

Sept. 20, 1949.

R. H. BRADWELL ET AL

2,482,647

TUFTING MACHINE

Filed June 24, 1947

6 Sheets-Sheet 1

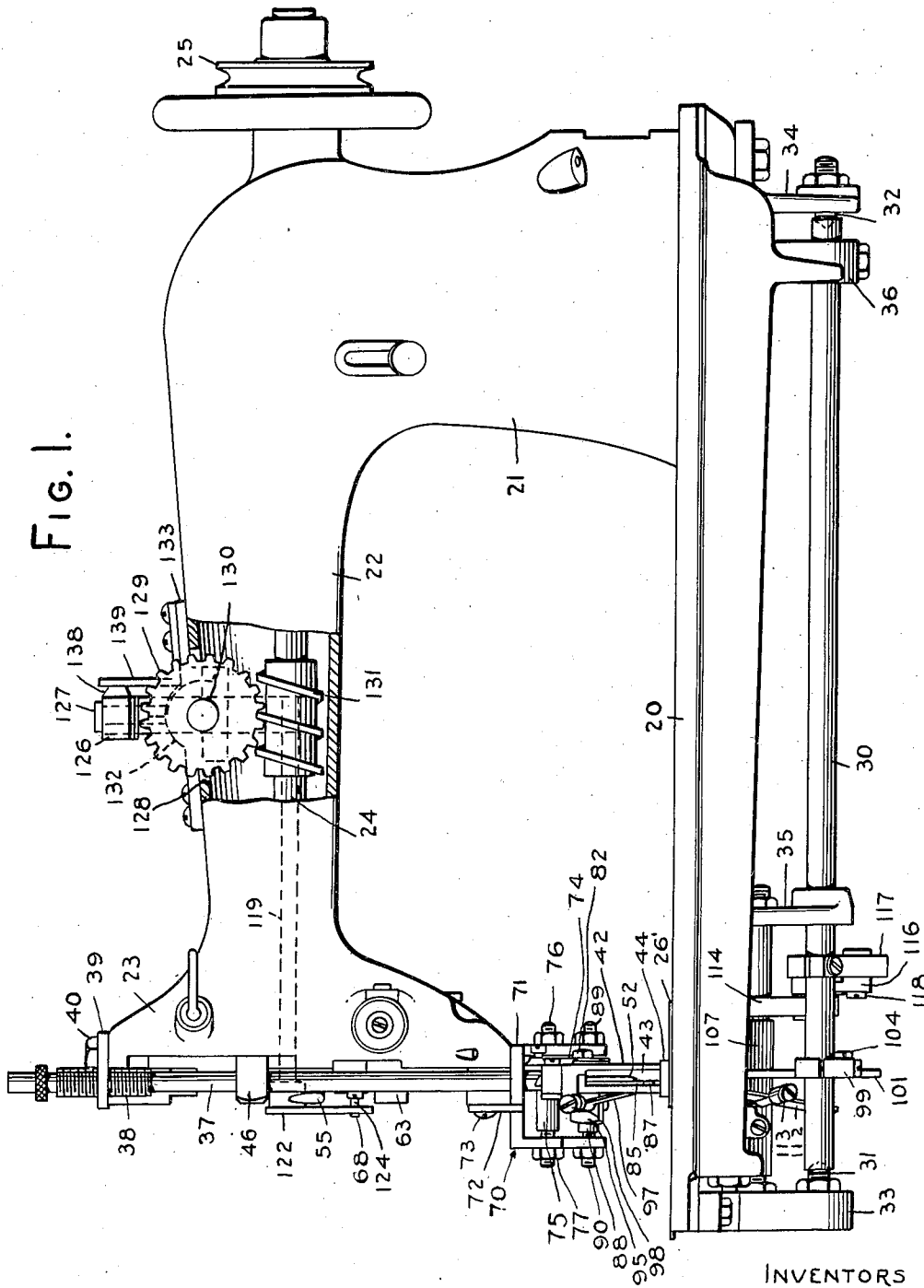


FIG. 1.

INVENTORS
ROBERT H. BRADWELL
& JOHN D. BROCK.

Robert H. Bradwell
ATTORNEYS

Sept. 20, 1949.

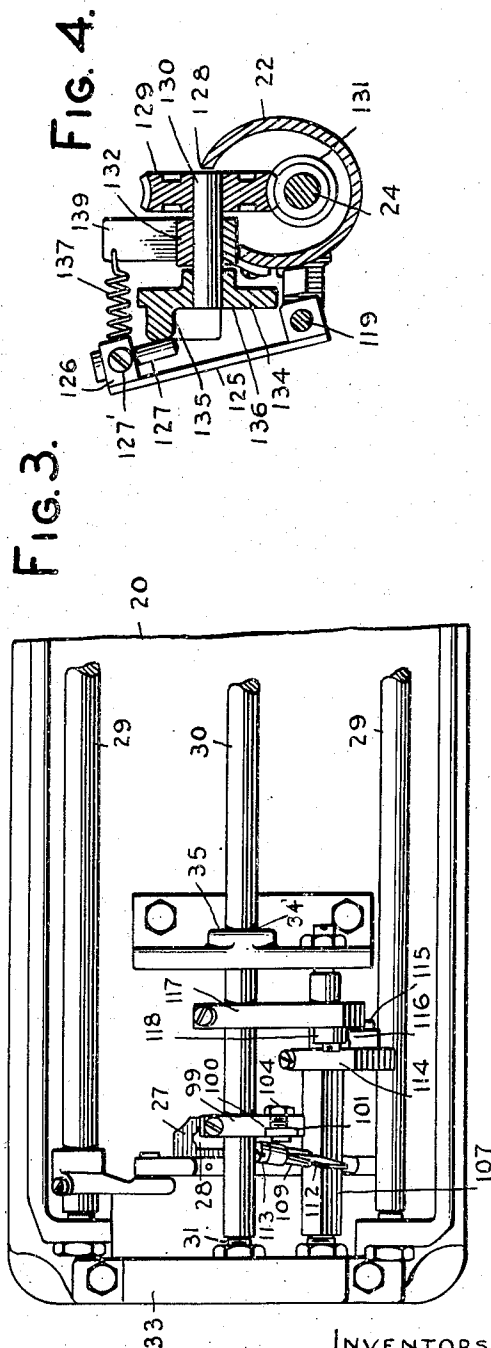
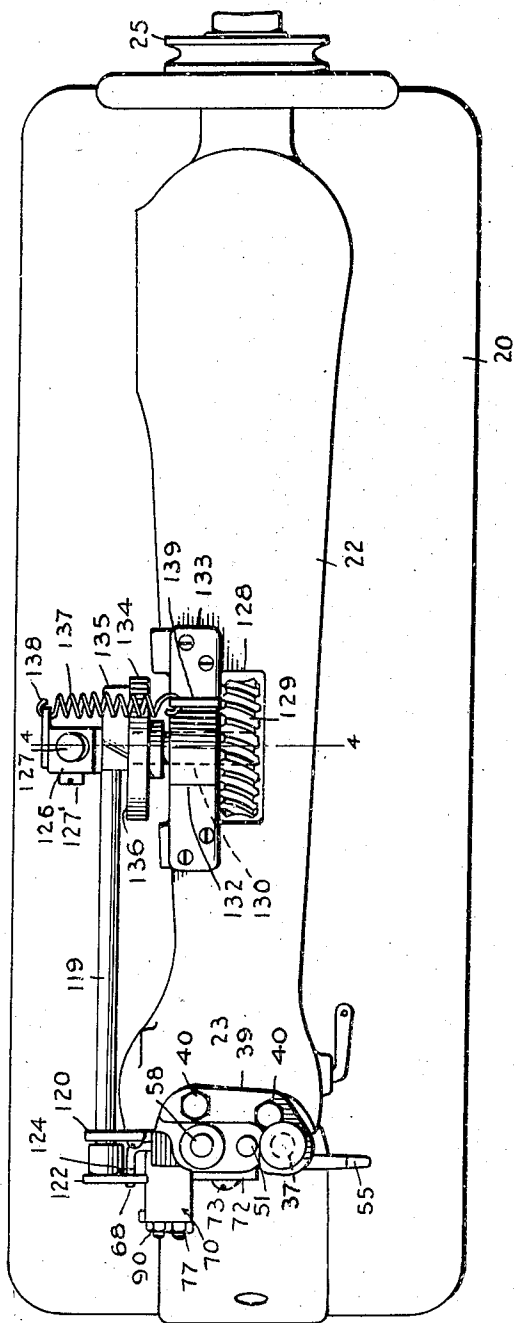
R. H. BRADWELL ET AL

2,482,647

TUFTING MACHINE.

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6 Sheets-Sheet 2



INVENTORS
ROBERT H. BRADWELL
& JOHN D. BROCK.

BP Johnson
ATTORNEYS

Sept. 20, 1949.

R. H. BRADWELL ET AL

2,482,647

TUFTING MACHINE

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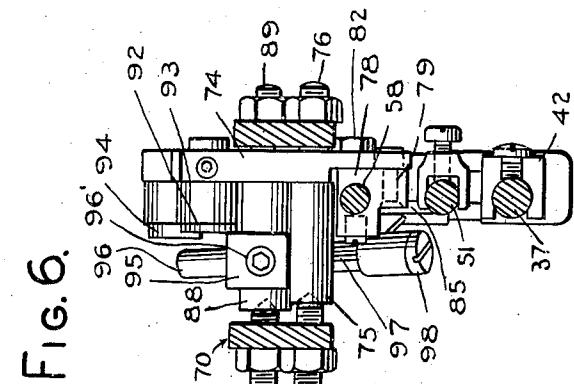


FIG. 6.

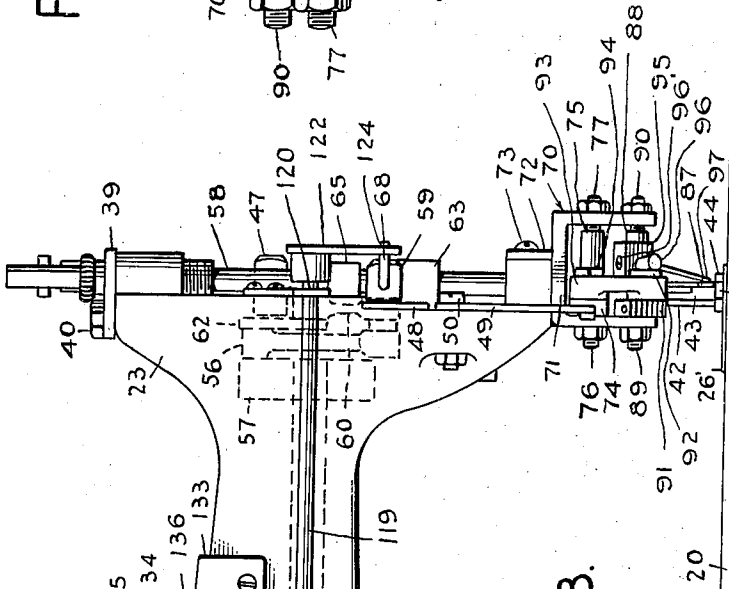


FIG. 7.

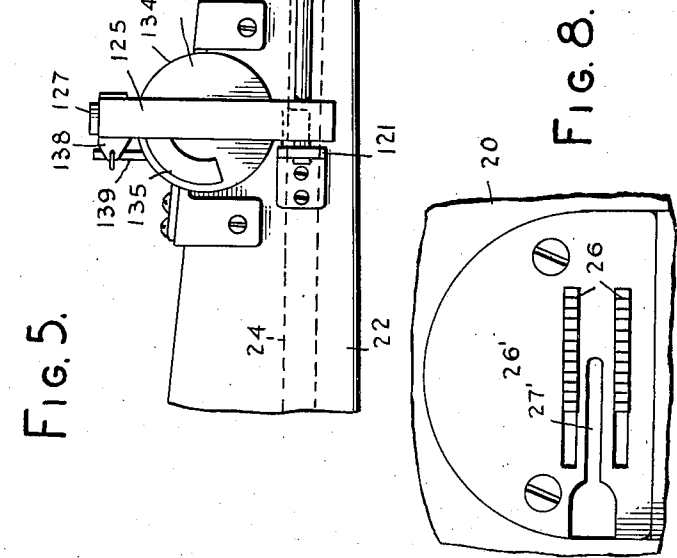


FIG. 8.

FIG. 5.

INVENTORS
ROBERT H. BRADWELL
& JOHN D. BROCK
Robert H. Bradwell
ATTORNEYS

Sept. 20, 1949.

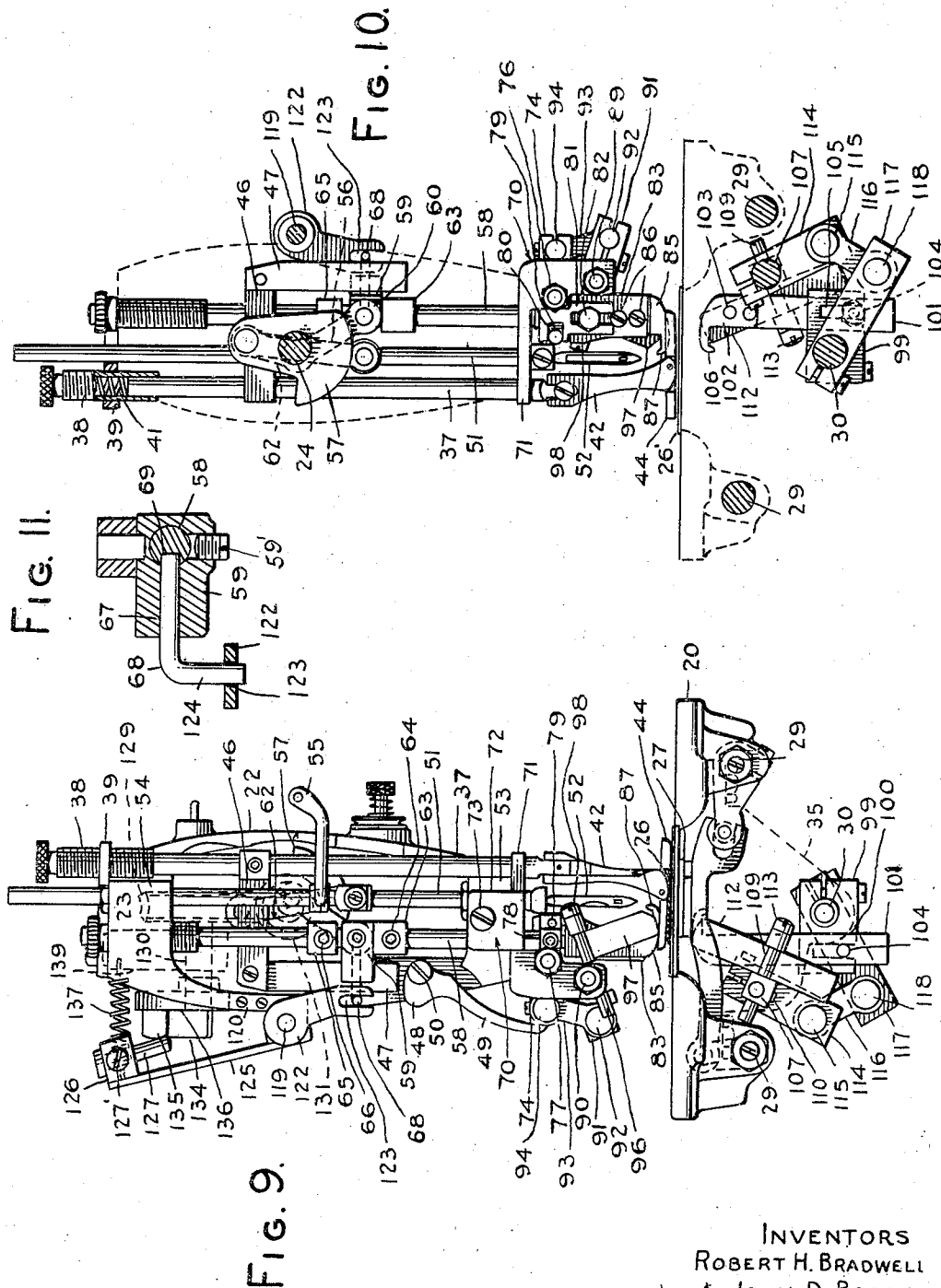
R. H. BRADWELL ET AL

2,482,647

TUFTING MACHINE

Filed June 24, 1947

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INVENTORS
ROBERT H. BRADWELL
& JOHN D. BROCK.
BPJ
ATTORNEYS

Sept. 20, 1949.

R. H. BRADWELL ET AL

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TUFTING MACHINE

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FIG. 14.

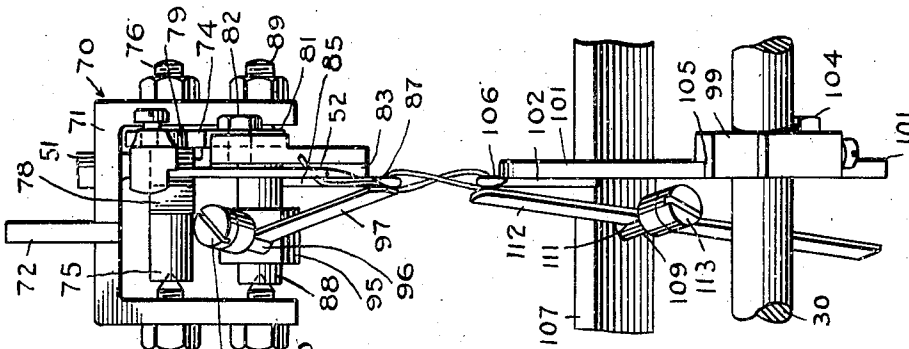


FIG. 13.

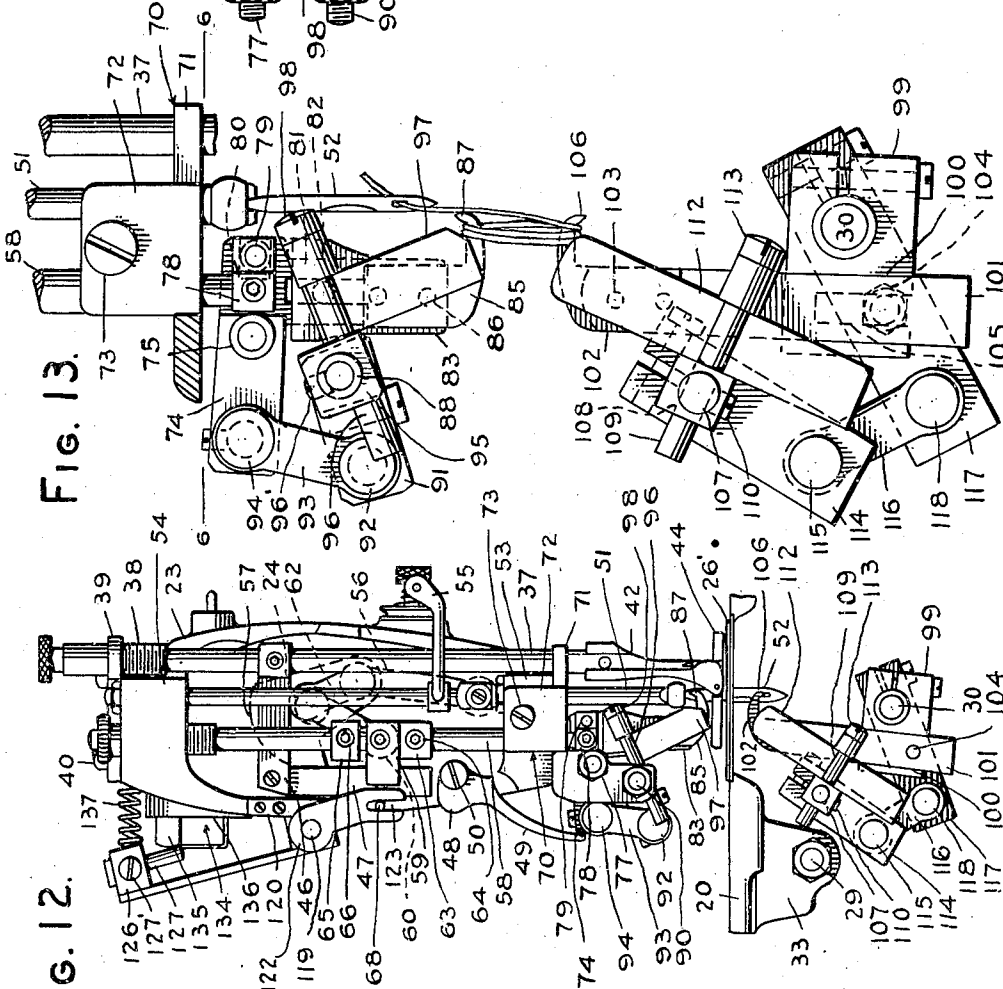
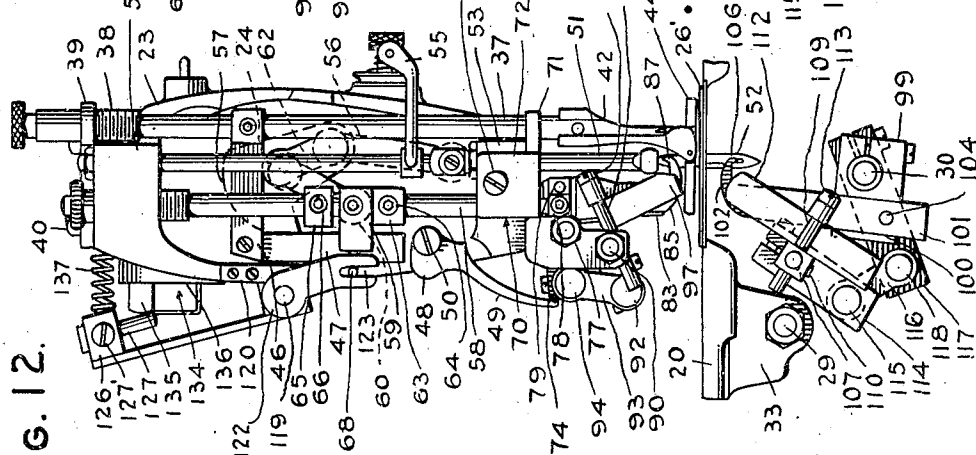


FIG. 12.



INVENTORS
ROBERT H. BRADWELL
& JOHN D. BROCK.

Boyd & Brock
ATTORNEYS.

Sept. 20, 1949.

R. H. BRADWELL ET AL

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TUFTING MACHINE

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6 Sheets-Sheet 6

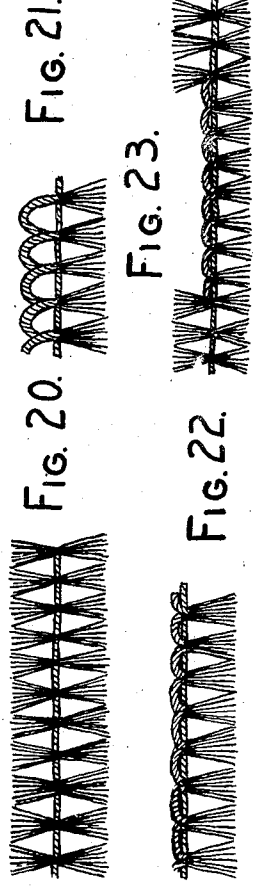
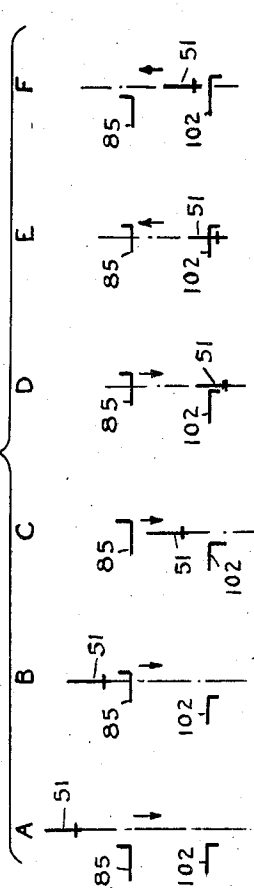
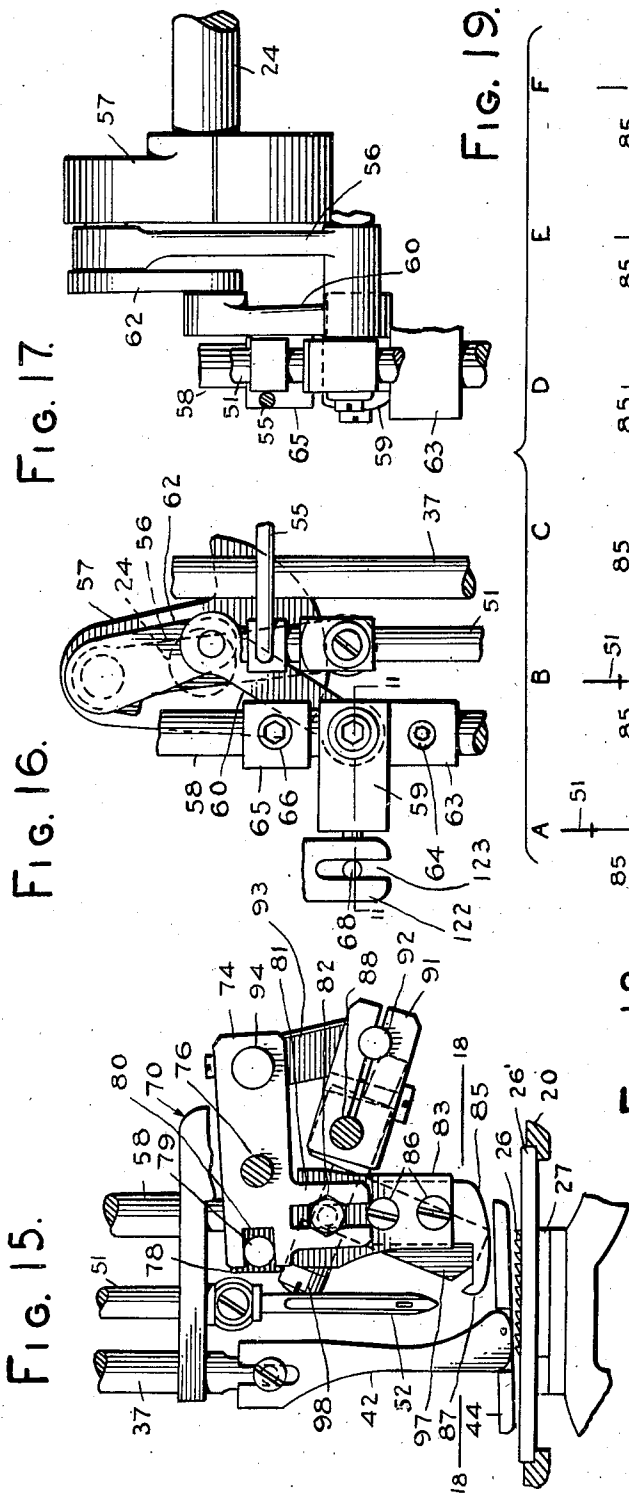
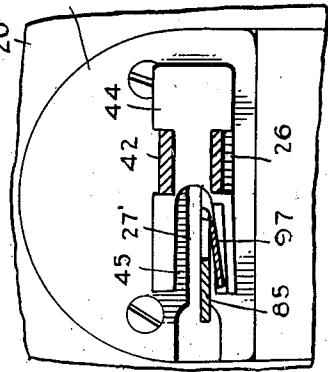


Fig. 18.



INVENTORS
ROBERT H. BRADWELL
& JOHN D. BROCK.

Robert H. Bradwell

ATTORNEYS.

UNITED STATES PATENT OFFICE

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TUFTING MACHINE

Robert H. Bradwell and John D. Brock, Dalton, Ga., assignors, by mesne assignments, to Russell-Lacey Manufacturing Company, Incorporated, Fairmount, Ga., a corporation of Georgia

Application June 24, 1947, Serial No. 756,764

5 Claims. (Cl. 112-79)

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The present invention relates to tufting machines.

Important objects of the invention are to provide a machine of the above mentioned character which will make a reversible tufted article such as a bedspread, bathmat, or the like; which will make continuous lines of tufting upon opposite faces of the fabric; which may make lines of tufting upon one face of the fabric and lines of unsevered loops upon the opposite face; which may make lines of tufting upon one face of the fabric and lines of stitches upon the opposite face; which may make lines of tufting upon one face of the fabric and lines of stitching upon the opposite face with spaced tufts in the lines of stitching; and which is automatic in operation and relatively simple in construction.

Other objects and advantages of the invention will be apparent during the course of the following description.

In the accompanying drawings forming a part of this application, and in which like numerals are employed to designate like parts throughout the same,

Figure 1 is a side elevation of a tufting machine embodying our invention, with parts broken away,

Figure 2 is a plan view of the same,

Figure 3 is a bottom plan view, with parts broken away,

Figure 4 is a transverse vertical section taken on line 4-4 of Figure 2,

Figure 5 is a side elevation of the machine viewed from the opposite side with respect to Figure 1, parts broken away,

Figure 6 is a horizontal section taken on line 6-6 of Figure 13,

Figure 7 is a detail section through a blade holder,

Figure 8 is a plan view of the feed dog and associated elements,

Figure 9 is a front elevation of the machine, the needle being shown in the raised position,

Figure 10 is an end elevation similar to Figure 9, but looking forwardly in the opposite direction from Figure 9, with parts omitted, and the needle being in the raised position,

Figure 11 is a horizontal section taken on line 11-11 of Figure 16,

Figure 12 is a front end elevation of the head of the machine, looking rearwardly, similar to Figure 9, with the needle in the lowered position,

Figure 13 is a view similar to Figure 9, showing the needle, loopers and associated elements upon an enlarged scale,

Figure 14 is an edge elevation of the same,

Figure 15 is a side elevation of the presser foot and associated elements,

Figure 16 is an end elevation of the crank disk and associated elements,

Figure 17 is a side elevation of the same,

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Figure 18 is a horizontal section taken on the line 18-18 of Figure 15,

Figure 19 is a diagrammatic view illustrating the relative positions of the loopers and needles,

Figure 20 is a longitudinal section through the fabric showing a continuous line of tufting upon opposite sides of the fabric,

Figure 21 is a similar view showing a line of tufting upon one face of the fabric and unsevered loops upon the opposite face,

Figure 22 is a similar view of the fabric showing a line of tufting upon one face and a line of stitching upon the opposite face,

Figure 23 is a similar view showing a line of tufting upon one face, and spaced tufts and stitches upon the opposite face.

The machine comprises a horizontal base 20 upon which the work is mounted and an upstanding stock 21 is rigidly mounted upon the base 20 and carries an overhanging horizontal tubular arm 22 in turn carrying a head 23. Extending through the arm 22 and journaled in suitable bearings is the usual horizontal drive shaft 24, rotated by a pulley 25 driven by the usual belt.

The machine comprises conventional work feed means including feed dogs 26 carried by a rigid plate 27, Figures 3, 8, and 18, having a slot 28 formed therein. The dogs 26 operate in slots formed in a throat plate 26', having a main slot 27' to receive the needle and tufts. This dog carrying plate is operated by rock shafts 29, in turn operated by the main drive shaft 24. The work feed means including the dogs and the operating means for the dogs is substantially the same as that shown in Figure 5 of Patent 2,314,339 and will not be described further in detail. The numeral 30 designates a bobbin or center rock shaft pivotally supported at its ends by pins 31 and 32, carried by fixed brackets 33 and 34 respectively. The shaft 30 also passes through a bearing 34' formed upon a fixed bracket 35. The rock shaft 30 is driven from the shaft 24 by connecting means including a crank 36. The same means for connecting the shaft 24 with the rock shaft 30 may be employed as is shown in Patent 2,314,339 for connecting the shaft 20 with the rock shaft 46; any other suitable means may be used for connecting the rock shaft 30 with the shaft 24, of applicants' construction.

As more clearly shown in Figures 8 and 10, the numeral 37 designates a vertical reciprocatory presser foot bar, slidable at its top in a vertical sleeve 38 which is exteriorly screw threaded to engage within a screw threaded opening formed in a bracket 39, rigidly attached to the top of the head 23 by bolts 40 or the like. The presser foot bar is urged downwardly by a compressible coil spring 41, arranged within the sleeve 38 and engaging the bar 37. By turning the sleeve 38 the tension of the spring may be adjusted. Rigidly

secured to the lower end of the presser foot bar 37 is a forked coupling 42, having a vertical passage 43 so that the sewing operation may be observed. Pivotally mounted upon the lower end of the forked coupling 42 is a presser foot 44, and this presser foot has a slot 45 for the passage of the severed loops. The slot 45 leads into slots 27' and 28. A horizontal bar 46 is rigidly secured to the bar 37 and is rigidly connected with a depending vertical bar 47, the lower end of which is arranged to be engaged and lifted by a cam 48 of a lever 49, pivoted at 50. The numeral 51 designates a vertical reciprocatory needle bar carrying the needle 52. This bar operates through the usual stationary guides or bearings 53 and 54. The needle bar 51 has the thread jerk 55 mounted thereon. The needle bar 51 is reciprocated by means of a link 56, pivotally connected with the crank disk 57, rigidly mounted upon the drive shaft 24. The numeral 58 designates a vertical reciprocatory looper operating bar. This bar 58 is suitably mounted within the guides or bearings 53 and 54. The bar 58 was the original presser foot bar but is now used as an operating bar and the bar 37 has been added, as explained. The block 59 is slidably mounted upon the bar 58 and has pivotal connection with a link 60, which is pivotally connected with the inner end of a crank 62, rigidly carried by the crank disc 57. The inner end of the crank 62 is eccentric with respect to the shaft 24. As stated, the block 59 is slidable upon the bar 58 and a stop block 63 is mounted upon the bar 58 beneath the block 59 and is clamped to the bar 58 by a set screw 64. A block 65 is mounted upon the bar 58 above the block 59 and is spaced from the block 59 when the block 59 engages the block 63 and is secured to the bar 58 by a set screw 66. There is a space between the block 59 and the block 65, to permit of lost motion, for a reason to be described. The block 59 has an opening 67 for receiving a reciprocatory bolt 68, to enter a notch 69 formed in the bar 58. The bolt 68 is biased to move out of the notch 69. When the bolt is projected into the notch 69 the block 59 is locked to the bar 58 and the movement of the block 59 will reciprocate the bar 58 throughout the entire length of the movement of the block 59. The means for operating the bolt 68 will be described later.

The numeral 70 designates a generally inverted U-shaped bracket having a horizontal extension 71 arranged beneath the head 23 and having openings formed therethrough for receiving the presser foot bar 37, needle bar 51, and looper operating bar 58. The extension 71 has a vertical extension 72 which is rigidly clamped to the lower end of the head by a screw 73 or the like. A screw is also previously employed for attaching the horizontal extension 71 to the head 23. A vertically swinging lever 74 is provided having a hub 75 which is pivotally mounted within the bracket 70 by means of pivot elements 76 and 77. The reciprocatory bar 58 has a block 78 clamped thereto and this block has a lateral extension carrying a pin 79, operating within a horizontal slot 80 formed in the lever 74. It is thus seen that the reciprocatory movement of the bar 58 swings the lever 74 upon its pivot. This lever is provided beneath and adjacent to the slot 80 with a depending extension 81, which is slotted, to receive a bolt 82, for securing the arm 83 to the extension 81, so that the arm 83 may be vertically adjusted with relation to the extension 81 and locked thereto in the selected adjusted position. The arm 83 carries the upper looper 85,

detachably secured thereto by screws 86, and the upper looper has an upturned end or hook 87. The lever 74 and associated elements swing the looper transversely with relation to the reciprocatory needle. The numeral 88 designates a lower hub or cylinder which is horizontally arranged beneath the hub 75 and is pivotally mounted within the bracket 70 by means of pivot elements 89 and 90. The hub 88 has a crank 91 rigidly secured thereto and this crank has pivotal connection at its outer end at 92 with a link 93, which in turn is pivotally connected with the outer end of the lever 74 as shown at 94. Rigidly mounted upon the hub or cylinder 88 is a block 95, for receiving a rod 96, clamped therein by a set screw 96'. This rod extends generally radially of the hub 88 and is longitudinally slotted for receiving a blade or cutter 97, clamped in place by a set screw 98. This blade or cutter is suitably resilient and has its free end sharpened and has a shearing action with the looper 85. The looper 85 turns about the pivots 76 and 77, while the blade 97 turns about the pivots 89 and 90, which are eccentric to the pivots 76 and 77. The result is that there is a relative movement between the blade 97 and looper 85 whereby the blade 97 severs the loops accumulated on the looper but leaves one or more of the accumulated loops unsevered.

Rigidly mounted upon the center rock shaft 30 is a block 99, having a groove 100 to receive the shank 101 of a lower looper 102 detachably secured to the shank by screws 103. The shank 101 is vertically adjusted with respect to the block 99 and is clamped to the block by a set screw 104, extending through an elongated slot 105 formed in the block. It is thus seen that the rocking movement of the shaft 30 will swing the looper 102 transversely of the needle. This looper has a depending end or hook 106. An auxiliary rock shaft 107 is pivotally mounted upon the brackets 33 and 35 and has a radial opening 108 for receiving a rod 109 clamped therein by a set screw 110. This rod has a slot 111 for receiving a blade 112, having a cutting edge arranged to have a shearing action with the looper 102. The blade is held in place by a set screw 113 similar to set screw 98. Rigidly mounted upon the auxiliary rock shaft is a crank 114, having pivotal connection at 115 with a link 116, pivoted to a crank 117, at 118. The crank is clamped to the rock shaft 30. The rock shaft constitutes the pivot for the looper while the auxiliary rock shaft constitutes the pivot for the blade, and since these pivots are eccentric there is a relative movement between the lower looper and its blade 112. This causes the blade 112 to sever the accumulated loops upon the looper while leaving one or more unsevered loops thereon.

We will now describe the automatic means which shifts the bolt 68. Extending longitudinally of the arm 22 and arranged exteriorly thereof is a rock shaft 119, see more particularly Figures 2, 4, and 5. This rock shaft is pivotally supported in bearings 120 and 121. At its forward end the rock shaft 119 has a depending crank 122 rigidly secured thereto, and this crank is slotted at 123, for receiving the lateral extension 124 of the bolt 68. Rigidly attached to the rock shaft 119 is an upstanding arm 125, Figure 4, having a block 126 rigidly secured thereto. This block carries a pin 127, detachably rigidly secured thereto by a set screw 127'. The arm 22 has an opening 128 formed therein, receiving a helical gear 129, 75 mounted upon a transverse shaft 130. This

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helical gear engages a worm 131, rigidly mounted upon the drive shaft 24. There is a gear ratio of one to ten between these gears and the worm 131 makes ten complete revolutions to one complete revolution of the helical gear 129. The transverse shaft 130, Figures 1 and 2, is journaled in a bearing 132, formed upon a bracket 133, rigidly secured to the arm 22. The horizontal shaft 130 extends to the exterior of the arm 22 and is provided with a cam disc 134 rigidly secured thereto. This cam disc has a high part 135 which extends for three parts or $\frac{3}{8}$ of the circumference of the cam disc 134 while the face 136 of the cam disc constitutes the low part of the same and extends for seven parts or $\frac{7}{8}$ of the circumference of the cam disc. The arm 125 is swung toward the cam disc 134 by means of a retractile coil spring 137, attached to the upper end of the arm 125 at one end, as shown at 133, and to a fixed part 139 of the bracket, as shown. It is thus seen that the spring 137 causes the bolt 68 to be biased open, that is it will ordinarily move out of the notch 69. The spring 137 swings the arm 125 toward the cam disc 134, and the pin 127 will engage with the high part 135 of the cam disc and then with the low part of the cam disc after moving from the high part.

The operation of the machine is as follows:

When the bolt 68 is in the closed position the block 59 is locked to the upper looper reciprocatory bar 58, as stated. Assuming that this condition exists, we will explain the cycle of operation of the machine. Starting with the needle in the uppermost position, the upper looper 85 is retracted from the path of travel of the needle and the lower looper 102 is also retracted from the path of travel of the needle, Figure 19—A. When the needle begins to move downwardly, the upper looper 85 moves toward the path of travel of the needle and when the eye of the needle travels below the upper looper, the upper looper has entered the loop above the fabric, while the lower looper 102 remains in the retracted position, Figure 19—B. The needle continues to descend and the upper looper remains in the projected position, Figure 19—C, while the lower looper 102 starts to travel toward the needle. When the needle reaches the lowermost position, Figure 19—D, the upper looper 85 remains in the projected position while the lower looper 102 continues to move toward the needle. Just as the needle starts on its upward movement, Figure 19—E, forming its slack in the loop, the lower looper 102 completes its movement across the needle and enters the loop upon the lower side of the fabric, the upper looper still remaining in the projected position. When the needle rises to the half way position, Figure 19—F, the lower looper 102 remains in the projected position while the upper looper 85 is retracted from the needle. When the needle reaches the uppermost position, Figure 19—A, and the lower looper moves to the retracted position, Figure 19—A, thus completing the cycle of operation. It is thus seen that a loop is accumulated upon the upper looper and a loop is accumulated upon the lower looper during each cycle of operation. The blades carried by the upper and lower loopers sever the loops accumulated thereon, but leave one or more unsevered loops. Tufts are therefore formed upon the opposite faces of the fabric, the fabric feeding in an opposite direction to which the loopers face.

Since the pin is now engaging the high part 135 of the cam disc, the arm 125 is positively

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swung outwardly, and the rock shaft 119 turned, so that the bolt 68 enters the notch 69 and locks the block 59 to the reciprocatory bar 58. This locked engagement between the block 59 and bar 58 continues for three cycles or for three revolutions of the drive shaft 24. Three loops are therefore formed above the fabric and three loops formed beneath the fabric. At the end of the third cycle, the pin 127 rides from the high part 135 and engages the lower part of the cam, and the bolt 68 is shifted by the spring 137 to the open position, unlocking the block 59 from the shaft 58, and this occurs when the upper looper is in the retracted position. The upper looper is now rendered idle with respect to entering loops formed by the needle upon the upper face of the fabric while the lower looper continues to enter the loops which are formed upon the lower face of the fabric. This operation continues for seven cycles whereby seven stitches are formed upon the upper face of the fabric and seven loops formed upon the lower face of the fabric, the upper and lower loops are severed in turn. The operation is repeated. As a result, upon the upper face of the fabric there are spaced groups of severed loops, three loops in each group, in a row with stitches between them, Figure 23, while there is a continuous row of severed loops upon the lower face of the fabric. As stated, the upper looper is rendered idle with respect to entering loops upon the upper face of the fabric, but when the block 59 which is now unlocked from the bar 58 moves upwardly, it contacts with the block 65 before the block 59 reaches the end of its travel, and moves the bar 58 for a slight distance, which is not enough to cause the upper looper to enter the loops above the fabric, but is sufficient to effect a slight relative movement between the upper looper and its blade, to complete the severing of accumulated loops upon the upper looper.

Should it be desired to form continuous lines of tufting upon opposite faces of the fabric, the block 59 would remain permanently locked to the bar 58 during the operation of the machine. This could be effected by clamping the block 59 to the bar 58 by means of a set screw 59', whereby the block 59 would not be unlocked from the bar 58 by the action of the spring 137.

The machine may also be adjusted whereby it may make rows of unsevered loops upon one side of the fabric and rows of severed loops upon the opposite side of the fabric. To accomplish this, the blade for the lower looper is omitted and a looper substituted for the present lower looper and the then lower looper would face in the direction in which the work travels so that the unsevered loops would move off of the looper. The machine may be adjusted to form lines of stitching upon the upper face of the fabric and lines of severed loops upon the lower face of the fabric. This is accomplished by permanently unlocking the collar 59 from the bar 58. This could be accomplished by removing the pin 127.

It is to be understood that the form of our invention herewith shown and described is to be taken as a preferred example of the same and that various changes in the shape, size, and arrangement of parts may be resorted to without departing from the spirit of the invention or the scope of the subjoined claims.

Having thus described our invention, what we claim is:

1. In a tufting machine, a work support, work

feed means including a feed dog arranged near the work support, a vertical reciprocatory needle bar for moving a needle to points above and below the work support, an upper reciprocatory looper arranged above the work support for movement toward and from the needle, a lower reciprocatory looper arranged beneath the work support for movement toward and from the needle, drive means connected with the lower looper to continuously operate the lower looper during the operation of the machine and operatively driven in timed relation with respect to the movement of the needle so that the lower looper moves toward the needle and enters the lower loops formed by the needle when the needle is in the lower position, drive means connected with the upper looper to intermittently operate the upper looper and operatively driven in timed relation with respect to the movement of the needle so that the upper looper moves toward the needle and enters the upper loops formed by the needle when the needle is in the raised position and to render the upper looper inactive with respect to entering the loops between the intermittent operations, means including a blade for severing the loops upon the lower looper, and means including a blade for severing the loops upon the upper looper.

2. In a tufting machine, a work support, work feed means including a feed dog arranged near the work support, a reciprocatory needle bar for moving a needle to points above and below the work support, an upper reciprocatory looper arranged above the work support, a lower reciprocatory looper arranged beneath the work support, means to sever the loops upon the upper looper including a blade, means to sever the loops upon the lower looper including a blade, drive means connected with the lower looper to continuously operate the lower looper during the operation of the machine and operatively driven in timed relation with respect to the movement of the needle so that the lower looper moves toward the needle and enters the lower loops formed by the needle when the needle is in the lowered position, drive means connected with the upper looper to intermittently operate the upper looper and including a movable member and a movable element to connect and disconnect the movable member with and from the upper looper, the second named drive means being operatively driven in timed relation with respect to the movement of the needle so that the upper looper moves toward the needle and enters the upper loops formed by the needle when the needle is in the raised position and to render the upper looper inactive with respect to entering the loops between the intermittent operations.

3. In a tufting machine, a work support, work feed means including a feed dog arranged near the work support, a reciprocatory bar for moving a needle to points above and below the work support, a drive shaft, a crank disc mounted upon the drive shaft, a link pivotally connecting the crank disc and reciprocatory bar, a crank mounted upon the crank disc for rotation therewith, a second reciprocatory bar arranged near the first named bar, a link pivotally connecting the crank and second bar, an upper reciprocatory looper arranged above the work support and connected with the second named bar to be moved thereby, a lower reciprocatory looper arranged beneath the work support and driven from the drive shaft,

means including a blade to sever the loops from the upper looper and means including a blade to sever the loops from the lower looper.

4. In a tufting machine, a work support, work feed means including a feed dog arranged near the work support, a power shaft, a crank disc mounted upon the power shaft, a reciprocatory bar for moving a needle to points above and below the work support, a link pivotally connecting the reciprocatory bar and crank disc, an upper reciprocatory looper for co-action with the needle, a second reciprocatory bar disposed near the first named reciprocatory bar, a drive member slidably mounted upon the second bar, a crank element carried by the crank disc, a link pivotally connecting the member and crank element, a bolt to lock the member to the second bar, a rock shaft, operative connecting means between the rock shaft and bolt, an arm connected with the rock shaft, a cam element driven from the power shaft and having a high part and a low part, an element carried by the arm for engagement with the cam, a spring to move the arm toward the cam, a lower reciprocatory looper arranged beneath the work support, drive means operated by the power shaft and connected with the lower looper to move it, means including a blade to sever the loops upon the upper looper, and means including a blade to sever the loops upon the lower looper.

5. In a tufting machine, a work support to receive fabric thereon, a head arranged above the work support, work feed means including a feed dog arranged near the work support to feed the fabric, an upper reciprocatory looper arranged near and above the work support, a lower reciprocatory looper arranged near and beneath the work support, an upstanding reciprocatory needle bar mounted upon the head and carrying a needle having an eye, a crank disc connected with the head, a link connecting the crank disc and needle bar, a second upstanding reciprocatory bar mounted upon the head, driving connecting means between the crank disc and second reciprocatory bar, driving connecting means between the second reciprocatory bar and the upper reciprocatory looper and timed in operation with respect to the movement of the needle bar to cause the upper looper to enter the upper loop when the needle bar is in the raised position, and driving means connected with the lower looper and timed in operation with respect to the movement of the needle bar to move the lower looper into the lower loop when the needle is in the lowered position.

ROBERT H. BRADWELL.
JOHN D. BROCK.

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