

[54] **SEWING MACHINE HAVING AUTOMATIC
PATTERN SEWING DEVICE**

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[51] Int. Cl. **D05b 3/02**

[58] Field of Search 112/157, 158 R, 158 A, 159,
112/205

[56] **References Cited**

UNITED STATES PATENTS

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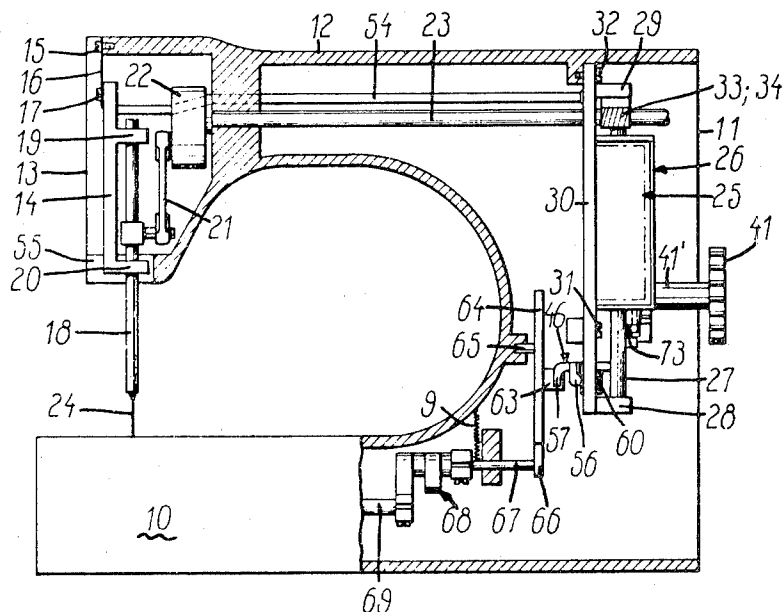
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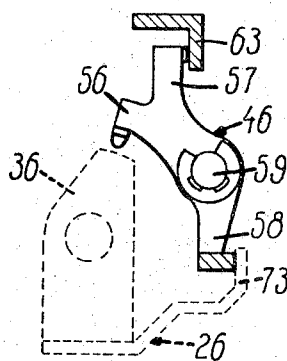
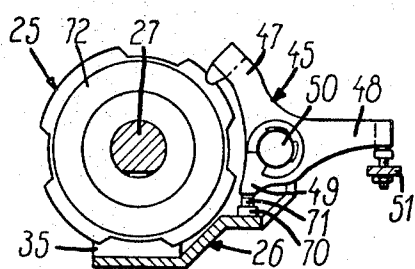
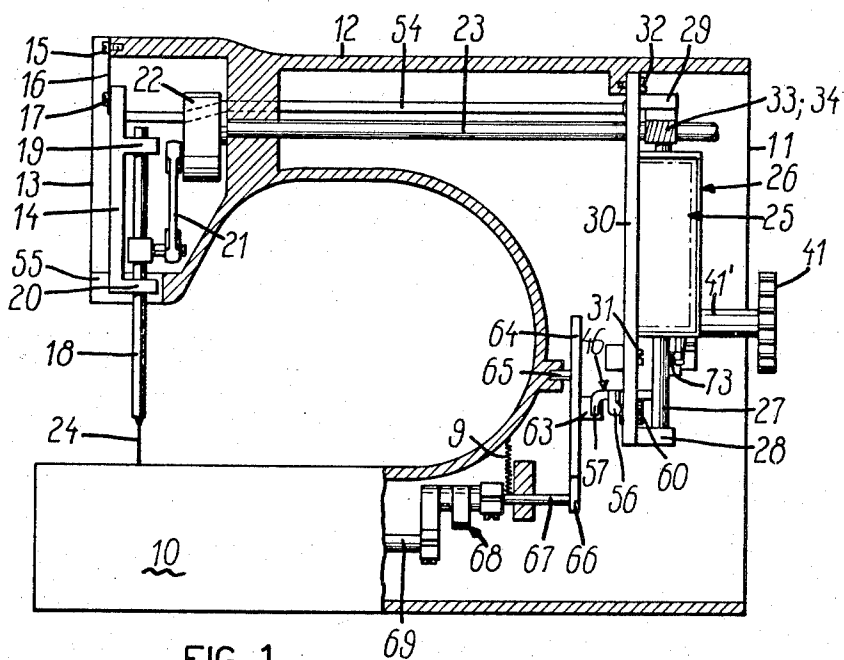
Primary Examiner—Werner H. Schroeder
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[57] **ABSTRACT**

The invention relates to a sewing machine which incorporates a device for automatically controlling the transverse displacements of the sewing needle and for controlling the fabric feeding mechanism in order to obtain various stitching patterns. The device is of the type which comprises a stack of axially displaceable rotary cams and the aforementioned controlling is achieved through the use of two separate cam followers, each of which includes separate follower points which respectively may be acted upon by either the rotary cams or by other non-rotary elements.

6 Claims, 7 Drawing Figures





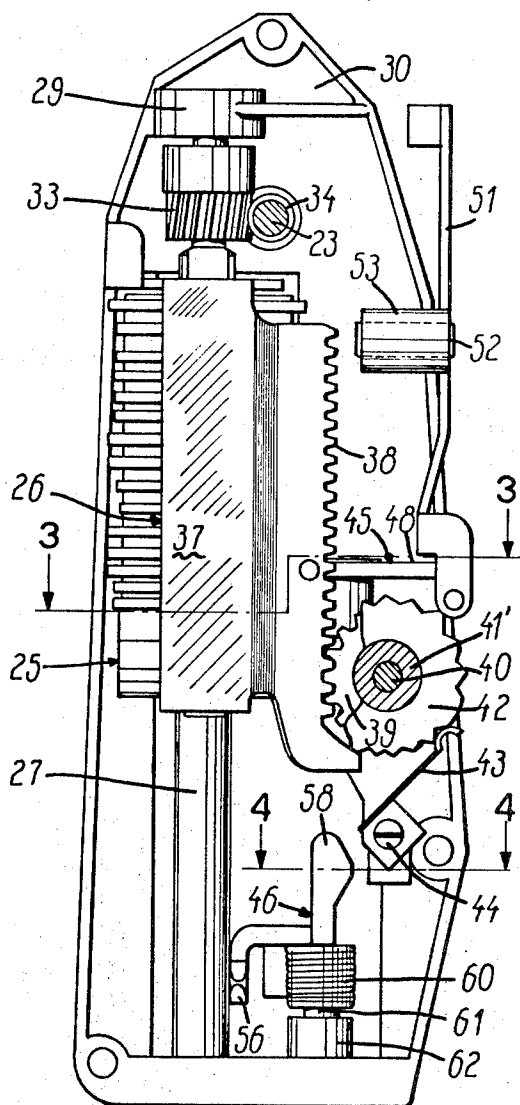


FIG. 2

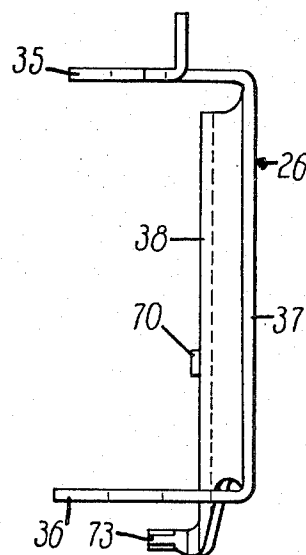


FIG. 6

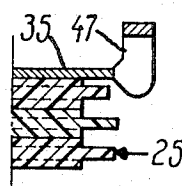


FIG. 5

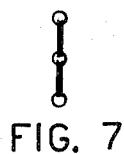


FIG. 7

SEWING MACHINE HAVING AUTOMATIC PATTERN SEWING DEVICE

The present invention relates to an improved means for regulating an automatic pattern sewing device in sewing machines of the type which comprise a cam stack, the respective cams of which are useable to sew stitches according to one of a plurality of different patterns.

Pattern sewing entails the imparting of an oscillatory motion to the needle bar and the making of differing patterns has heretofore been effected by the interchanging of replaceable cams or by the pre-setting of particular operating members of the sewing machine, which cams and members affect the needle bar oscillations as well as the fabric feeding. A particular disadvantage of prior known devices is in the necessity for the machine operator to introduce different operating members into the machine in order to effect a change in stitch pattern. The present invention is free of this disadvantage in that all the parts necessary for different stitch patterns are permanently operatively incorporated within the machine assembly.

Generally, the machine of this invention incorporates two different cam followers each of which comprises three angularly separate arms, two of which are for receiving control impulses while the third of which is for transmitting the effect of such impulses to a member which is to be adjusted.

The invention is intended to be applied to machines having various types of cam stacks; however, it preferably is intended for use with a cam stack of the type disclosed in U.S. Pat. No. 3,356,052, which is incorporated herein by reference.

An object of this invention is that of realizing in a sewing machine a simple but highly effective and reliable means for permitting the sewing of different stitch patterns.

Other objects are those which are obvious or inherent in the invention as disclosed.

The following is a detailed description of a preferred embodiment of the invention referred to the accompanying drawings, wherein:

FIG. 1 is a vertical frontal view of the interior of a machine which incorporates a device according to this invention;

FIG. 2 is an end view, on enlarged scale relative to FIG. 1, of the device of this invention;

FIGS. 3 and 4 are respective top views of the cam follower mechanisms as seen along lines 3—3 and 4—4 of FIG. 2;

FIGS. 5 and 6 are detail views of certain parts of the device of this invention; and FIG. 7 illustrates a stitch pattern obtainable with a device according to this invention.

Referring to FIG. 1, the sewing machine includes a hollow housing which comprises a lower horizontal bed portion 10, a standard 11 extending upwardly from said bed, and an upper horizontal arm portion 12 which terminates in a head 13 within which are housed a needle bar support 14 including guide means 19 and 20 in which a needle bar 18 and needle 24 are reciprocally mounted. The support 14 is supported on the fixed housing by a leaf spring 16 and appropriate fastening means 15 and 17 therefor whereby said support (and therefore the bar 18) may oscillate transversely to the direction of fabric feed. The needle bar is reciprocally

driven by drive shaft 23 through a linkage comprising crank 22 and crank-arm 21.

Means for automatically oscillating the needle bar support 14 and for simultaneously regulating the length and direction of the fabric feed are mounted within the standard 11. The means for doing this, according to the present invention, comprise a cam assembly 25 (FIGS. 1 and 2) mounted within a housing member 26 and mounted on a cam shaft 27 rotatively integral therewith and axially displaceable therealong. Said shaft 27 is rotatively supported in bearings 28 and 29 which, in turn, are mounted on a vertically extending base plate 30 which is rigidly attached to the stationary housing by appropriate fastening means 31 and 32.

The main drive shaft 23 is drivingly connected in a known manner to a not shown electric motor and said drive shaft drives the cam shaft 27 through a worm and gear set 33,34. The cam stack housing member 26 is C-shaped and includes a central slot in its upper and lower legs 35 and 36 through which extends the shaft 27 so that said member 26 is free to slide axially along shaft 27 together with the cam stack 25. The web portion 37 of member 26 includes a vertical tooth rack 38 (FIG. 2) which meshes with gear 39 which in turn is mounted on pin 40 which is supported at one end thereof by the rigid plate 30 and which at its other end extends into the sleeve 41' of a hand knob 41 which is located exteriorly of the machine housing. Said knob is connected by said sleeve 41' to said gear 39 whereby the machine operator may raise or lower the rack 38 through simple rotation of said knob 41. The rack, of course, moves integrally with the housing member 26 which in turn carries along with it the cam stack 25. The gear 39, and through it the rack 38, is stabilized against unwanted drifting or movement caused by vibrations, by a flat spring 43 having a head portion which resiliently seats itself within any of a series of circumferential indentations of a toothed wheel 42, said wheel 42 being coaxial and rotatively rigid with said gear 39. The spring 43 is mounted on the machine housing by a screw means 44. The indentations on wheel 42 coincide respectively with the cam stack 25 being in different respective axial positions along said cam shaft 27, which positions are operating positions for different ones of the cams. A known, not shown, indicator means correlated with the cam stack can be placed at a conveniently viewable location so that the machine operator can accurately set the cam stack at any desired position. Two cam followers 45 and 46 are actuated by the cam stack and transmit corresponding impulses to the needle bar support 14 and to the fabric feeding members, respectively, through appropriate kinematic linkages, as follows.

FIG. 2 shows the cam stack 25 at its upper position along shaft 27.

The positioning of the cams on the stack and the vertical distance between the two followers is such that as the stack moves downward to different positions, certain of the lowermost cams are able to engage exclusively with the follower 46, other intermediate cams are able to coact only with the follower 45, and finally the uppermost cams are able to coact with the follower 45 while certain of the lower cams simultaneously coact with the follower 46. In other words, the stack can be moved to different positions along shaft 27 whereby the action of the cams is either only to oscillate the bar 14, or is only to affect the feeding of the fabric, or is to do

both of the foregoing at the same time. Consequently, various patterns are obtainable such as patterns of differing zig-zag width such as the "pine", "squares", and "scallops". Also various combined patterns are obtainable such as the Paris stitch, the overcasting stitch and the stretch stitch.

Cam follower 45 (FIGS. 2 and 3) comprises three arms 47, 48, and 49 all integrally pivoted about pin 50 which is mounted on the base plate 30. Said follower is normally biased so that its arm 47 is in contacting engagement with either of various cams on the cam stack 25, the profile of the cam being thus contacted determining the amplitude of the oscillations imparted to needle bar support 14. Such oscillations are transmitted from the cam to arm 47 and to arm 48 which acts against one arm of a lever 51 whose other arm acts against an end of an axially reciprocable rod 54 whose other end abuts against the needle bar support 14. Said support, in turn, is urged to oscillate transversely to the direction of fabric feed by virtue of rod 54 urging it in one transverse direction and spring 16 urging it oppositely thereto. The force of said spring 16 acts through the aforescribed kinematic chain to resiliently bias the follower 45 whereby its arm 47 bears against the cam stack. Said lever 51 is pivotally mounted on pin 52 in turn is mounted on bushing 53 which is mounted on the base plate 30. Also, the needle bar support 14 is guided in its oscillatory movement by virtue of its free end being slidably received within a slot 55 formed in the lower part of the head portion 13 of the machine housing.

The second cam follower 46 (FIGS. 2 and 4) also comprises three integral arms 56, 57 and 58 which are pivotally mounted on pin 59 mounted in element 62 which in turn is mounted on base plate 30. A coil spring 60 mounted on a bushing portion 61 of element 62 has one end thereof connected to said follower 46 and its other end attached to a fixed part of the base plate 30 whereby said spring serves to resiliently urge said follower 46 about pivot pin 59 in a direction whereby its arm 56 is detached from the cam stack 25. Arm 57 of follower 46 abuts against lug 63 of a lever 64 (FIG. 1) rigid with a pin 65 which is pivotally mounted in a wall portion of the standard 11. Lever 64 in turn acts against a lever 66 which is rigid with a rotatable shaft 67 which in turn actuates a known switch control device 68. The position of lever 66, acting through shaft 67 and device 68 serves to regulate the oscillation amplitude of shaft 69 which in turn determines the amplitude and direction of the work feed.

A spring 9 (FIG. 1) secured to a fixed part of the machine housing, acts upon a member of the control device 68 whereby the tension in said spring 9 is transmitted through shaft 67, lever 66, lever 64, and lug 63 to bias arm 56 of follower 46, against the urging of spring 60, in the direction of engagement with the cam stack.

Housing member 26 which is arranged to move axially together with cam stack 25 along the shaft 27 but not rotatably therewith, serves not only as a mounting means and movement translation means for said stack, but also performs a function in the formation of stitch patterns. Said member 26 includes along a central part thereof a bushing 70 into which there is threadably received a pin 71 which bears against third arm 49 of cam follower 45 when the cam stack is at its upper position as shown in FIG. 2. When this occurs, the first arm 47 of the follower faces but does not contact the surface

of a circular cam 72 of reduced radius. In this situation, it is the pin 71 rather than any cam which determines the pivotal positioning of follower 45 and consequently the positioning of the needle bar 18. This feature is utilized to set the machine prior to operation thereof. That is, the pin 71 will be screwed into bushing 70 to an extent such that the needle bar 18 will be at its central position so that it will simply sew a straight stitch. The resulting advantage of this feature as compared to the use of a constant radius cam is that the resulting straight stitch does not manifest the normally unavoidable lack of perfect concentricity occurring in cams.

Member 26 also includes a tongue 73 projecting from its lower leg 36 (FIGS. 4 and 6), said tongue having a shape and being positioned that it interferes with the side of arm 58 of follower 46 when the member 26 is displaced downwardly from the FIG. 2 position. Such interference with arm 58 will bring about a pivoting of follower 46 such that arm 57 will consequently pivotally displace lever 64 and through it the lever 66 to a position whereby the stitch control device will effect a backward feeding of the work fabric, this being necessary to realize certain stitching patterns.

The free end of upper leg 35 of member 26 is utilized to impart a cyclic movement to the work feeding mechanism, namely two impulses forward and one backward (FIGS. 5 and 7) in order to effect a straight stretch stitch. This occurs when the member 26 and the cam stack 25 are displaced axially until the end of leg 35 contacts arm 47 of the follower 45 and a feeding cam contacts arm 56 of follower 46.

What is claimed is:

1. A sewing machine adapted to sew a plurality of stitch patterns, comprising: a fabric feeding means and a needle bar mounted to oscillate transversely of the fabric feeding direction, a cam stack comprising a plurality of different cams arranged axially successive to each other on a common rotary cam shaft, said stack of cams being axially slidable along said shaft but being rotatably integral with said shaft, a cam stack housing movable with said cam stack along said shaft and having abutments thereon, a first and a second cam follower arranged to cooperate with said cam stack and housing, the first follower being arranged to engage different ones of said cams and to transmit oscillatory motion to said needle bar in accordance with respective cam profiles, the second follower being arranged to be acted upon pursuant to said stack being axially moved along said cam shaft and to transmit corresponding regulating impulses to said fabric feeding means, each of said followers comprising three angularly separate bearing points two of which of each follower are engageable with parts of said stack and housing while the third bearing point of said first follower controls the oscillation means for the needle bar and the third bearing point of said second follower controls the fabric feeding means.

2. The machine of claim 1 in which said first follower comprises a first pressure point arranged to engage the profile of respective ones of said cams, and a second pressure point arranged to engage a first abutment on said housing whereby said first point is biased to a position out of contact with any cam on said stack, and a third pressure point arranged to transmit a force to said needle bar.

3. The machine of claim 1 in which said second follower comprises a first pressure point arranged to en-

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gage the profile of respective cams on said stack, and a second pressure point arranged to engage a second abutment on said housing whereby said first point is biased to a position out of contact with any of said cams, and a third pressure point arranged to transmit a force to said fabric feeding means.

4. The machine of claim 2 in which said stack is movable axially along said cam shaft to one of a plurality of positions, one of said positions being such that said housing abutment engages said second pressure point thereby maintaining said first pressure point in radially spaced relationship out of contact relative to any cam on said stack, another of said positions being such that said first pressure point is in engagement with one of said cams while said second follower is out of engagement with any cam, another of said positions being such that a one of said cams engages said first point on said first follower while another of same cams engages and actuates said second follower, and another of said positions being such that only said second follower is

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engaged and acutated by one of said cams while none of said cams engages said first follower.

5. The machine of claim 1 including a manual means for sliding said housing along said shaft, said housing carrying said cams as a unit axially along said shaft pursuant to actuation of said manual means, said housing comprising a third abutment for engaging said first point on said first follower, the engagement of said abutment with said first point serving to maintain said first point in a fixed position and such engagement coinciding with said second follower being in engagement with one of said cams whereby said needle bar may sew a straight stitch simultaneously as said second follower actuates the fabric feeding means.

6. The machine of claim 2 in which said abutment is adjustable whereby the position of said first follower may be regulated in accordance with adjustment of said abutment.

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