Nov. 27, 1945. J. S. KILE 2,389,914

MACHINE AND METHOD FOR MAKING TUFTED ARTICLES

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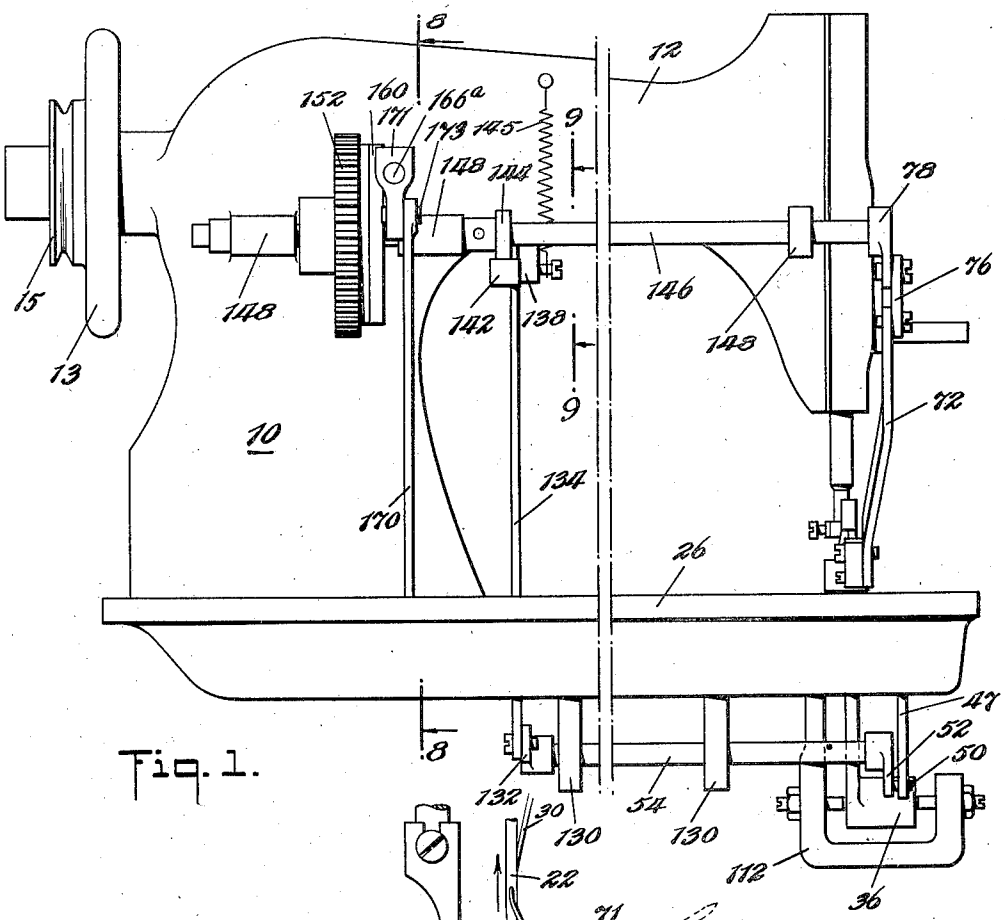


Fig. 1.

Fig. 6.

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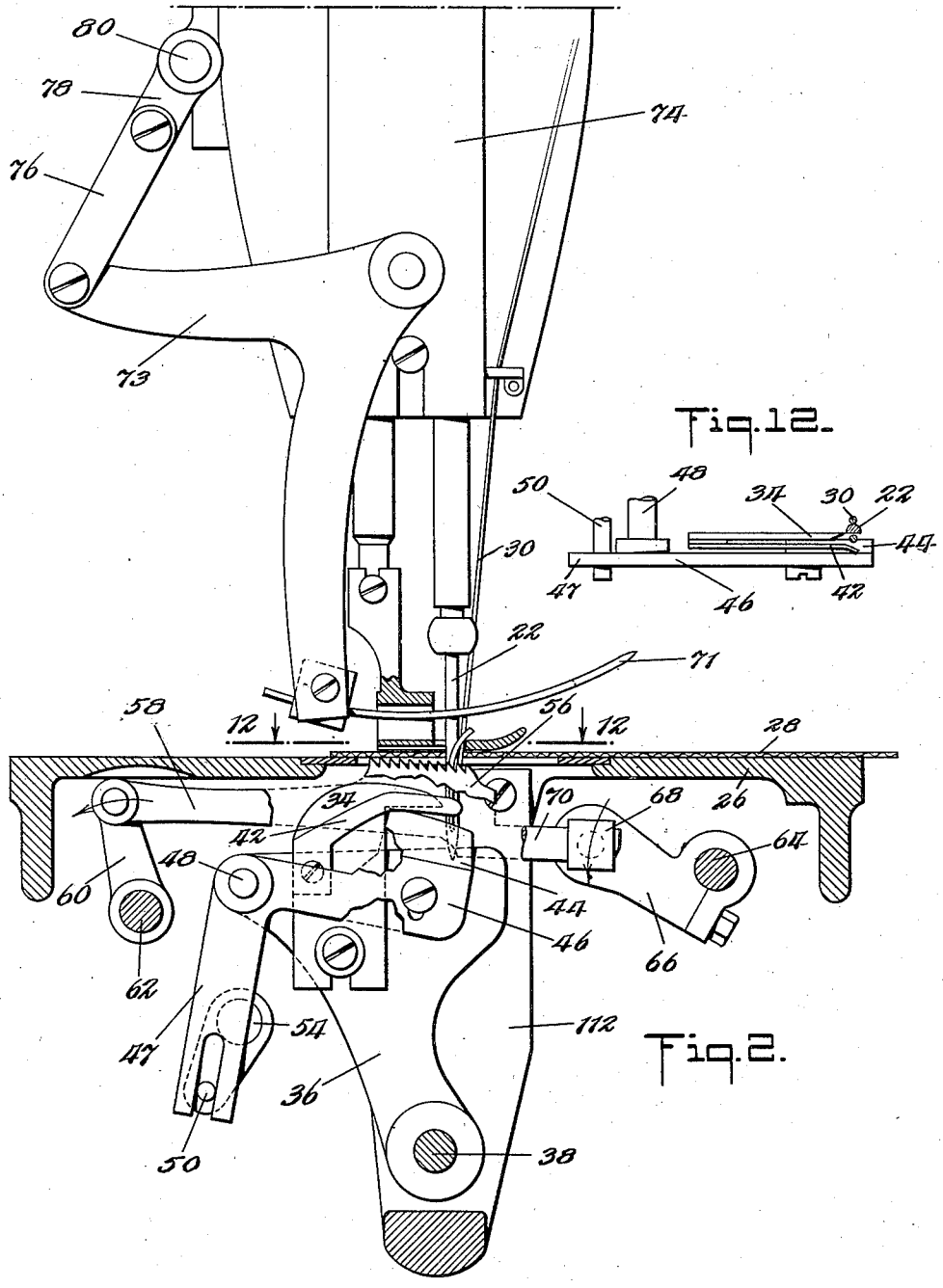


Fig. 12.

Fig. 2.

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Fig. 3.

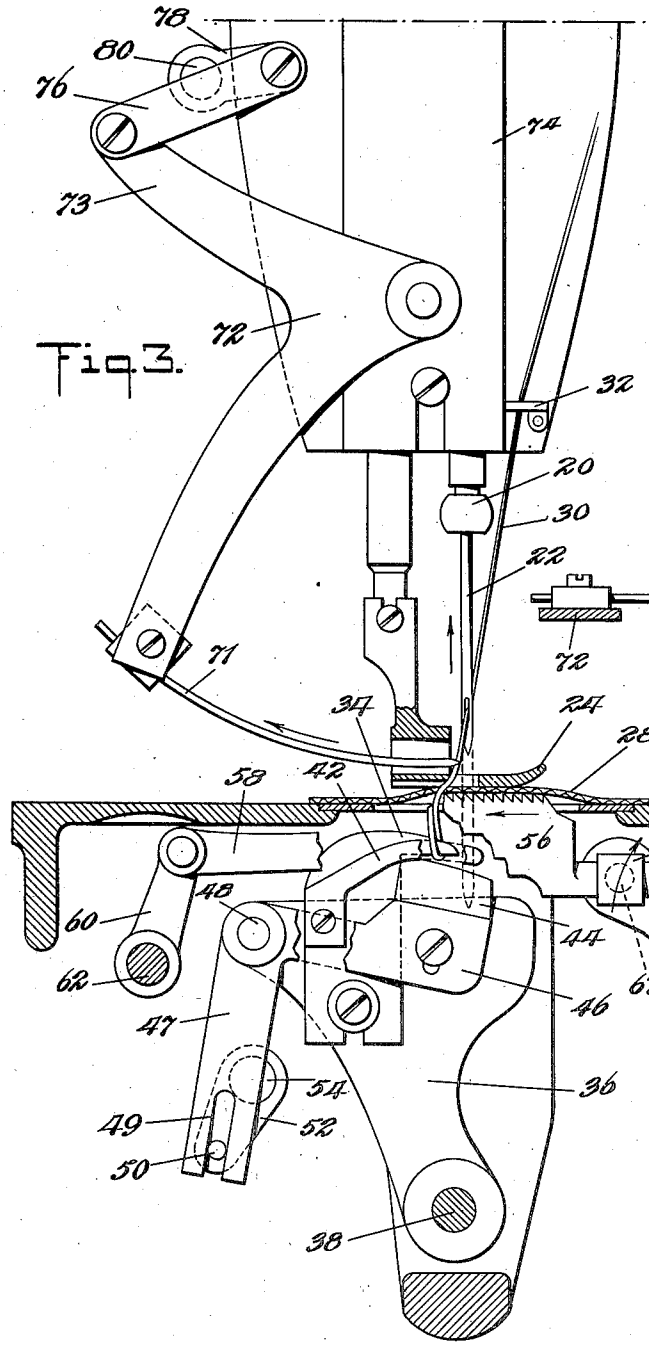
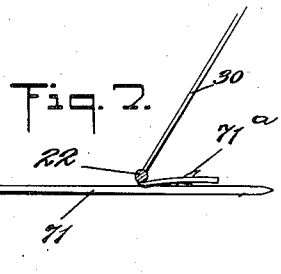


Fig. 2.



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Fig. 4.

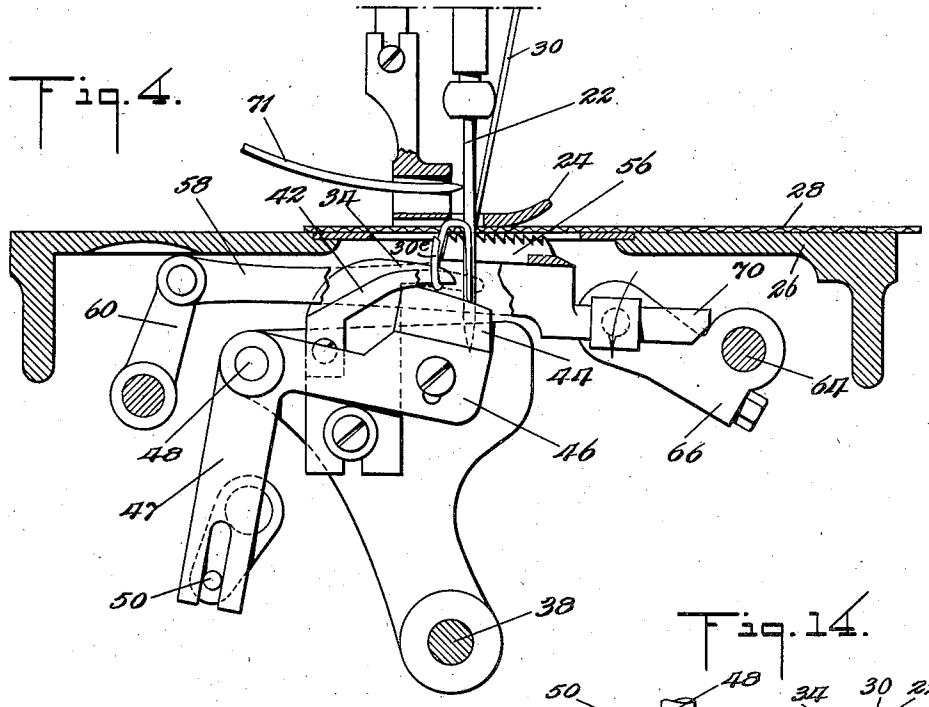


Fig. 14.

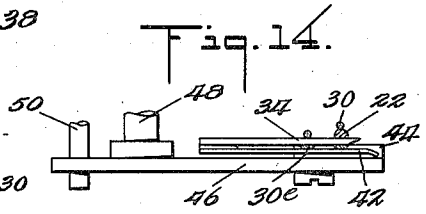
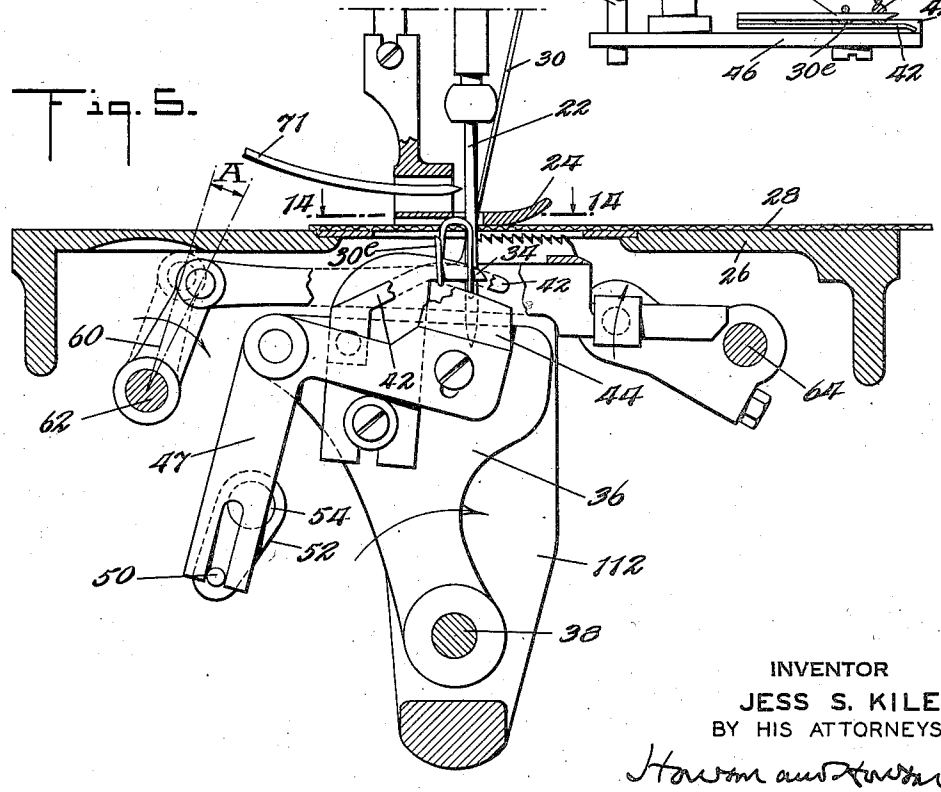


Fig. 5.



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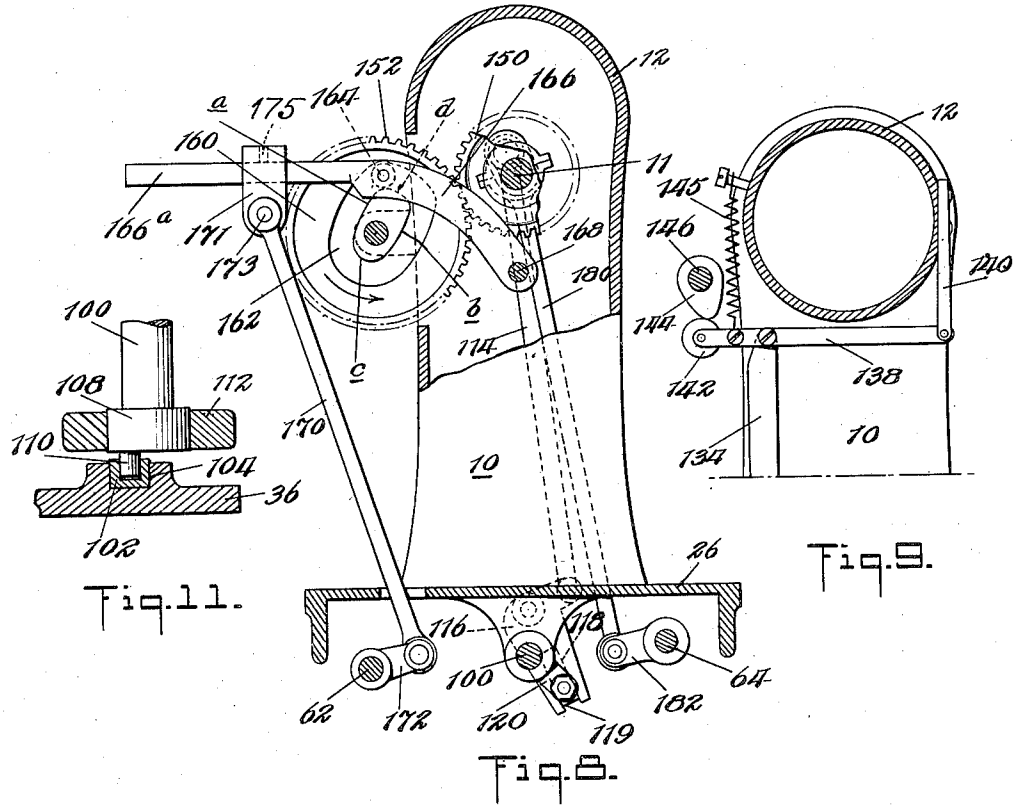


Fig. 8.

Fig. 9.

Fig. 11.

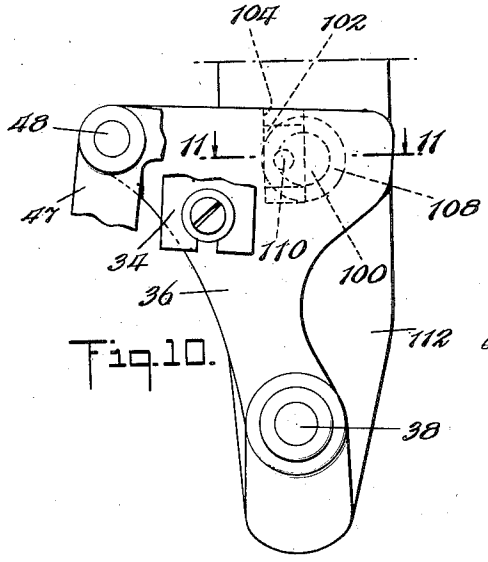


Fig. 10.

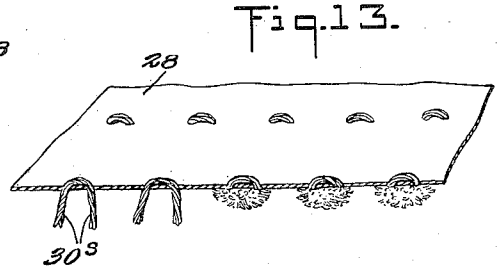


Fig. 13.

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UNITED STATES PATENT OFFICE

2,389,914

METHOD AND MACHINE FOR MAKING TUFTED ARTICLES

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Application July 25, 1939, Serial No. 286,462

34 Claims. (Cl. 112—79)

This invention relates to a method and machine for making tufted articles. More particularly it relates to a method and machine for making tufted articles in which the tufts are formed of one or more individual stitches and in which the tufts are or may be spaced from one another.

It is an object of this invention to provide a machine which will automatically form spaced tufts in a fabric.

Another object of this invention is to provide a machine of the foregoing type which is adaptable to forming tufts of one or more stitches.

Another object of the invention is to provide a machine of the foregoing type in which increasing or decreasing the spacing between the tufts may be easily accomplished.

Another object of the invention is to provide a machine of the foregoing type in which on completion of each tuft, withdrawal of the fabric from the machine or the starting of a new tuft or series of tufts is possible without the necessity of cutting the thread of which the tufts are made.

Other objects and advantages of the invention will appear as it is described in connection with the accompanying drawings.

In the drawings—

Fig. 1 is a side elevation view of a machine embodying the principles of my invention, the central portion of the machine being broken away;

Fig. 2 is an end section view of the tufting elements, feed mechanism, and a part of the head of the machine. In this view the parts are in position for the looper to advance and take on the first loop in the process of making a tuft.

Fig. 3 is a view similar to Fig. 2 but with the parts in the position they occupy on completion of the first loop with the needle ready to start on its down stroke for the making of a second loop;

Fig. 4 is a view similar to Fig. 3 but with the parts in position to have the looper advance to take on a second loop;

Fig. 5 is a view similar to Fig. 4 but with the parts in the position they occupy when the looper is taking on a second loop;

Fig. 6 is a view similar to Fig. 5 but with both loops cut and the fabric advanced and thread withdrawn, completing the formation of a tuft;

Fig. 7 is a detail plan view of the needle and the member for withdrawing the thread from the fabric when the machine is in the position of Fig. 6;

Fig. 8 is a vertical section view taken along line 8—8 of Fig. 1;

Fig. 9 is a fragmentary vertical section view taken along line 9—9 of Fig. 1;

Fig. 10 is a fragmentary detail view showing in end elevation the member which carries the looper and cutter, the looper and cutter being broken away for clarity;

Fig. 11 is a horizontal section view taken along line 11—11 of Fig. 10;

Fig. 12 is a detail view on line 12—12 of Fig. 2 showing in plan the relation of the needle, the looper and looper operating parts in the same position they occupy in Fig. 2;

Fig. 13 is a perspective view of a fabric having formed therein tufts comprising single stitches as made by the machine illustrated in Figs. 1 to 12.

Fig. 14 is a detail view on line 14—14, of Fig. 5 showing in plan the relation of the needle, the looper and looper operating parts in the same position they occupy in Fig. 5.

Referring to the drawings, my invention is or may be attached to a Singer sewing machine having a casing of which the conventional hollow standard 10 and overhanging arm 12 support and enclose a main shaft 11 as well as operating mechanism for the tufting elements. The machine is provided with the usual hand wheel 13 and power pulley 15 fixed on the main shaft. Conventional mechanism is provided within the machine casing for reciprocating a needle holder 20 carrying a tufting needle 22 of conventional form. The machine casing may also carry and support a presser foot 24 which may be raised and lowered in the usual manner. The machine is provided with a table 26 across which the fabric 28 may be fed as it is worked upon by the machine. In the machine shown, the needle reciprocates once with each revolution of the hand wheel and main shaft of the machine. The yarn or thread 30 may be threaded through the needle 22 and guided by thread guides such as 32 and may be tensioned by the usual tensioning devices (not shown).

The present invention differs from tufting machines of the prior art in the following respect, among others: the tuft—which may be formed of one or several stitches—is completed by the operation of cutting mechanism (hereinafter to be described) which operates intermittently to cut at one time all of the loops which are to make up one tuft, after all the loops have been formed. Thus each tuft comes into existence as a unit. The machine then goes on to form another tuft

unit, and in doing so provides a space between the tuft just formed and the next one.

The loop forming mechanism

The mechanism by which the tufts are formed comprises a looper 34 which is mounted upon one end of, and is reciprocated by, an arm or carrier 36 whose other end is mounted upon a pivot 38. The reciprocation of the looper is coordinated with the reciprocations of the needle 22 so that when the thread 30 has been carried through the fabric 28 by the needle the looper will move toward the needle and while the needle is at the bottom of its travel the looper will catch or take on the loop of thread and hold it as the needle withdraws from the fabric. To assist the holding of the loops upon the looper, there is provided a spring finger 42 attached to and extending along the looper toward and beyond the point of the looper so that as the looper catches the loop formed by the needle, the end of the thread or yarn will be wedged between the spring arm or loop holder 42 and the body of the looper. It may thus be seen that with each reciprocation of the needle and corresponding movement of the looper, a loop will be formed.

The invention will be described in connection with a machine for forming tufts containing only one stitch which is spaced from its successor and predecessor by a distance in excess of the stitch length.

The looper carrier 36 is operated (see Figs. 8 and 10) by a rocking shaft 100 through a block 102 which slides in a slot 104 in the carrier 36. The block 102 is pivotally mounted on a head 108 on the rock shaft 100 by a pin 110. The head 108 oscillates in a bearing in a post 112 that may be cast as a depending extension from the table 26. This post also carries the pivot 38 about which the looper carrier 36 rocks.

The rocking shaft 100 receives its motion from the main shaft 11 of the machine by means of a crank, to which is connected the upper end of a rod 114 whose lower end is connected to a bell-crank 116 that is pivotally mounted under the hollow standard 10 of the machine. One arm of the bell-crank 116 is slotted as at 118 to receive a block 119 that is pivotally mounted on the end of a crank arm 120 fixed to the rock shaft 100.

As the connecting rod 114 is moved up and down by its crank connection to the main shaft 11, the bell-crank 116 is rocked and with it the shaft 100 through the agency of crank 120 and block 119 sliding in the slotted bell-crank arm.

The cutting mechanism

For the purpose of cutting loops formed upon the looper there is provided cutting mechanism consisting of a cutter 44 mounted upon one arm 46 of a bell crank which may be pivotally mounted upon the looper carrier 36 by a pivot pin 48 taking into the looper carrier 36. In order to operate the cutter the other arm 47 of the cutter-carrying bell-crank 46 may be provided in its end portion with a slot 49 in which may work a pin 50 mounted upon a rocking arm 52. The rocking arm 52 is caused to rock by being fixedly mounted upon a rock shaft 54. The shaft 54 may be caused to operate only when a predetermined number of stitches or loops have been formed on the looper 34.

For rocking the shaft 54 the following mechanism is provided as may be seen by referring particularly to Figs. 1, 2, 8 and 9. The shaft runs lengthwise of the machine and is supported in bearing brackets 130 depending from the machine table 26. On the left end (see Fig. 1) of the shaft a crank 132 is affixed and is pivotally connected to the lower end of a connecting rod 134 whose upper end is pivoted by a pin to a cam operated lever 138. Lever 138 extends transversely of the machine, being pivoted at its right end (see Fig. 9) to a bar 140 affixed to the machine casing and being provided at its left end with a cam roller 142. Cam 144 operates the cutting mechanism. This cam is fixed in mid position on a shaft 146 running lengthwise of the machine adjacent the overhanging arm 12 of the machine, and is supported in spaced bearings 148 extending from the side of the machine casing.

The shaft 146 is rotated from the main shaft 11 of the machine through small gear 150 on the main shaft which meshes with a larger gear 152 on the secondary shaft 146. When a one stitch tuft is to be made the gear ratio of gear 150 and 152 will be 1 to 2. When a two or three stitch tuft is to be made the ratio will be 1 to 3 or 1 to 4 respectively.

As the machine operates, gears 150 and 152 rotate the cam 144 at one-half the speed of the main shaft. When the high point of the cam depresses lever 138 and connecting rod 134 to rock the shaft 54 the cutter-carrying bell-crank will be rocked (through the action of crank 52) into the position of Fig. 6, thereby cutting the loops on the looper with a scissor action, the operating edge of the cutter and the lower edge of the looper being sharpened in order to give such action. This action occurs every second reciprocation of the needle because the ratio of gears 150 and 152 causes the needle to reciprocate twice as often as the cutter operates.

The lever 138 may be retracted by a tension spring 145 after being depressed by cam 144. This will withdraw the cutter from the cutting edge of the looper 34. It may here be mentioned that as the cutter 44 moved toward the looper 34 to cut the loops the cutter passed in between the looper and the spring holder 42, pressing the spring holder away from the looper to release the cut or trimmed-off end 30e of the yarn to let it drop into discard as hereinafter described.

The cloth feeding mechanism

In order to feed the fabric 28 as the individual loops which are to form the stitches of a particular tuft are made, a feeding mechanism is provided consisting of a serrated feed dog 56 which is mounted on one end of a reciprocating arm 58 deriving its reciprocating movement from a rocking arm 60 mounted fixedly upon a rock shaft 62. The rock shaft 62 may be caused to rock in such manner that when the individual loops of a tuft are being formed the reciprocations will be equal and comparatively close together so as to form stitches or loops which are comparatively close together; but when the tuft is completed, by the cutting of all of the loops accumulated upon the looper, the rock shaft may give the feed dog an extra long travel so as to provide a space in the fabric between the completed tuft and the tuft subsequently to be formed.

The mechanism for accomplishing variation in the movement of the rock shaft in the travel of the feed dog may comprise a cam 160 attached to one face of the gear 152 (see Fig. 8) and having a cam groove 162 with diametrically opposed

points *a* and *b* equally spaced from the axis of rotation and diametrically opposed points *c* and *d* both farther from the axis than *a* and *b* but point *d* is farther from the axis than *c*. A cam follower **164** on the mid-portion of a bent arm **166** imparts motion to that arm. Arm **166** is pivoted at the right end (Fig. 8) on a fixed pivot **168** within the standard **10** of the machine. The left end of arm **166** is of rod-like cylindrical horizontal form **166***a* on which is adjustably secured a block **171** which is bored so as to be slidable along extension **166***a* and can be permanently fixed in its proper position of adjustment by a set screw **175**. The block is pivotally connected by a pivot pin **173** to the upper end of a rod **170** whose lower end is pivotally connected to a crank **172** on rock shaft **62**. The rock shaft extends lengthwise of the machine and may be supported in suitable bearings beneath the table **26** of the machine.

The construction of the cam groove **162** determines the reciprocative motion of the feed dog **56**. When the arm **166** is raised highest by the coming around of point *d* of the groove, the rock shaft **62** is turned through the maximum angle B in Fig. 6. When the arm is raised by the coming around of point *c*, the rock shaft will be turned through angle A in Fig. 5. The low points *a* and *b* define the same starting point for both angles A and B.

From the foregoing it may be seen that the feed dog is given a long and a short travel. The long travel serves to space the tufts while the short travel determines the stitch length. But, the stitch length and tuft spacing can be varied by adjusting the position of block **171** on rod **166***a*, since moving the block inward will shorten the radius and hence the arc of movement of the block **171**, while moving the block outward will lengthen the arc of movement. These variations will cause corresponding variations in the rocking of the shaft **162** and the travel of feed dog **56**, so that the stitch length and tuft spacing are both varied proportionately.

If the ratio of gears **150** and **152** is changed in case more stitches per tuft are to be made, then the form of the cam groove will also have to be changed to provide two or more spaced points like *c* each followed by a point like *a* and *b*.

As is customary in cloth feed mechanisms, there is provided means to move the feed dog vertically at the proper times so that it will catch the cloth and move it forward when the reciprocations of the dog are to the left in Figs. 2–6 but will not catch the cloth while the dog is moving to the right. The mechanism for accomplishing the vertical movement of the feed dog may comprise a rock shaft **64** on which is fixedly mounted a rocking arm **66**. The rocking arm **66** is swivelly connected to the feed dog **56** by means of a block **68** which is bored to receive a rod **70** formed integrally with and extending horizontally from the feed dog **56**. The block **68** has a bearing pin **67** extending from it perpendicularly to the axis of the rod **70**, into a bearing or hole in arm **66**. Thus as the arm **66** rocks, it carries the sleeve **68** up and down with it and compels the rod **70** and feeder **56** also to move up and down. When the feed dog **56** reaches its extreme right position (see Fig. 5), the arm **66** is thereafter caused to move up. It will stay up while the dog moves to the the left position in feeding the fabric and then the rock arm **66** will rock to lower the feed dog while the feed dog is being moved from left to right. The feed dog is up in Figs. 3 and 6 and down in Figs. 2, 4 and 5.

The rocking shaft **64** extends lengthwise of the machine and derives its movement from the main shaft **11** by means of an accentric on the main shaft. The eccentric works in a bearing in the upper end of a connecting rod **180** whose lower end is connected with a crank **182** on the rock shaft **64**. As the main shaft turns, the eccentric raises and lowers the connecting rod **180** to cause oscillation of the crank **182** and rocking of shaft **64**. The rocking is timed to raise and lower the feed dog **56** with each reciprocation of the needle and feed dog.

Operation

In operation of the machine as thus far described, the cloth is first placed in position while the needle **22** and presser foot **24** are elevated. Then the presser foot is lowered to hold the cloth and the machine operation is started. As the needle **22** descends, it carries the thread or yarn **30** through the cloth forming a loop. Then the looper **34** will move toward the needle and catch the loop formed, and the needle will rise. The raising of the needle will tend to pull the end of the thread around the looper **34** but this tendency will be resisted by the spring loop holder **42** pressing against, and frictionally holding, the end of the loop on the looper. When the needle has withdrawn from the cloth, the feed dog **56** will be in the extreme right position and will then move to the left (see Fig. 3) to feed the fabric one stitch length. Thereupon the needle will again penetrate the cloth forming a second loop. Thus as the needle withdraws from the cloth in completing its second reciprocation, there will be two loops formed upon the looper. Since the described machine is constructed and regulated for forming only one stitch in each tuft, the cutter will be rocked by the rocking arm **52** when the needle has withdrawn from the fabric and two loops will be severed. But, since the end **30E** of the thread, that is to say, the beginning of the first loop, was held simply between the loop holder **42** and looper **34** and was not caught within the cloth, the severing of the first loop is in substance a trimming operation and a short end of yarn will fall down as a waste product, but two cut ends **30S** of yarn will extend downwardly through the fabric forming a tuft (see Figs. 13 and 6). Also extending down through the fabric will be the end of the yarn resulting from the cutting of the second loop but this does not appear in Figs. 6 and 13 since means are provided—as will now be described—to remove the cut end of the yarn from the fabric.

In order to remove this cut end from the fabric, there is provided an arcuate finger **71**, made of stiff wire or thin rod material, which is mounted upon the arm of, and is oscillated by, a bell crank support **72** that is pivoted upon the sewing machine head **74**. This bell crank **72** has a link **76** connected to its other arm **73** by means of which the bell crank is rocked. The link **76** forms a connection between the arm **73** and a rotary arm **78** on the previously described rotating axis or shaft **146**. It will be recalled that in the machine described (that is, in a machine for forming a one stitch tuft) the shaft **146** rotates once for each two reciprocations of the needle so that as the second loop is cut, the arcuate finger **71** will move to the right and will catch the cut end of the yarn or thread and pull it from the fabric, as shown in Fig. 6. For this purpose, a lateral

hook or extension 71ª (see Fig. 7) may be formed on the side of the arcuate finger 71 in proper position to catch the end of the yarn at the proper moment in the movement of the arcuate finger 71.

At this point the feed dog 56 will again be in position at the right in engagement with the under surface of the fabric and will be ready to move to the left on its long travel, as results from movement of the rock arm 60 through the angle B. This long feed of the fabric causes a spacing between the already formed stitch or tuft and the tuft next to be formed in the fabric. As the needle again descends, the sequence of operations just described again takes place, and as the cutter operates after the second reciprocation of the needle in forming the succeeding tuft, the waste end of the yarn is again cut off as the first loop is trimmed, and the cut end of the yarn is pulled from the fabric by the motion of the arcuate finger 71. From the foregoing, it will be apparent that on the completion of any tuft, the fabric may be removed from the machine by raising the presser foot, without the necessity of cutting the yarn with a scissors or knife, since the yarn is already entirely free of the cloth.

From the foregoing it will be apparent that machine and method of forming tufted articles are not limited to the formation of tufts having only one stitch, but are disclosed as applying with equal facility to any variation in number and spacing of the stitches and tufts within the scope of my invention. Many modifications within the scope of my invention will occur to those skilled in the art. Therefore I do not limit myself to the specific embodiments described.

I claim:

1. In a tufting machine, loop forming means including a needle, means to reciprocate said needle uninterruptedly, a reciprocating looper cooperating with said needle, resilient means on the looper adapted to frictionally hold loops on said looper, cloth feeding means, means to operate said feeding means to feed the cloth different distances whereby tufts formed of at least one stitch may be spaced apart by a distance greater than the stitch length, cutting means cooperating with said looper and operative to cut a plurality of loops simultaneously to form a tuft comprised of at least one stitch, and means to withdraw the thread from the cloth after the cutting of the final stitch in forming a tuft.

2. In a tufting machine, loop forming means including a needle, means to reciprocate said needle uninterruptedly, a reciprocating looper cooperating with said needle, resilient means on the looper adapted to frictionally hold loops on said looper, cloth feeding means, cutting means cooperating with said looper and operating to cut a plurality of loops simultaneously to form a tuft comprised of at least one stitch, and means to withdraw the thread from the cloth after the cutting of the final stitch in forming a tuft.

3. In a tuft forming machine, loop forming means including a needle, means to reciprocate said needle uninterruptedly, a reciprocating looper cooperating with said needle, cloth feeding means, means to operate said feeding means to feed the cloth different distances whereby tufts formed of at least one stitch may be spaced apart by a distance greater than the stitch length, cutting means cooperating with said looper and operative to cut a plurality of loops simultaneously to form a tuft comprised of at least one stitch, and means to withdraw the thread from the cloth after the cutting of the final stitch in forming a tuft.

4. In a tufting machine, loop forming means including a needle, means to reciprocate said needle uninterruptedly, a reciprocating looper cooperating with said needle, cloth feeding means, cutting means cooperating with the looper and operative to cut a plurality of loops simultaneously to form a tuft comprised of at least one stitch, and means to withdraw the thread from the cloth after the cutting of the final stitch in forming a tuft.

5. In a tufting machine, loop forming means including a needle, means to reciprocate said needle uninterruptedly, and a reciprocating looper cooperating with said needle, resilient means on the looper adapted to frictionally hold loops on said looper, cloth feeding means, means to operate said feeding means to feed the cloth different distances whereby tufts formed of at least one stitch may be spaced apart by a distance greater than the stitch length, and cutting means cooperating with said looper and operative to cut a plurality of loops simultaneously to form a tuft comprised of at least one stitch.

6. In a tufting machine, loop forming means including a needle, means to reciprocate said needle uninterruptedly, a reciprocating looper cooperating with said needle, cloth feeding means, means to operate said feeding means to feed the cloth different distances whereby tufts formed of at least one stitch may be spaced apart by a distance greater than the stitch length, and cutting means cooperating with said looper and operative to cut a plurality of loops simultaneously to form a tuft comprised of at least one stitch.

7. In a tufting machine, loop forming means including a needle, means to reciprocate said needle uninterruptedly, a reciprocating looper cooperating with said needle, resilient means on the looper adapted to frictionally hold loops on said looper, cloth feeding means, and cutting means cooperating with said looper and operative to cut a plurality of loops simultaneously to form a tuft comprised of at least one stitch.

8. In a tufting machine, loop forming means including a needle, means to reciprocate said needle uninterruptedly, a reciprocating looper cooperating with said needle, cloth feeding means, means to operate said feeding means to feed the cloth different distances whereby tufts formed of at least one stitch may be spaced apart by a distance greater than the stitch length, and cutting means cooperating with said looper and operative to cut a plurality of loops simultaneously to form a tuft comprised of at least one stitch, said cutting means cutting the component parts of the tuft in such manner that all are of equal length.

9. In a tufting machine for making spaced tufts comprised of groups of individual stitches, a needle, a looper cooperating with said needle, means to reciprocate said needle and looper uninterruptedly to form thread loops through a fabric, means holding the end of the thread as the first loop of a tuft is formed, cutting means, and means causing the cutter to operate when all the loops of a given tuft are formed, said cutting means cutting all the formed loops simultaneously to an equal length to form a tuft.

10. In a tufting machine for making spaced tufts comprised of groups of individual stitches, a needle, a looper cooperating with said needle,

means to reciprocate said needle and looper uninterruptedly to form thread loops through a fabric, means holding the end of the thread as the first loop of a tuft is formed, cutting means, means causing the cutter to operate when all the loops of a given tuft are formed, said cutting means cutting all the formed loops simultaneously to an equal length to form a tuft, and means to feed the fabric a distance greater than one stitch length after said cutting means has operated, in order to space successive tufts from one another.

11. In a tufting machine for making spaced tufts comprised of groups of individual stitches, a needle, a looper cooperating with said needle, means to reciprocate said needle and looper uninterruptedly to form thread loops through a fabric, means holding the end of the thread as the first loop of a tuft is formed, cutting means, means causing the cutter to operate when all the loops of a given tuft are formed, said cutting means cutting all the formed loops simultaneously to an equal length to form a tuft, means to feed the fabric a distance greater than one stitch length after said cutting means has operated, in order to space successive tufts from one another, and means to withdraw the thread from the fabric after the last stitch is cut.

12. In a tufting machine for making spaced tufts comprised of groups of individual stitches, a needle, a looper cooperating with said needle, means to reciprocate said needle and looper uninterruptedly to form thread loops through a fabric, means holding the end of the thread as the first loop of a tuft is formed, cutting means, means causing the cutter to operate when all the loops of a given tuft are formed, said cutting means cutting all the formed loops simultaneously to an equal length to form a tuft, and means to withdraw the thread from the fabric after the last stitch is cut.

13. The steps in the method of forming spaced tufts comprised of a group of individual stitches in a fabric, comprising progressively forming a plurality of loops automatically, cutting said loops simultaneously by automatic means and removing the thread from the fabric after cutting the loops.

14. The steps in the method of forming spaced tufts comprised of a group of individual stitches in a fabric, comprising progressively forming a plurality of loops automatically, cutting said loops simultaneously by automatic means, removing the thread from the fabric after cutting the loops and automatically advancing the fabric a distance in excess of the stitch length in order to space the tufts.

15. The steps in the method of forming spaced separate stitches in a fabric comprising progressively forming two loops on a looper, holding the end of the first of said loops beneath the fabric, cutting both loops to form one stitch in the fabric, discarding the held end of said first loop and withdrawing the severed end of the second loop from the fabric

16. The steps in the method of forming spaced separate stitches in a fabric comprising progressively forming two loops on a looper, holding the end of the first of said loops beneath the fabric, cutting both loops to form one stitch in the fabric, discarding the held end of said first loop and withdrawing the severed end of the second loop from the fabric, and advancing said fabric a distance greater than a stitch length to space the just-formed stitch from its successor.

17. In a machine for forming tufts of thread in a fabric, a main drive shaft, a needle, a looper cooperating with the needle to form loops, means operated from said drive shaft for reciprocating said looper, means operated from said drive shaft causing a reciprocation of said needle for each reciprocation of said looper, cutting means, and means operated from said drive shaft for operating said cutter when a predetermined number of loops are on said looper to cut all said loops at once.

18. In a machine for forming tufts of thread in a fabric, a main drive shaft, a needle, a looper cooperating with the needle to form loops, means operated from said drive shaft for reciprocating said looper, means operated from said drive shaft causing a reciprocation of said needle for each reciprocation of said looper, cutting means, means operated from said drive shaft for operating said cutter when a predetermined number of loops are on said looper to cut all said loops at once, and means operating after said loop cutting to withdraw the thread from the fabric preparatory to forming a succeeding tuft.

19. In a machine for forming tufts of thread in a fabric, a main drive shaft, a needle, a looper cooperating with the needle to form loops, means operated from said drive shaft for reciprocating said looper, means operated from said drive shaft causing a reciprocation of said needle for each reciprocation of said looper, cutting means, means operated from said drive shaft for operating said cutter when a predetermined number of loops are on said looper to cut all said loops at once, and means operable from the main shaft to feed the fabric to space the stitches in each tuft substantially equally and to space the tufts apart a distance greater than the stitch length.

20. A machine as claimed in claim 17 wherein in each cycle of operations the needle and looper operate at least two times to form at least two loops and the cutting means operates only once in the cycle to cut all the loops.

21. A machine as claimed in claim 18 wherein in each cycle of operation the needle and looper operate at least two times to form at least two loops and the cutting means operates only once in the cycle to cut all the loops and the thread-withdrawing means operates only once.

22. A machine as claimed in claim 19 wherein in each cycle of operations the needle and looper operate at least two times to form at least two loops, said cutter operating means operating only once in the cycle to cut all the loops, and said spacing means being constructed and arranged to operate, for short spacing during each cycle as many times as the number of stitches in the completed tuft and to operate for long spacing only once in each cycle.

23. In a tufting machine, loop forming means including a continuously operating reciprocating needle and a continuously operating reciprocating looper cooperating therewith, cloth feeding means, means to operate said feeding means to feed the cloth different distances whereby tufts formed of at least one stitch may be spaced apart by a distance greater than the stitch length, and cutting means cooperating with said looper and operative to cut a plurality of loops simultaneously to form a tuft comprised of at least one stitch.

24. In a tufting machine, loop forming means including a continuously operating reciprocating needle and a continuously operating reciprocat-

ing looper cooperating therewith, cloth feeding means, means to operate said feeding means to feed the cloth different distances whereby tufts formed of at least one stitch may be spaced apart by a distance greater than the stitch length, and cutting means cooperating with said looper and operative to cut a plurality of loops simultaneously to form a tuft comprised of at least one stitch, said cutting means cutting the component parts of the tuft in such manner that all are of equal length.

25. The steps in the method of forming spaced tufts in a fabric comprising continuously forming loops, cutting a plurality of loops simultaneously to form a tuft and advancing the fabric a distance equal to at least one stitch length between the cut loops and the loop next to be formed to space one tuft from the next, said advancing taking place without interrupting the continuous formation of loops.

26. The method of forming spaced tufts in a fabric, comprising progressively forming a plurality of loops on a looper, holding the end of the first of said loops, cutting all the loops simultaneously to form a tuft, discarding the held end of the first loop and withdrawing from the fabric the end severed from the last loop, and advancing said fabric a distance greater than a stitch length to space the just-formed tuft from a succeeding tuft.

27. The method of forming spaced tufts in a fabric comprising forming a plurality of regularly-spaced loops in the fabric and cutting the loops, advancing the fabric regular distances while forming the loops, and periodically in a single step advancing the fabric a distance greater than said regular distance to space the tufts.

28. The steps in the method of forming spaced tufts in a fabric comprising forming a plurality of regularly spaced loops in the fabric by continuously operating stitch forming mechanism and cutting the loops, advancing the fabric regular distances while forming the loops, and periodically in a single step advancing the fabric during operation of the stitch forming mechanism a distance greater than said regular distance to space the tufts.

29. In a machine for producing spaced groups of tufts, a support, work feed means, a reciprocatory needle to carry the yarn through the fabric and produce loops, a looper associated with the needle to receive the loops produced by the needle, means to operate the needle and work feed means for producing spaced groups of loops, each group having a plurality of loops which are received by the looper, a cutter associated with the looper, and means operated in timed order with respect to the operation of the needle to cause the cutter to sever the loops upon the looper only after the group of unsevered loops are received by the looper and to then sever all of such unsevered loops at one cycle of operation.

30. The method of producing spaced groups of tufts upon a fabric, comprising feeding the fabric while sewing groups of loops in the fabric and spacing the groups, each group having a plurality of loops, holding the unsevered loops in each group against displacement during the sewing operation and substantially simultaneously severing all the loops in one group before the formation of the loops in the succeeding group.

31. In a tufting machine for making spaced tufts comprised of groups of individual stitches, a needle, a looper cooperating with said needle, means to reciprocate said needle and looper uninterruptedly to form thread loops through the fabric, means to regularly space the loops within each tuft, means to cut said loops, and means periodically to advance the fabric in a single step a distance greater than said regular distance, to space the tufts.

32. In a tufting machine for making spaced tufts comprised of groups of individual stitches, a needle, a looper cooperating with said needle, means to reciprocate said needle and looper uninterruptedly to form thread loops through the fabric, means to regularly space the loops within each tuft, means to cut said loops, and means periodically to advance the fabric between succeeding uninterrupted needle reciprocations a distance greater than said regular distance, to space the tufts.

33. A tufting machine comprising a reciprocating needle, a loop holding member, means supporting said member for swinging movement from a cutting position to a loop receiving position, a loop cutting means carried by said member, said cutting means comprising a pair of angularly related parts, means pivotally mounting one end of one of said parts to said member, a cutting element fixed to the other end of said one part, means engaging an end of the other part and including a cam and spring pressed follower to thereby rock said cutting means relative to said member.

34. A tufting machine comprising a reciprocating needle, a loop holding member below said needle, means supporting said member for swinging movement from a cutting position to a loop receiving position, a loop cutting means carried by said member, said cutting means comprising an elongated substantially horizontal bar, means pivotally mounting one end of said bar on said supporting means, a cutting surface on said bar adjacent the opposite end thereof, a depending bar carried by said first bar, and means engaging said one end of said depending bar and including a cam and spring pressed follower to thereby rock said cutting means relative to said member.

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