

**July 19, 1960**

KOSUKE KAGIYAMA  
SEWING MACHINE

**2,945,460**

Filed Jan. 4, 1957

3 Sheets-Sheet 1

*Fig.1*

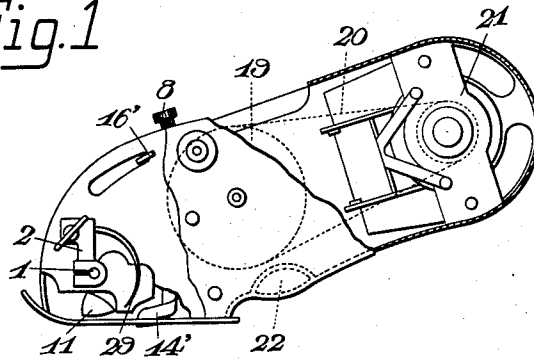


Fig.2

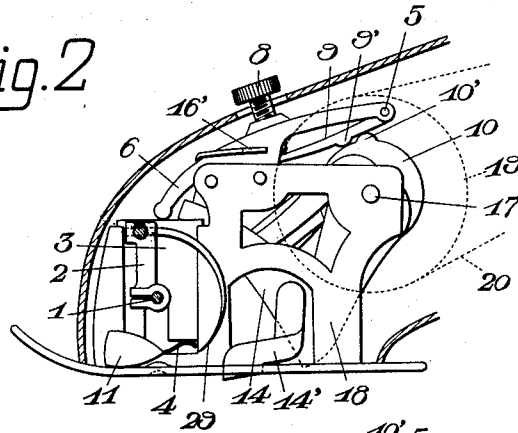
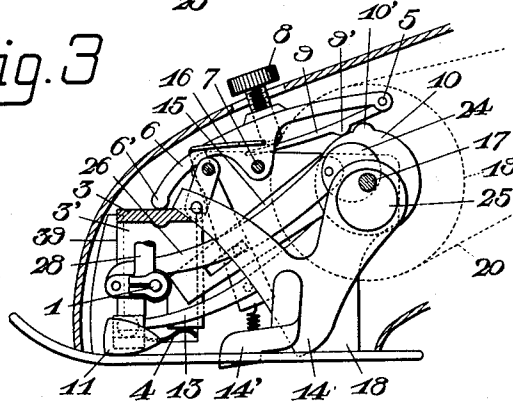


*Fig. 3*



July 19, 1960

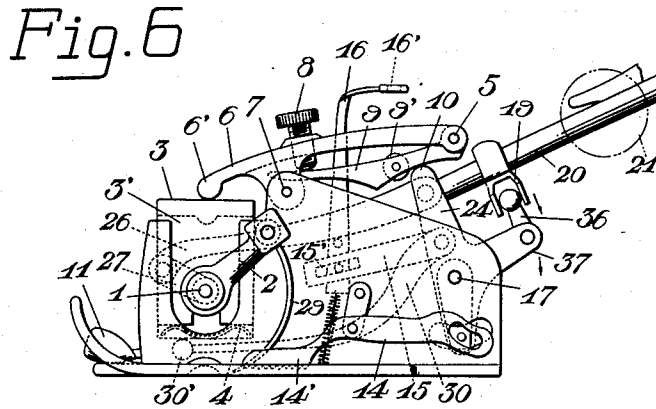
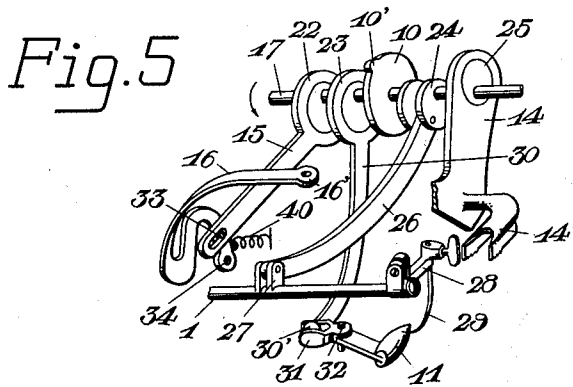
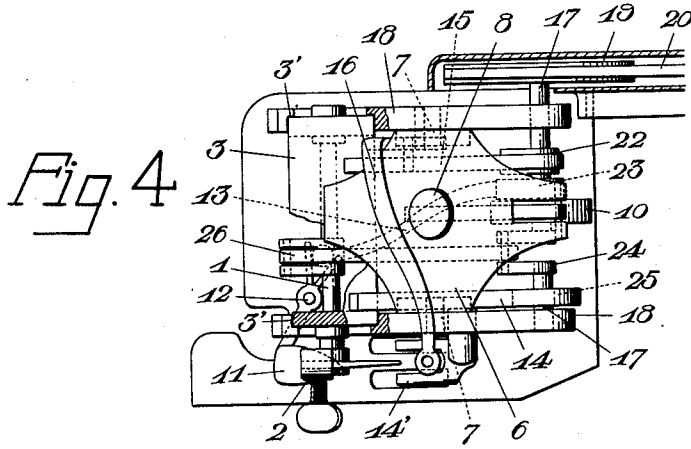
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3 Sheets-Sheet 2



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Filed Jan. 4, 1957

3 Sheets-Sheet 3

*Fig. 7*

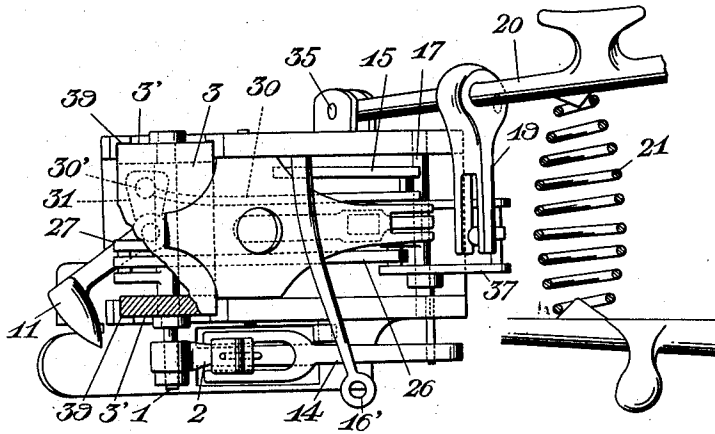


*Fig. 8 A*

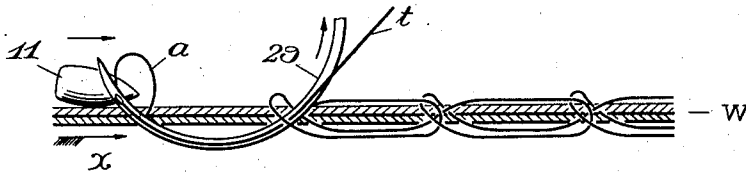
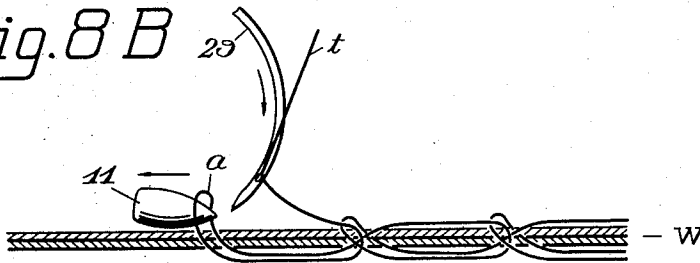


*Fig. 8 B*



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1

2,945,460

## SEWING MACHINE

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Filed Jan. 4, 1957, Ser. No. 632,577

Claims priority, application Japan Apr. 11, 1956

2 Claims. (Cl. 112—169)

This invention relates to the improvement in a single thread chain-stitch sewing machine for a work such as cloth, being held in one's hand. It is particularly suited for sewing up a bag with contents, for example when a bag filled with wheat is torn while it is being transported, the tear can be mended, for the first aid with a piece of cloth on the torn part and sewing up by this invented machine. It also fits for field use or home use as a portable sewing machine.

This invention is characterized by a portable chain-stitch sewing machine which comprises a curved needle which oscillates in the vertical plane and a looper which oscillates in the horizontal plane corresponding to the movement of the needle, and the axis of the arc-shaped curved needle is adapted to slide down with its bearings when the needle goes forward to stitch the work.

Thus, due to the resultant of vertical component of the oscillation of the curved needle and the vertical sliding movement of the needle axis, the needle may be inserted into the work such as cloths.

The object of the invention is that the insertion depth of the curved needle into works can be adjusted properly to the thickness of works, by regulating the stroke of vertical sliding movement of the curved needle axis by an adjusting device.

Fig. 1 to Fig. 5 show one embodiment of this invention, which is illustrated by a manually operated sewing machine driven by a small electric motor; Fig. 1 is the side-view of this machine in which is shown its electric motor, the cover being cut off partially. Fig. 2 is the side-view showing the principal parts of this invention, the cover being removed, Fig. 3 is a sectional side-view of a part of the machine showing the internal mechanism, Fig. 4 is the plan view of the machine, a part of which is cut off, and Fig. 5 is a perspective view of the main shaft and the members driven by it.

Fig. 6 and Fig. 7 show another embodiment; in which is shown the manually operated sewing machine which is adapted to be operated by the gripping power of one's hand like a pair of hair clippers. Fig. 6 is the side-view of the machine in which the cover is removed, and Fig. 7 shows the plan.

Figs. 8A and B show two stages in the sewing operation.

In the embodiments shown in Fig. 1 to Fig. 5, when the rotation of the motor 21 connected to a proper electric source is transmitted by a belt 20 to a pulley 19 which is fixed at one end of the horizontal main shaft 17 carried on the frames 18, 18, eccentric discs 22, 23, 25 and a crank 24 all which are fixed on this axis rotate together. By the rotation of the crank, the needle bar or arm 1 which is paralleled to the main shaft 17 oscillates through a connecting rod 26 and a crank 27. Accordingly the curved needle 29 carried on the end of the axis 1 oscillates through a crank arm 28. The end 30' of the connecting-rod 30 which is carried on the eccentric wheel 23 is connected to a ball-shaped universal joint 31, which is pivoted

2

on the arm carried on the vertical axis 32 fixed on the frame. And so the looper 11 at the end of its arm oscillates on the vertical pivot 32 due to the rotation of the eccentric wheel or ring 23, and thus makes the stitching motion, co-operating thereby with the curved needle. The end of a connecting rod 15 carried on an eccentric wheel 22 has a slit 15', which is connected slidably to the thread taker 16 which is pivoted about support 34 on the side plate of the frame 18 through a pin 33. And so as the reciprocating movement of the connecting rod 15 acted by the rotation of the eccentric wheel 22 when the pin 33 set at the end of the slit 15', the thread take up 16 inclines on the axis 34 to give the tension to the curved needle thread which is drawn from the spool through the thread hole 16' at the end of the thread take-up lever 16, and makes the stitch tight. The returning motion of the thread take up lever 16 is acted by a tension spring 40 attached to the frame. The connecting rod 14 carried on the eccentric wheel 25 at the end of the main shaft 17 has an extension 14' that acts like a work feeder, of which the under surface is serrated. The extension 14' of the feeder touches on the surface of the work to feed it. The cam wheel 10 which is a circular plate with a projection 10' on its circumference is fixed on the middle part of the main shaft 17. As shown in Fig. 3, lever 9 with a projection 9' touching on the circumference of the cam wheel 10 is pivoted on the end of a lever 6 which is carried on the axis 7, 7 on each side of the frame 18, 18. The other end 6' of the lever 6 rests on the upper surface of a bearing frame 3 having side plates or legs 3' which carry a needle bar 1 for the curved needle 29. These side plates are vertically slidable in recesses 39 in the frame 18. For controlling the vertical position of the bearing frame 3, an adjusting or set screw 8 threadably extends through the lever 6 and bears upon the lever 9. Thus, turning the screw 8 in one direction or the other will move the levers 6 and 9 toward or away from each other, as the case may be.

When the cam wheel 10 with the main shaft 17 rotates its projection 10' contacts the projection 9' of the lever 9 to oscillate the levers 9 and 6 simultaneously about the axis 7, 7. The end 6' of the lever 6 thereby pushes down the needle bar support 3 with the slide 3', 3' and needle bar 1 of the curved needle.

The phase of the cam wheel 10 has been arranged to synchronize the downward movement of the needle bar 1 with the insertion of the curved needle 29 into the work. The compression-springs 4, 4 are set under the end of each slide 3, 3 to force the bearing frame 3 upwards. Accordingly the frame 3 contacts always to the end 6' of the lever 6. When the projection 10' slides past the projection 9' of the lever 9, the bearing frame 3 returns upwards. Due to the resultant of circular motion of the oscillating curved needle 29 and the downwards movement of the needle axis, the needle sticks the work W such as cloth, as shown in Fig. 8. Adjusting the control screw 8 to project or withdraw, the relative position of the projections 9' of the lever 9 to the end 6' of the lever 6 may be changed, and so the stroke of the downwards movement of the needle axis can be adjusted properly to the thickness of the work.

The embodiment of this invention in a manually driven sewing machine is shown in Fig. 6 and Fig. 7. Like a hair clippers, driving power of this machine is supplied by the oscillating motion of its handles 20 on the axis 35 by the gripping power of one's hand, against the compression spring 21. When the handle 20 is moved clockwise in Fig. 7 against the spring 21, the arm 37 of the lever 24 is moved in the direction of the arrow-sign in Fig. 6 by the arm of a bellcrank 19 through a connecting rod 36. Accordingly the lever 24 rotates clockwise on the axis 17, as shown in Fig. 6 by an arrow-sign, and so each con-

necting rod 14, 15, 26, 30 carried on the lever 24 is moved longitudinally. As the movements and effects of the work feeder's extension 14', the thread take-up lever 16, the curved needle 29, and the looper 11 are almost all the same as in the above mentioned first embodiment, the reference numeral of each element or part in Fig. 6 and Fig. 7 corresponds with that of Fig. 1 to Fig. 5, and the illustration of the mechanism is abbreviated. But in the secondary embodiment the back movements of these parts are caused by the repulsive power of the compression spring 21 set between two handles 20. And in this embodiment the levers 6 and 9 are moved through a roller 9' contacting with the circular end 10 of the lever 24, in place of the cam wheel 10 in the first embodiment. As the under surface of the lever 9 is shaped a circular arc on the axis 17, the end 10 of the lever 24 does not influence the oscillatory movement of lever 6 even when it oscillates on the axis 17. But when it touches the roller 9', the lever 9 in turn oscillates about the lever 6 and the bearing frame 3 with the needle axis 1 reciprocates due to the pressure exerted thereagainst by the lever end 6'. Its effect on the work and the controlling of its sliding stroke by the adjusting screw 8 are the same as the first embodiment, so the illustration of them is abbreviated.

The stitch made by the sewing machine equipped with the mechanism of this invention is what is called a chain-stitch. As shown in Fig. 8, the thread *t* inserted in the thread hole at the point of the curved needle 29 through some thread guides from a spool goes to the work such as the piled cloth *W* along the circular path of the needle, and pricks them from the surface and goes out under the back surface (or may not go out in case the lower cloth is too thick) and comes out of the upper surface again. And when the needle finished its forward stroke and just begins to go back as shown in Fig. 8A, a loop of the thread is made by the slacking of the thread, and at the same time the bullet shaped looper 11 which oscillates horizontally, comes near the needle point, catches the loop *a* and still continues to go to the right in Fig. 8. When the needle goes back and its point comes off the work, the work is carried to the right in Fig. 8 by the serrated surface of the work feeder's extension 14', and again the needle 29 begins the following forward stroke clockwise, and just before sticking into the work it passes through the loop *a* held by the looper 11 as shown in Fig. 8B and sticks into the following part of the work which has already been stitched. At this moment the thread take-up lever 16 inclines as mentioned above, and gives the thread tension so that the stitch is tied tightly, and at the same time the looper 11 returns back. Thus the sewing operation is executed. Although two embodiments, one a motor drive machine and the other a hand-operated machine, have been illustrated and described in detail, it is to be expressly understood that the invention is not limited thereto.

Various changes can be made in the design, arrangement, and constituents of the parts without departing from the spirit and scope of the invention, as the same will now be understood by those skilled in the art.

What I claim is:

1. In a sewing machine comprising a main frame hav-

ing side walls, a drive shaft mounted transversely in said main frame, a plurality of circular discs affixed eccentrically upon said drive shaft, a thread take up operable by one of said discs, a work advancer operable by another of said discs, a looper operable by still another of said discs, and a curved needle, the provision of means for adjusting the stroke of said needle, said means comprising an inverted U-shaped bearing frame having its legs vertically slidable in the walls of said main frame, spring means interposed between said main frame and said bearing frame for urging the latter upwardly, a needle bar rotatably mounted in said legs of said bearing frame and extending in a direction parallel to said drive shaft, a first lever substantially centrally and pivotally mounted in said main frame for oscillatory movement in a vertical plane, said first lever having its forward end abutting the bight portion of said bearing frame, a second lever pivoted to the rearward end of said first lever and extending beneath said first lever and having a dependent projection formed integrally therewith, a set screw threadably extending through said first lever and abutting the upper side of said second lever, a circular plate affixed concentrically upon said drive shaft and having a cam projection formed integrally therewith and having its periphery in contact with the projection on said second lever, a crank affixed to said drive shaft, a crank affixed to said needle bar, a connecting rod interconnecting said cranks, and a crank arm carried by said needle bar, said curved needle being affixed to the outer end of said crank arm.

2. A device as defined in claim 1 wherein said looper comprises a looper connecting rod having a ring at one end thereof, said ring rotatably encompassing one of said discs, a horizontal arm vertically pivoted upon said frame, a universal connection between the other end of said looper connecting rod and one end of said horizontal arm, and a looper head affixed to the free end of said horizontal arm.

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