

Dec. 30, 1952

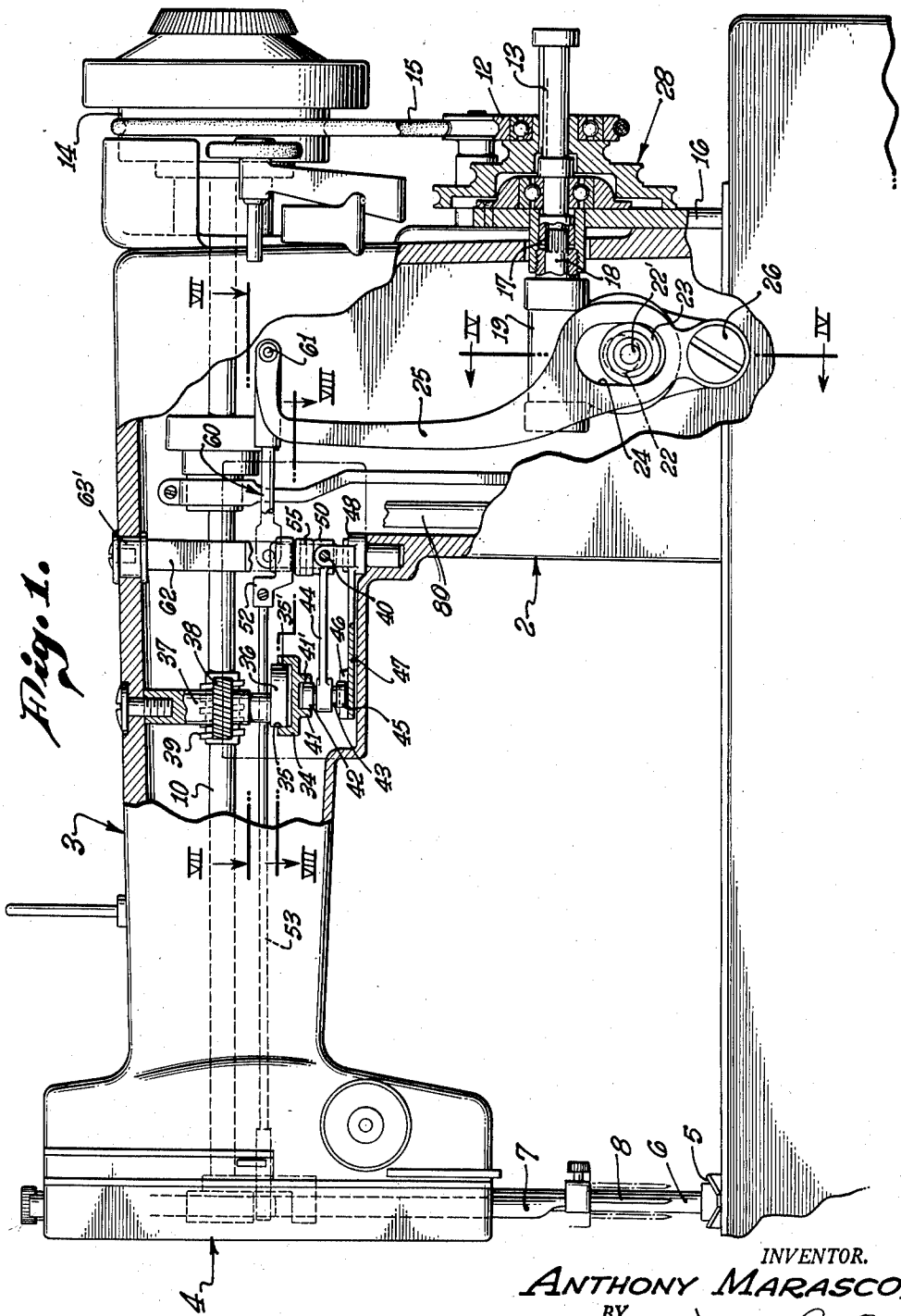
A. MARASCO

2,623,487

SELECTIVELY AUTOMATIC, STITCH-VARYING DEVICE

Filed March 14, 1950

4 Sheets-Sheet 1



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Dec. 30, 1952

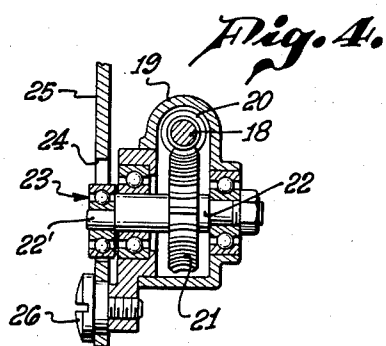
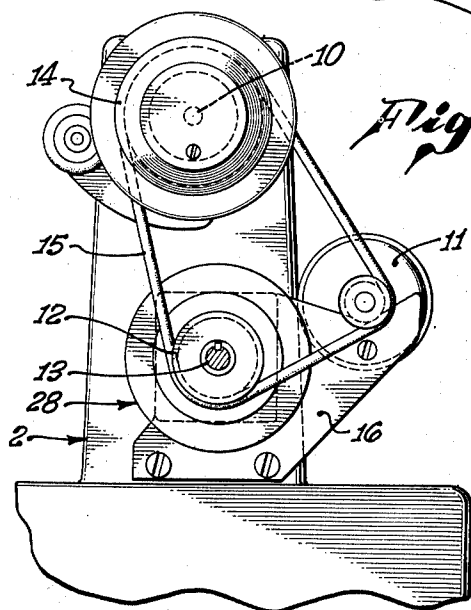
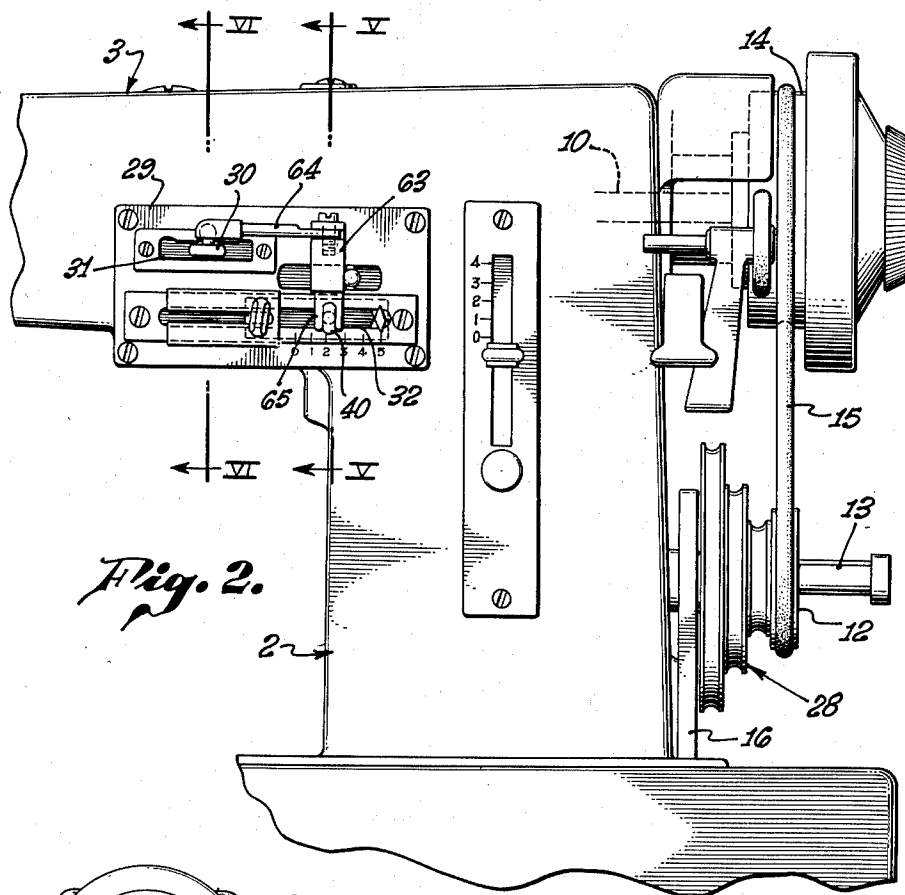
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SELECTIVELY AUTOMATIC, STITCH-VARYING DEVICE

Filed March 14, 1950

4 Sheets-Sheet 2



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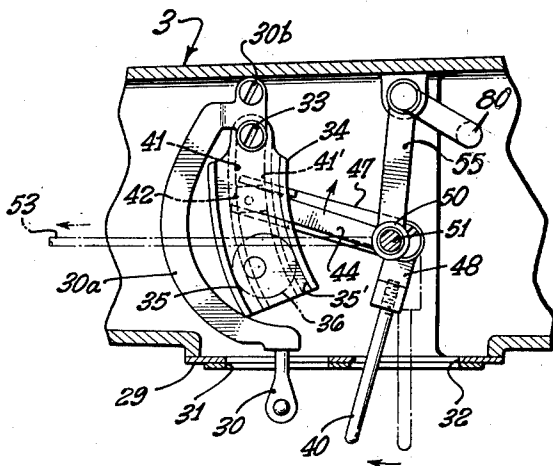
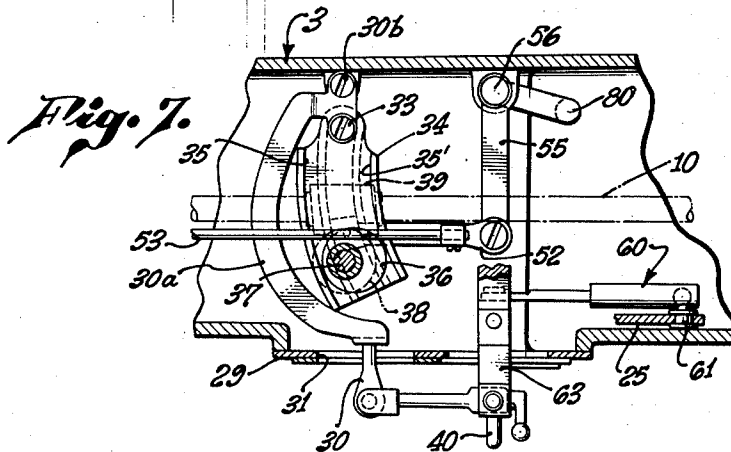
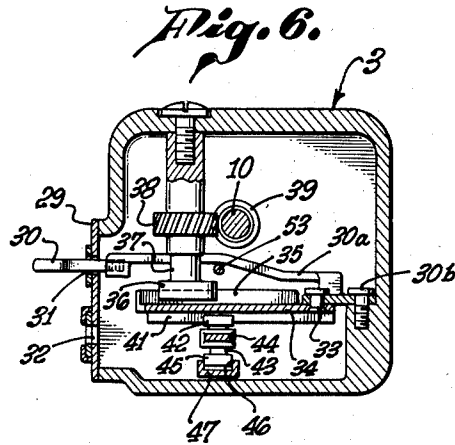
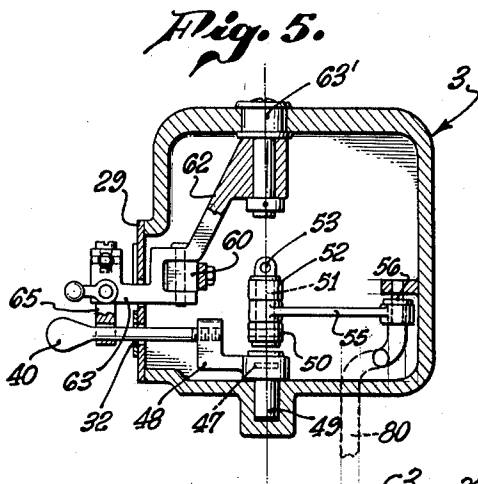
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**2,623,487**

## SELECTIVELY AUTOMATIC, STITCH-VARYING DEVICE

Filed March 14, 1950

4 Sheets-Sheet 3



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SELECTIVELY AUTOMATIC, STITCH-VARYING DEVICE

Filed March 14, 1950

4 Sheets-Sheet 4

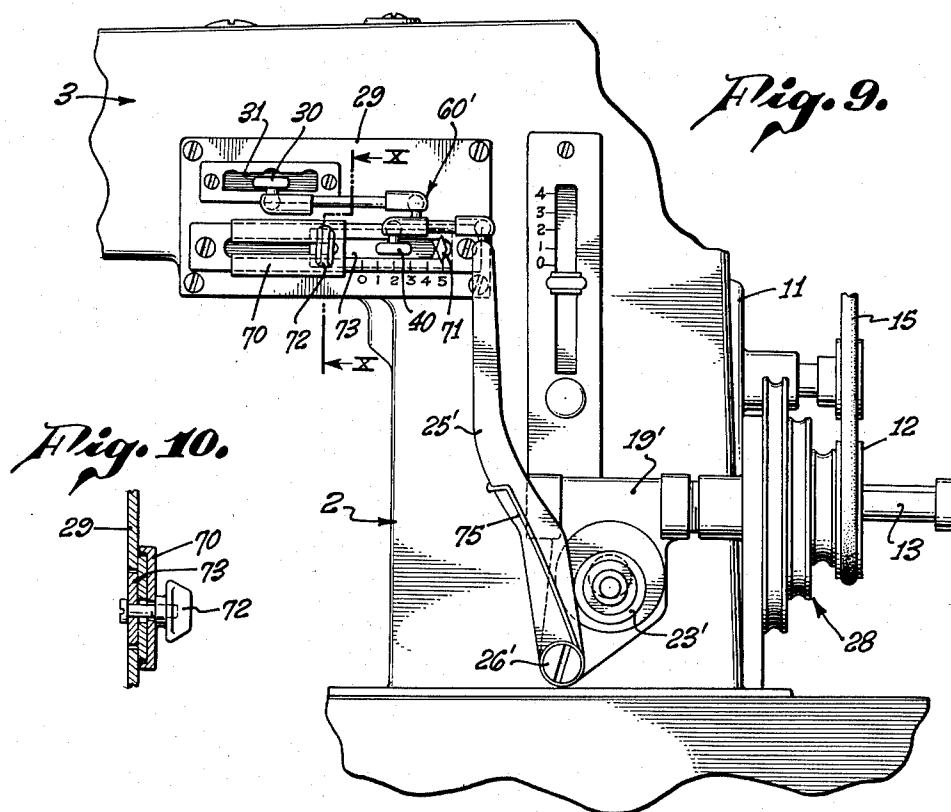
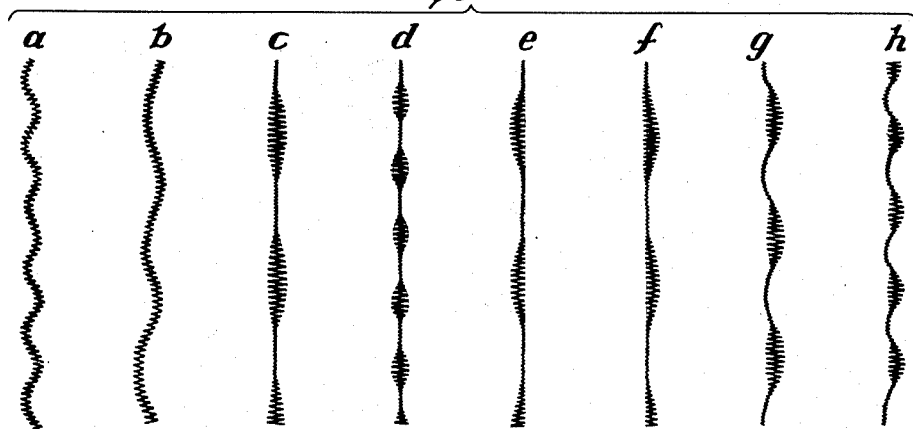


*Fig. 11.*



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## UNITED STATES PATENT OFFICE

2,623,487

## SELECTIVELY AUTOMATIC, STITCH-VARYING DEVICE

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Application March 14, 1950, Serial No. 149,540

10 Claims. (Cl. 112—159)

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This invention relates to improvements in sewing machines and is particularly directed to means and arrangements whereby new and different forms of stitching may be attained and regularity of form in a desired pattern can be maintained.

The art is familiar with sewing machines in which the single needle can either reciprocate in a single vertical axis, or by manually adjustable means, such vertical axis of reciprocation can be shifted laterally either to the right or to the left of the normal position. By continuing to move the adjusting lever to and fro, the line of stitching (produced upon goods moving in a straight line) is in the form of a wave. By varying the rate at which the adjustment lever is moved to and fro, the frequency of the wave form (per unit length) may be increased or decreased, while the height of the wave (deviation from normal or straight line stitching) is regulated by the degree of departure of the adjustment lever from its normal position.

Some modern sewing machines are also provided with means for varying the width of the stitch, i. e., the machine may be set to produce the normal thin stitch wherein the needle reciprocates along a fixed axis, or by manually adjusting a stitch-width varying means, the needle is caused to pierce the goods on successively alternate sides of the center line, thereby producing a wide stitch. By manually and repetitively moving the stitch-width adjustment lever to and fro (from its zero position to its maximum and vice versa) during sewing, it is possible to produce an alignment of elongated stitch-bodies or designs which are useful in decorative stitching, reinforcing, such bodies being symmetrical with respect to a normal, straight centerline. A commercial sewing machine embodying such manually controllable stitch-width varying means and means for laterally shifting the center line of the needle is known as the Necchi and although made in Italy is sold extensively in this country. Such machine is shown in Italian Patent No. 363,084 of 1938.

Although movable, manually actuatable means of the character above stated have been provided, it is virtually impossible for the operator of a sewing machine to operate either of such means, separately, in a sustained and constant manner so as to obtain a desired regularly repeating variation or change in resulting stitch. It is practically impossible for an operator to remember and reproduce the same tempo of to and fro movements. It is impossible for an operator to manually and simultaneously adjust both the

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means for laterally shifting the stitching center-line and the stitch-width varying means, and as a matter of fact, the possibility of adjusting these means jointly has not been conceived heretofore.

Therefore, it is an object of the present invention to disclose and provide improvements in construction of sewing machines.

An object of this invention is to provide an automatic means, capable of being easily attached to previously made sewing machines, for selective engagement with usual stitch-width varying means, or with means for varying the location of the stitching center-line, or with both of such means.

A further object is to disclose and provide means and arrangements of construction whereby the motor employed in driving the sewing machine may be selectively employed in automatically varying the position of the stitching center-line, or the width of the stitches about such center-line or both of these factors.

These and further objects of the invention, as well as the numerous advantages derived therefrom, as well as the different forms in which the invention can be embodied, will be readily appreciated and understood by those skilled in the art from the following description of an exemplary construction. The illustrative construction, as well as results attained thereby is shown in the appended drawings and diagrams.

In the drawings:

Fig. 1 is a side elevation of a sewing machine, partly broken away, equipped with my invention.

Fig. 2 is a side elevation, showing the external appearance of a machine equipped with the form of invention shown in Fig. 1.

Fig. 3 is an end view showing the driving motor and belt drive.

Fig. 4 is a vertical section taken along plane IV—IV in Fig. 1, through the gear reduction and cam drive.

Fig. 5 is a vertical section taken along plane V—V in Fig. 2.

Fig. 6 is another vertical section taken along plane VI—VI in Fig. 2.

Fig. 7 is a horizontal section taken along plane VII—VII in Fig. 1.

Fig. 8 is a horizontal section taken along plane VIII—VIII in Fig. 1.

Fig. 9 is a side elevation of a modified construction.

Fig. 10 is a vertical section along plane X—X in Fig. 9.

Figs. 11a to 11h illustrate a few of the various stitches which this invention makes available.

As in most sewing machines of the type used

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in the home, there is a base forming the work supporting table, an upright pedestal 2 provided with the horizontal extension 3 and the head 4. A foot 5 carried by a manually adjustable post 6 depends from the head 4, from which also extends the needle post 7 to which needle 8 is removably connected. A feeding table and bobbin shuttle are positioned beneath the foot and needle. Details of the machine, not forming a part of this invention will not be described in detail since they are well known in the art, and only those portions will be specifically referred to which are directly affected by my improvement and which orient my improvement with respect to the rest of the machine.

Extending horizontally through the extension 3 is a main drive shaft 10 driven, as shown in Fig. 3, through a belt drive involving motor 11, an idler pulley 12 on counter shaft 13, a pulley 14 on shaft 10 and belt 15. Motor 11 is adjustably mounted upon a supporting bracket. I provide a counter shaft 13 which is journaled in suitable bearings carried by bracket 16 attached to pedestal 2, the counter shaft terminating in a splined connection 17 with an extension shaft 18 journaled in the gear reduction housing 19. Shaft 18 carries a worm 20 which is in engagement with worm gear 21 mounted on stub shaft 22 (see Fig. 4). Stub shaft terminates in an eccentric 22' which, with its associated roller bearing forms a cam identified as 23 fitting within a cam port 24 formed in master lever 25. The lower end of master lever is pivotally connected to the housing 19 by stud 26 while the upper end is connected to an actuating carriage, as more fully described hereafter. It will be evident that cam 23 contacts opposite sides of cam port 24 and rotation of the cam imparts controlled, accurate, virtually frictionless oscillation to the master lever 25. I am not limited to this particular arrangement since any other method of imparting oscillation to the master lever in timed relation to the main drive shaft 10 can be used. Cam 23 may contact an outer edge of master lever 25, the lever being spring-biased against the cam. Cam 23 should be driven at a materially lower speed than main drive shaft 10, and I have successfully used a 50:1 reduction in gear housing 19.

In addition, I provide a variable speed drive for counter shaft 13. It will be noted that counter shaft 13 is connected (as by a key) to a set of interconnected change-speed pulleys 23 and a boss or hub on which idler 12 is journaled. Countershaft 13 is not driven while belt 15 is on idler 12, but such counter-shaft is driven when belt 15 is on either the high, low or intermediate face of the change-speed pulley 23. Great flexibility of result is attained by being able to drive cam 23 at various speeds, by the use of the arrangement disclosed.

The sewing machine, to which my invention is applicable, is provided with a face plate 29 having two parallel horizontally elongated ports 31 and 32. Normally a manually actuatable lever arm 30 extends through the upper port 31 and another manually actuatable lever arm 40 extends through the lower port 32. The upper lever arm 30 is used in shifting laterally the stitching centerline of the needle. The upper edge of port 31 is often centrally indented to cooperatively engage control arm 30 and hold it in such position, whereupon the needle will vertically reciprocate in its normal position, shown in full lines in Fig. 1. By moving lever

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arm 30 to the left in slot or port 31 the needle will move bodily to the left and reciprocate in such new position, the extent of movement to the left being correlated to the degree of movement imparted to lever arm 30. A similar displacement or shift to the right is obtained by moving lever arm 30 to the right.

The lower control arm 40 controls the width of the stitch, and normally such arm is set at one end of its slot 32, the needle making a thin, narrow stitch when the arm is in such position. When control arm 40 is moved to a new position (removed from the end of its slot 32) a wide stitch will be obtained. If arm 30 was in the center (normal position) it will be found that the needle will pierce the goods first on one side of the normal centerline and then on the other, so as to produce a wide stitch. Again, the width of the stitch depends upon the extent to which arm 40 has been moved from its normal position.

The manually actuatable means for laterally shifting the stitching center-line of the needle, controlled by lever arm 30 may include an arcuate offset lever 30a, such lever carrying the lever arm 30 at its free end and being mounted for pivotal movement upon a vertical pivot pin 30b adjacent the rear of the horizontal extension 3. This offset, arcuate lever 30a carries a pivot point 33 to which is pivotally connected a cam arm 34. Cam arm 34 is curved and is provided with a curved groove or cam race in its upper face, such cam race being defined by the shoulders 35 and 35' and adapted to slidably receive a cam 36 carried by the lower end of a vertical shaft 37 which is suitably journaled and held from the top of the horizontal extension 3. The shaft 37 carries a worm wheel 38 which is in engagement with a worm 39 mounted upon the main drive shaft 10. Rotation of the main drive shaft 10 will be converted into rotation of shaft 37 and cam 36 will cause an oscillation of the cam arm 34 about the pivot 33. Movement of control lever arm 30 will of course shift the position of the movable pivot point 33 with respect to the rotatable shaft 37.

The lower surface of the curved cam arm 34 is provided with another groove defined by the shoulders 41 and 41', these shoulders slidably engaging a crosshead 42 carried upon a pivot pin 43 extending downwardly through a boss carried by the end of arm 44. The lower end of 43 carries another crosshead 45 which is slidably held between the lips of a groove 46 formed in the end of a lever arm 47. Lever arm 47 is connected to a bracket 48 mounted for rotation about a pivot pin 49, one end of the bracket being connected to the control lever arm 40.

Lever 44 extends to a boss 50 which is pivotally connected as by means of a stud pivot pin 51 to a bracket 52 carrying an actuating rod 53, said rod extending to the head 4 of the machine and there operating a linkage through which the needle post 7 extends. Reciprocation of the actuating rod 53 will therefore change the position of the needle post 7. The stud pivot pin 51 is also connected by means of a link 55 connected to the upper, offset portion of a rod 56 whose top is journaled at a fixed pivot point 56 at the rear of the horizontally extending extension 3.

It will be evident that the longitudinal reciprocation of rod 53 as well as the zone or amplitude of such reciprocation is influenced by the position of upper cross-head 42 within the cam groove formed in the lower surface of cam arm

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34. When crosshead 42 is beneath pivot point 33, rotation of cam 36 will not cause oscillation of arm 44 and actuating rod 53 will not oscillate. As crosshead 42 is moved away from the axis of pivot point 33, the amplitude of oscillation will increase. Change in position of control lever arm 30 will change the location or centerline about which the stitching width variations can take place. Actuating rod 53 can therefore either be moved longitudinally and thereby position the axial center of the needle post 7 or such needle post 7 may be caused to move from one side to the other of such centerline position by an adjustment of the control lever arm 40 which controls the width of the stitch being produced by the needle. Oscillation of the needle from one side to the other of the stitching centerline is accomplished by a similar oscillation of the bobbin and rotary hook beneath the work table and foot of the needle, since pivotal movement of link 55 causes a partial rotation and oscillation of offset rod 60 and the lower end of such rod translates such oscillation into a controlled reciprocation of the bobbin and hook assembly, as described in Italian Patent No. 363,084 previously mentioned.

In accordance with my invention a carriage 60 is provided, one end of this carriage being pivotally connected as at 61 to the upper end of the master lever 25. It will be evident that this carriage 60 will reciprocate under the influence of the cam 23 and master lever 25. Means are provided for selectively connecting the carriage to either the lever arm 30 which laterally shifts the stitching centerline of the needle or to the control lever arm 40 which varies the width of the stitch being produced, or to both of these control levers. Such means may comprise a variety of forms. For example, the carriage 60 may be in the form of a link (preferably constructed to be of accurately variable length) and include as one of its component parts a bracket 62 which is pivotally suspended from a pivot pin 63' in the top of the horizontal extension 3 and directly above the axis of the pin 49. Carriage 60 then comprises a link which is pivotally connected to the bracket 62 maintaining the link in a horizontal plane. Bracket 62 may be provided with an extension 63 extending forwardly through the face plate 20, preferably through a slot formed in such face plate. The forward extension of the carriage, such extension being identified at 63, may then carry pivotal attachment links such as 64 and 65. One of the links 64 may be capable of being selectively swung into engagement with control lever 30 and when so engaged the master lever 25, will, through the carriage and its connections, cause the control lever 30 to be oscillated from left to right. When only control lever arm 30 is thus being automatically oscillated the line of stitching produced will be in the form of a regular sinusoidal curve similar to that illustrated in Fig. 11a. The distance separating the crests of such wave depend somewhat upon which of the pulleys of the speed change assembly is being employed. If the low speed pulley is used the wave will be longer, as indicated in Fig. 11b, whereas if the high speed pulley is used the wave will be shorter, as indicated in Fig. 11c.

The other U-shaped, adjustably positionable bracket 65 may be caused to swing downwardly and engage the control lever arm 40. When the gear reduction unit is being driven and master lever 25 is being oscillated such oscillatory

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motion will be translated by the carriage hereinbefore described (including link 60, pivotally mounted bracket 62, extension 63 and the U-shaped manually and selectively positionable engaging yoke 65) thereby varying the width of the stitch. In the event control lever arm 30 has been left in its center position, then oscillation of the control lever 40 by the means herein provided will produce a line of stitching characterized by the presence of cigar shaped elliptical bodies such as are illustrated in Fig. 11c. Again, depending upon which of the pulleys of the speed change assembly is being employed, the length of such bodies can be controlled. Fig. 11c illustrated what is obtained by the use of the slow speed pulley, whereas Fig. 11d illustrates the form which is obtained by the use of the high speed pulley.

When the control lever arm 30 is set to one side (so that the needle assumes a position to the left, for example,) and the lower control arm 40 is mechanically and automatically actuated in the manner described hereinabove, a stitch of varying width, automatically and perfectly reproduced repetitively will be obtained, such stitch being illustrated in Fig. 11e. If, on the other hand, the upper control lever arm 30 has been set to the right and the lower stitch-width varying control arm 40 is mechanically actuated, the resulting stitch resembles that indicated in Fig. 11f. Again, the frequency of the enlargements in stitch width, that is the distance between the crest of such enlargements, depends upon which of the variable speed pulleys is being employed.

A totally new form of stitch incapable of being obtained in any other sewing machine known to applicant herein can be produced by the conjoint automatic operation of both lever arms 30 and 40. For example, by employing the slow speed pulley and causing both of the U-shaped engagement elements 64 and 65 to engage their respective control lever arms 30 and 40 a stitch similar to that illustrated in Fig. 11g is obtained, whereas by the use of a smaller diameter pulley a stitch similar to that illustrated in Fig. 11h is obtained.

It is to be understood that I am not to be limited to the specific construction of the carriage nor the means whereby such carriage is selectively caused to operate either one or both of the control levers 30 and 40. For example, the carriage need not include the pivoted bracket 62 (although such bracket insures smooth operation) and a crosshead similar to 63 may be caused to grasp and slidably engage the face plate 29, such crosshead being operated by a link such as 60 pivotally connected to the end of master lever 25. The control lever arms 30 and 40 may be provided with pivotally jointed portions capable of being bent either upwardly or downwardly so as to engage a reciprocatable crosshead driven by the master lever 25.

The embodiment described hereinabove placed the gear reduction 19 and master lever within the pedestal 2 of the machine, but it is not necessary to do so, since the gear reduction can be placed externally if desired. For example, as shown in Fig. 9, gear reduction 19' can be attached to the face of the pedestal 2 and cam 23' can act against one side of master lever 25', such master lever being normally spring-pressed toward the cam by a spring 75. Carriage link 60' may be coupled by snap-on coupling links, as desired, to the control levers 30 and 40.

Furthermore, the width of the stitch being obtained may be varied between limits other than minimum 0 and maximum 5; for example, it may be desired to vary the width from, say 0 to 3. Pointer 71 indicates the width of the stitch being produced, as indicated in Fig. 9. Control lever 40 may be automatically actuated by master lever 25' within any desired range, as the range 0 to 3 of the scale adjacent pointer 71, by loosening thumb screw 72 carried by limit plate 73 and moving limit plate 73 so as to position the pointer 71 (carried by the other end of plate 73) opposite the desired maximum (such as 3) on the scale. Plate 73 has a slot therein through which lever 40 extends and the movement of lever 40 to the right in Fig. 9 would be limited by the closed end of the slot in limit plate 73. It will be evident that under such circumstances, lever 25' would periodically lose contact with the cam 23' and oscillation of lever 40 would only take place between 0 and 3. Lever 30 cannot be automatically operated throughout its range when the travel of lever 40 is limited in the manner stated.

Many other advantages, uses, and modifications will become apparent to those skilled in the art, and all changes and modifications coming within the scope of the claims are embraced thereby, it being understood that the structures shown and described herein are exemplary only and the invention is not limited thereto.

#### I claim:

1. In a sewing machine provided with a motor, a main drive shaft, a reciprocable needle driven by the drive shaft, a normally manually actuatable means for laterally shifting the stitching center-line of the needle and a normally manually actuatable stitch-width varying means, the provision of: a rotatable cam; a driving connection including a reduction gearing between the motor and said rotatable cam; a master lever arranged for oscillation by the cam; a carriage operatively connected to the master lever for movement thereby, and means for connecting the carriage to the means for laterally shifting the stitching center-line of the needle.

2. In a sewing machine of the character stated in claim 1, the provision of: means for connecting the carriage to the stitch-width varying means.

3. In a sewing machine provided with a motor, a main drive shaft, a reciprocable needle driven by the drive shaft, a needle post in which said needle reciprocates and means including a manually controllable lever arm and an actuating rod operably associated therewith for laterally shifting the needle post to shift the centerline of the needle, the provision of: a rotatable cam; a driving connection including a reduction gearing between the motor and said rotatable cam; a master lever arranged for oscillation by the cam, and means for selectively connecting the master lever and the controllable lever of the means for laterally shifting the needle post, whereby the centerline of the needle is automatically shifted.

4. In a sewing machine of the character stated in claim 3, the provision of: a variable speed pul-

ley drive between the motor and the reduction gearing.

5. In a sewing machine provided with a motor, a main drive shaft, a reciprocating needle driven by the drive shaft and a manually operable stitch-width varying means for controlling the lateral movement of the needle, the provision of: a rotatable cam; a driving connection including a reduction gearing between the motor and said rotatable cam; a master lever arranged for oscillation by the cam; reciprocable carriage means operatively connected to the master lever and driven thereby, and means for selectively connecting the carriage to the stitch-width varying means, whereby the width of the stitch of the needle is automatically and repetitively varied.

6. In a sewing machine of the character stated in claim 5, the provision of: a selectively engageable variable speed means in the driving connection between the motor and reduction gearing.

7. In a sewing machine of the character stated in claim 5, the provision of: a worm shaft in the reduction gearing; an assembly of variable speed pulleys connected to the worm shaft; and an idler pulley; said idler and variable speed pulleys being selectively interposable in said driving connection without changing a driving connection between the motor and the main drive-shaft.

8. In a sewing machine of the character in claim 3, the provision of: a master lever pivotally supported at one end and spring means yieldably urging the master lever against said rotatable cam to impart oscillation to said master lever.

9. In a sewing machine provided with a motor, a main drive shaft, a reciprocable needle driven by the drive shaft, a needle post in which said needle reciprocates, and means for varying the width of the stitch of said needle, said means including a normally manually actuatable control arm, the provision of: a rotatable cam; a driving connection including a reduction gearing between the motor and said rotatable cam; a master lever arranged for oscillation by the cam, and means connecting the master lever and the control arm, whereby the width of the stitch of the needle is automatically and repetitively varied.

10. In a sewing machine of the character stated in claim 9 the provision of: a selectively engageable, variable speed means in the driving connection between the motor and reduction gearing.

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