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SAFETY NEEDLE DEVICE FOR SEWING MACHINE

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FIG. 1.

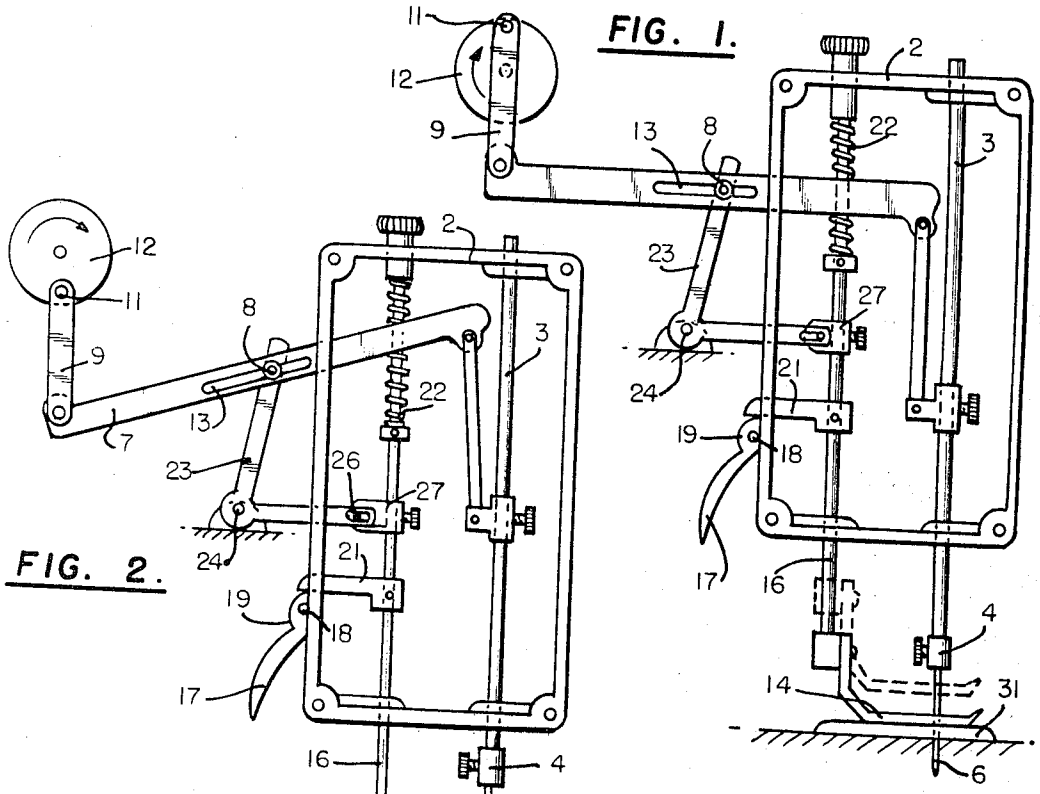
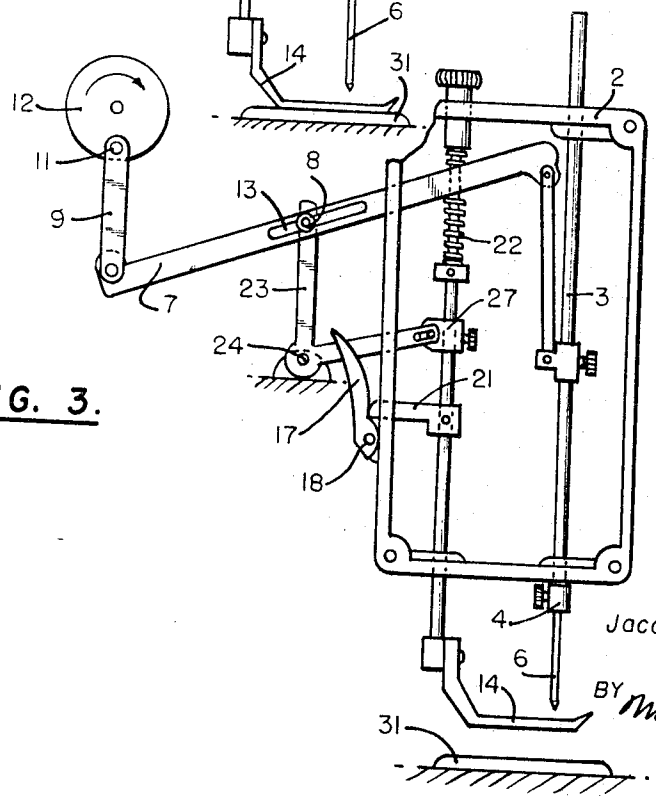


FIG. 2.

FIG. 3.



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SAFETY NEEDLE DEVICE FOR SEWING MACHINE

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ABSTRACT OF THE DISCLOSURE

Apparatus for preventing the possibility of a sewing machine needle penetrating the operator's finger during sewing by adjusting the length of the needle stroke as the presser foot is raised and lowered so that there is never sufficient clearance between the needle and the presser foot to permit insertion of a finger.

A fairly common accident occurring during the use of sewing machines is for the operator's finger to get under the needle during sewing, with sometimes several stitches being made through the flesh before the finger can be removed. This is due to the fact that in conventional sewing machines the height of the needle stroke is fixed at a point such that sewing can be accomplished with the presser foot raised to its maximum position above the sewing table surface, and since the needle stroke in conventional machines is not variable, when the presser foot is lowered for sewing ordinary thin materials, there is sufficient space between the needle point at the top of its stroke and the presser foot for a finger to be inserted beneath the needle.

In accordance with the present invention, this possibility is obviated by an arrangement which changes the length of the needle stroke as the presser foot is raised and lowered in such a way that the bottom of the needle stroke remains always substantially at the same point, but the length of the needle stroke is increased as the presser foot is raised, and vice versa, in such a way that the top of the needle stroke remains at all times only a small distance above the presser foot, so that there is no possibility of inserting the finger between the needle and the presser foot at any time. More specifically, the above object is accomplished, in a machine having a reciprocating needle-driving lever, by adjusting the fulcrum point of this lever as the presser foot is raised, so that the length of the needle stroke is increased or decreased in accordance with the position of the presser foot in such a manner that while the bottom of the needle stroke remains at substantially the same point, the top of the needle stroke is maintained at all times only a short distance above the presser foot, this distance being insufficient for the insertion of a finger between the needle and the presser foot.

To accomplish this, a lever is provided which is fixed to a part of the presser foot or its lifting mechanism at one end, while the other end moves the pivotal point of the needle lever to adjust the length of the needle stroke. By positioning the movable fulcrum point so that it moves along a line corresponding to the lever position at the lowest point of the needle stroke, the adjustment of the fulcrum point will vary only at the top of the stroke, so that the desired result is attained.

Alternatively, the safety feature of the present invention can also be accomplished by keeping the length of the stroke constant, but moving the stroke-controlling means so that the top of the stroke remains at all times just above the presser foot as the latter is raised and lowered, so that there is no position of the presser foot where a finger can be inserted between it and the needle.

The specific nature of the invention, as well as other objects and advantages thereof, will clearly appear from a description of a preferred embodiment as shown in the accompanying drawing, in which:

FIG. 1 is a side elevation of a presser foot and needle mechanism with both the presser foot and needle at their lowest positions;

FIG. 2 is a view similar to FIG. 1 with the needle shown at the top of its stroke; and

FIG. 3 is a similar view showing the presser foot and needle both at the top of their strokes.

In the figures, the entire presser foot and needle mechanisms are shown contained within a frame **2**, of conventional construction as is well known in the sewing machine art. Mounted for reciprocal sliding motion within the frame is the needle shaft **3** having at its end a conventional needle holder **4** for reception of a needle **6**. During sewing, the needle is reciprocated vertically by needle drive lever **7** which is pivoted at point **8** and is reciprocated through link **9** which is pivotally connected at point **11** of drive wheel **12** which is driven by any suitable power source. It will be apparent that as drive wheel **12** rotates, the needle drive lever **7** oscillates about a fulcrum point **8** and thereby carries with it the needle shaft **3** and needle **6**. The length of the needle stroke is determined by the position of fulcrum **8**, which is movable in a slot **13** in drive lever **7**. In the position shown in FIG. 1, the needle is at the bottom of its stroke, while FIG. 2 shows the needle at the top of its stroke, when the presser foot is in the lowest position possible.

Presser foot **14** is mounted on presser foot shaft **16**, which is manually reciprocal from the position shown in FIGS. 1 and 2 to the position shown in FIG. 3 by means of presser foot lever **17** pivotal about point **18** to vary the position of cam surface **19** with respect to cam follower **21** which is fixed to shaft **16** so that manually pivoting lever **17** will adjust the vertical position of the presser foot to any point between the two extreme positions. A spring **22** is provided, as is conventional, to urge the presser foot to its lowest position permitted by the position of the handle **17**. A bell crank **23** mounted on fixed pivot **24**, which may be secured to any suitable part of the sewing machine is pivotally connected to the presser foot shaft **16** by means of pivot pin **26** set in pin holder **27** which is fixed to the shaft **16**. The other end of bell crank **23** carries a pivot pin **8** which is slidable in slot **13** in needle drive lever **7**. It will be seen that as the presser foot is raised from its lower position shown in FIGS. 1 and 2 to its highest position shown in FIG. 3, pivot point **8** moves toward link **9**, thus increasing the length of the needle stroke, since the length of the power drive stroke remains unchanged. The arrangement is such that pivot point **8** moves along a small segment of an arc of a circle having its center at point **24**, the segment being sufficiently short to approximate a straight line, so that the pivot point **8** can be said to move substantially along the straight line formed by drive lever **7** in the position shown in FIG. 1, that is, wifh the link **9** at the top of its stroke and the needle **6** at the bottom of its stroke. It will be seen that movement of the pivot point **8** therefore does not appreciably change the position of the needle at the bottom of its stroke; however, since the length of the stroke at the needle end of the lever **7** is greater when the pivot point **8** has moved to its extreme left-hand position, it will be apparent that the top of the stroke occurs at a higher point as the pivot point **8** is moved to the left, and vice versa. The top of the needle stroke is shown in FIG. 3 for the extreme raised position of the presser foot, and it will be seen that the relation of

the needle at this point to the presser foot is substantially the same as in the case of FIG. 2, where the presser foot is in its lowest position and the needle **6** is also shown at the top of its stroke. This relationship is very closely maintained for all intermediate positions of the presser foot, and it will therefore be apparent that in no position of the presser foot will there be sufficient clearance between the needle and the presser foot for a finger to be inserted during the sewing operation, although the sewing stroke can be maintained in any position of the presser foot.

It will be understood that it is desirable to have the needle, at the top of its stroke, in all positions of the presser foot, resting slightly above the presser foot so that material can be freely moved and positioned between the presser foot and the sewing table **31**; furthermore, the needle must be above the presser foot while it is being threaded. The arrangement shown, therefore, permits normal operation of the sewing machine in all respects, and at the same time prevents the possibility of the operator's finger becoming impaled by the needle during the sewing operation.

If desired, it will be apparent that the stroke can be kept constant, yet provide no position where a finger can get between the presser foot and the needle; for example, by suitably raising and lowering the pivot point **8** vertically by one-half the distance the foot is raised, without changing the position of the pivot point on the drive lever **7**. The important consideration is to keep the needle from ever clearing the presser foot by a distance sufficient for a finger to be inserted.

While the stroke-changing means is shown here as a fulcrum-shifting device, it will be apparent that the same object can be accomplished by other mechanisms, such as a three-dimensional cam arranged so that the stroke can be varied by making the follower ride on a different portion of the cam, and so forth.

It will be apparent that the embodiments shown are only exemplary and that various modifications can be made in construction and arrangement within the scope of my invention.

I claim:

1. In a sewing machine having a table, an adjustable presser foot and a needle vertically reciprocable through an opening in the presser foot from a point above the presser foot to a point below it,

(a) a vertically reciprocable needle shaft terminating in a needle holder for said needle,

(b) a reciprocating needle drive means for reciprocating said needle through a desired vertical stroke for sewing, and means for vertically adjusting said stroke,

(c) a presser foot, and means for vertically adjusting said presser foot from a low sewing position to a high point above the table,

(d) manually operable means for moving the presser foot between its two positions, and

(e) stroke-control means movable with said manually operable means to vary the position of the stroke adjusting means as the presser foot is adjusted so that the point of the needle at the top of the needle stroke, in all positions of the presser foot, remains sufficiently close to the presser foot to prevent the insertion of a finger between the needle and the presser foot.

2. In a sewing machine having a table, an adjustable presser foot and a needle vertically reciprocable through an opening in the presser foot from a point above the presser foot to a point below it,

(a) a vertically reciprocable needle shaft terminating in a needle holder for said needle,

(b) a reciprocating needle drive lever having a reciprocating power drive and a needle drive end pivotally attached to said needle shaft, and a fulcrum intermediate said ends,

(c) a presser foot, and means for vertically adjusting said presser foot from a low sewing position to a high point above the table,

(d) manually operable means for moving the presser foot between its two positions, and

(e) adjusting means movable with said manually operable means to change the position of said fulcrum to adjust the lever stroke at the needle drive end of the lever as the presser foot is adjusted so that the point of the needle at the top of the needle stroke, in all positions of the presser foot, remains sufficiently close to the presser foot to prevent the insertion of a finger between the needle and the presser foot.

3. The invention according to claim **2**, said adjusting means comprising means moved by said manually operable means to change the position of said fulcrum along the lever to adjust the length of the lever stroke at the needle drive end of the lever as the presser foot is adjusted.

4. The invention according to claim **3**, said fulcrum means comprising a bell-crank lever having a fixed pivot, one end of said bell-crank lever being movable by said manually operable means as the presser foot is raised and lowered, the other end of said bell-crank lever moving said fulcrum along the lever in alignment with the direction of the said lever when the lever is in the position corresponding to the bottom of the needle stroke.

5. In a sewing machine having a table, an adjustable presser foot and a needle vertically reciprocable through an opening in the presser foot from a point above the presser foot to a point below it,

(a) a vertically reciprocable needle shaft terminating in a needle holder for said needle,

(b) a reciprocating needle drive lever having a reciprocating power drive end and a needle drive end pivotally attached to said needle shaft, and a fulcrum intermediate said ends,

(c) a presser foot, and means for vertically adjusting said presser foot from a low sewing point to a high point above the table,

(d) manually operable means for moving the presser foot between its two positions, and

(e) fulcrum adjusting means moved by said manually operable means to change the position of said fulcrum along the lever to adjust the length of the lever stroke at the needle drive end of the lever as the presser foot is adjusted so that the point of the needle at the top of the needle stroke in all positions of the presser foot remains sufficiently close to the presser foot to prevent the insertion of a finger between the needle and the presser foot.

6. The invention according to claim **5**, said fulcrum means comprising a bell-crank lever having a fixed pivot, one end of said crank lever being movable by said manually operable means as the presser foot is raised and lowered, the other end of said bell or lever moving said fulcrum along the lever in alignment with the direction of the said lever when the lever is in the position corresponding to the bottom of the needle stroke.

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