

Sept. 21, 1937.

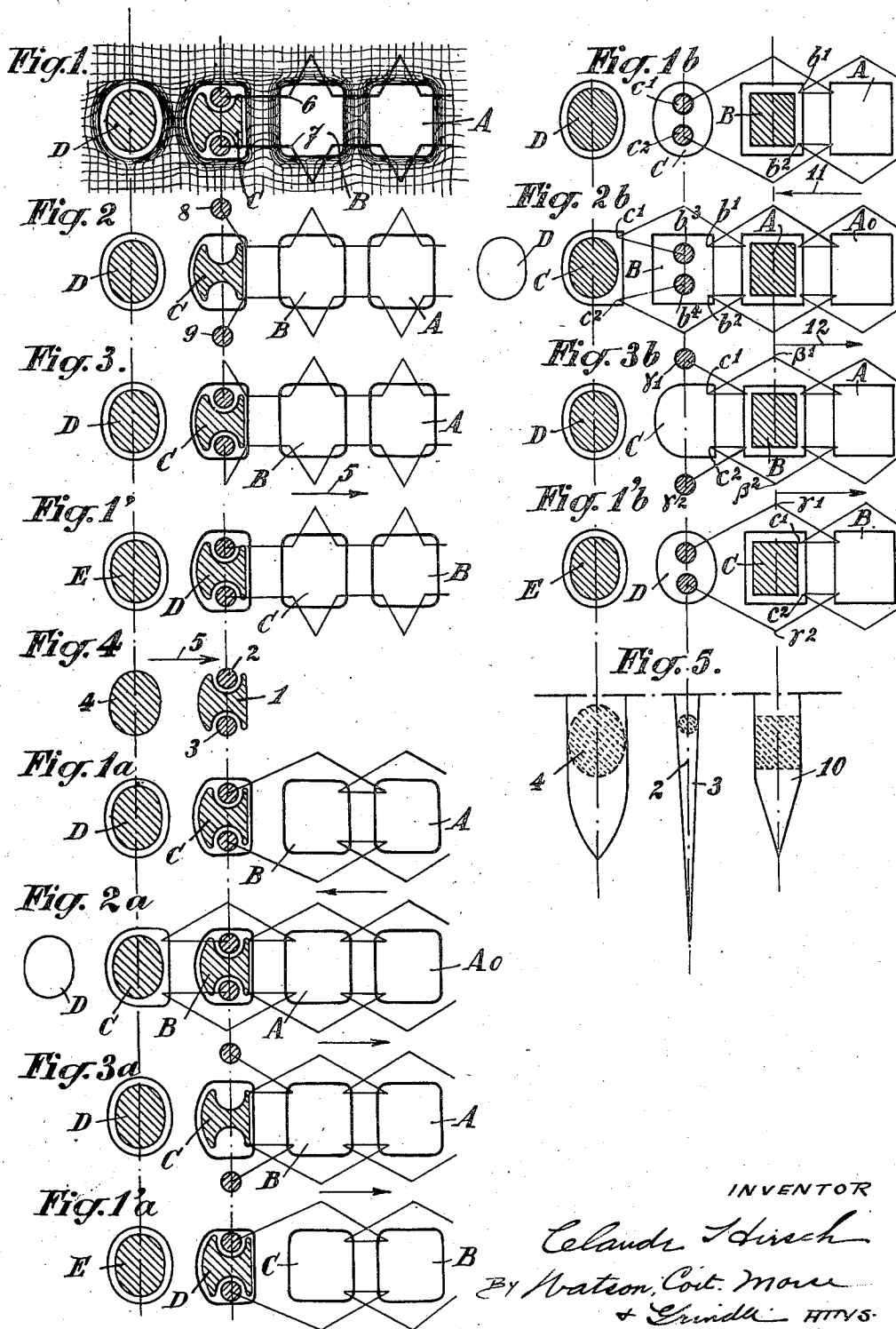
C. HIRSCH

2,093,558

HEMSTITCHING MACHINE

Filed Jan. 29, 1936

3 Sheets-Sheet 1



INVENTOR

Celaude Hirsch

BY *Watson, Coit, Moore*
& *Grindle* ATTS.

Sept. 21, 1937.

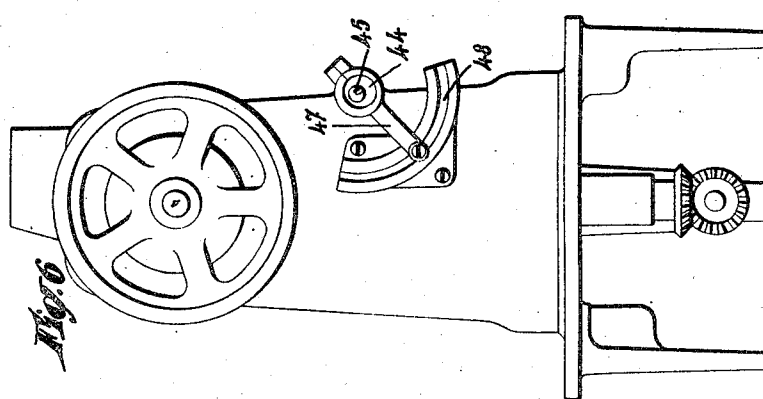
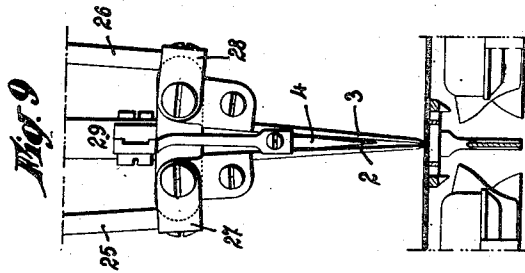
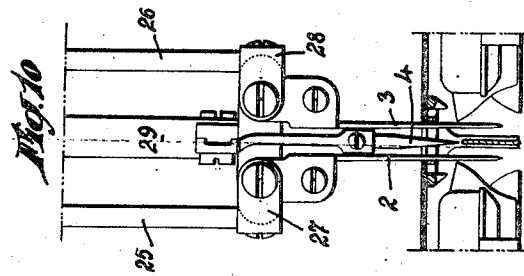
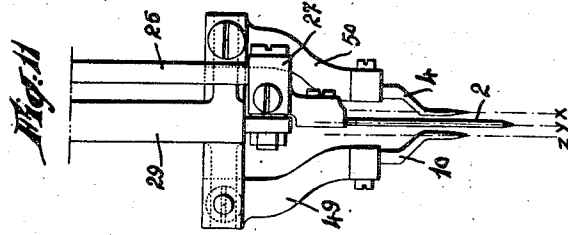
C. HIRSCH

2,093,558

HEMSTITCHING MACHINE

Filed Jan. 29, 1936

3 Sheets-Sheet 2



INVENTOR

Claude Hirsch

By Watson, Coit, Moore & Ginder
ATTYS.

UNITED STATES PATENT OFFICE

2,093,558

HEMSTITCHING MACHINE

Claude Hirsch, Paris, France, assignor to Anciens
Etablissements R. Cornely & Cie., Société
Anonyme, Paris, France, a French company

Application January 29, 1936, Serial No. 61,411
In France February 7, 1935

2 Claims. (Cl. 112—81)

The present invention has for its object the provision of a plain or "ladder" hem-stitching machine adapted to operate at very high speeds whilst allowing perfect work to be obtained at those speeds whatever be the nature of the fabric, and even with a large number of fabrics superposed.

This result can be obtained, according to the present invention, in the case of fabrics of small thickness, by the suppression of the punch arranged between the needles in known hem-stitching machines; this obviates the presence of any driving means for the punch, such driving means having the effect, by reason of its inertia, of slowing down the running of the machine; the auxiliary piercer, disposed in advance of the punch in present machines, is however retained.

When it is desired to obtain hem-stitch work having very accurate contours, even with thick or strong fabrics, it is possible according to the present invention to arrange behind the needles, in the direction of advance of the fabric, a supplementary piercer having for its object the shaping of the aperture after its passage below the needles, the said piercer being of a suitable cross-section for that purpose. The machine is then provided with reversing feed, that is to say that the fabric performs alternate movements in one direction and in the other, with a greater amplitude in the direction in which it is first to advance. That allows in fact several successive shapings of the aperture by the rear piercer, as will be explained hereafter.

Moreover, as will be understood, it is possible to add a rear piercer to existing machines comprising a punch between the needles, when it is desired to execute more perfect work with these needles.

The subsequent description, with reference to the annexed drawings given by way of example, will explain in what manner the invention can be carried out.

Figs. 1, 2, 3 and 1' show in plan the successive stages in the formation of a ladder hem-stitch in ordinary hem-stitching machines with straight feed.

Fig. 4 represents in plan, diagrammatically, the arrangement of the fore-piercer, punch and needles in these known machines.

Figs. 1a, 2a, 3a and 1'a show the stages in the form of a ladder hem-stitch in known machines with reversing feed.

Figs. 1b, 2b, 3b and 1'b represent likewise the stages in the formation of the ladder hem-stitch in a machine according to the invention.

Fig. 5 represents in side view the arrangement in this machine of the fore-piercer, needles and rear-piercer serving for the shaping of the aperture.

Fig. 6 is an end view of a machine according to the invention, seen from the driving side.

Fig. 7 shows this machine in lateral elevation, partly in section.

Fig. 8 is an end view of the machine, seen from the side of the needles.

Figs. 9 and 10 are partial views of Fig. 7, on a larger scale, showing the needles and punches in the positions which they occupy at the stages of Figs. 1b and 2b (in Fig. 9) and 3b (in Fig. 10).

Fig. 11 is a partial view of Fig. 5, on a larger scale, likewise showing the needles, fore-piercer and rear-piercer.

Machines for plain or ladder hemstitching, hitherto known operate with a piercer or punch placed between the two needles and 3; this punch serves to perforate the fabric and at the same time it accompanies the needles in the course of their passage into the fabric, in order that they may not leave between them any longitudinal thread of the fabric.

Moreover, another piercer 4, or fore-piercer, situated in advance of the needles (looking at the machine in the direction of the feed of the fabric, indicated by the arrow 5), is frequently utilized in order to separate the threads of the fabric and to produce a first perforation forming a blank or rough outline of the aperture.

It is to be noted that while the fore-piercer 4 can be mounted and fixed upon the needle-bar, in such a way as to follow the upward and downward movement of the needles, it is not the same for the punch 1, although this punch works in the same hole of the fabric as the needles. The punch cannot in fact be fixed upon the needle carrier for that would result in an excessive length for the punch and a considerable inertia to be overcome. This makes it necessary to provide for the punch 1 a special drive, independent of that for the needles, which makes the movements of the machine sluggish and diminishes considerably the possibilities of speed.

Ladder hem-stitching machines hitherto known, working with the system of punch and fore-piercer described above, can operate either with straight feed or with reversing feed.

In the case of the straight feed, the apertures blanked by the fore-piercer 4 (which passes successively three times through them) are thereafter traversed by the punch and needles as a unit. As a reminder, there will be explained,

with reference to Figs. 1, 2, 3 and 1', the various stages in the formation of the stitch with straight feed.

In Fig. 1, the fabric has just been fed forward in the direction of the arrow 5 in such a way that the needle threads extending above and below the fabric (below the fabric they are taken on by the hooks) pull upon the corners 6 and 7 of the previously formed aperture B; the needles now descend into the aperture C prepared in the preceding stage by the fore-piercer D, and proceed to the taking of the loop with the hooks, then they rise again.

In Fig. 2, the needles descend again, while moving apart and penetrate into the fabric at the points 8 and 9 either side of the aperture C; then they move together and rise again.

In Fig. 3 they descend once more into the hole C, proceed to the taking on of the loop with the hooks and rise again.

In Fig. 1', the feeding of the fabric is produced, thus returning to stage 1.

All this is well known in the art.

The punch and needle unit which traverses the hole prepared by the fore-piercer, during the descent of the needles, cannot have a square or even a rectangular cross-section and it is therefore not suitable for obtaining a perfectly square or rectangular shape for the aperture. It is only by the action of the thread tensions that the corners of the aperture can be given a sharp angular shape, and the execution of square hemstitch apertures is due really to this cause alone. But since the pull of the threads acts generally with great irregularity, the hemstitch is far from presenting the square (or rectangular) hole which characterizes fine work.

A considerable improvement can be obtained by retaining the same punch and needle system, but having recourse to reversing feed (Figs. 1a, 2a, 3a; 1'a), because with the threads crossing one another at each rung of the ladder, their tensions act upon the angles of the aperture and give them a more nearly square shape than with straight feed; hemstitching with reversing feed will be referred to hereafter at the same time that the operation of the machine according to the present invention is described.

This machine comprises, behind the needles 2, 3 (assuming that the machine is looked at in the direction of the general advance of the fabric, that is to say from the position occupied by the operator), a piercer 10 (see Fig. 5) which can present in cross-section the exact shape which it is desired to give the aperture, namely a square shape in the case illustrated in the drawings; this rear-piercer therefore permits the shaping of the aperture and giving it a perfect conformation. The fore-piercer 4 is retained, but the punch 1 situated between the needles in the known machine is suppressed.

This machine operates preferably with reversing feed; in fact, in this case, the rear-piercer becomes fully effective for it acts several times over upon the shape of the incompletely sewn hem-stitch, as will be now explained with reference to Figs. 1b, 2b, 3b and 1'b.

In Fig. 1b, the needles descend with their points together (see also Fig. 9) into the hole C prepared in the course of the preceding stage by the fore-piercer 4, which in the present stage prepares the following hole D. Within the hole C, where they have thus penetrated without leaving any fabric thread between them, the needles separate while descending, until at the taking-on of

the loop with the hooks they have a position further apart (see Fig. 10). Then the taking of the loop takes place, as well as the formation of the stitch $c^1 c^2$ which is drawn tight while the needles rise again and while the backward feed (arrow 11) brings the hole C under the fore-piercer 4 and the hole B under the needles, ready for the next stage.

In the second stage (Fig. 2b) the needles descend with their points together into the hole B, already partly sewn (by the stitch b^1-b^2 made in a preceding stage) and shaped by the rear-piercer 10. In descending, they move apart for the taking on of the loop and rise again, forming the stitches b^3-b^4 , whilst the forward feed (arrow 12) takes place for the third stage, and brings the hole B under the rear-piercer 10, the hole C under the needles, and the hole D for the second time under the fore-piercer 4.

In the course of the third stage (Fig. 3b) the separated needles penetrate into the fabric almost vertically and produce the stitches $\gamma^1 \gamma^2$. Then a new feed movement in the forward direction takes place for the next stage, bringing the hole C under the rear-piercer 10 (for a first shaping), the hole D under the needles (like the hole C in Fig. 1b) and the portion E of the fabric for a first perforation below the fore-piercer 4. This reproduces the same stage as Fig. 1b; the needles descend with their points together into the hole D, and the cycle of operations already explained is repeated.

It is to be noted that each apertured portion of the fabric passes, in this cycle of operations, twice beneath the fore-piercer, twice beneath the needles in their closed-together position, and twice beneath the rear-piercer, which makes in all six graduated operations of perforation, hemstitching and shaping.

Figs. 6 to 11 represent the general arrangement of a machine allowing the carrying out of the work described, it being understood that only the parts necessary to the understanding of the invention are represented in these figures.

Fig. 7 shows in particular the driving means for the vibration of the needles from the cam 20 transmitting to the needles 2, 3, symmetrical separating and closing movements, by the intermediary of the connecting rod 21, regulating segment-lever 22, rod 23, jointed parallelogram 24, rods 25, 26, and needle-carriers 27, 28. The cam 20, which revolves in the known manner at one third of the speed of the main shaft 30 of the machine, has a profile suitable for giving the needles 2, 3 the desired separations, as a function of the height of the bar 29 which carries the said needles.

The feeding of the fabric is effected by the feeder 31, driven by a system well known in itself.

This system is composed essentially of the cam 32 for moving the feeder backwards and forwards, and the feeder-lift cam 33, the one controlling the movement back and forth of the feeder-support 39 by the intermediary of the levers and connecting rods 34, 35, 36, 37 and 38, and the other the lifting of the feeder by the intermediary of the levers and connecting rods 40, 41, 42 and 43, (see Fig. 8).

A special feature of the machine consists in mechanism for controlling the phase of the lifting of the feeder in relation to the other movements of the machine.

This regulation allows of adjusting considerably in relation to one another the forward and rearward movements of the fabric, in order to

obtain, whatever be the nature of the fabric worked upon, exact amplitudes for the various forward and rearward movements of the fabric, in such a way that the prepared or shaped holes are placed at each movement in the desired position with relation to the needles and the piercers.

This mechanism comprises an eccentric bush 44 pivotally mounted on the metal frame of the machine and serving as supporting sleeve for the fulcrum-pin 45 of the arm 40, which controls the rise and fall of the feeder. Rotation of this bush shifts the pivot 45; consequently the other end of the lever 40, carrying the roller 46 guided in the cam 33, moves along this cam, which brings about the desired alteration of phase.

In order to facilitate this regulation, the bush 44 is fast with a lever 47 of which the other end travels over a sector 48 which may bear setting marks and upon which it can be locked.

The piercers 4 and 10 are advantageously mounted upon slidable supports 49 and 50 (Fig. 11) integral with the needle-carrier bar 29, in such a way that it is possible to set each of them at a distance from the plane of the needles corresponding to the length of the stitch.

As regards their cross-section, that of the fore-piercer 4 is preferably oval or circular, whereas that of the rear-piercer 10 presents the final shape of the hem-stitch aperture (square or rectangular).

The curved profiles of these piercers are progressive, especially upon the fore-piercer, in order to separate the fabric threads in a proper manner without breaking them.

What I claim is:

1. A hem-stitching machine for obtaining in a fabric hem-stitched work of very clear conformation at very high speed, which comprises, in combination, two needles, means for giving said needles a reciprocating movement at right angles to the fabric, means for oscillating said needles in a direction transverse to that of said reciprocating movement, a fore piercer adapted to perforate the fabric prior to its passage under the

needles, the space between the needles being wholly free from any punch as is usually provided between the needles in machines of this type, a rear piercer arranged behind the needles in the direction of the advance of the fabric, said rear piercer having a cross section adapted to exactly shape the hem-stitch aperture after its passage under the needles, means for actuating said fore piercer and said rear piercer in accordance with the movement of the needles, a feed mechanism for the fabric including a feeder and means for lifting said feeder with respect to the fabric, and regulating means for modifying the feed of the fabric, including means for controlling the phase of the lifting of said feeder with relation to the other movements of the machine.

2. A hem-stitching machine for obtaining in a fabric hem-stitched work of very clear conformation at very high speed, which comprises, in combination, two needles, means for giving said needles a reciprocating movement at right angles to the fabric, means for oscillating said needles in a direction transverse to that of said reciprocating movement, a fore piercer adapted to perforate the fabric prior to its passage under the needles, the space between the needles being wholly free from any punch as is usually provided between the needles in machines of this type, a rear piercer arranged behind the needles in the direction of the advance of the fabric, said rear piercer having a cross section adapted to exactly shape the hem-stitch aperture after its passage under the needles, means for actuating said fore piercer and said rear piercer in accordance with the movement of the needles, a feed mechanism for the fabric including a shaft for operating the machine, a cam controlled by said shaft, a feeder for moving the fabric, at least one lever for transmitting to said feeder a vertical reciprocating motion operatively controlled by said cam, a fulcrum for said lever, and an eccentric bush adapted to act as a support for said fulcrum.

CLAUDE HIRSCH.