Feb. 9, 1937. E. P. SPAINE 2,070,029

THREAD CUTTER FOR SEWING MACHINES

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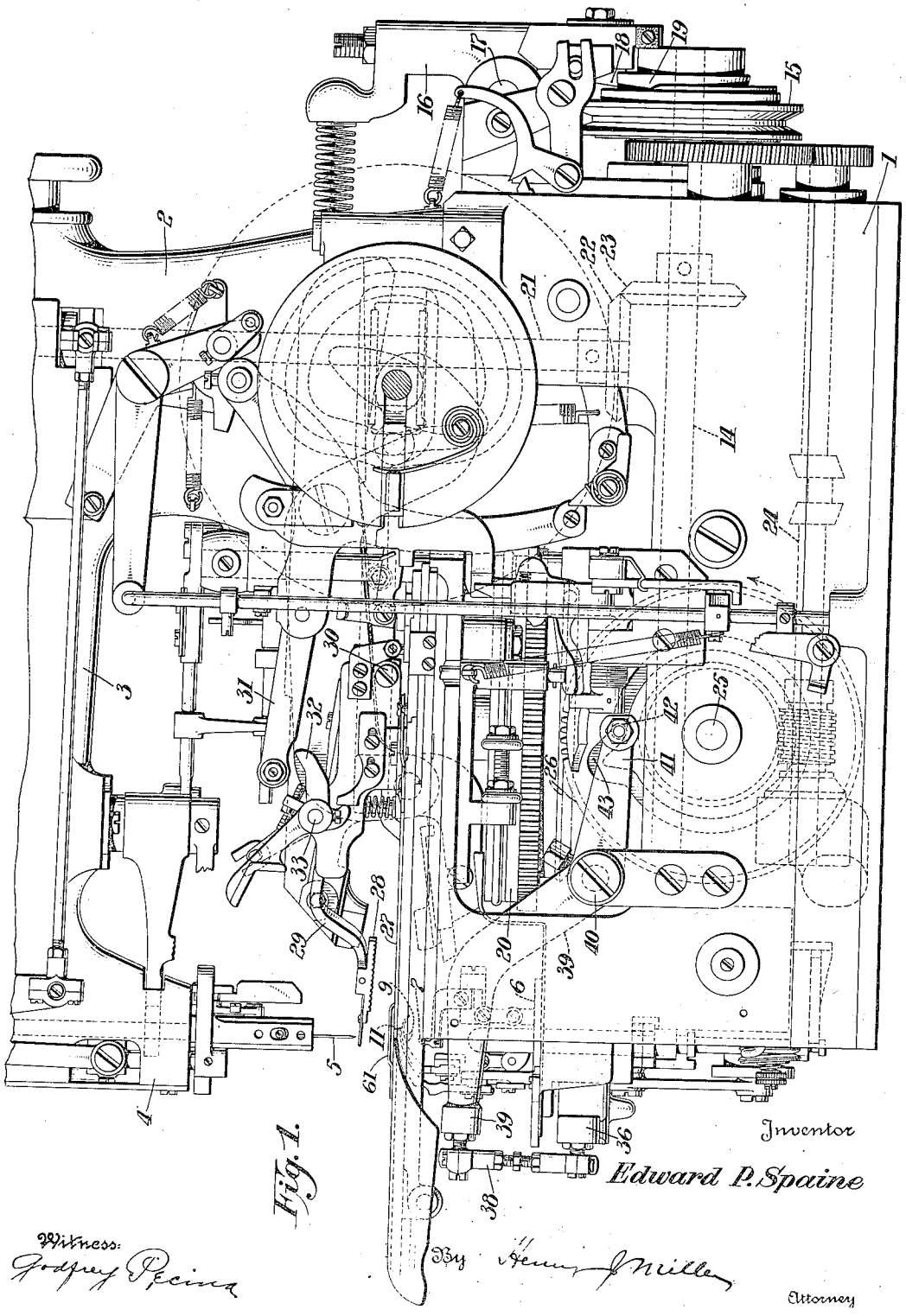

Fig. 1.

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THREAD CUTTER FOR SEWING MACHINES

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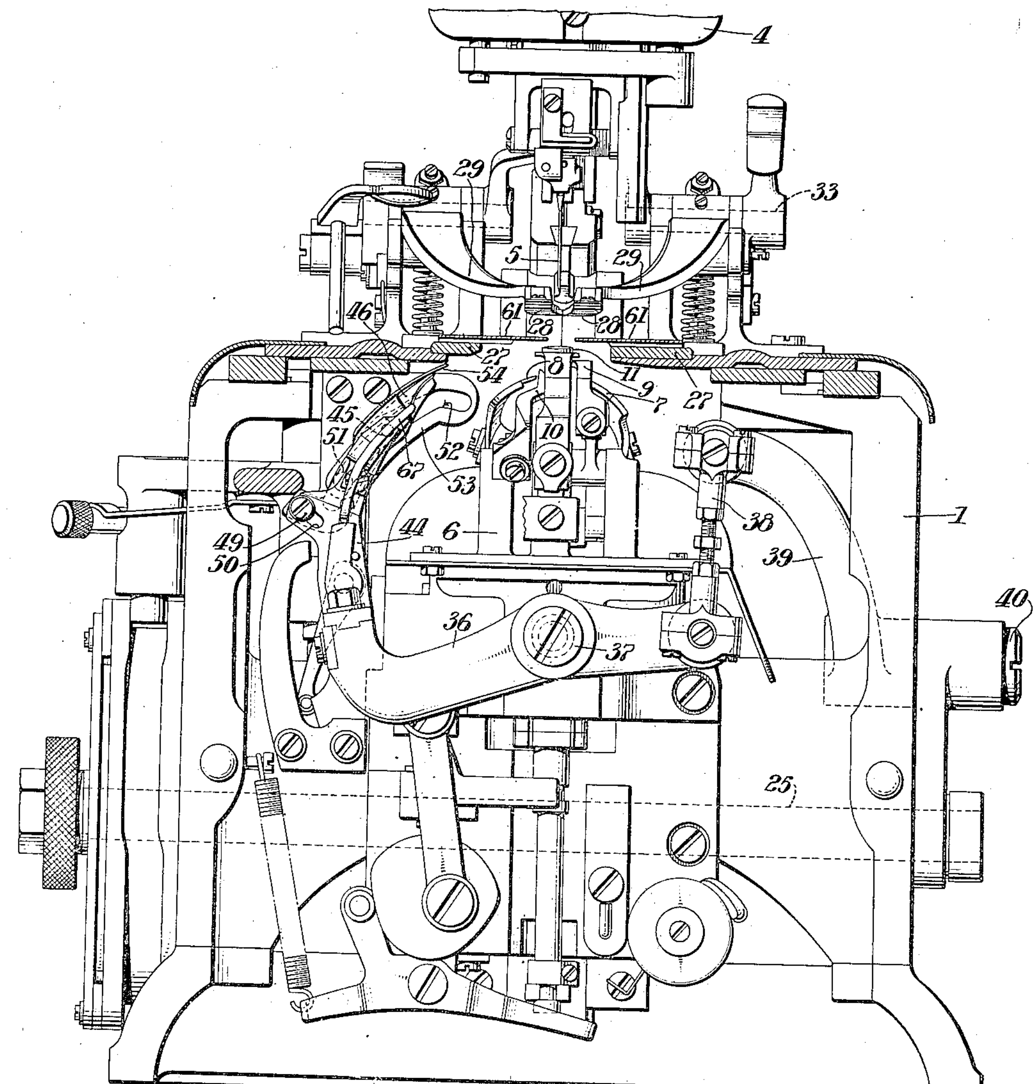

Fig. 2.

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THREAD CUTTER FOR SEWING MACHINES

Filed Oct. 4, 1935 6 Sheets-Sheet 3

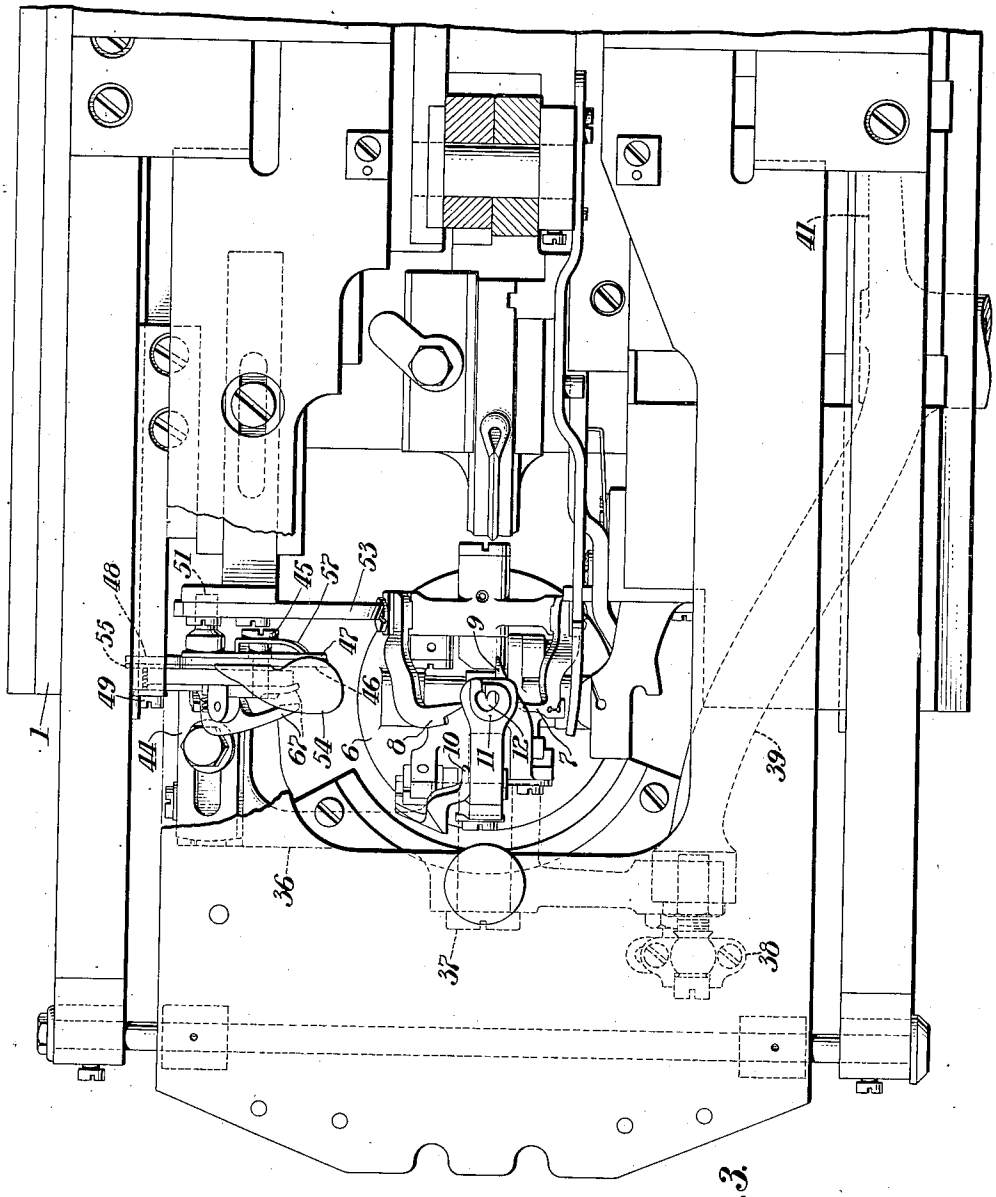

Fig. 3.

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THREAD CUTTER FOR SEWING MACHINES

Filed Oct. 4, 1935 6 Sheets-Sheet 4

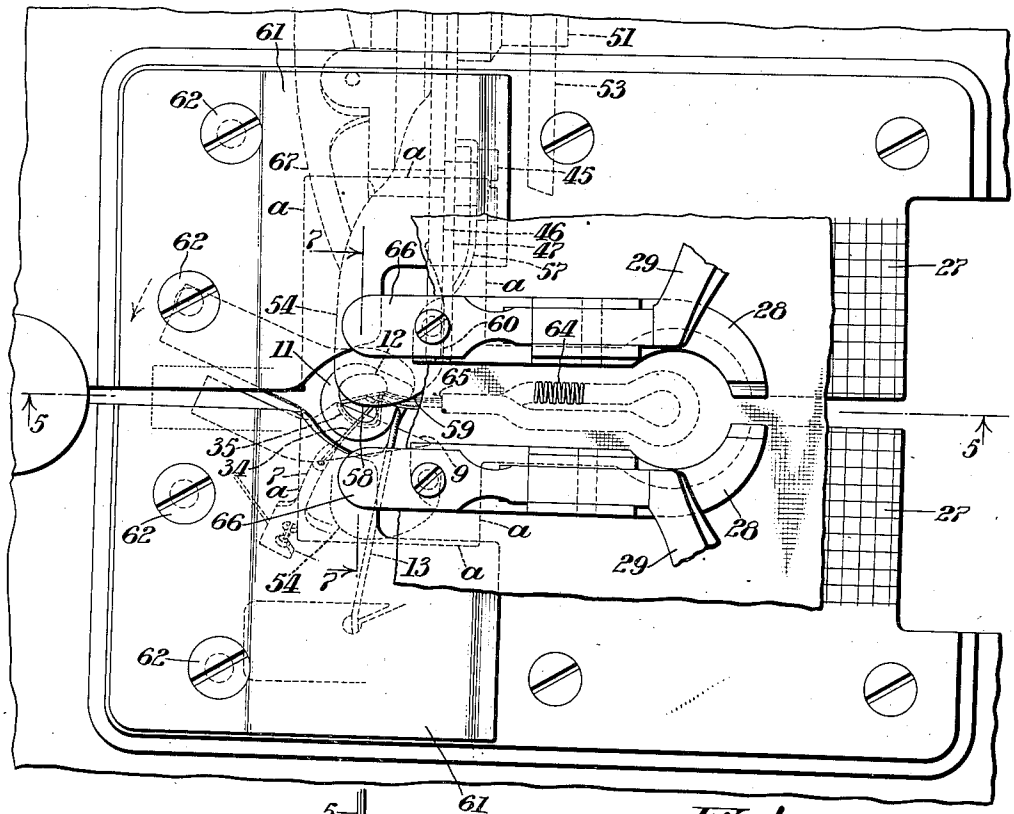

Fig. 4.

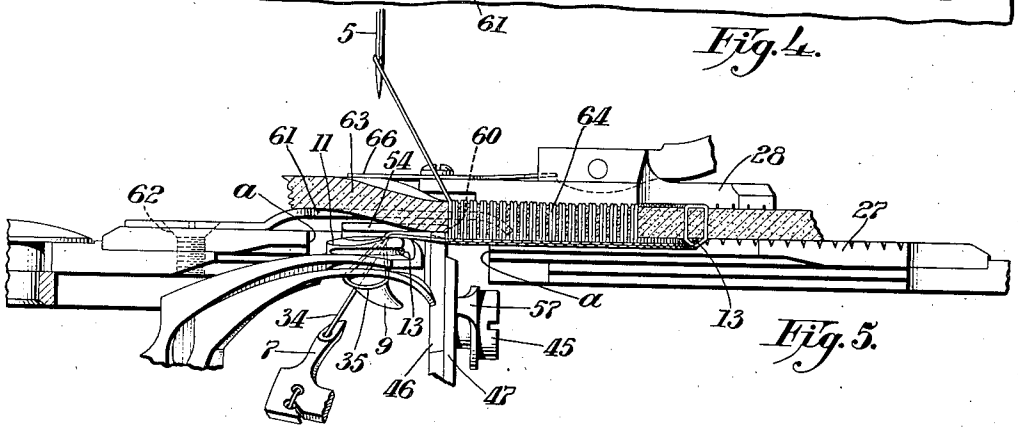

Fig. 5.

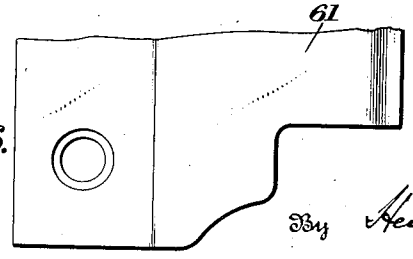

Fig. 6.

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THREAD CUTTER FOR SEWING MACHINES

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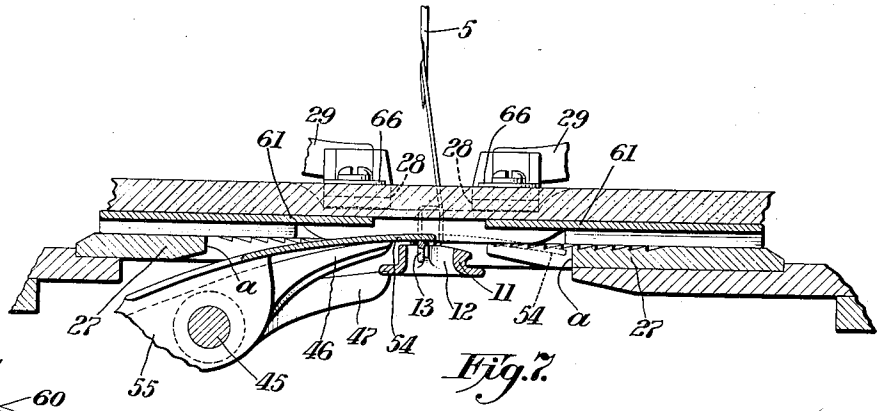

Fig.7.

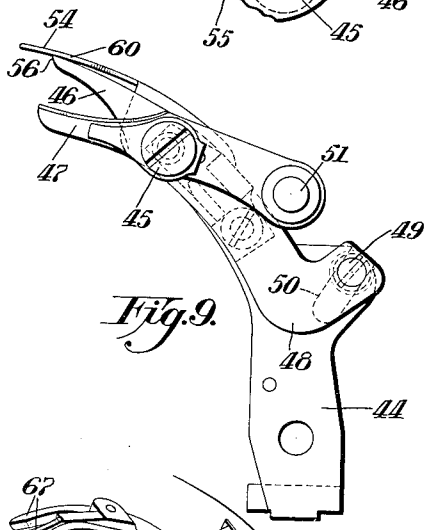

Fig.9.

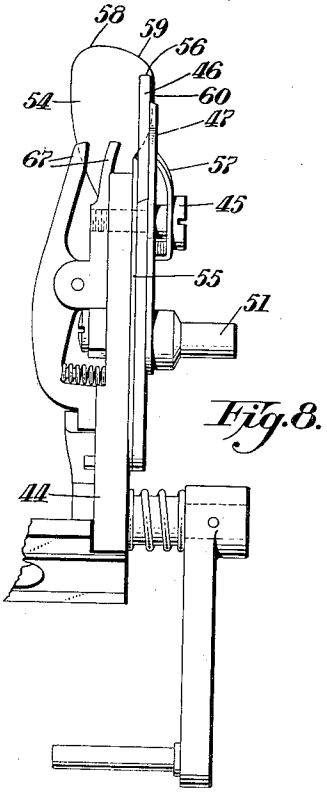

Fig.8.

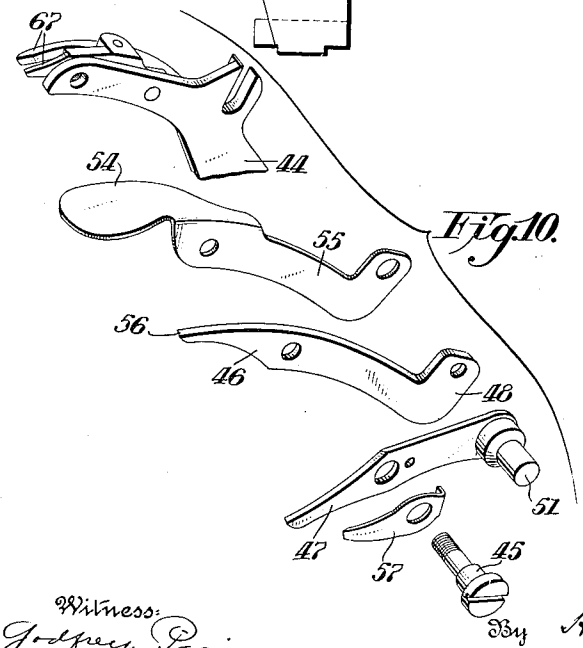

Fig.10.

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THREAD CUTTER FOR SEWING MACHINES

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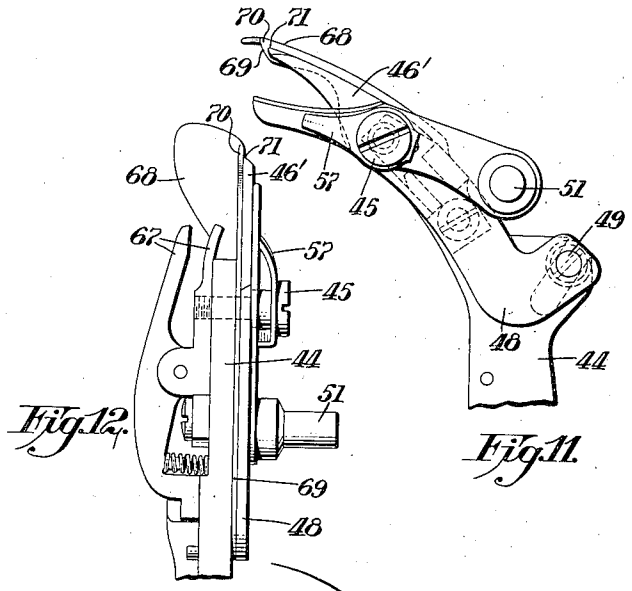

Fig. 12.

Fig. 11.

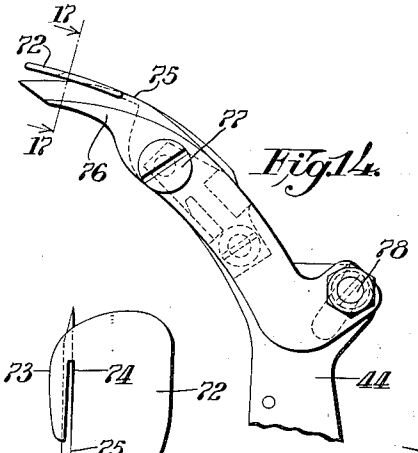

Fig. 14.

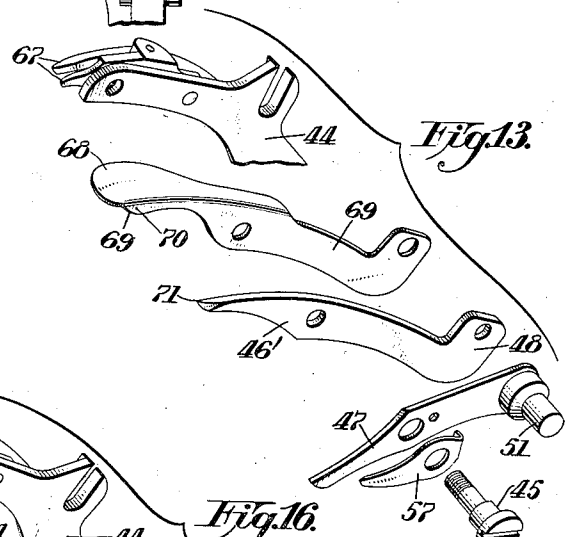

Fig. 13.

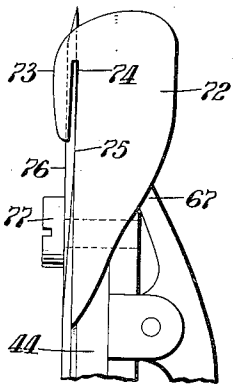

Fig. 15.

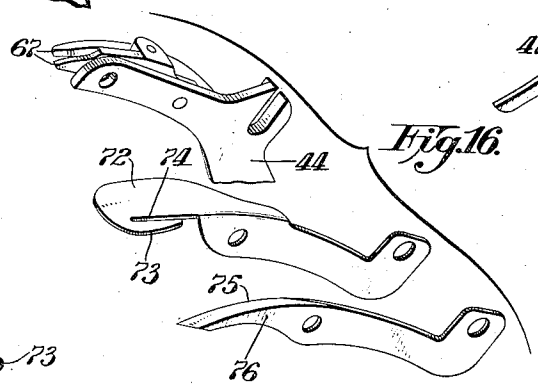

Fig. 16.

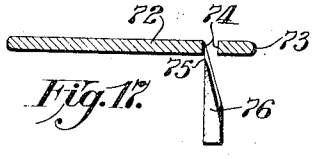

Fig. 17.

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Patented Feb. 9, 1937 2,070,029

UNITED STATES PATENT OFFICE

2,070,029

THREAD-CUTTER FOR SEWING MACHINES

Edward P. Spaine, Bridgeport, Conn., assignor to The Singer Manufacturing Company, Elizabeth, N. J., a corporation of New Jersey

Application October 4, 1935, Serial No. 43,467

9 Claims. (Cl. 112—252)

This invention relates to thread-cutting mechanisms for sewing machines and more particularly to thread-cutting mechanisms for machines of the buttonhole sewing type having stitch-forming mechanism and a work-clamp with means for relatively moving the stitch-forming mechanism and work-clamp after the sewing of the buttonhole has been completed to draw out a length of thread from the needle-throat member at the under side of the work; means being provided to separate the drawn out thread or threads from the work and to cut such thread or threads close to the last stitch.

The invention aims to improve the thread-cutting mechanism disclosed in the U. S. patent to E. B. Allen, No. 1,579,200, dated Apr. 6, 1926, so that it will handle work of any texture without damaging the work. In the mechanism of the Allen patent there is provided a scissors device for cutting the thread, which scissors device is moved along an upwardly arched path transversely of the thread-lengths to be cut and substantially tangent to the under surface of the work, so that the blunt point or nose of the upper scissors blade will graze the under surface of the work and enter between such surface and the threads to be cut, deflecting the threads downwardly into the throat of the scissors.

The setting or adjustment of the operative radius of the scissors device of said patented construction is rather critical as, if too short the blunted point of the upper scissors blade is not likely to catch all of the threads and cord to be cut and, if too long, there is danger that the point, even though blunted, will snag the work, particularly if the latter is of a loosely woven or knitted, sleazy or spongy nature.

According to the present improvement, the nose of the upper scissors blade is made of special shape so that it cannot possibly snag the work but will safely graze the latter and catch the threads to be cut, regardless of the character of the fabric in which the buttonhole is stitched. The principal characteristic of the nose of the present device is its broad, flat, duck-bill or spatula shape affording a thin and dull leading edge which is rounded horizontally along a broad curve so that it can safely graze the spongiest and sleaziest work without catching the fibres of the work.

With the above and other objects in view, as will hereinafter appear, the invention comprises the devices, combinations and arrangements of parts hereinafter set forth and illustrated in the accompanying drawings of a preferred embodiment of the invention, from which the several features of the invention and the advantages attained thereby will be readily understood by those skilled in the art.

The invention will be better understood by reference to the following detailed description of certain specific embodiments of the invention shown in the accompanying drawings, in which Fig. 1 is a side elevation of a buttonhole sewing machine embodying the invention. Fig. 2 is a fragmentary front elevation of the machine. Fig. 3 is a plan view of the machine bed with the work-clamp removed. Fig. 4 is a plan view of the work-clamping elements and thread-cutting device, showing the nose of the latter entering between the threads to be cut and the under surface of the work. Fig. 5 is a section substantially on the line 5—5, Fig. 4. Fig. 6 is a fragmentary plan view of one of the lower auxiliary work-supporting plates of the work-clamp. Fig. 7 is a section substantially on the line 7—7, Fig. 4. Fig. 8 is a bottom or under side view of the thread-cutter of Figs. 1 to 7, inclusive. Fig. 9 is a side view of the thread-cutter opposite to that shown in Fig. 2. Fig. 10 is a disassembled perspective view of the thread-cutter of Figs. 1 to 9, inclusive.

Figs. 11, 12, and 13 are, respectively, side elevation, bottom plan and disassembled perspective views of a modified form of thread-cutter. Figs. 14, 15, and 16 are, respectively, side elevation, top plan and disassembled perspective views of another modification of the thread-cutter, and Fig. 17 is a section on the line 17—17, Fig. 14.

The machine is constructed with a frame having a bed 1 from which rises the standard 2 of the bracket-arm 3 terminating in the head 4.

The stitch-forming mechanism comprises the usual upper endwise reciprocatory and laterally vibratory needle 5 which cooperates with the under stitch-forming instrumentalities carried by the rotary turret 6; such under instrumentalities including the usual threaded and non-threaded loopers, 7 and 8, respectively, and the loop-detainers 9 and 10; being constructed substantially in accordance with the disclosure of the U. S. Patent to Allen et al., No. 1,372,473, dated Mar. 22, 1921. The turret 6 carries the usual needle-throat member 11 having the needle-receiving aperture 12 and the usual means for guiding the stay cord 13 which is incorporated within the buttonhole overseam at the under side of the work.

The stitch-forming mechanism is operated from the sewing shaft 14 at the rear end of which

is the usual belt-pulley 15 and stop-motion device which is constructed substantially in accordance with the disclosure of the Allen Patent No. 15,324; reissued Apr. 4, 1922, and includes the tilting stop-motion lever 16 which is fulcrumed at 17 and carries the stopping tooth 18 adapted for cooperation in a manner well known with the stopping cam 19 on the shaft 14.

Within the bed 1 is mounted the usual feed-wheel 20 which makes one complete rotation per buttonhole-producing cycle and is driven during the sewing portion of such cycle by a suitable one-way gear-driven connection (not shown) with the upright shaft 21 driven by the bevel gear connection 22, 23 with the sewing shaft 14. The feed-wheel is connected to be driven at a higher speed both prior and subsequent to the sewing period by the usual automatically operated clutch (not shown) intermediate the constantly running shaft 24 and the rapid-feed shaft 25, which latter is permanently geared at 26 to the feed-wheel 20.

The work-clamp, which has the usual operative connections with the feed-wheel 20, comprises the lower work-supporting plates 27 and upper pivotally mounted clamping feet 28 sustained by the respective clamp-levers 29 fulcrumed at 30. The work-clamp is closed automatically at the beginning of a buttonhole-producing cycle by a single oscillatory movement of the usual clamp-closing lever 31 which engages the arm 32 on the clamp-closing rock-shaft 33, as explained in said Allen reissued patent. As soon as the work-clamp is closed, the feed-wheel 20 and rapid-feed shaft 25 are coupled to the rapid-drive shaft 24, whereby the work-clamp is rapidly shifted forwardly from its initial position on the bed 1 to sewing position. When the work-clamp reaches sewing position the rapid-feed drive-shaft 24 is unclutched from the rapid-feed shaft 25 and the stitch-forming mechanism is started, whereupon the feed-wheel 20 and rapid-feed shaft 25 are more slowly driven through the usual gear-connections with the sewing shaft 14 and the work is moved in the usual path to space the stitches around the buttonhole. During the sewing around the eyelet end of the buttonhole the stitch-forming mechanism is slowly turned 180° about the vertical axis of the turret 6. When the sewing of the buttonhole is completed the stop-motion lever 16 is tripped to stop the sewing shaft 14. The feed-wheel and rapid-feed shaft 25 are then again connected to the rapid-feed drive-shaft 24 which operates to rapidly shift the work-clamp rearwardly from sewing position to the initial or buttonhole-cutting position on the bed 1, which movement of the work-clamp draws out from the needle-throat member 11 four thread lengths in close juxtaposition. One of these thread lengths is the stay-cord 13. Another is the looper-thread 34. The remaining two are the limbs of the last needle-thread loop 35 retained on the loop-detainer 9 when the machine comes to rest.

In the U. S. patent to Allen, No. 1,579,200 cited, and in U. S. patents to Allen Nos. 1,600,206, of Sept. 21, 1926; 1,711,483, of May 7, 1929; 1,852,634, of Apr. 5, 1932; 1,867,129, of July 12, 1932; and in the U. S. Patent to Wood No. 1,938,128, of Dec. 5, 1933, there are disclosed scissor devices for severing these drawn out thread-lengths close to the last stitch in the work. The device of the present invention is broadly similar in principle and mode of operation to that of the Allen Patent No. 1,579,200. It comprises the usual thread-cutter-carrying lever 36, Fig. 2, which is fulcrumed on the stud 37 and is connected by the link 38 to the arm 39 of a lever fulcrumed at 40 and having an arm 41, Fig. 1, which has a roller-stud 42 entering the thread-cutter-actuating cam-slot 43 in the gear 26 on the rapid-feed shaft 25; the connections described being substantially the same as shown and described in said U. S. Patent No. 1,600,206, and the subsequently issued patents above cited.

The lever 36 carries the thread-cutting device including a supporting shank 44, Figs. 8 and 9, carrying a fulcrum-stud 45 on which is mounted the upper and lower blades 46, 47 of the scissors. The upper blade 46 has a tail portion 48 which carries a screw 49 passing through a slot 50 in the shank 44. By loosening the screw 49 the upper blade 46 may be adjusted about the fulcrum-stud 45 to adjust the radius of action of the thread-catching point of the blade. The lower blade 47 has the usual lateral stud 51 which enters the groove 52 of the stationary scissors-closing and opening cam 53.

In the device of the U. S. Patent No 1,579,200, the upper or ledger-blade of the scissors is formed with a dulled and rounded leading point so that it will not catch the fibres of the work while grazing the latter. In accordance with the present improvement this pointed end has been eliminated and the nose given a spatulate or duck-billed form by being considerably widened at one side of the vertical cutting plane of the scissors and formed with a broadly curved leading edge which may safely graze the under surface of work of any texture without catching the fibres thereof.

As shown in Figs. 7 to 10, inclusive, this spatulate or duck-billed-shaped nose of the upper blade of the thread-cutter is constituted by a separate element 54 having an attaching shank 55 similar to the shank 48 of the upper blade 46 of the scissors and attachable with the latter to the thread-cutter support 44 by the pivot-stud 45 and holding screw 49.

The point 56 of the upper blade of the scissors is in intimate contact with the under surface of the spatulate member 54, so that the threads caught by the advance of said member 54 readily slip under the point 56 and into the throat of the scissors. The member 54 is only made separate from the blade 46 for convenience. Functionally it is integral with the blade 46. The spring 57 holds the lower scissors blade 47 in working contact with the upper or ledger-blade 46. The broadly curved and dulled leading edge of the spatulate nose of the upper thread-cutter blade is preferably shaped as shown in Figs. 4 and 8. Its broadly curved foremost or leading portion 58 is widely spaced from the vertical cutting plane of the thread-cutter and is connected by an inclined portion 59 of gradually decreasing radius of curvature leading to the side edge-portion 60, Figs. 4 and 8, which latter is in line with the end of the buttonhole after the work has been shifted from sewing position to initial position and the threads to be cut have been drawn out from the needle-throat member 11, as usual, by such shifting of the work.

The lower clamp-plates 27, 27 are provided with thread-cutter clearance apertures *a* to permit the thread-cutter to move along its upwardly arched path grazing the under surface of the work.

To dress up the machine, it is preferred to partially cover these apertures *a* and to this end there are provided a pair of cover-plates 61 attached to the lower clamp-plates 27 by screws 62.

The cover-plates 61 are thin and expose the under surface portion of the work directly over the needle-throat member 11. The upper clamp-feet 28 may be provided with spring toe extensions 66 to press the work upon the cover-plates 61 in the regions thereof at the sides of the needle-throat-member 11. The broadly curved tip end 58 of the nose 54 of the thread-cutter preferably passes over the needle-throat-member 11 and the threads issuing therefrom, and under the portion 63 of the work in front of the buttonhole 64. The inclined portion 59 of the nose 54 carries the separation of the threads from the work up close to the last stitch 65 where the threads are subsequently cut by closure of the scissors in the usual manner. The fully advanced position of the thread-cutter nose 54 is shown in dotted lines in Figs. 4 and 7. The threads are cut, however, before the thread-cutter reaches the end of its advancing movement; the closure of the scissors being effected by the inclined upper end of the stationary cam-slot 52, Fig. 2, in the usual manner disclosed in U. S. Patent No. 1,579,200, previviously referred to.

It is to be understood that the use of the cover plates 61 is not essential to the functioning of the present thread and work-separating nose 54 of the thread-cutter, as the device functions just as well in the absence of the cover-plates 61; the duck-bill or spatulate nose 54 scraping the threads 13, 34, and 35 from the under surface of the work without the slightest danger of catching the threads or fibres of the work.

The thread-gripper 67 seizes and removes the severed or waste loop 35 of needle-thread which is around the loop-detainer 9 when the machine comes to rest. This thread-gripper is preferably constructed and operated substantially in accordance with the disclosure of said U. S. Patent No. 1,579,200. After the threads are cut, the thread-cutter is retracted to its normally out-of-the-way position, Fig. 2.

In Figs. 11, 12, and 13 there is illustrated a modified construction 68 of the duck-bill shaped member. Its shape, in plan is substantially the same as that of the first described member 54. It differs from the first described member 54 in that it does not overlie the point of the upper scissors blade 46', Fig. 13, but has a downturned flange 69 against the side face 70 of which the point 71 of the blade 46' bears. The flange 69 guides the threads downwardly onto the point 71 and into the throat of the scissors.

In Figs. 14 to 17, inclusive, there is illustrated a further modification of the present improvement. The thread-cutter supporting shank 44 has mounted thereon the duck-bill shaped member 72 having substantially the same shape, in plan, as the previously described members 54 and 68 but differing therefrom in being formed adjacent its inner edge 73 with a slot 74 into which extends the sharpened upper curved edge 75 of the knife 76 which is secured rigidly to the support 44 by the screws 77, 78 affording the usual adjustment of the working radius of the thread-cutter. The nose 72 acts to separate the threads from the under surface of the work in the same manner as do the noses 54 and 68 of the previously described modifications.

It will be understood that near the close of a buttonhole-producing cycle and after the work-clamp has been rapidly shifted rearwardly to the position shown in Fig. 4 to draw out the lengths of thread from the needle-throat-member 11, the hump in the thread-cutter operating cam 43 in the gear 26 on the rapid-feed shaft 25 effects a single up-and-down vibratory movement to the lever 39 which rocks the thread-cutter carrying lever 36 about its fulcrum 37 and advances the thread-cutter along its upwardly curved path in a direction transverse to the thread-lengths to be cut. The operating radius of the duck-bill shaped nose of the thread-cutter is adjusted to graze flatwise of itself the under surface of the work and pass over the needle throat-member 11 and the threads issuing therefrom. The inclined edge 59 and side edge 60 of the thread-cutter nose effects a separation of the threads from the work at a point close to the last stitch where the threads are cut by the thread-cutter. It is of course understood that the pivotal axis 37 of the thread-cutter substantially intersects a vertical line normal to the work at the sewing point. In other words the thread-cutter axis 37 is directly under the sewing point, as viewed in Fig. 2, so that the threads to be cut are at the top of the curved path of travel of the thread-cutter.

Having thus set forth the nature of the invention, what I claim herein is:—

1. In a sewing machine in which that portion of the thread to be cut extends along and close to the surface of the work, means having a spatula shaped nose movable in a direction transverse to the thread-length and between the thread and the surface of the work to separate the thread from the work at a point close to the last stitch, and means to cut said thread close to the last stitch.

2. A sewing machine having, in combination, stitch-forming mechanism including a reciprocatory needle and complemental loop-taking means mounted at opposite sides of the plane of the work, a thread-cutter-carrying lever pivoted at the loop-taker side of the work on an axis transverse to and in substantially intersecting relation with a line normal to the plane of the work at the sewing point, and a thread-cutter carried by said lever and having a spatula shaped nose adapted when said lever is swung on its pivot to enter flatwise of itself between the under surface of the work and the thread leading from the last stitch to the sewing point, to separate the thread from the work close to the last stitch preparatory to the severing of the thread by the thread-cutter.

3. A buttonhole sewing machine having a frame comprising a bed and bracket-arm, stitch-forming mechanism including a needle and a needle-throat member, a work-clamp, means for relatively moving the stitch-forming mechanism and work-clamp to sew around a buttonhole and to relatively separate the buttonhole and stitch-forming mechanism lengthwise of the machine bed subsequent to the sewing operation, thereby drawing out a length of thread from the needle-throat member, and a thread-cutter pivoted on an axis extending lengthwise of the machine bed, said thread-cutter having a thin spatula shaped nose adapted to scrape the thread from the under surface of the work and separate the thread from the work close to the last stitch preparatory to the thread-cutting action.

4. In a sewing machine adapted to perform a predetermined sewing operation and then come to rest, the combination with stitch-forming mechanism and work-holding means movable relative to each other during and subsequent to the sewing operation, of a needle-throat member through which the thread is led to the work, the

relative movement after the sewing operation drawing out a length of thread from the needle-throat member, means movable over the needle-throat member in a direction transverse to the length of thread to a position between the length of thread and the work, said means having a broadly curved leading edge, and means to sever the thread close to the last stitch.

5. In a sewing machine adapted to perform a predetermined sewing operation and then come to rest, the combination with stitch-forming mechanism and work-holding means movable relative to each other during and subsequent to the sewing operation, of a needle-throat member through which the thread is led to the work, the relative movement after the sewing operation drawing out a length of thread from the needle-throat member, of means movable transversely of the length of the thread and having a thin and wide nose with a broadly curved and non-pointed leading edge to separate the thread from the work close to the last stitch, and means to sever the thread.

6. In a sewing machine adapted to perform a predetermine sewing operation and then come to rest, the combination with stitch-forming mechanism and work-holding means movable relative to each other during and subsequent to the sewing operation, of a needle-throat member through which the thread is led to the work, the relative movement after the sewing operation drawing out a length of thread from the needle-throat member, of means movable in a curved path transversely of the length of thread and having a thin wide nose with a broad tip and an inclined edge leading from said tip to separate the thread from the work close to the last stitch, and means to sever the thread.

7. In a sewing machine adapted to perform a predetermined sewing operation and then come to rest, the combination with stitch-forming mechanism and work-holding means movable relative to each other during and subsequent to the sewing operation, of a needle-throat member through which the thread is led to the work, the relative movement after the sewing operation drawing out a length of thread from the needle-throat member, means movable transversely of the length of thread and having a thin wide nose with a broadly curved tip and an inclined edge portion leading from said tip to pass between the thread and the work, and means to sever the thread.

8. A sewing machine thread-cutter having a thread-cutting blade and a thin wide nose substantially normal to the cutting plane of said blade; the extreme end of said nose being broadly curved in the plane thereof.

9. In a sewing machine adapted to perform a predetermined sewing operation and then come to rest, the combination with stitch-forming mechanism and work-holding means movable relative to each other during and subsequent to the sewing operation, of a needle-throat member through which the thread is led to the work, the relative movement after the sewing operation drawing out a length of thread from the needle-throat member, of thread and work-separating means having a thin, broadly curved and non-pointed leading edge movable transversely of the thread and between the latter and the work, and means to sever the thread.

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