

Oct. 12, 1965

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SEWING MACHINE WITH HEATED MATERIAL PERFORATING MEANS

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3 Sheets-Sheet 1

Fig. 1.

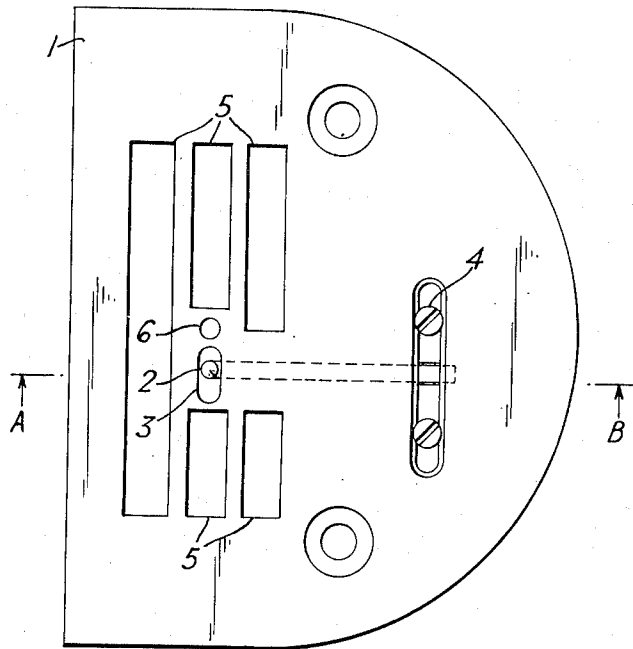
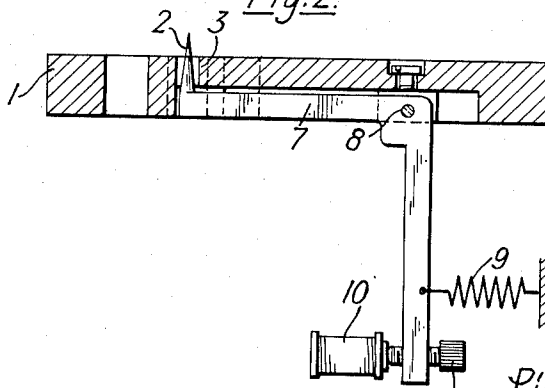


Fig. 2.



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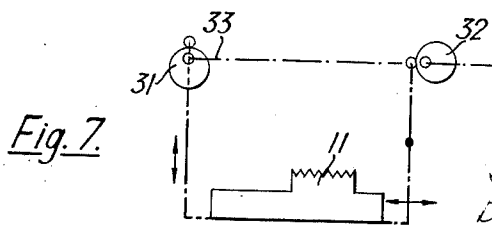
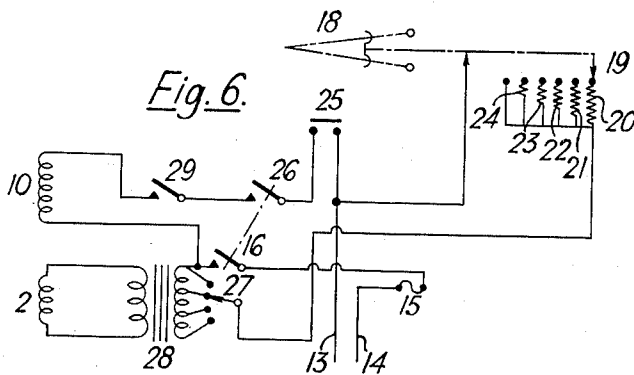
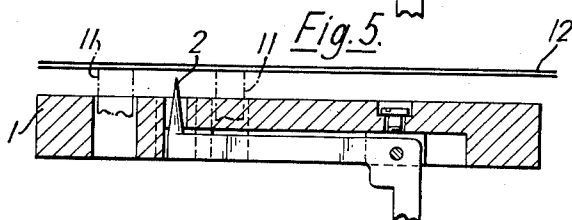
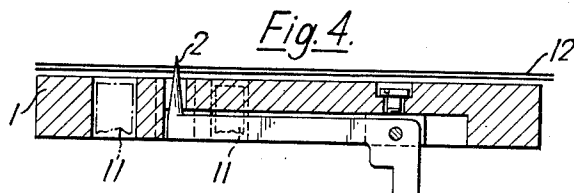
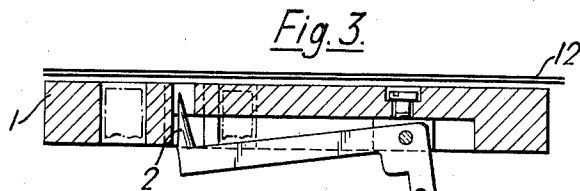
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SEWING MACHINE WITH HEATED MATERIAL PERFORATING MEANS

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SEWING MACHINE WITH HEATED MATERIAL PERFORATING MEANS

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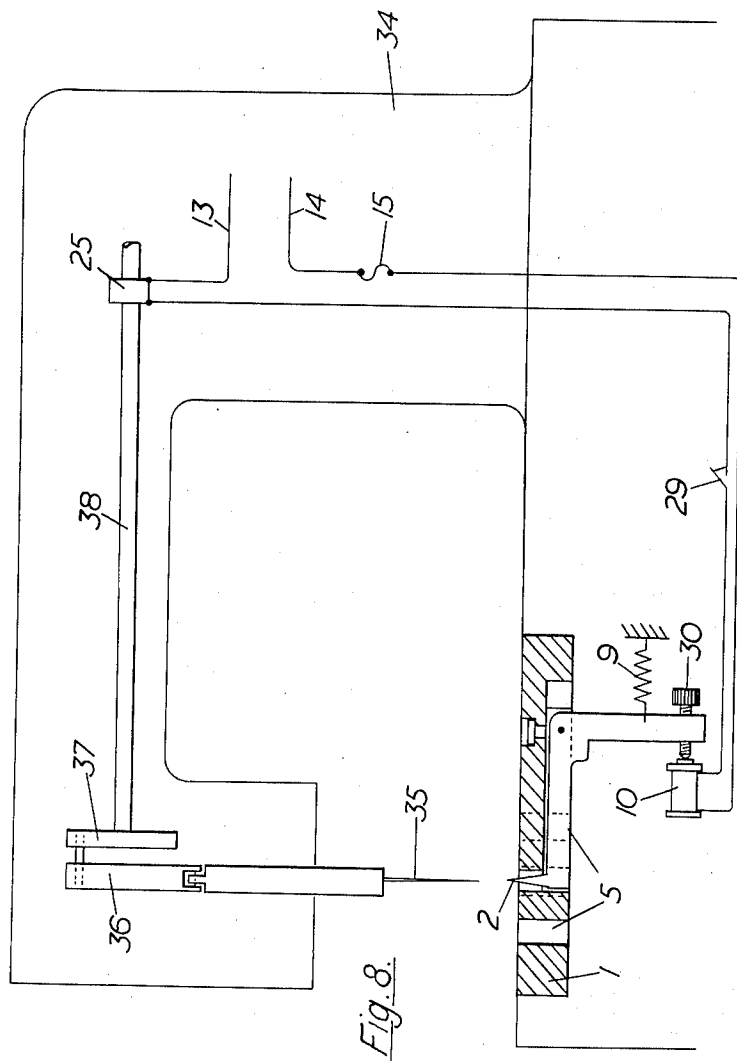


Fig. 8.

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SEWING MACHINE WITH HEATED MATERIAL PERFORATING MEANS

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7 Claims. (Cl. 112-2)

The present invention relates to a sewing machine for sewing fabrics or sheets of a thermoplastic material.

Certain difficulties are encountered when using sewing to connect fabrics having a base of thermoplastic threads.

Firstly puckering occurs at the seams since the sewing threads disturbs the network forming the fabric, thus creating tensioning of the fabric.

In addition to the puckering of the seam which is formed, the ease with which the various layers of fabrics slide on one another causes irregularities in the stitch. In order to overcome this disadvantage, special machines have been designed which are provided with feed means both at the lower portion and their upper portion, or provided with means which drive the fabric by the needle.

Furthermore it is difficult to use high-speed sewing machines when using a thermoplastic thread since the heating of the needle caused by the friction against the fabric is such that it causes melting and breakage of the thread. In order to avoid such breakage, it is possible, for example, to fix to the sewing machine a device comprising a heated piercing needle which is secured to the sewing needle, so that the sewing needle enters the holes previously formed by the heated needle which is situated in front of the said sewing needle.

However, if a device of this kind is used, it will be appreciated that sewing in the reverse direction requires the removal of the piercing needle; if this needle were left in position it would in fact penetrate into the holes where the thread had already passed and would melt the thread. Furthermore, sewing at an angle requires the removal of the needle otherwise the finished article would have holes extending beyond the first line of stitching. Finally, the use of a heated needle secured to the sewing needle creates the risk of burning the user and the risk of causing the sewing thread to be melted.

It is an object of the present invention to provide a sewing machine which overcomes the above disadvantages.

According to the present invention there is provided a sewing machine for sewing flat thermoplastic materials such as woven fabrics or webs, by sewing through holes previously formed in the flat material, such machine comprising at least one heated point which is situated upstream of the hole of the sewing plate relatively to the advancing movement of the fabric, at a distance equal to n times the length of the stitch where n is a positive integer and projecting upwardly from said needle plate and means for causing the heated point to pierce the material by a relative movement between the heated point and the material.

The heated point can be heated in any manner but is preferably effected electrically using the Joule effect. Means can be provided for permitting the regulation and/or the discontinuing of the heating in dependence on

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working conditions, sewing speed, nature and thickness of the flat elements which are to be sewn. If electrical heating is used, a centrifugal governor can be provided which is fixed to the driving shaft of the machine and act on a rheostat, to regulate the current flowing through the heating means in dependence on the speed of the machine. Advantageously this system is used in conjunction with a manual control to stop and regulate the heating to suit the nature and thickness of the material being sewn.

The device for making the heated point emerge above the needle plate may be constructed, for example, by fixing the heated point to one end of a bell-crank. The other end of the lever may be acted on in one direction by a spring which tends to hold the heated point below the level of the needle plate, and in the opposite direction by an electromagnet which, when energized, attracts the lever and pivots the heated point to a position above the needle plate.

When the material is stationary, approximately at the instant at which the sewing needle of the sewing machine is about to penetrate the material the electromagnet is energized and thus causes the heated point to perforate the material from below. In order to synchronise the movement of the needle and the movement of the heated point, the electromagnet can be energized through a switch coupled to the drive mechanism of the sewing machine.

As an alternative to the device referred to above the material may be lifted and lowered while the heated point which projects above the needle plate remains stationary. The material, which is lifted and lowered by the feed system impales itself on the fixed heated point.

Means are advantageously provided for enabling the heated point to be retracted when not required or when stitching is carried out in reverse. These means may also permit the heated point to be rendered inoperative when turning the fabric, particularly when sewing stitches at an angle to a previous line of stitches. The retraction of the heated point can also be effected at any instant, for example when it is desired to sew non-thermoplastic fabrics. It will be apparent that when the heated point is not used, it may be advantageous to discontinue the heating of the point, if the inoperative period is to be prolonged.

Advantageously, the line of action of the heated point is parallel to the line of action of the sewing needle. However, in certain types of sewing machine, for example those known as "elliptical feed" machines, such as certain whip stitch apparatus, it may be advantageous to incline the axis of the heated point in the direction of advance of the fabric with respect to the line of action of the sewing needle.

Advantageously, the retractable device for the heated point comprises means for regulating the amount that the point emerges above the needle plate.

In order that the invention may more readily be understood the following description is given, by way of example of one form of sewing machine according to the invention. Reference is made to the accompanying drawings in which:

FIGURE 1 is a plan view showing the needle plate of a simple-feed machine, provided with a device according to the invention for preforming holes;

FIGURE 2 is a sectional view taken on AB of FIGURE 1;

FIGURE 3 is a view similar to FIGURE 2 showing the point in the retracted position; FIGURES 4 and 5 show a variant in which the fabric is raised and lowered relative to the heated point;

FIGURE 6 shows diagrammatically the electrical circuit of the machine according to the invention; and

FIGURE 7 shows diagrammatically the operation of the feed dogs.

FIGURE 8 shows a sewing machine, in accordance with the invention, in diagrammatic front elevation.

FIGURE 1 shows a needle plate 1 a heated point 2 which can slide in an elongated aperture 3 permitting the position of the said heated point to be regulated by means of adjusting screws 4. Apertures 5 and 6 are provided for the feed dogs, and the needle respectively.

FIGURE 2 shows the retractable device for the heated point. The heated point 2 is fixed on a steel bell-crank lever 7 which can pivot about a fixed pivot 8. It is urged in one direction by a return spring 9 which tends permanently to hold the heated point below the sewing plate, and in the opposite direction by an electromagnet 10 whose attraction force is greater than the force supplied by the spring.

A screw 30 passing through the lower arm of bell-crank lever 7 abuts against the core of the electromagnet 10 and permits adjustment of the lever 7 so that the point projects through the needle plate 1 by an amount suitable for the thickness of the cloth being sewn.

The electric circuit diagram of the apparatus of the invention is shown in FIGURE 6. The apparatus is supplied by an alternating source of current (not shown) through the conductors 13 and 14. The circuit is protected by means of a fuse 15 and is provided with a main switch 16. The arms of a governor, connected to the drive mechanism of the machine, are illustrated schematically at 18 and move the slider 19 which comes into contact with one of the resistances of decreasing value 20, 21, 22, 23 and 24. The system automatically increases the heating power as the speed of the machine rises.

A rotary switch 25 is coupled to the drive mechanism of the machine and connects the electromagnet 10 to the circuit. The switch 26 is coupled to the switch of the machine and disconnects the electromagnet 10 when this switch is opened. The heated point 2 is provided with a resistance for heating, the resistance being fed from transformer 28 via a rheostat 27 to give a manual regulation of the temperature to suit the nature and thickness of the material to be sewn.

A switch 29 is ganged to the reversing switch of the machine to disconnect the electromagnet when the machine is run in reverse.

The movement of the feed dogs is effected in a known manner through a system of cams shown schematically in FIGURE 7. Two cams 31 and 32 are secured to the motor arm 33 and transmit to the feed dog 11 forward and backward reciprocating motion and a raising and lowering reciprocating motion. The amplitude of movement of the forward and backward reciprocation transmitted to the feed dog 11 is regulated in a known manner by the cam 32.

The machine 34 is of standard form: the needle 35 is reciprocated through needle aperture 6, by means of crank 37 driven by motor arm 33 via linkage 38 so that movement of the feed dogs is coordinated with movement of the needle.

In one embodiment relative movement between the fabric and heated point is effected by the electromagnet 10 and spring 9 pivoting the bell crank lever between the position of FIGURE 2 and that of FIGURE 3. According to a variant, as shown in FIGURES 4 and 5 the point remains stationary and the fabric is raised and lowered.

FIGURES 4 and 5 show diagrammatically, during the

sewing operation, two separate positions of the feed dogs 11, the heated point 2 and the material 12 relatively to the needle plate 1.

Since the sewing machine has dogs which carry out a raising and lowering movement, the heated point projects through the needle plate for the entire duration of the sewing operation.

In FIGURE 4, the machine is shown in a position in which a stitch has just been formed and, at the same time, a perforation has been formed by the heated point. In the position of FIGURE 5, the feed dogs have lifted the fabric and made it advance, rearwardly with respect to the plane of the figure, above the heated point by the length of a stitch.

At the end of the advancing movement, the dogs are retracted and the fabric impales itself on the heated point (FIGURE 4).

The device according to the invention makes it possible for the preforming of sewing holes to be carried out quite easily, and therefore stitching without puckering is made possible.

In the foregoing description only one heated point and one needle have been mentioned. It will be apparent that it is possible to use a sewing machine which comprises several heated points and several needles without departing from the scope of the present invention.

We claim:

1. A sewing machine comprising a needle and needle plate; drive means for reciprocating said needle through said needle plate; means for translating material by a stitch length relative to said needle and plate from a position upstream of said needle, a heated point situated upstream of said needle by a distance equal to n times a stitch length, where n is a positive integer and projecting upwardly from said needle plate and means for causing the heated point to pierce material by relative movement thereof with respect to said heated point.

2. A sewing machine comprising a needle and needle plate; drive means for reciprocating said needle through said needle plate; means for translating material by a stitch length relative to said needle and plate from a position upstream of said needle, a heated point situated upstream of said needle by a distance equal to n times a stitch length, where n is a positive integer and projecting upwardly from said needle plate and means for causing said heated point to reciprocate through said needle plate in time with said needle.

3. A sewing machine comprising a needle and needle plate; drive means for reciprocating said needle through said needle plate; means for translating material by a stitch length relative to said needle and plate from a position upstream of said needle; a point situated upstream of said needle by a distance equal to n times the stitch length, where n is a positive integer and projecting upwardly from said needle plate, electrical heating means effective to heat said point and means for causing said heated point to reciprocate through said needle plate in time with said needle.

4. The sewing machine specified in claim 3 wherein said means causing the point to reciprocate comprise a bell crank lever having two ends, a pivot for said bell crank lever, said point being fixed to one of said ends, a spring secured to the other of said ends urging said lever in one direction effective to retract said needle below said plate and an electromagnet so positioned, when energised, to urge said other lever in the opposite direction effective to raise said point above the needle plate.

5. The sewing machine specified in claim 4, and including a switch connected to said drive means effective to energise said electromagnet.

6. The sewing machine specified in claim 3, wherein a centrifugal governor is connected to said drive means and a rheostat is operated by said governor to regulate the current in dependence on the speed of said machine.

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7. A sewing machine comprising a needle and needle plate; drive means for reciprocating said needle through said needle plate; means for translating material by a stitch length relative to said needle and plate from a position upstream of said needle a heated point situated upstream of said needle by a distance equal to n times a stitch length, where n is a positive integer and projecting upwardly from said needle plate and means for lifting and lowering material translated by said translating means whereby said material is impaled on said heated point.

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