Sept. 26, 1944. W. B. PATEY 2,359,050

MULTIPLE NEEDLE SKIP-STITCH MACHINE

Filed Nov. 6, 1942 3 Sheets-Sheet 1

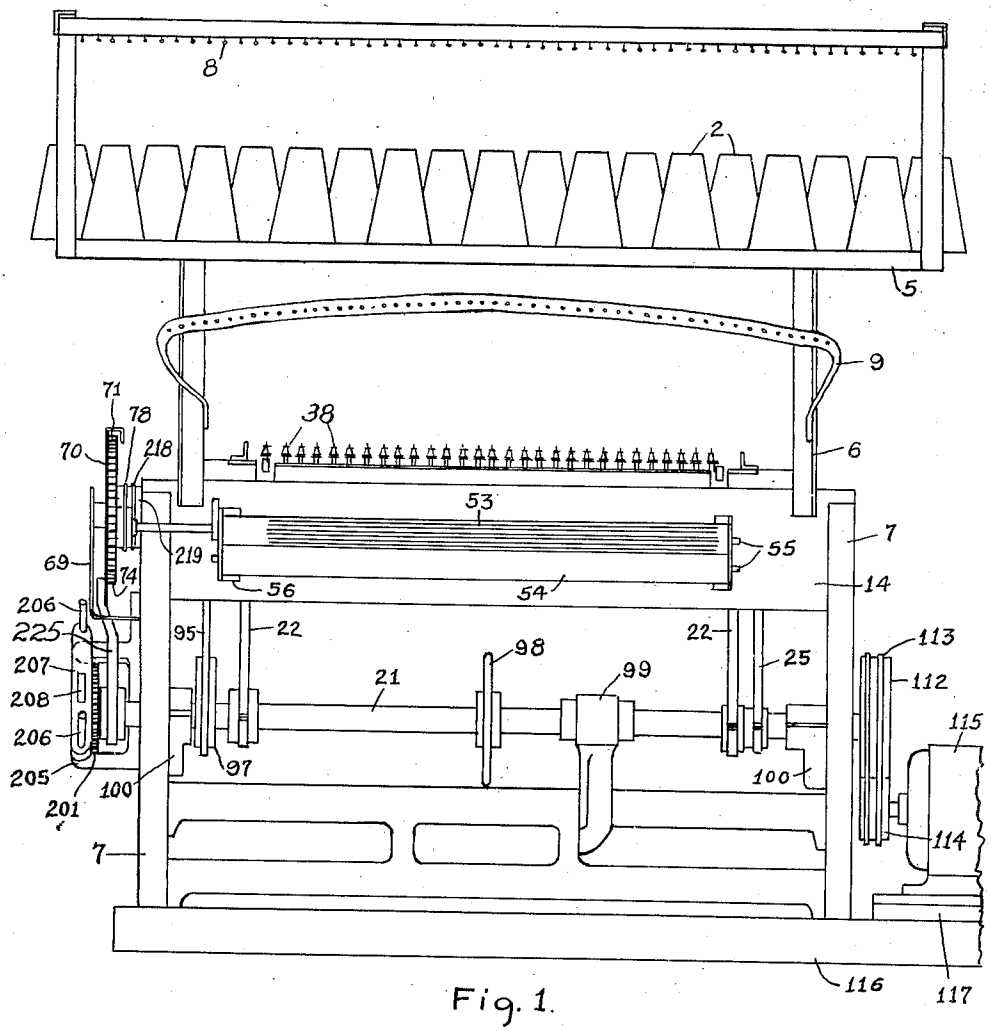


Fig. 1.

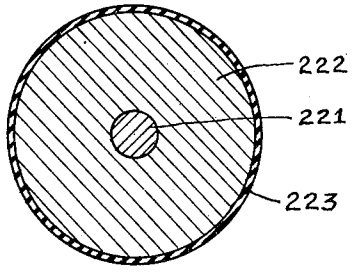


Fig. 2.

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Filed Nov. 6, 1942 3 Sheets-Sheet 2

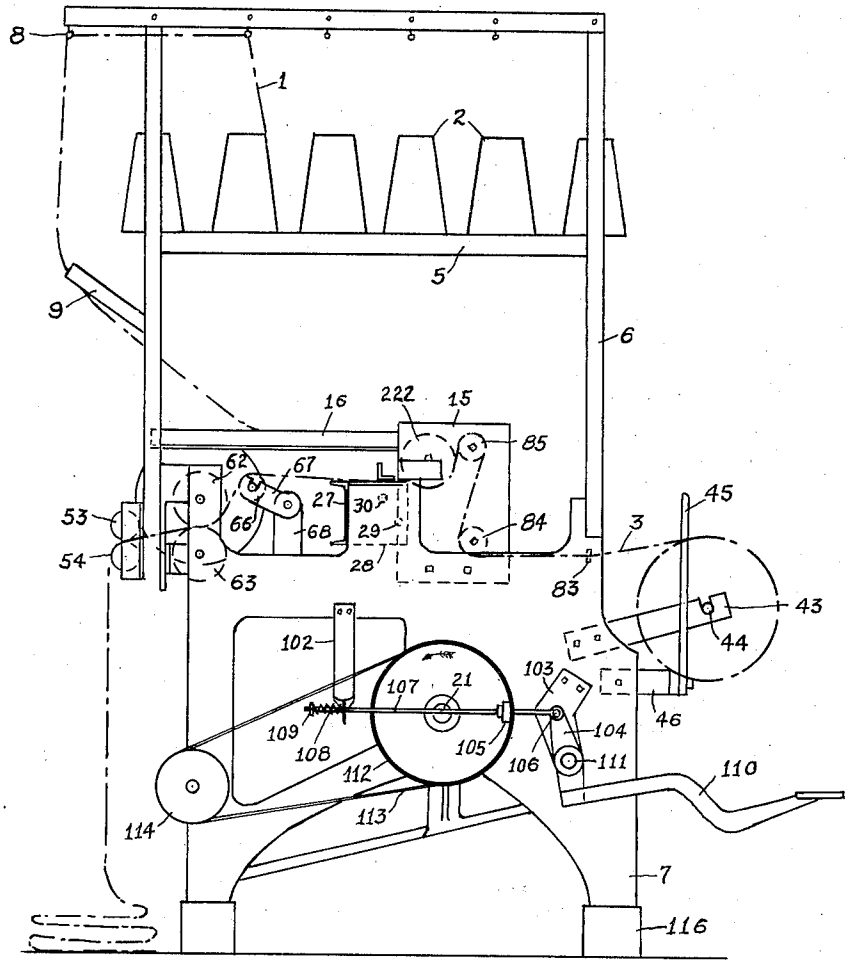


Fig. 3.

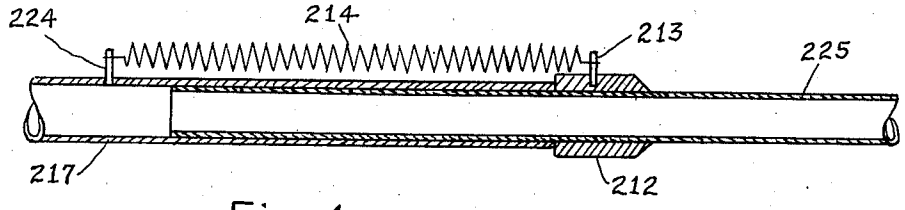


Fig. 4.

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Filed Nov. 6, 1942 3 Sheets-Sheet 3

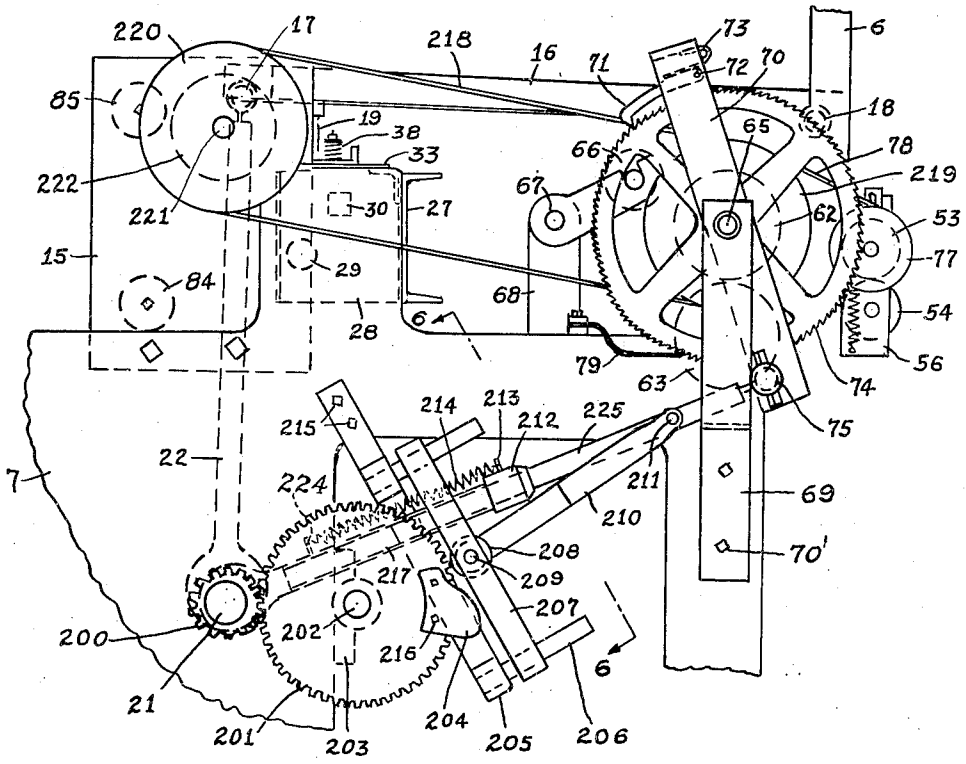


Fig. 5.

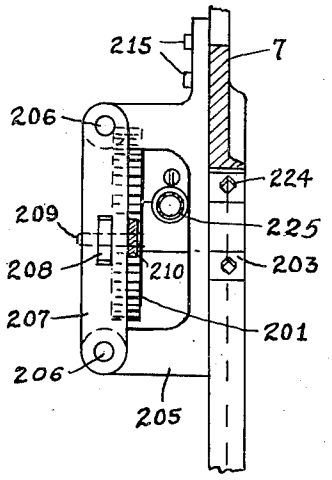


Fig. 6.

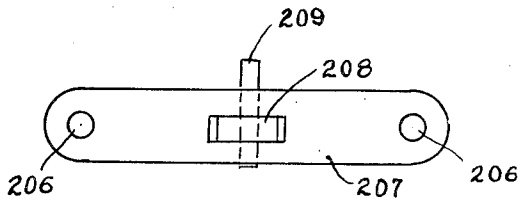


Fig. 7.

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UNITED STATES PATENT OFFICE

2,359,050

MULTIPLE NEEDLE SKIP-STITCH MACHINE

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Application November 6, 1942, Serial No. 464,803

10 Claims. (Cl. 112—205)

My invention relates to tufting machines and more particularly to tufting machines of the multiple needle, skip-stitch type for simultaneously forming rows of spaced tufts on relatively long sections of cloth as it progressively passes through the machine and constitutes an improvement over the machine disclosed in my Patent No. 2,352,153, dated June 20, 1944.

It is an object of the invention to provide a multiple needle skip-stitch machine having an improved feed mechanism which will at intervals move the cloth a distance of several stitches without disabling or rendering inoperative the needle carriage and without interference with its operation.

A further object of the invention resides in providing a ratchet mechanism for rotating the feed rolls of the machine having a main reciprocating arm for actuating the mechanism to turn the rolls and move the cloth a pre-determined distance, and an auxiliary reciprocating arm associated with said main arm and intermittently operated, said auxiliary arm having a longer stroke whereby the rolls are turned to move the cloth a greater distance.

Other objects and advantages of my invention will appear from the following specification and accompanying drawings and the novel features thereof will be pointed out in the annexed claims.

In the drawings Figure 1 is a rear elevation of my improved tufting machine. Figure 2 is a cross section of my improved feed roller and its shaft. Figure 3 is an end elevation of my improved machine showing the cloth and the thread passing therethrough. Figure 4 is a detail of my improved actuating rod for the feed mechanism of my machine. Figure 5 is a fragmental end elevation of my improved machine showing the feed actuating mechanism for producing the skip-stitch effect by moving the cloth a distance of several stitches at intervals during the operation of the machine. Figure 6 is a sectional view of my improved feed mechanism taken along the line 6, 6 of Figure 5. Figure 7 is a detail plan view of a feed actuating member of my improved machine.

Referring to the drawings in detail 7 designates the frame of my improved machine and may conveniently be the frame of a conventional loom which has been converted. This frame may be of structural steel and may have base members 116, 116 which join the ends 7, 7 of the frame. Mounted on each end of the base elements 116, 116 and bridging them is a supporting base 117 for an electric motor 115. This motor may be of the conventional type, that is, a single, double or triple phase induction motor or an appropriate D. C. motor. Of course, the conventional electrical leads or conductors (not shown) pass from a source of electrical energy to the motor. The motor has adjacent one of its ends a shaft extension and pulley 114 mounted on such extension and having one or more grooves for coaction with the belts or other appropriate means. Mounted intermediate the frame and bridging its ends is a central drive shaft 21 journaled in appropriate bearings 100, 100 mounted preferably on the inner faces of the ends 7, 7 of the frame. Shaft 21 extends beyond either end thereof and mounted on one end is a pulley 112 having grooves therein for cooperation with V belts 113 bridging the pulley on the motor 115 and the pulley 112 on the machine. The shaft 21 is also supported intermediate its ends in a bearing 99 on the end of an arm extending upwardly from side members of the frame. Mounted on and intermediate of drive shaft 21 is a hand wheel 98 for turning the drive shaft manually, and independent of the motor 115, primarily for use when threading up the machine.

Positioned on an intermediate portion of the frame and adjacent the top thereof is a U shape angle iron or channel element 27 which bridges the ends 7, 7 of the frame. A throat plate 33 is attached to the angle iron 27. Positioned beneath the throat plate 33 and mounted on the plates 28 at either end of the machine are rock shafts 29, 30. On shaft 29 is mounted the conventional looper and on shaft 30 is mounted the conventional cutter. Likewise the cutter shaft may be actuated from the looper shaft by the conventoinal link arrangement. Such an arrangement is disclosed in my prior patent as identified above, and such a combination is conveniently shown in Bradwell 2,241,113. Shaft 29 receives its movement through a connecting rod 25 extending from the main drive shaft 21 of the machine, and may be joined to the shaft 29 through any arm and conventional joint such as a ball and socket joint disclosed in detail in my prior patent.

Positioned over the bed plate 33 of the machine is a needle carriage 16 made up of a structural frame work of pieces extending longitudinally and transversely which are preferably of angle iron construction. Mounted on the lower front edge of the carriage are a series of conventional needle sockets for the reception of needles 19 in spaced relation. These needles span

the entire front of the carriage and are coextensive with the width of cloth to be operated upon. Also appropriate thread guide openings may be made in the members of the carriage for the passage of thread to the needles.

Mounted on the inner faces of the front ends of the carriage frame 16 in sockets carried thereby are balls 17, 17 which balls coact with these sockets in the movement of the carriage. The balls 17, 17 are rigidly mounted on the ends of connecting rods 22 which extend upwardly from the main drive shaft 21 of the machine. On the rear of the carriage 16 and serving to mount it are sockets and balls 18. The balls 18 are rigidly mounted on the carriage 16 and coact with and are received in sockets carried by the rear uprights, extensions of the frame. This permits the carriage to rock about balls 18, 18 as an axis so that the needles 19 mounted on the front thereof are moved in an arcuate path.

As indicated above the connecting rods 22 extend from the carriage 16 down to the main drive shaft 21 and it is pointed out that the lower end of each connecting rod 22 terminates in a socket which is disposed about cams on the drive shaft and they act to reciprocate the rods 22, 22 and the carriage is rocked or swung about its pivots in the well known manner of an eccentric.

Mounted in advance of and positioned above and below the bed plate of the machine are a plurality of spreader rollers 84, 85 and a feed roller 222. The former rollers preferably have a plurality of spiral ribs extending outwardly towards each end thereof from the center. These rollers are preferably cylindrical in configuration and roller 85 receives its power from roller 84, being connected thereto through a belt, preferably in the manner indicated in my previous patent. It is also preferred that the belt leading to pulley 85 be reversed or crossed in order to drive that roller in the opposite direction to that of roller 84. Roller 84 in turn receives its power from a pulley on the main drive shaft 21 and is connected thereto through an appropriate belt, which detail is well brought out in my patent. On the other hand roller 222 mounted on extension 15 of the frame by shaft 221 is driven from pulley 220 which in turn derives its power from feed shaft 65 and pulley 219 mounted thereon and operatively connected to pulley 220 by belt 218.

Mounted on the opposite end of drive shaft 21 from that of the driving pulley 112 is a cam for normally actuating the feed mechanism to be hereinafter described. Rearwardly of the bed plate of the machine and in substantially vertical alinement and extending across the machine are upper and lower feeder rollers 62, 63. The lower roller 63 is mounted on a shaft carried by frame 7 of the machine but may be adjusted towards and away from the upper roller by any appropriate means. The upper roller is mounted at one end in the frame 7 and at the other end its shaft 65 is carried by an angle bracket 69 having a lower end secured through stud 70' to the frame and the upper end extending outwardly from the frame 7. This provides clearance for movement of the arm 225 which actuates cross member 70. These various rollers are all similar to that shown in Figure 2 wherein a metal base 222 has a metal surface coated with a coating of rubber 223. This gives these rollers better adherence to cloth which they are moving through the machine. Mounted on the shaft 65 adjacent the standard or bearing 69 is a pivoted cross member 70. The lower end of the member 70 is slotted or grooved to receive the pivot pin 75 in adjusted relation in order to somewhat vary the length of the stroke. Mounted pivotally by pin 72 on the upper end of cross member 70 is a pawl 71 which is actuated into contact with the teeth of a ratchet wheel 66 in the usual manner by a spring 73 set in the inner face of the cross arm adjacent its upper end. The sprocket wheel 66 is mounted on the shaft 65 adjacent the cross-arm 70 and is keyed or otherwise secured directly to the shaft. A resilient finger 79 is mounted on the frame 7 by a stud or other appropriate support which tensions the resilient finger 79 against the ratchet wheel 66 to retard its movement, and act as a brace in the usual and well known manner.

Mounted adjacent drive shaft 21 and on one of the ends 7 of the frame in bearing 203 is supplemental shaft 202 which carries toothed disk 201 whose teeth are adapted to mesh with the teeth of gear 200 mounted on the main drive shaft 21. Mounted on the toothed disk 201 is a cam element 204 having studs or other securing means 216 passing therethrough and into disk 201 for securing the cam to the disk. Positioned just above and passing across and just adjacent to the disk 201 is a bracket 205 secured at its upper end through screws or studs 215 to the end 7 of the frame. Projecting upwardly from the bracket 205 are guides 206 upon which member 207 is adapted to reciprocate. Pivotally mounted intermediate its ends is a roller 208 on pivot 209 along with arm 210, which arm 210 is pivotally joined to the expansible arm 225 at 211. The extensible arm 225 is shown at Fig. 4 as carrying a collar 212 intermediate its ends. One end of rod 225 extends into tubular member 217 which coacts at its other end with a cam on shaft 21 to reciprocate it and its mating rod 225 and operate the feeding mechanism through cross arm 70. Pin 224 mounted on rod 217 and pin 213 mounted on collar 212 have bridging them a tension spring 214 which tends to urge the collar 212 and the end of tubular member 217 into intimate engagement.

Mounted rearwardly of the initial feed rollers 62, 63 and carried by extensions of the frame are additional feed rollers 53, 54 mounted in vertically alined adjusted relation. These rollers as in my prior patent are mounted on flanged plates, which flanges are secured adjacent their upper ends to extensions of the frame. The lower plain surface roller 54 is mounted on a shaft or otherwise bridges the aforesaid plates. The upper roller 53 has a knurled or roughened outer surface. It is mounted on a shaft which preferably projects some distance beyond the roller at one end. The upper shaft passes through slots in the supporting bracket and is journaled on either end on blocks. The extending free end of the upper shaft has a pulley 77 mounted thereon, which pulley is joined through belt 78 to a pulley on shaft 65, which latter pulley is positioned adjacent the ratchet wheel 74 or if desired can coact with pulley 219 which drives pulley 220. Mounted on either end 7 of the frame is a standard 68 carrying a pivoted arm 67 for adjustment to any desired or appropriate position. Formed in the upper edge of each arm 67 is a groove which serves as a bearing for supporting a roller or stationary cloth guide 66, bridging the space therebetween.

Extending upwardly from the frame 7 at its corners are four uprights or extensions 6, 6 having a supporting structure 5 made of fabricated

steel or other appropriate material for supporting various cones of yarn 2. Additional members extend upwardly from the supporting structure 5 and additional members bridge the upper ends of these extensions and extend on beyond them at the rear of the machine as shown in Fig. 3. To these cross members are secured a series of pins or looped guides 8 for directing the removal of the thread or yarn from the cones 2. Mounted on the uprights 6, 6 intermediate their ends is a bowed thread guide 9 of relatively thin material having a great many openings therein for the passing of yarn.

Mounted forwardly of the frame 7 on projecting arms 43 is a roll of fabric or backing. Passing through the roll of backing is a shaft 44 having portions thereof seated in grooves of the arms 43. Extending upwardly from one side of the frame adjacent one of the arms 43 is a lever 45 pivotally mounted on a bracket 46 on frame 7 to move longitudinally of shaft 44. This lever is for the purpose of moving the shaft 44 and is joined to it intermediate its ends but this feature constitutes no part of this invention and is covered in applicant's previous patent.

Mounted on the frame adjacent the roll of cloth 3 are guides 83, 83 which project inwardly from ends 7 of the frame above and below the cloth for limiting the upward and downward movement thereof, and the other usual guides are also employed.

This machine as has already been indicated has a series of loopers and cutters mounted on shafts 29, 30, one each to each needle. It also has a presser foot positioned over the throat plate 33. It is normally tensioned against the throat plate by upstanding studs passing through the presser foot and having compression springs 38 disposed about them and bearing upon the presser foot. The throat plate is made in the usual manner having the enlarged throats as is customary in the tufting art.

For stopping the machine after the power has been cut off an appropriate brake is provided. This brake consists of a foot lever 110 pivotally mounted on a bracket 103 carried on one side of frame 7 by appropriate studs or other means. Pivot pin 111 pivotally mounted on bracket 103 carries an arm 104 which in turn pivotally supports a rod 107 at one end. The rod 107 is also supported by a strap 102 secured to a side of the frame 7 through studs or other means. The end of rod 107 extends through an out turned portion of the strap and the free end of the rod 107 has a compression spring 108 and a nut or washer 109 thereon. Rigidly mounted on the rod 107 is a brake shoe 105 which is adapted to engage and work against the inner surface of the rim or flange of the drive pulley 112.

Special attention is directed to Figs. 6 and 7 wherein the bracket 205 and sliding member 207 are shown and the particular mounting for the roller 208 is indicated. This roller is preferably set in a slot in member 207 and the extension of shaft 209 pivotally coacts with member 210. The bracket 205 will also be seen to be of U shape permitting the passage of the rod comprised of the telescoping rods 217, 225. It also shows how bearing 203 is mounted by studs 224 on frame end portion 7.

In its operation the cloth 3 is mounted on the shaft 44 in the form of a roll. Cones of yarn, one to each needle, positioned on support 5 feed the needles 19. The cloth is threaded through the machine passing between guides 83, 83 under spreader roller 84, over spreader roller 85, under relatively larger spreader roller 222, across the throat plate 33 and under the presser foot, onto and over guide 66, between feed rollers 62, 63 and on between feed rollers 53, 54.

When the switch is closed the electric motor rotates pulley 114 and this in turn rotates pulley 112, and causes them to rotate in a counterclockwise direction as indicated in Fig. 3. This reciprocates the rods 22, 22 up and down and causes the needle carriage to oscillate in an arcuate path, intermittently passing the needles 19 carried thereby through the slots in the presser foot and throat plate 33 and successively piercing the fabric thereon as it is fed across the throat plate. Likewise rod 25 is made to reciprocate and to rock shafts 29, 30 thereby actuating the loopers and cutters in timed relation with the looper. Rods 217, 225 are likewise reciprocated causing the cross arm 70 to be oscillated, and in turn causing the pawl 71 to advance the ratchet wheel 74 as it indexes with the teeth thereof. This intermittently moves the shaft 65 and in turn the pulleys 219, 77, and 220 and this moves the feed rollers 222, 62, 63, and 53, 54 in synchronism, and feeds the cloth. However, during this same time the pinion 200 on shaft 21 is rotating disk 201 and moving the cam 204 towards the roller wheel 208. In the cycle of operations when the cam 204 reaches wheel 208, such wheel rides up its surface and moves the member 207 on the guides 206 causing the arm 210 to move the rod 225 a very long stroke with respect to rod 217 and against spring 214. This causes the cross arm 70 to take several times the swing it normally takes and in turn causes the pawl 71 to move the ratchet wheel over a much greater arc and acting through shaft 65, belts 218, 78 and rollers 222, 62, 63, etc. to move the cloth 3 a distance of several normal stitches on the throat plate 33 of the machine. This causes the machine to skip a space of several stitches before the next stitches are put in, and produces a skip stitch effect. After cam 204 has moved on, spring 214 causes the rod 225 to return to its normal position with the collar 212 resting against the end of tubular rod 217, and the machine continues to operate with normal feed until the cam is brought around again and engages the wheel 208.

In their cycle and upon reaching the lowermost postion of their stroke the needles 19 start their upward travel and ascend from the cloth. As is usual in these tufting machines the loopers pass between the needles and their respective strands and catch and hold the strands as the needles pass back up out of the fabric to form loops. The knives then come up and sever the loops on the looper. The machine may either be adjusted to accumulate loops on the looper in the well known manner or it may cause the loops to be severed as they are formed on the looper. This, of course, is not an important feature of applicant's invention, since already old and well known in the art.

In this machine it is ordinarily desirable to use a great many needles, preferably at least 57 in number, and their spacing is ordinarily from one-half to five-eighths inch apart, although this may be altered to meet the situation at hand.

As raised portions of cloth or tufts pass between the feed rollers, and particularly the last set, they move apart and facilitate the passage of such enlarged portions.

It will be understood that the timing of the skips in stitches may be altered by changing the

ratios between the gears 200 and 201, and that the extent of the skip or the spacing between sets of stitches may be changed by changing the size and/or position of the cam 204.

It will also be understood that in moving the roll of cloth endwise for compensating for irregularities in the cloth and also in the wrapping, lever 45 is swung about its pivot on bracket 46, causing the shaft 44 to be moved lengthwise. This, however, is described in detail in my prior patent.

If it is desired to operate this machine in the normal manner without producing skip stitch work, either the cam 204 or either of the gear wheels 200 or 201 may be removed. The cam 204 may be removed by simply removing the studs 216 or slipping off the gears 200, or 201 from their shafts, or the supplemental shaft 202 may be removed, and this can be done by removing studs 224.

Having thus described my invention, I claim:

1. A skip-stitch mechanism for tufting machines including cloth feeding rolls, a ratchet mechanism mounted on the shaft of one of the rolls, a reciprocating arm for actuating said ratchet mechanism to move the cloth a pre-determined distance, said arm having an extensible section connected to the ratchet mechanism and an auxiliary reciprocating member connected to the extensible section of said reciprocating arm and having a longer stroke than said arm.

2. A skip-stitch mechanism for tufting machines including cloth feeding rolls, a ratchet wheel mounted on the shaft of one of the rolls, a movable pawl for turning said ratchet wheel, a reciprocating member for actuating said pawl having an extensible section, and an auxiliary reciprocating member connected to the extensible section of said reciprocating member, said auxiliary reciprocating member having a longer stroke than the first-mentioned reciprocating member.

3. A skip-stitch mechanism for tufting machines including cloth feeding rolls, a ratchet wheel mounted on the shaft of one of the rolls, an oscillating member mounted adjacent said ratchet wheel, a pawl carried by said oscillating member for operative engagement with said ratchet wheel, an extensible reciprocating arm connected to said oscillating member, and an auxiliary reciprocating member connected to the extensible section of said reciprocating arm, said reciprocating member having a longer stroke than the reciprocating arm.

4. A skip-stitch mechanism for tufting machines including cloth feeding rolls, a ratchet mechanism for turning said rolls, a reciprocating arm for actuating said ratchet mechanism intermittently, said arm being composed of telescoping sections, and an auxiliary reciprocating member connected to the section of said arm connected to the ratchet mechanism, said auxiliary reciprocating member having a longer stroke than said reciprocating arm.

5. A skip-stitch mechanism for tufting machines including cloth feeding rolls, a ratchet wheel for turning said feed rolls, a reciprocating pawl for turning said ratchet wheel, a reciprocating arm for driving said pawl composed of telescoping sections, and an auxiliary reciprocating arm connected to the section of said main arm connected with the pawl, said auxiliary arm having a longer stroke than said main arm.

6. A skip-stitch mechanism for tufting machines including cloth feeding rolls, a ratchet wheel for turning said feed rolls, a reciprocating pawl for turning said ratchet wheel, a drive shaft having an eccentric mounted thereon, a reciprocating arm composed of telescoping sections, one section being connected to the eccentric on said drive shaft and the other section having connection with said pawl, and an auxiliary reciprocating arm having one end connected to section of said main arm connected with the pawl, said auxiliary reciprocating arm having a longer stroke than said main arm.

7. A skip-stitch mechanism for tufting machines including cloth feeding rolls, a ratchet wheel for turning said feed rolls, a reciprocating pawl for turning said ratchet wheel, a drive shaft having an eccentric mounted thereon, a reciprocating arm composed of telescoping sections, one section being connected to the eccentric on said drive shaft and the other section having connection with said pawl, an auxiliary reciprocating arm having one end connected to the section of said main arm connected with said pawl, and means for intermittently imparting a longer stroke to said auxiliary arm than the stroke of said main arm.

8. A skip-stitch mechanism for tufting machines including cloth feeding rolls, a ratchet wheel for turning said feed rolls, a reciprocating pawl for turning said ratchet wheel, a drive shaft having an eccentric mounted thereon, a reciprocating arm composed of telescoping sections, respectively connected to the eccentric on said drive shaft and said pawl, expansible means normally holding said sections together, and an auxiliary reciprocating arm having a longer stroke than said main arm connected to the section of the main arm connected to said pawl.

9. A skip-stitch mechanism for tufting machines including a cloth feeding roll, a ratchet wheel for turning said roll, a reciprocating pawl for turning said ratchet wheel, a drive shaft having an eccentric mounted thereon, a reciprocating arm composed of telescopiing sections, respectively connected to the eccentric on said drive shaft and said pawl, extensible means normally holding said sections together, an auxiliary reciprocating arm connected at one end to the section of said main arm connected to said pawl, and means driven by said drive shaft for intermittently imparting a longer stroke to said auxiliary arm than the stroke of said main arm.

10. A skip-stitch mechanism for tufting machines including a cloth feeding roll, a ratchet wheel for turning said roll, a reciprocating pawl for turning said ratchet wheel, a drive shaft having an eccentric mounted thereon, a reciprocating arm composed of telescoping sections, respectively connected to the eccentric on said drive shaft and said pawl, extensible means normally holding said sections together, an auxiliary reciprocating arm connected at one end to the section of said main arm connected to said pawl, and a cam wheel connected with said drive shaft for intermittently driving said auxiliary arm at a longer stroke than said main arm.

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