

### [54] TUFTING MACHINES

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[58] Field of Search..... 112/79 R, 79 A, 266, 410, 112/220, 221; 74/42, 117, 520

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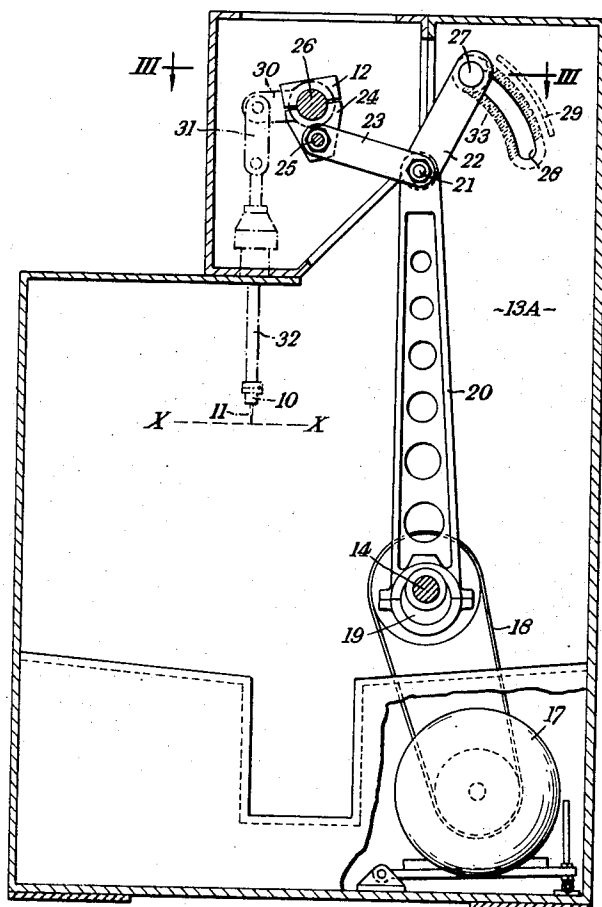
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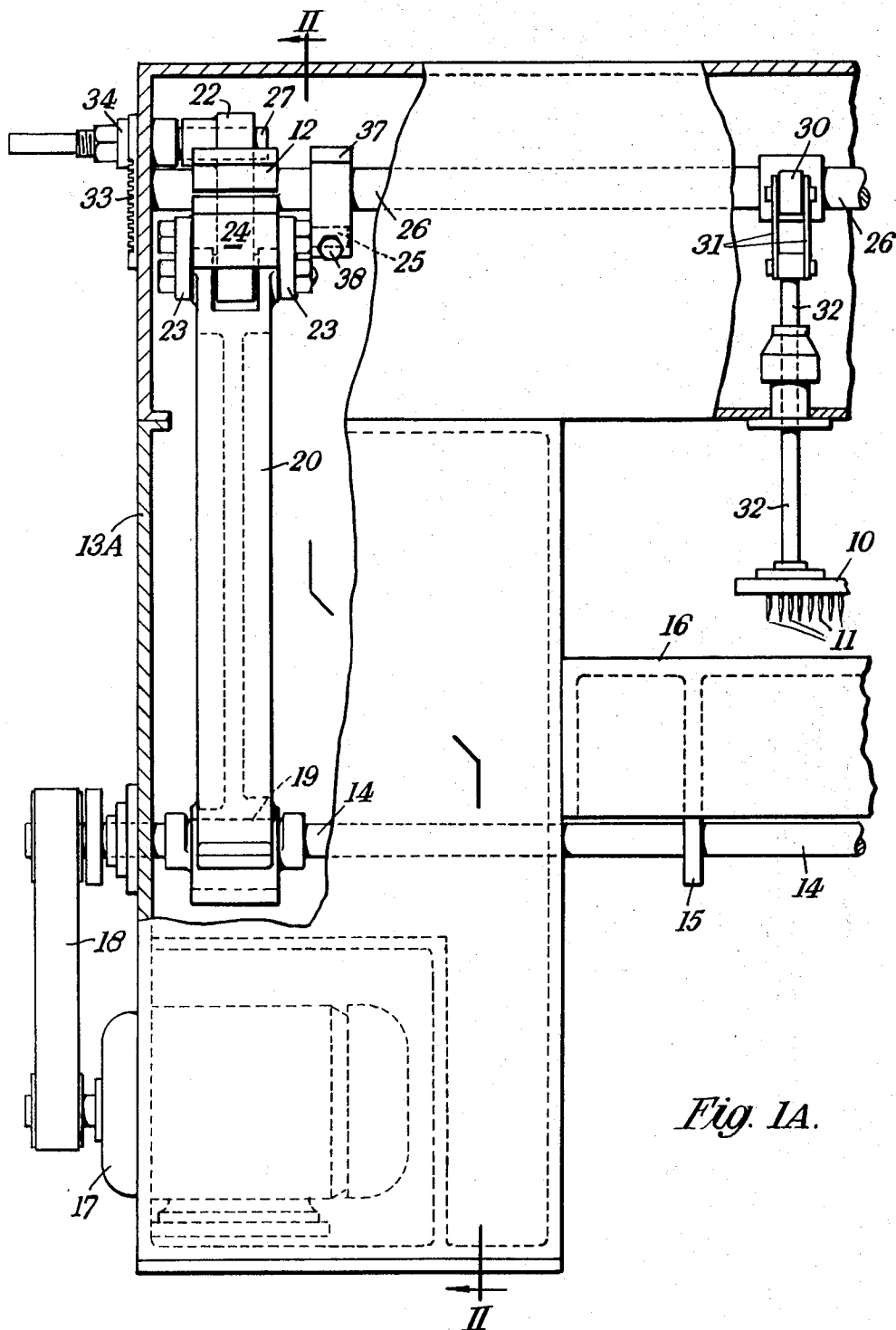
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### ABSTRACT

A tufting machine comprising a framework, a main driving shaft disposed near the bottom of the framework, a needle rocker shaft disposed near the top of the framework, eccentrics on the main driving shaft at opposite sides of the machine, connected rods coupled at their lower ends to the eccentrics and pivoted at their upper ends to arms connected to the rocker shaft and adapted to oscillate the rocker shaft in response to rotation of the main driving shaft, a needle bar disposed below the rocker shaft and mounted for vertical reciprocating movement, means connecting the needle bar and the rocker shaft for imparting reciprocation to the needle bar in response to rocking of the rocker shaft, a control arm pivoted at one end to the upper end of each connecting rod and having its other end adjustable in a quadrant slot in the framework, and means external to the framework for adjusting the control arms in their respective slots and thereby adjusting the stroke of the needle bar.

4 Claims, 10 Drawing Figures





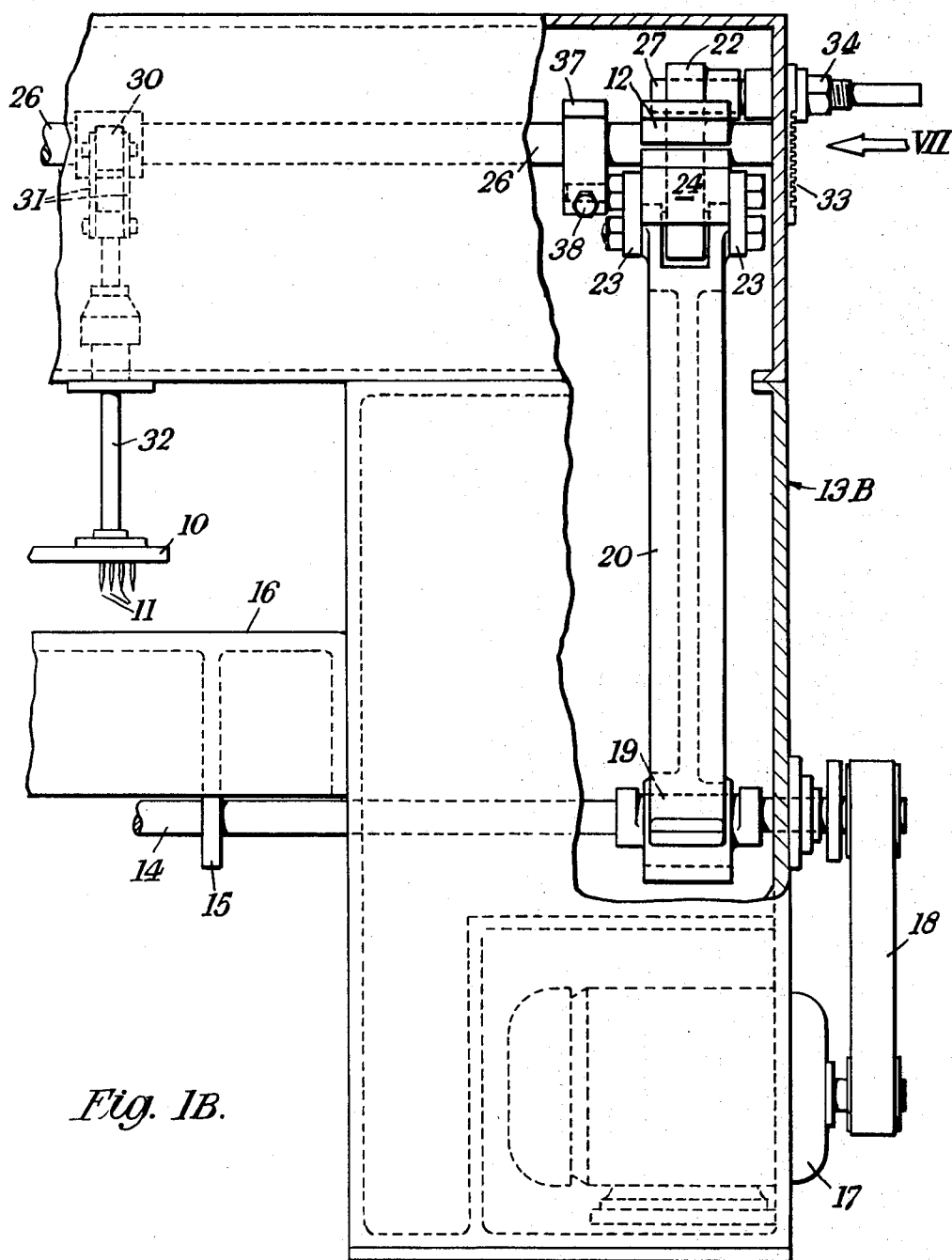


Fig. 1B.

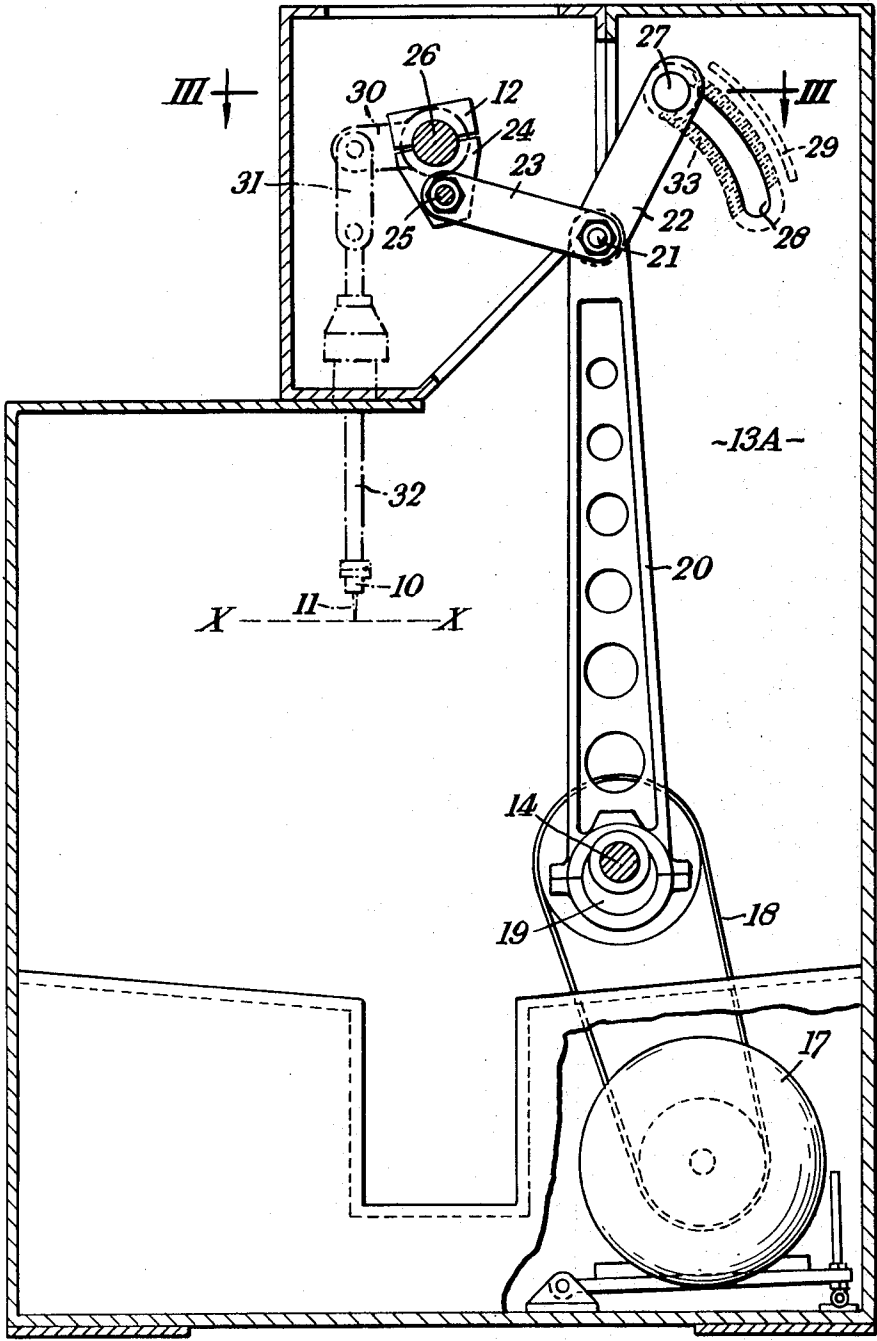
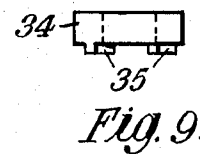
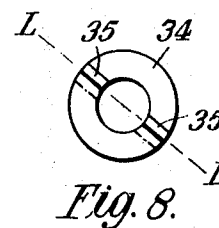
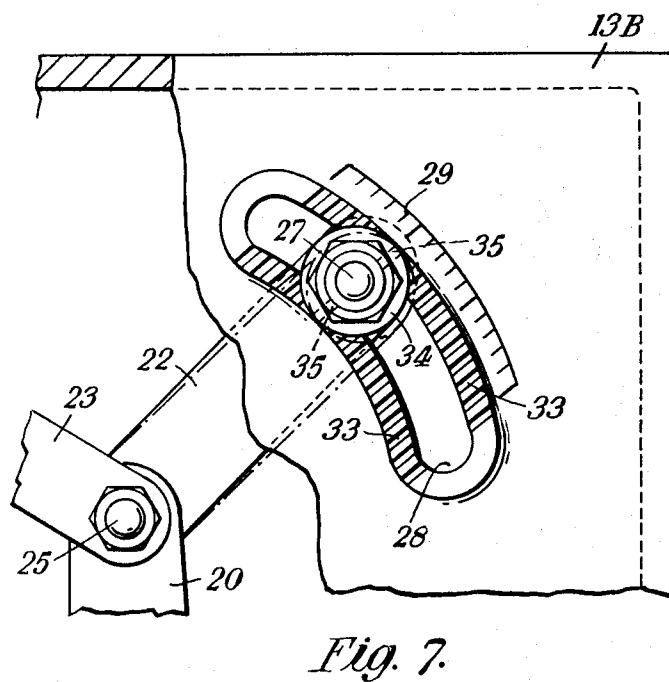
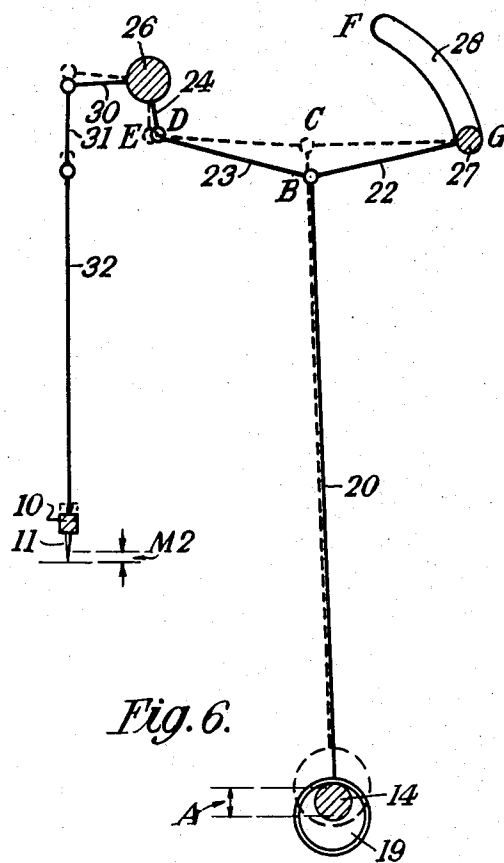
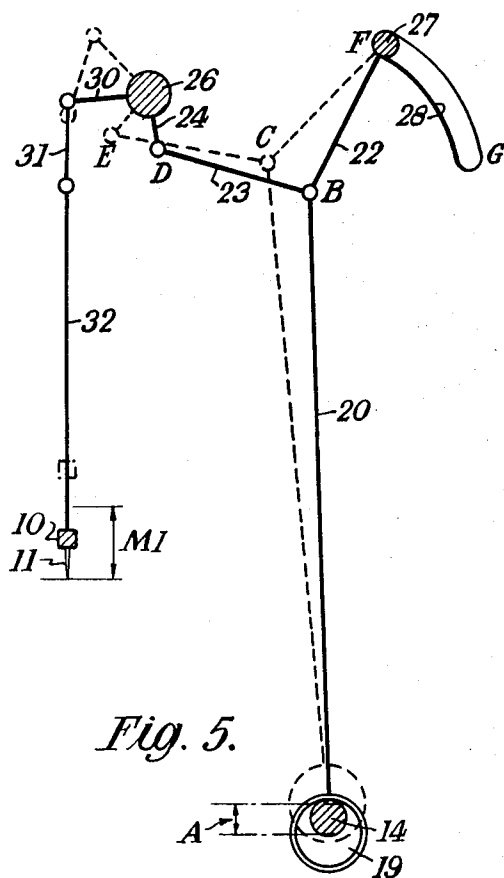


Fig. 2.





## TUFTING MACHINES

This invention provides an improvement in the earlier tufting machine described in my British Pat. Application No. 47279/70. In common with the earlier machine, the machine according to the present invention includes a lower main shaft, an upper needle rocker shaft for imparting up and down reciprocating movement to the needles and a needle stroke adjustment which varies the top position only of the needle stroke.

In the earlier machine, the adjustment, which may be required to suit the pile height to the particular needles fitted to the machine, is performed by changing the effective length of an arm connected to the rocker shaft and can only be performed from inside the machine by removing a cover plate.

The object of the present invention is to provide an improved needle stroke adjustment which can be operated from outside the machine, so that access to the interior will only be required when a change in needle length is made. Such adjustment would then be required to adjust the position of the needle bar relative to the tufting hooks of the machine.

The invention accordingly provides a tufting machine comprising a framework, a main driving shaft disposed near the bottom of the framework, a needle rocker shaft disposed near the top of the framework, eccentrics on the main driving shaft at opposite sides of the machine, connected rods coupled at their lower ends to the eccentrics and pivoted at their upper ends to arms connected to the rocker shaft and adapted to oscillate the rocker shaft in response to rotation of the main driving shaft, a needle bar disposed below the rocker shaft and mounted for vertical reciprocating movement, means connecting the needle bar and the rocker shaft for imparting reciprocation to the needle bar in response to rocking of the rocker shaft, a control arm pivoted at one end to the upper end of each connecting rod and having its other end adjustable in a quadrant slot in the framework, and means external to the framework for adjusting the control arms in their respective slots and thereby adjusting the stroke of the needle bar.

The bottom position of the needles, the forward position of the tufting hooks and the upward position of the knives (when provided) are not affected by the adjustment of the needle stroke. Also the adjustment may be calibrated so that when later returning to the same fabric style, the machine settings can be identical without any trial and error searching for the correct setting, normally known as the "tune-in period."

One embodiment of tufting machine according to the invention will now be described in detail, by way of example, with reference to the accompanying drawings, in which :-

FIGS. 1A and 1B collectively constitute a front elevation of the machine, partly in section,

FIG. 2 is a section on the line II—II in FIG. 1A,

FIG. 3 is a section on the line III—III in FIG. 2,

FIG. 4 is a section on the line IV—IV in FIG. 3,

FIG. 5 is a diagram showing the needles set for maximum stroke,

FIG. 6 is a similar diagram showing the needles set for minimum stroke,

FIG. 7 is a view, on a larger scale, looking in the direction of the arrow VII in FIG. 1B,

FIG. 8 is an underside plan view of a locking washer, and

FIG. 9 is a corresponding side elevation.

Like reference numerals indicate like parts throughout the FIGURES.

The tufting machine illustrated includes conventional means, not shown, for feeding a base fabric through it in a direction transverse to a vertically reciprocating needle bar 10, which carries a large number of closely adjacent equally spaced needles 11. These needles penetrate the base fabric (FIG. 1B) on the downstroke of the needle bar to form loops of yarn, supplied to the needles by a conventional yarn feed mechanism not shown, which extend beneath the fabric and are penetrated by the conventional tufting hooks, also not shown, on the return stroke of the needles. If the machine is to be used for producing cut pile fabric, conventional loop cutting knives are also provided. Since the invention is concerned solely with a novel mechanism for adjusting the stroke of the needles, the drawings are confined to a showing of this adjusting mechanism.

The machine framework includes side members 13A, 13B in which is journaled a main drive shaft 14, which is also supported by intermediate bearings 15 and is disposed at the bottom of the machine beneath a base plate 16 which carries the bearings 15. The main shaft 14 is driven at each end by an electric motor 17 through a belt drive 18.

The shaft 14 drives all the working parts of the machine through identical driving mechanisms disposed at its opposite ends. The shaft 14 carries at each end an eccentric 19 (FIG. 2) rotating inside a connecting rod 20, thereby imparting a vertical stroke A (FIGS. 5 and 6) to the connecting rod 20. The upper end of each connecting rod 20 is connected by a pivot pin 21 to a control arm 22 and to a pair of arms 23 (FIG. 3), which are connected at their other ends to a rocker arm 24 (FIG. 2) by a pin 25. The rocker arms 24 are clamped to opposite ends of a needle rocker shaft 26, each by a cap 12 and screws 12A (FIG. 3). A control pin 27 on the other end of each control arm 22 is accommodated in an arcuate slot 28 in the machine frame, struck to a radius from the centre of the pin 21. The pin 27 is adjustable in the slot 28 from the exterior of the machine frame, the extent of adjustment being indicated by a scale 29 (FIG. 7).

By reference to FIG. 5 and 6 it will be seen that as each eccentric 19 imparts movement A to its connecting rod 20 the pin 21 (FIG. 2) moves from point B to point C, thereby imparting movement DE to the pin 25 (FIG. 2) on the rocker arm 23 to effect oscillation of the rocker shaft 26. A number of arms 30 keyed to the rocker shaft 26 therefore cause a needle bar 10 to reciprocate vertically through conventional linkages 31 and pushrods 32, see also FIGS. 1A and 1B.

In order to maintain a constant bottom dead centre position XX (FIG. 2) for the needles when altering the needle stroke, each control pin 27 is adjustable within the slot 28, which is struck from point B at a radius BF (FIG. 5). As a result the point B will remain stationary when the control pin 27 is moved.

FIG. 5 shows the control pins 27 set at the point F in the slot 28 corresponding to maximum stroke M1 of the needles. To reduce the stroke, the control pins 27 are moved in the slot 28 towards point G which corresponds to minimum stroke M2, (FIG. 6). Needle

strokes of from  $3/4$  inch up to  $3\ 3/4$  inches are available dependent upon the position of the control pin 27 in the slot 28. Variations of these needle strokes and of the range of stroke can be obtained by altering the following:-

- Throw of the eccentrics 19.
- Length of the arms 22 or 23.
- Length of the slots 28.
- Angular position of the slots 28 relative to point B.

Length of the rocker arms 24.

Length of the arms 30.

To prevent the control pins 27 from moving whilst the machine is in operation, slots 33, shown most clearly in FIG. 7, are machined in the machine frame alongside each slot 28 and these slots 33 cooperate with a washer 34 (FIGS. 1A, 1B, 3, 7, 8 and 9) having tongues 35 on its undersurface. The slots 33 are  $1/4$  inch wide at  $1/2$  inch pitch. The tongues 35 on the washer 34 are offset  $1/8$  inch from the centre line LL (FIG. 8) of the bore of the washer so that by turning the washer through  $180^\circ$ , to bring the tongues 35 into the position shown in chain dotted lines, two alternative positions of the control pin 27 with reference to the same slot 33 can be obtained. This change represents approximately  $1/8$  inch actual increase or decrease of needle stroke. The scale 29 (FIG. 7) indicates the slot numbers and thus facilitates making the adjustment at each end of the machine exactly the same. By issue to the purchaser of the machine of a chart setting out scale numbers relative to needle strokes, adjustment of the machine can be greatly facilitated.

In order to set the needle bar 10 initially in the bottom dead centre position, an adjustment bracket 37 (FIGS. 3 and 4) is keyed to the shaft 26 near each rocker arm 24 and fitted with screws 38. After loosening the cap 12 by slackening off the screws 12A, the screws 38 are adjusted against a block 39 (FIG. 4) carried on the pin 25 to cause the rocker shaft 26 to move angularly within the rocker arm 24 (FIG. 2) so raising or lowering the needle bar 10 relative to the datum XX. On attaining the correct needle position, the rocker arm 24 is clamped to the rocker shaft 26 by the cap 12 and the screws 12A.

A mechanism of similar construction and operation can also be provided for adjusting the stroke of the tufting hooks and of the knives (if such are provided), the only difference being the length of connecting rod and

range of movement.

What I claim as my invention and desire to secure by Letters Patent is:

1. A tufting machine comprising a framework, a main driving shaft disposed near the bottom of the framework, a needle rocker shaft disposed near the top of the framework, arms connected to the rocker shaft, eccentrics on the main driving shaft at opposite sides of the machine, connecting rods coupled at their lower ends to the eccentrics and pivoted at their upper ends to said arms connected to the rocker shaft and adapted to oscillate the rocker shaft in response to rotation of the main driving shaft, a needle bar disposed below the rocker shaft and mounted for vertical reciprocating movement, means connecting the needle bar and the rocker shaft for imparting reciprocation to the needle bar in response to rocking of the rocker shaft, a quadrant slot in said framework, a control arm pivoted at one end to the upper end of each connecting rod and having its other end adjustable in said quadrant slot in the framework, and means external to the framework for adjusting the control arms in their respective slots and thereby adjusting the stroke of the needle bar.

2. A tufting machine as claimed in claim 1, wherein each control arm carries a pin at its end remote from the connecting rod, the pin engaging in the arcuate slot and carrying a washer having tongues which are engageable with slots in the framework alongside the arcuate slot to retain the pin in adjusted position within the arcuate slot.

3. A tufting machine as claimed in claim 2, in which the tongues in the washer are offset from a centre line through the axis of the washer so that, by rotating the washer through  $180^\circ$  about its centre, the pin may be located in different positions in the arcuate slot by engagement of the tongues in the same pair of slots in the framework.

4. A tufting machine as claimed in claim 1, in which each of the arms is pivoted by a pin to a rocker arm detachably connected to the rocker shaft and in which the rocker shaft carries, adjacent each rocker arm, a block fixed to the rocker shaft and carrying screws engaging a block on said pin, the screws being adjustable against the block after release of the rocker shaft from the rocker arms, to set the needle bar initially in its bottom dead centre position.

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