D. GRIFFITHS.
ORNAMENTAL STITCH SEWING MACHINE.
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Fig. 8.

Fig. 9.

Fig. 3.

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By his Attorney

CHAS. T. SMITH
To all whom it may concern:

Be it known that I, DANIEL GRIFFITHS, a citizen of the United States, residing at Jersey City; Union county, State of New Jersey, have invented certain new and useful Improvements in Ornamental-Stitch Sewing-Machines, of which the following is a specification.

This invention relates to sewing-machines, and especially to two-needle sewing-machines in which two parallel rows of stitches are interlocked with a third row of ornamental or fancy loops formed by an auxiliary loop-forming device, the main object of this invention being the provision of an improved stitch-forming mechanism positive in action, operative at a high rate of speed, and capable of interlocking a row of auxiliary or ornamental closed loops with a row or rows of ordinary stitches without gathering the goods being sewed and without undue strain upon the respective threads. In order to accomplish these results, the several operating parts of the main stitch-forming mechanism and the auxiliary loop-forming device are preferably geared together for movement in proper timing, the use of springs dispensed with, and each working stroke of the auxiliary loop-forming device effected by a movement in a direction the reverse of that in which the goods are fed during the sewing operation, this auxiliary loop-forming device preferably cooperating directly with the needle or needles of the main stitch-forming mechanism to form the auxiliary or ornamental stitches without the intervention of any other parts.

My invention is embodied in any sewing mechanism in which an auxiliary closed loop-forming device is movable in the general direction of the feed of the goods and operates to form or wrap loops around the needle or needles of the main stitch-forming mechanism as the operation of the latter proceeds. In the preferred construction, however, which is capable of forming and interlocking with two rows of ordinary stitches a row of ornamental loops, my improved stitch-forming mechanism embodies two associated stitch-forming devices and a loop-forming device cooperative directly with the other two for forming the auxiliary or ornamental loops without the aid of any intermediate devices, such as the guide-fingers heretofore mounted on the presser-foot of a two-needle sewing-machine. Of these three associated devices that forms the ornamental loops is usually movable, preferably, transversely to the members or needles of the other two and should cooperate with such members or needles alternately, it being timed in this case to move into and out of working relation first with one needle and then with the other and to wrap or wind a loop first around one of the needles and then around the other. Usually each ornamental stitch will be several times as long as the ordinary stitches, the length of the former being an exact multiple of that of the latter.

In the drawings accompanying the specification and forming part of this application, Figure 1 is a side elevation of a sewing-machine head illustrating my invention applied thereto. Fig. 2 is a plan of the same, showing my improved mechanism in full lines and the remainder of the head in outline. Fig. 3 is an end elevation of said sewing-machine head as viewed from the right in Fig. 1. Figs. 4, 5, and 6 are enlarged details illustrating the normal position and the two working strokes of the auxiliary device or looper. Fig. 7 is an enlarged detail illustrating said looper and a universally-movable carrier therefor. Fig. 8 is an enlarged detail illustrating a cam and a forked lever for actuating the looper in one direction. Fig. 9 is a similar view of a cam and slide for actuating the looper in a different direction. Fig. 10 is a detail illustrating the three rows of interlocked stitches and loops made by my improved stitch-forming mechanism. Fig. 11 is a side elevation of the sewing-machine head similar to that of Fig. 1, illustrating a further feature of my invention; and Fig. 13 is an enlarged sectional detail showing the connection between certain of the parts to be hereinafter referred to.

Similar characters designate like parts in the different figures of the drawings.
My invention may be embodied as part of or applied as an attachment to any suitable sewing-machine; but in the drawings it is shown as an attachment applied to a Wheeler & Wilson two-needle vertical-hook sewing-machine, it being evident, of course, that it may be used with equal facility in connection with other types of two-needle machines.

In the construction shown I have illustrated the usual type of head, having a horizontally-ranging arm A rising from a support carried by a base or bed plate B in the well-known manner, said arm having therein the main driver or driving shaft 2, carrying the band-wheel 3.

The needle-bar may be of the usual type, as illustrated at N, and will have the usual two needles n and n', constituting the stitch-forming members of the main stitch-forming mechanism for making two parallel rows of ordinary stitches. In connection with these needles I may employ two guides, such as g and g', of well-known construction for controlling the movements of the two pieces of goods to be sewed at their edges and interlocked or connected with each other.

The auxiliary loop-forming device or looper mechanism may be of any suitable construction provided that it cooperates with the main stitch-forming mechanism in substantially the manner hereinbefore stated. In the preferred form of the device, however, the thread-carrying member proper is a simple loop-forming member or looper for wrapping or looping an ornamental thread around the needle and the needle-thread. The looper shown is an arm L, having a tubular thread-guiding end 5, through which the thread, usually silk floss, for forming the ornamental stitches passes from a suitable supply device, (not shown,) which may be mounted on a spool-holder, such as 6, supported at a suitable point on the framework. This looper is intended to cooperate with each needle in such a manner as to constitute therewith the sole means for forming the loops in the ornamental thread. As the looper is intended to be in working relation with the two needles alternately, it is evident that it should be moved transversely to the needles in such a path as will assure the wrapping of the third or ornamental thread around the needles and the needle-threads alternately. For this reason I prefer to actuate the looper in two paths transverse to each other and also to the needles, the resultant being a movement in an irregular path or orbit extending, preferably, beyond the ends of a line connecting the needles and to both sides of such line.

The looper L will usually be secured to a carrier, such as C, which should move in two directions transverse to each other and to the needles, this looper-carrier preferably having a universal connection, such as 8, with a support such as the presser-bar P, said carrier therefore being capable of oscillation in two intersecting arcs. These two movements of the looper-carrier and the looper may be obtained in any desired manner, but I prefer to derive them from the main driver or shaft 2, by means of which the main stitch-forming mechanism or needle-bar mechanism is operated, thus assuring a positive action in proper timing with that of the main stitch-forming mechanism. Here the driver 2 has at the end thereof remote from the needle-bar a pinion 2', in mesh with a spur-gear 10, secured to a long shaft 12, parallel with the shaft 2 and mounted in bearings 13 and 13', these latter forming in this case parts of the body or frame of the loop-forming attachment, said body being designated in a general way by A', and being in this instance removably secured to the arm A by screws 15.

From the shaft 12 two movements are transmitted to the looper-carrier and its looper by suitable intermediate connections, cams being preferably employed for this purpose. One of these cams is shown at c secured to the shaft near the bearing 19', and has a cam-groove 16, in which works a pin 17, carried by a forked lever 17, pivoted on a stud 18, secured to an arm 19, carried by the body A' of the attachment. This forked lever straddles and serves to impart transverse movements to a connecting-rod 20, and thence directly to the looper-carrier and the looper, the longitudinal movement of said connecting-rod being utilized to obtain the other movement of the looper. I prefer to derive this longitudinal movement of the connecting-rod 20 directly from the shaft 12, and in the construction shown the lever has thereon a bevel-pinion 21, which meshes with a bevel-gear 22, secured to the upper end of a short shaft 23, journal'd in vertical bearings 24 and 24' on the frame of the attachment, and having secured thereto a cam c', having therein a cam-groove 26, in which works a pin 27, carried by a slide s, movable along a guide g, also secured to the frame of the attachment, and having a guideway in which said slide reciprocates. At the inner end thereof the slide is pivoted to the inner end of the connecting-rod 20, and hence serves to impart a reciprocating movement to the latter, which reciprocation is in turn converted into an oscillation of the looper-carrier C of an arc transverse to the arc in which such carrier is moved by the lateral swing of said connecting-rod, this connecting-rod having here at its outer end an adjustable bearing-collar 20', surrounding a pin 30, secured to the carrier C.

The connected parts should be so timed and the cam-grooves 16 and 26 should be so shaped as to cause the looper to shift from its normal position, (shown in Fig. 4,) first to one working position with respect to the needle mechanism and then to its other working position, (see Figs. 5 and 6,) it being apparent that the
endwise movement of the rod 20 serves chiefly to determine with which of the two needles the looper is to cooperate at any given time, while the lateral movement of said rod serves principally to shift the looper to the front and to the rear of the needle for winding a loop around the latter, and thus forming a closed loop, the plain stitches made by the needle-bar mechanism acting to lock the ornamental loop in place and permit the goods being sewed to carry such loop ahead to complete the diagonal portion of the stitch, it being evident that during this operation of forming the loop of an ornamental stitch the looper moves toward the needle, and hence in a direction the reverse of that in which the fabric is fed, thus facilitating the formation of such ornamental stitch and assuring the rapid completion thereof. It will be seen that the ornamental stitch formed by these devices is what is known as a "figure 8" stitch, but other forms of stitch may be made by the looper mechanism.

The ornamental stitch formed from the thread $t$ will ordinarily be several times as long as the plain stitches made by the needles, and in this case, by referring to Fig. 10, it will be seen that each ornamental stitch has a length equal to three plain stitches, the distance between similar loops of the ornamental stitching being the length of six plain stitches, although this timing may of course be varied. The thread or silk floss $t$ may be led to the looper from the spool-holder 6 in any desired manner, the looper-carrier C being here provided with thread-guides 35 and 36, from the latter of which the thread passes into the rear end of the tubular portion of the looper at the notch 5.

I have herebefore described the connection of the looper-carrier to the presser-bar P by means of a universal connection 8, the object of supporting the looper from this bar being to permit the two to be raised from the goods or lowered together. The organization of these devices, and particularly of the looper and the presser-foot $f$, is an important feature of this invention. It will be noticed that said foot has an opening therein (designated here by 40) in which the looper is movable to and fro and from side to side as it wraps the floss around the needles $n$ and $n'$. alternately, the working strokes of the looper being always through this opening toward the needles—that is, toward the front of the machine. Said presser-foot has the usual needle-opening therein for the passage of the two needles during their stitch-forming operations, said needle-opening being shown herein at 41, and the walls thereof having the additional function in this mechanism of controlling the forming of the ornamental stitches. In connection therewith I also prefer to provide on the presser-foot a tongue, such as 42, which extends between the two needles $n$ and $n'$ and substantially fills the space between them. This tongue therefore serves to maintain the two strips of goods $r$ and $r'$ at a uniform distance from each other during the forming of each ornamental stitch and the interlocking thereof with the plain stitches, and thus prevents gathering of the material. It also cooperates with the walls of the slot 41 to slightly friction the thread $t$ and lay the stitches there-in as they are formed, preventing undue tension on such thread and assuring the proper tightening thereof.

In order to obtain a perfect positioning of the looper vertically, I prefer to secure it adjustably to the carrier C, it being clamped in place when adjusted by means of a screw 45.

Referring to Fig. 11, I have illustrated a further form of my invention, which includes a means of adjustment whereby the lateral throw or movement of the looper L may be regulated in order to adapt the same for forming the ornamental stitch between the two parallel rows of plain stitches when the latter are arranged at different distances apart. In this particular construction I dispense with the slide $s$ as a means of connection between the rod 20 and its actuating-cam on the shaft 23 and substitute in lieu thereof a bell-crank lever, (indicated at 47,) which latter is pivotally mounted upon the frame A' at 48 and has one arm 49 provided with an arcuate groove 50, within which is adjustably mounted a pivot-block 51, to which the inner end of the rod 20 is pivotally connected and its other arm 52 provided with a pin 53, which is engaged and actuated by a cam 54 on the shaft 23, the said cam in this instance being provided with a peripheral cam-groove in which the said pin 53 works. The rocking movement of this bell-crank lever as given by the cam 54 communicates a longitudinal movement to the rod 20, and by adjusting the position of the pivot-block 51 in a direction either away from or toward the fulcrum of said lever the longitudinal movement of the rod 20 will be rendered greater or less and so regulate the lateral throw of movement of the looper L accordingly. Any suitable adjusting means for regulating the movement of the looper L other than that shown and described may, however, be employed without departure from the invention.

Various sewing-machine elements forming no part of the present invention are illustrated in connection with my improved stitch-forming mechanism; but as their construction and mode of operation are well understood they have not been particularly described.

What I claim is—

1. The combination with a two-needle stitch-forming mechanism, of a looper mechanism having a thread-carrying looper and organized and timed to form loops around said needles alternately and embodying a looper-carrier having a universal connection with its sup-
port, and a thread-guide on said looper-carrier.

2. The combination with a two-needle stitch-forming mechanism, of a thread-carrying looper having a universal connection with its support and movable in two directions transverse to the needles to form loops around said needles alternately, and looper-actuating mechanism embodying a pair ofcams controlling said respective movements of the looper.

3. The combination with a driver, of a driver-actuated needle-bar having a pair of needles; a looper-carrier having a universal connection with its support and oscillatory in two directions transverse to each other and to the needles; a rotary driver-actuated cam having a cam-groove; a guide; a reciprocatory slide movable along said guide and having a pin working in said cam-groove; connecting means between said slide and the looper-carrier for oscillating the latter in one direction; means for oscillating said looper-carrier in the other direction; and a looper on said looper-carrier and timed to form loops around said needles alternately.

4. The combination with a driver, of a driver-actuated needle-bar having a pair of needles; a looper-carrier having a universal connection with its support and oscillatory in two directions transverse to each other and to the needles; a rotary driver-actuated cam having a cam-groove; a guide; a reciprocatory slide movable along said guide and having a pin working in said cam-groove; a connecting-rod pivoted to the slide and the said looper-carrier; a second driver-actuated cam; a forked lever controlling said connecting-rod and operated by said second cam; and a looper on said looper-carrier and timed to form loops around said needles alternately.

5. The combination with a two-needle main stitch-forming mechanism, of a presser-bar and presser-foot, and looper mechanism organized and timed to form loops around said needles alternately and embodying a looper cooperating directly with said needles and supported by the presser-bar and having a universal connection therewith.

6. The combination with a two-needle main stitch-forming mechanism, of a presser-bar; a presser-foot associated with the looper and having an opening therein and also having a tongue extending in the direction of the goods to be sewed and substantially filling the space between said needles and adapted to prevent gathering of said goods; and looper mechanism embodying a looper extending through said opening toward the tongue and organized and timed to form loops around said needles alternately.

7. The combination with a driver, of a driver-actuated needle-bar having a pair of needles, a looper-carrier having a universal connection with its support and oscillatory in two directions transverse to each other and to the needles, a rotary driver-actuated cam, connecting means between said cam and the looper-carrier for oscillating the latter in one direction, means for oscillating said looper-carrier in the other direction, and a looper on said looper-carrier and timed to form loops around said needles alternately.

8. The combination with a driver, of a driver-actuated needle-bar having a pair of needles, a looper-carrier having a universal connection with its support and oscillatory in two directions transverse to each other and to the needles, a rotary driver-actuated cam, adjustable connecting means between said cam and the looper-carrier for oscillating the latter in one direction, means for oscillating said looper-carrier in the other direction, and a looper on said looper-carrier and timed to form loops around said needles alternately.

Witnesses:

CHAS. F. DANE,
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