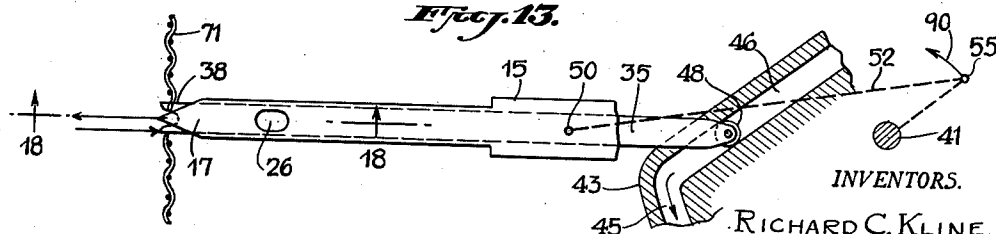


Fig. 13.



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Fig. 14.

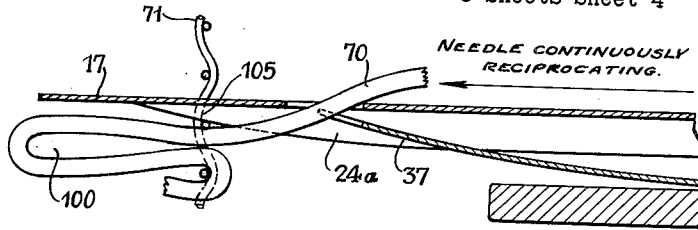


Fig. 15.

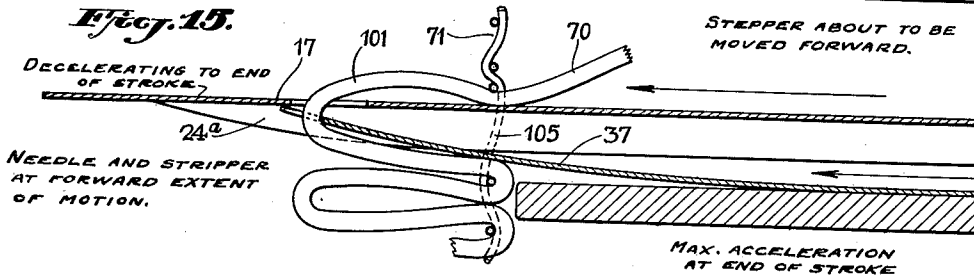


Fig. 16.

NEEDLE WITHDRAWING AT MAXIMUM SPEED.
YARN BETWEEN NEEDLE AND STRIPPER INCREASES TENSION IN EXPANDED OPENING.

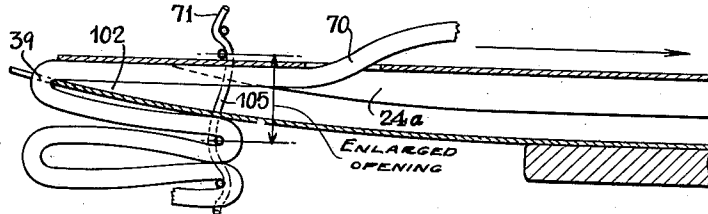


Fig. 17.

NEEDLE AT MIN. WITHDRAWAL SPEED.

NEEDLE SPRINGS AHEAD LATERALLY DUE TO EXPANSIVE FORCE OF COMPACTED YARN.

REDUCTION IN WIDTH OF OPENING PLACES POINT OF NEEDLE CENTRALLY OVER NEXT SUCCEEDING MESH OPENING OF GROUND MATERIAL.

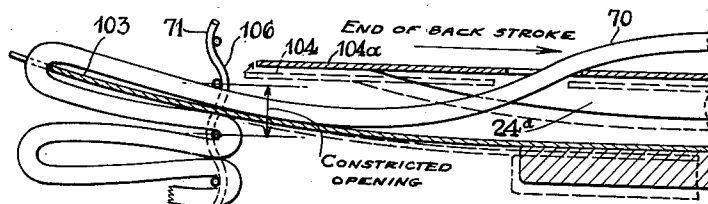


Fig. 18.

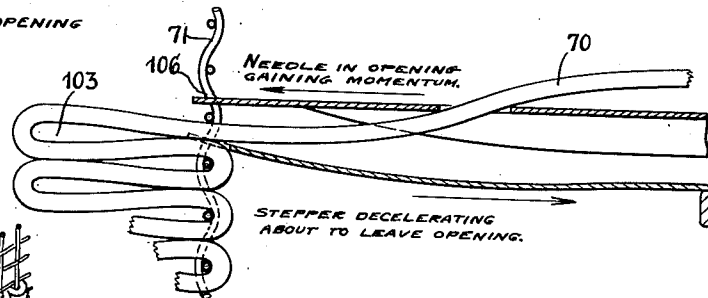
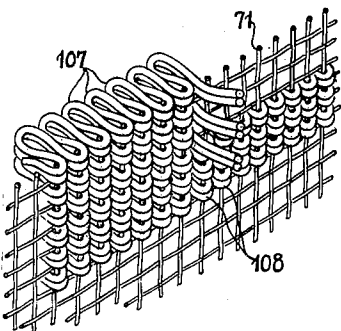


Fig. 19.



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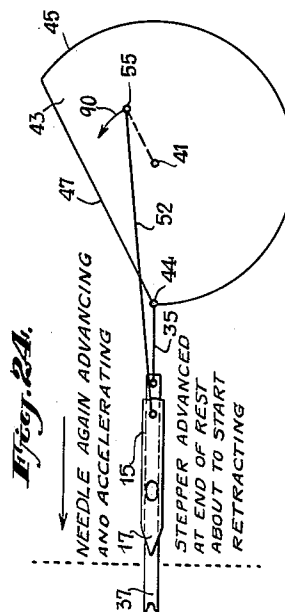
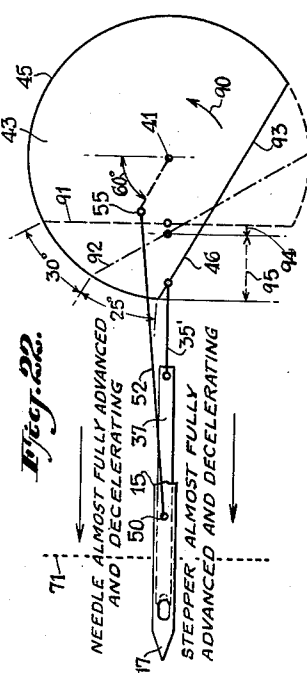
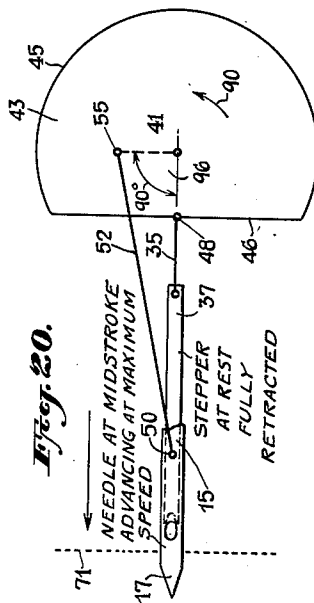
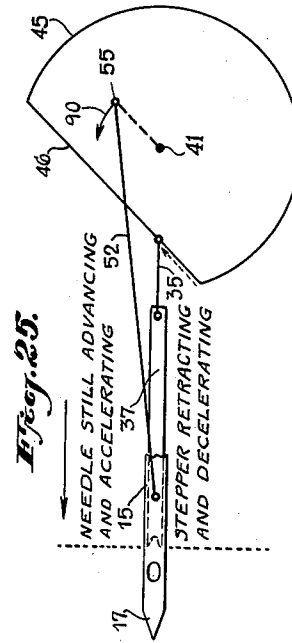
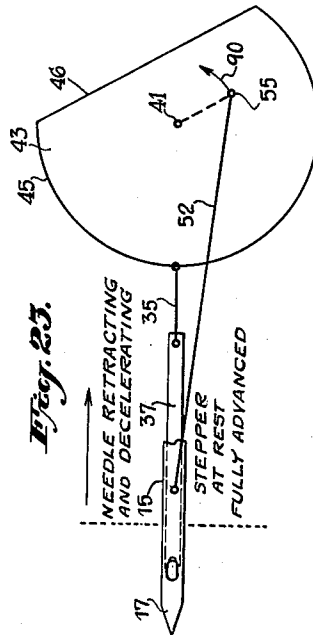
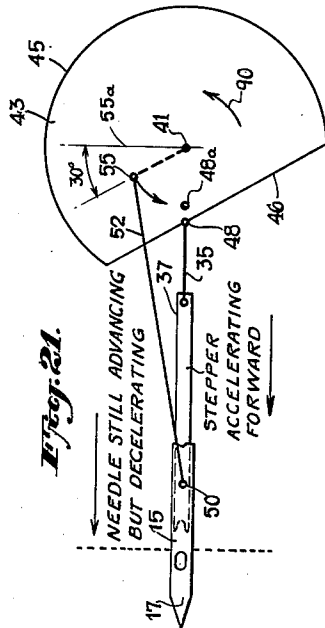
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5 Sheets-Sheet 5



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UNITED STATES PATENT OFFICE

2,600,993

CARPET TUFTING MACHINE

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Application November 19, 1949, Serial No. 128,314

4 Claims. (Cl. 112—79)

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This invention pertains to carpet manufacture and more particularly to carpet tufting devices and provides a portable, power driven tufting mechanism which is especially adapted to the high speed production of carpets in special designs, configurations and dimensions.

Machine made or loom woven carpets, such as Brussels, Axminster, Wilton, etc. including broadloom, can be produced only in particular widths and designs for any given loom set-up, the design being thus duplicated from carpet to carpet. For producing carpets in unique designs, sizes and configurations for each carpet, such as orientals, strictly hand weaving procedures were originally employed. More recently for the production of tufted carpets of unique designs, sizes and shapes, a manually operated device has been devised and employed, which consists of a pair of hand grips, usually wooden blocks, secured together in longitudinally slidable relation to each other, there being mounted at one end of these grips respectively and projecting therefrom, one or more needles, and a corresponding number of steppers, which are longitudinally displaceable in reciprocatory fashion relative to each other by reciprocatory actuation of the hand grips in the opposite hands respectively of a workman. To perform the tufting operation, the woolen or worsted yarns to be tufted, are threaded through the needle holes, and the tufting device thrust against the foundation fabric with the needles advanced relative to the steppers, the tufting being thereafter affected in successive stitches by reciprocatory manipulation of the hand grips in the manner aforesaid.

The manufacture of carpets with a tufting device of this character is, like the ancient, strictly hand weaving procedures, necessarily a relatively slow, tedious and expensive procedure, and hence have proved commercially feasible only where carpets of unique designs, shapes or widths are insisted upon. Moreover, the resulting product depends in large measure on the skill and experience of the artisans, and even with the best, the degree of uniformity of the stitching and end product varies with the physical condition and attention of the workmen throughout the day.

In accordance with our invention we have eliminated the above noted objections of the manually actuated tufting device aforesaid, by devising a power driven mechanism which simulates the operations of the manual device, but at much greater speed and uniformity of end product, and at greatly reduced cost of production and requisite skill of the workmen.

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The tufting mechanism of our invention comprises in its essentials and in its preferred embodiment, an elongated frame member having oppositely disposed upstanding sidewalls provided with longitudinally extending upper and lower oppositely disposed pairs of parallel grooves or slots in which are respectively mounted, needle and stepper thrust bars, which are thus slidably displaceable longitudinally relative to each other along substantially parallel paths. The needle thrust bar mounts at one end thereof, one or more needles the latter in laterally disposed relation; while the stepper thrust bar, similarly mounts a corresponding number of stepper prongs. At the opposite end of the frame from the needle and stepper mountings, there is journaled perpendicular to the direction of thrust bar displacement, a drive shaft having keyed thereto a cam which is linked to the needle thrust bar by an eccentric arm which is pin-connected at one end eccentrically to the cam and at its opposite end to the needle thrust bar, whereby as the drive shaft is rotated, the needle thrust bar is longitudinally reciprocated and with it the needle or needles mounted thereon. In addition the cam has formed therein, an arcuate cam slot portion which subtends and joins a substantially rectilinear cam slot portion, such as to provide a continuous cam slot of substantially D-shaped configuration. Journaled to the stepper thrust bar is a cam roll which engages and rides within the cam slot aforesaid, whereby as the drive shaft is rotated the stepper thrust bar and steppers mounted thereon, are intermittently reciprocated in timed relation to the reciprocation of the needle thrust bar and needles. The eccentric arm pin-connection to the cam is so disposed in relation to the rectilinear portion of the cam slot, that the steppers are reciprocated in lagging relation to the needles, the steppers being substantially one-quarter of a cycle behind the needles with respect to their most withdrawn positions and such that the needles are first pierced through the foundation fabric carrying the tufting yarns with them, whereupon the steppers are advanced through the fabric into substantial alignment with the needle holes whereupon the needles are withdrawn preparatory to the next tufting stitch, while the steppers remain stationary to hold the yarn and form the tuft of the previous stitch, the steppers being thereupon withdrawn while the needles are advancing on the next stitch.

Having thus described the invention in general terms, reference will now be had for a more de-

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tailed description, to the accompanying drawings, wherein:

Figure 1 is a plan view, Figure 2 is a view in side elevation, and Figure 3 a view in end elevation, as viewed from the left in Fig. 2, of a preferred embodiment of the power driven tufting mechanism of the invention; while Figure 4 is a transverse section thereof as taken at 4—4 of Fig. 2.

Figure 5 is an enlarged plan view, as viewed from below, illustrating the construction and assembly on the needle thrust bar, of the needles and yarn tensioning prongs associated therewith, while Figure 6 is a longitudinal section of Fig. 5, taken at 6—6 thereof.

Figure 7 is an enlarged plan view, as viewed from above, illustrating the construction of the stepper element and the assembly thereof on the stepper thrust bar; while Figure 8 is a longitudinal section of Fig. 7 as taken at 8—8 thereof.

Figures 9 to 13 inclusive are fragmentary plan views of the needle, stepper, cam and eccentric assemblies, and interlinking connections, illustrative of the relative positionings of these elements at successive stages of rotation of the eccentric and cam.

Figures 14 to 18 inclusive are longitudinal sections of the needle and stepper mechanisms, as taken at 14—14 to 18—18 inclusive respectively of Figures 9 to 13 inclusive, and illustrative of the manner in which the tufting of the yarn through the foundation fabric is accomplished by the mechanism of the invention; while Figure 19 is a fragmentary perspective view of the resulting carpet produced.

Figures 20 to 25 inclusive are diagrammatic showings, generally similar to Figs. 9 to 13 inclusive, which further illustrate diagrammatically the principals of operation of the power driven tufting mechanism of the invention.

Referring to Figs. 1 to 6 inclusive for the constructional details of the apparatus, the tufter mechanism of the invention comprises a metal frame 10, of narrow, elongated configuration at one end, 10a, and of widened table-like configuration at the opposite end, 10b. The narrow portion 10a has disposed along its opposite sides, upstanding sidewalls 11, 12, having machined therein oppositely disposed pairs of longitudinally extending grooves 13, 14. Slidably positioned in the upper grooves 13, for reciprocatory displacement, as explained below, is the needle supporting, thrust bar 15, on the forward or left hand end of which is mounted, as shown in Figs. 1 and 2, and more in detail in Figs. 5 and 6, an assembly comprising series of three needles 17, 18, 19.

Referring to Figs. 5 and 6, these needles are mounted, in laterally contiguous alignment, on the under side of the thrust bar 15, being secured thereto by screws, as at 20, passing through appropriately drilled apertures in the base portions 21 of the needles, and threading into the thrust bar 15. For additionally maintaining the needles 17, 18, 19 in rigid assembly and contiguous alignment, they are soldered together along the contiguous longitudinal edges of the base portions, by means of silver solder as at 22, 23. The needles comprise sheet metal stampings of tempered steel or equivalent, which are outwardly flared from their points 24 toward the bases 21 thereof, and slightly back of the points the flared metal is bent at right angles in the manner indicated at 24a, to provide reinforcement and laterally spaced needle points of substantially constant width viewed in elevation, as at 25. Somewhat back of the point 24 each needle is pro-

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vided with an elongated needle hole 26, for passage of the yarn therethrough in the manner shown at 27, Figs. 1 and 2. In order to impose an appropriate tensioning on the yarn, during operation of the mechanism, resilient prongs 28, Fig. 5, of a yarn tensioning stamping 29, extend along the grooves between the sidewalls 24a, on the underside of the needles, these prongs being longitudinally adjustable in relation thereto by means of screws, such as 30 passing through elongated apertures as at 31 in the base portion 32 of the yarn tensioning stamping 29. By virtue of this construction and assembly, the effective apertures of the needle holes 26, may be adjusted in accordance with the diameter of the yarn employed, by adjusting the tensioning bars 28 in greater or lesser overlapping relation to the needle holes 26 in the manner indicated at 33.

Slidably mounted in the lower grooves 14, Fig. 4, for reciprocatory displacement therealong, as explained below, is a stepper thrust bar 35, which projects beyond the frame 10, to the left as shown in Figs. 1 and 2, on which end is mounted a stepper prong stamping 36. Referring to the detailed showing of Figs. 7 and 8, the stamping 36 is secured to the stepper thrust bar 35 by means of screws as at 37 passing through appropriate apertures in the stamping and threading into the thrust bar 35. The stamping 36 is made of a resilient material, such as spring steel or equivalent, and has stamped therein, a series of three stepper prongs 37, which are laterally spaced corresponding to the needle spacings 17 to 19, inclusive, these prongs being bent upwardly toward the needles in the manner shown at 38, Figs. 2 and 8, for effecting stitching displacement as explained below, and having formed in their outer ends, concave notches as at 39, adapted to receive and grip the yarn during the tufting operation, also as explained below.

Reverting to Figs. 1 to 4 inclusive, at the end opposite to that on which the needles and steppers are mounted, the frame 10 is substantially flat and rectangular, as at 10b, and has journaled therethrough, a shaft 41 to which is keyed as at 42 a substantially D-shaped cam 43, having milled in the lower surface thereof, a slot 44 of substantially rectangular cross section as shown in Fig. 2, and which extends about the periphery of the cam in an arcuately slotted portion, as indicated at 45, which subtends a substantially rectilinear slot portion 46, whereby the entire slot 45, 46, is of roughly D-shaped configuration corresponding to the outer contour of the cam.

Referring to Fig. 2 the cam 43 is spaced above frame portion 10b on shaft 41, to provide space for the stepper thrust bar 35, to project to the right beneath the cam slot 44, at which point the thrust bar has journaled thereto on an upstanding stud 47, a cam roll 48, which rides within the cam slot 44. In consequence, as shaft 41 is rotated, carrying with it the cam 43, the stepper thrust bar 35 will be longitudinally displaced in accordance with the positioning determined by the cam slot 44, and in the manner illustrated in Figs. 9 to 13 inclusive, for successive degrees of angular rotation of shaft 41 as described in detail hereinafter.

To continue, however, with description of the constructional details of the apparatus, and still referring to Figs. 1 to 4 inclusive in connection therewith, the needle thrust bar 15 has mounted at an intermediate point thereon an upstanding pin 50 to which is journaled a sleeve member 51 integral with an eccentric arm 52, which latter

extends to the right in Figs. 1 and 2 to the cam 43, and is eccentrically pin-connected thereto by means of a screw 53 passing through a bore 54 of the eccentric arm 52, and threading into the cam as at 55, Fig. 2. The eccentric arm is in turn pivotally secured in position on the upstanding pin 50 by means of a screw 56 which threads into the upstanding pin 50, as at 58, Fig. 4.

For driving the shaft 41, there is mounted on the underside of frame portion 10b, a housing 60, within which is mounted an electrical motor 61, the shaft 62 of which is geared to shaft 41 through speed reduction, intermeshing pinion gears 63. The housing 60 provides a trigger grip, as shown in Fig. 2, for supporting the rear end of the tufting mechanism in one hand, while the opposite end is supported in the opposite hand by means of a holding grip 64 secured to the opposite end portion 10a of the frame 10 in the manner shown in Fig. 2. The holding grip 60 has mounted in the angle portion thereof, a switch-arm 66 which controls through a switch 67 the connection of electrical power, supplied from a suitable source not shown, to the motor 61 for energizing the same. In order thus to energize the motor 61 it is required only to grip the housing 60 with sufficient force to depress switch 66, which upon release of the grip, is restored to the deenergizing position by means of a tension spring 68 extending between the switch-arm 66 and a fixed support, as shown in Fig. 2.

Successive strands of yarn 70, for tufting the carpet foundation fabric 71, are separately fed to the needles 17-19 inclusive respectively, through upstanding eyelets 72 mounted upon a block 73 mounted at the rear upon frame portion 10b, the yarn being fed thence through upstanding eyelets 74 mounted upon the rear end of the eccentric arm 52, and thence through other upstanding eyelets 75 thereon, and thence through additional upstanding eyelets 76 mounted upon a plate 77 bolted as at 78, to the forward end of the frame walls 11, 12, from whence the yarn strands pass individually through the needle holes, as at 27.

In the tufting operation, the mechanism is held against the foundation fabric 71 in the position illustrated in Figs. 1 and 2, and in order to regulate the degree of penetration of the needles and steppers through the fabric in accordance with the height of tufting desired, a wire guard 80 is provided. This guard is preferably made of a single section of wire, bent into substantially inverted U-shaped configuration 81, as viewed in end elevation, Fig. 3, with the ends of the wire bent substantially at right angles in the manner illustrated at 82, Figs. 1 and 2, these ends extending into appropriate holes 83, Fig. 2, of the frame 10, and being adjustably positionable therein by means of set screws, such as 84, tapped to the frame. In this way the upstanding portion 81 of the guard may be longitudinally adjusted in relation to the frame 10 thereby, as stated, to regulate the extent of penetration of the needles and steppers through the foundation fabric 71.

As above explained in connection with Figs. 5 and 6, the yarn tensioning prongs 28 are adjusted in appropriate overlapping relation to the needle holes 26 to maintain suitable tension on the yarn as it is fed through the needle holes during the tufting operation. To further facilitate this tensioning of the yarn, there is mounted between the upstanding eyelets 74, 75, on the eccentric arm 52 a brush-like tensioning device 85, comprising a supporting frame 86, from the upper face of which a series of wires 87 project,

being inclined as shown in Fig. 2, in the direction in which the yarn is fed. Thus as the yarn tends to slip back, between stitches, it is gripped and held taut by the wires.

Having thus described with reference to Figs. 1 to 4 inclusive, the constructional details of the carpet tufting mechanism in accordance with the preferred embodiment of the invention, the operation thereof in tufting a carpet foundation fabric will now be described with reference to Figs. 9 to 25, inclusive. In these views Figs. 9 to 13 inclusive, and 20 to 25 inclusive, illustrate the manner in which the rotation of cam 43, as driven by shaft 42 from the motor 61 of Fig. 2, reciprocates the needles such as 17, and stepper prongs 37 in appropriately timed relation to each other. In these views but one needle 17 and but one associated stepper 37 are shown for simplicity in explaining the principles of operation. Since the needle thrust bar 15 is merely linked eccentrically by the eccentric arm 52 to a point 55 on cam 43 which is off center from the drive shaft 41, the rotation of cam 43 will reciprocate the needle thrust bar 15 and with it the needle 17 in accordance with a simple harmonic motion mode of displacement. That is to say with the eccentric arm 52 in the position shown in Figs. 9 and 20, and with the direction of rotation as indicated by the arrow 90, the needle 17 is being advanced at its maximum speed of penetration through the carpet foundation fabric 71. In the position shown in Fig. 10 the needle 17 will have penetrated the fabric 71 to the maximum extent, and will be momentarily at rest. In the position shown in Fig. 11 the needle is being withdrawn from the fabric 71 at its maximum speed; while in the position shown in Fig. 12, the needle has been withdrawn to the maximum extent from the fabric, and is again momentarily at rest. In Fig. 13 the needle is shown advancing on the next stitch, and is in the position where it is just penetrating the fabric 71, while its speed of advance is being accelerated to the maximum speed of penetration above described with reference to Fig. 9, whereupon the cycle of operations described with reference to Figs. 9 to 13 inclusive is repeated on the next cycle, and so on.

Now considering the accompanying movements of the stepper 37 in relation to those of the needle 17, in the position shown in Figs. 9 and 20, the stepper is momentarily at rest, at its maximum position of withdrawal from the fabric. An instant later when the cam 43 has advanced to the position of Fig. 21, the cam roll 49 will have been displaced slightly to the left of its initial position, the latter as shown at 42a, by forced traverse of the cam roll along the substantially rectilinear portion 46 of the cam slot. The stepper 50 will thus be displaced by a corresponding amount toward the fabric 71. During this same interval the eccentric arm 52 will have been displaced from the position of Fig. 20 to that of Fig. 21, since its pivotal point 55 on cam 43 has moved from 55a to 55, thus to displace the needle 17 to the left by substantially the distance 55a to 55, which it will be observed considerably exceeds the distance 42a to 43 of accompanying displacement of the stepper. That is to say at this juncture the needle is advancing much more rapidly toward the fabric 71 than is the stepper. As the cam 43 continues to rotate in the direction indicated, the needle and stepper will continue to advance to the left, the needle at an ever decreasing rate and the

stepper at an increasing rate, until the cam has reached the position shown diagrammatically in Fig. 22, in which position the stepper has caught up with the needle so to speak, both having penetrated the fabric substantially to their maximum extents.

Figure 22 shows at 91, 92 and 93, the successive positions of the cam in its rotation from the position of Fig. 20 through that of Fig. 21 to that of Fig. 22, from which it will be observed, that as the needle penetrates the fabric at a decelerating rate, the stepper is being displaced into the fabric at an accelerating rate, the latter as indicated by the progressively increasing displacements 94, 95 thereof. Thus, although in the position of Fig. 20 the needle is penetrating the fabric with its maximum speed while the stepper is in a state of rest in its most fully retracted position, nevertheless, due to the progressive deceleration of the advancing needle combined with the progressive acceleration of the stepper in passing from the position of Fig. 20 through Fig. 21 to that of Fig. 22, the degree of penetration of the stepper will catch up with that of the needle, so that the two have penetrated the fabric substantially to the same degree when the cam has rotated slightly past the position of Fig. 22, namely into the position of Fig. 10.

It will also be observed that with the cam in the position of Fig. 22, the cam roll 44 is almost at the point of passing out of the rectilinear portion 46 of the cam slot, and is on the point of passing into the arcuate portion 45 thereof, which it enters an instant later when the cam has rotated to the position of Fig. 10.

As the cam continues to rotate further from the position of Fig. 10, the stepper remains at rest at its maximum position of fabric penetration, so long as the cam roll 48 remains in the arcuate portion 45 of the cam slot, since this arcuate portion being concentric with the drive shaft 41, imparts no longitudinal displacement to the stepper thrust bar 35 or to the steppers 37. Meantime, however, as the cam rotates from the position shown in Fig. 10 to the successive positions of Figs. 11 and 12, the needle is being withdrawn from the fabric, while the stepper remains at rest at its maximum degree of fabric penetration. In passing from Fig. 10 to Fig. 11, the rate of needle withdrawal is being accelerated, but is thereafter decelerated in passing from Fig. 11 to Fig. 12. In the position of Fig. 12, the needle has been withdrawn to its maximum extent from the fabric, so that with further rotation of the cam, it will start to advance again on the next stitch in the manner illustrated diagrammatically in Fig. 24. Also in the position shown in Fig. 24, it will be observed that the cam roll 48 has reached the end of the arcuate portion 45 of the portion 47 thereof, whereby the stepper is on the point of being withdrawn from the fabric as the needle starts to advance on the next stitch. In the position as shown in Fig. 13 and also diagrammatically in Fig. 25, the cam roll has entered the rectilinear portion 47 of the cam slot, whereby the stepper is being rapidly withdrawn from the fabric as the needle is being rapidly advanced therein on the next stitch.

It will be observed from the above explanation that whereas the needle is continuously reciprocated, the stepper is reciprocated intermittently in lagging relation to the needle, this being effected by eccentrically coupling the needle to the

cam at a point physically spaced 90° from the coupling of the stepper to the point on the cam nearest the axis of rotation of the cam, as shown in Fig. 20 by the 90° angle designated by the numeral 96.

The manner in which the relative displacements of the needle and stepper elements in the successive positions of Figs. 9 to 13 inclusive, perform the tufting operation, is illustrated by the corresponding sectional views of Figs. 14 to 18 inclusive, respectively. Thus referring to Fig. 14 and assuming that the mechanism has just formed the previous tuft 100, the point of the needle 17 has penetrated fabric 71 on the next stitching operation, carrying with it the yarn 70, the stepper 37 being in the fully retracted position relative thereto, as shown, and being on the point of advancing into the fabric as explained in connection with Fig. 9.

In the position of Fig. 15, as explained with reference to Fig. 10, both the needle 17 and stepper 37 have penetrated the fabric to their maximum extents, the needle carrying with it the yarn 70, to form the next tuft 101, and the stepper being maintained stationary, to grip the yarn and prevent retraction of the tuft 101 as the needle is withdrawn. In the position of Fig. 16, as was explained with reference to Fig. 11, the needle is rapidly being withdrawn from the fabric while the stepper remains stationary, whereby the needle pulls the yarn taut over the pronged end 39 of the stationary stepper in the manner illustrated at 102.

In the position of Fig. 17, as was explained with reference to Fig. 12, the needle has been withdrawn to its maximum extent from the fabric, while the stepper still remains stationary as its maximum extent of fabric penetration, so that the newly formed tuft is stretched over the stepper in the manner shown at 103. Meantime it should be pointed out that as the needle is being withdrawn from the fabric in the manner illustrated at Figs. 16 and 17, the stepper and yarn looped thereover, automatically displaces the needle upwardly as it clears the fabric by the amount of the next stitch. This results from the fact that the stepper prong is resilient and is bent toward the needle point, so that it tends to displace the needle point upwardly, and does so by virtue of its resiliency and the yarn looped thereover, as soon as the needle clears the foundation fabric 71, this action being indicated at 104, 104a in Fig. 17. Also in this same connection it should be noted that as the needle penetrates the fabric the flanged sidewalls 24 thereof form an opening of progressively increasing dimension between adjacent strands of the foundation fabric 71, as illustrated at 105, Figs. 14 to 16 inclusive, through which the stepper prong enters as shown, due to the fact that the stepper prong is bent toward the needle point. When, however, the needle is withdrawn the displaced strands of the base fabric spring back into position as shown in Fig. 17, to grip the newly formed tuft 103, and also to cause the upwardly displaced needle point to enter the fabric on its next penetration between other strands of the base fabric, as at 106, Figs. 17 and 18, thus to displace the next tufting stitch from the preceding one.

In the position shown in Fig. 18, as was explained with reference to Fig. 13, the needle is again entering the fabric on the next stitch, having been displaced upwardly to this end in the manner aforesaid while the stepper is being rap-

idly withdrawn from the newly formed tuft 103.

Fig. 18 illustrates in perspective a portion of the tufted carpet produced in the manner above described. The foundation fabric is again shown at 71, the tufting on the upper surface of the carpet at 107 and on the lower surface at 108, wherein it will be observed the yarn strands of the tufting material are drawn lightly about the successive strands of the base fabric 71.

We claim:

1. In a tufting device for producing tufted carpets and the like: a plurality of tufting needles integrally joined in lateral alinement and each having yarn-receiving holes therein; a thrust member, and means mounting said needles thereon; a corresponding plurality of yarn tensioning prongs mounted on said thrust member in longitudinal alinement with said needles respectively and each mounted with its free end adjacent the hole in the needle corresponding thereto; and means for adjustably positioning said tensioning prongs longitudinally of said needles for adjusting the effective apertures of the needle holes.

2. In a tufting device for producing tufted carpets and the like: a needle thrust bar and a stepper thrust bar mounted in slidable relation to each other for longitudinal displacements thereof along substantially parallel paths; a plurality of tufting needles integrally joined in lateral alinement and having yarn-receiving holes therein, and means mounting the same on said needle thrust bar; a corresponding plurality of yarn-tensioning prongs and means adjustably mounting the same on said needle thrust bar in alinement respectively with said needles and with the free ends thereof at said holes, for adjusting the effective apertures of the needle holes; a corresponding plurality of stepper prongs and means mounting the same on said stepper thrust bar, in coacting relation to said needles respectively.

3. In a tufting device for producing tufted

carpets and the like; a tufting needle having a yarn-receiving hole therein; a thrust member, and means mounting said needle thereon; a yarn tensioning prong mounted on said thrust member in longitudinal alinement with said needle and having its free end adjacent the hole in said needle; and means for adjustably positioning said tensioning prong longitudinally of said needle for adjusting the effective aperture of the needle hole.

4. In a tufting device for producing tufted carpets and the like: a needle thrust bar and a stepper thrust bar mounted in slidable relation to each other for longitudinal displacements thereof along substantially parallel paths; a tufting needle having a yarn-receiving hole therein, and means mounting the same on said needle thrust bar; a yarn-tensioning prong and means adjustably mounting the same on said needle thrust bar in alinement with said needle and with the free end adjacent said hole, for adjusting the effective aperture of the needle hole; a stepper prong and means mounting the same on said stepper thrust bar, in coacting relation to said needle.

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