

Dec. 9, 1958

H. GEORGE

2,863,407

SPIRAL SEWING MACHINE

Filed Oct. 20, 1950

3 Sheets-Sheet 1

Fig. 1.

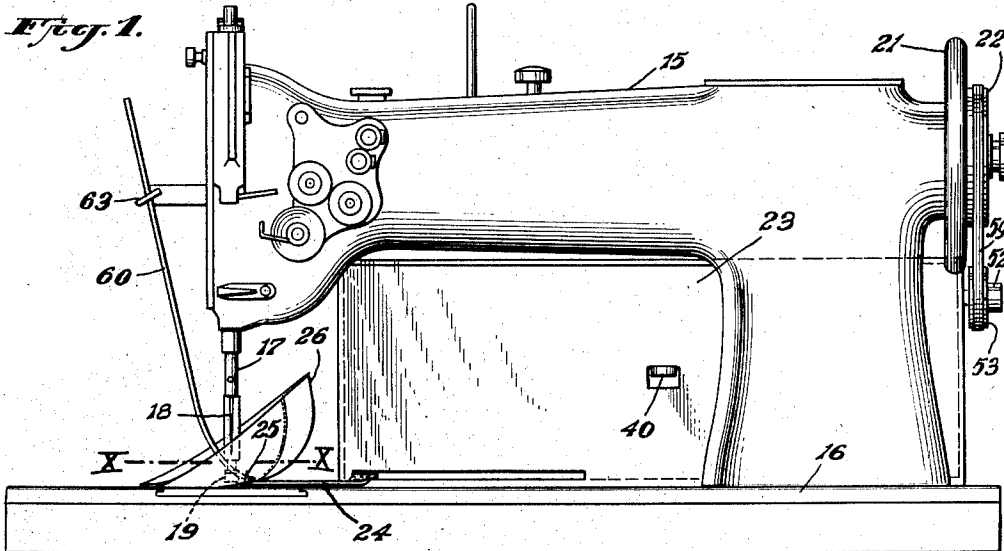


Fig. 5.

Fig. 3.

Fig. 2.

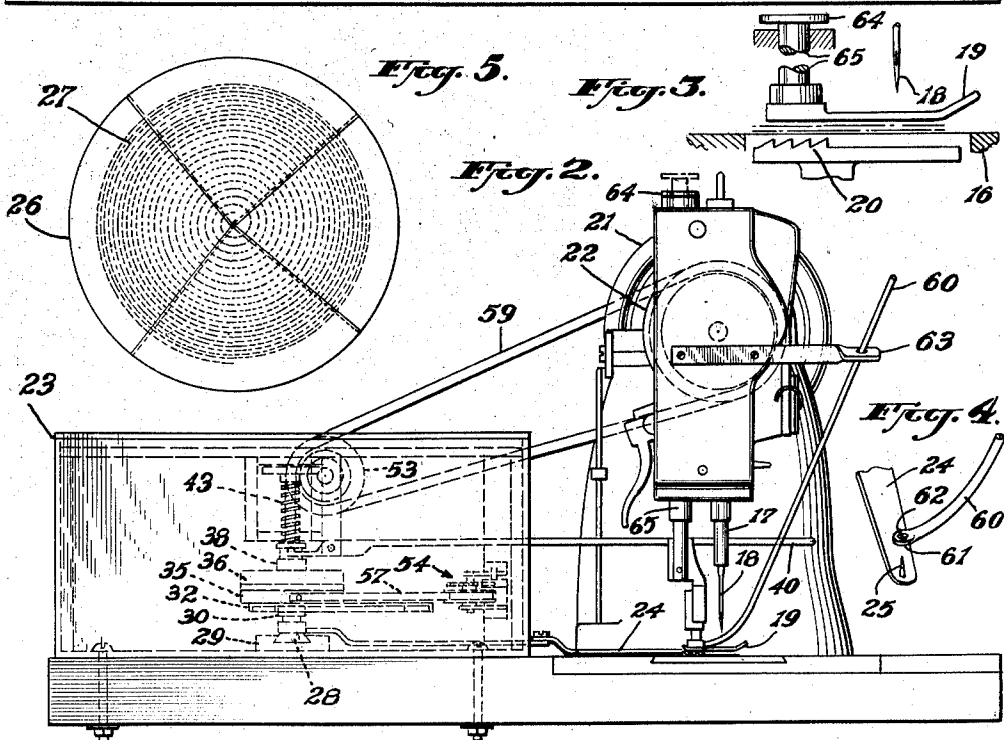


Fig. 4.

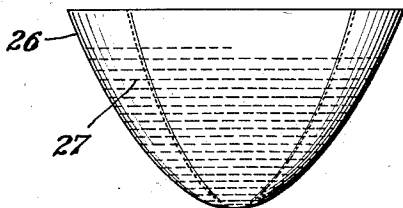


Fig. 6.

INVENTOR.
HENRY GEORGE.
BY
Howard P. King
ATTORNEY.

Dec. 9, 1958

H. GEORGE

2,863,407

SPIRAL SEWING MACHINE

Filed Oct. 20, 1950

3 Sheets-Sheet 2

Fig. 9.

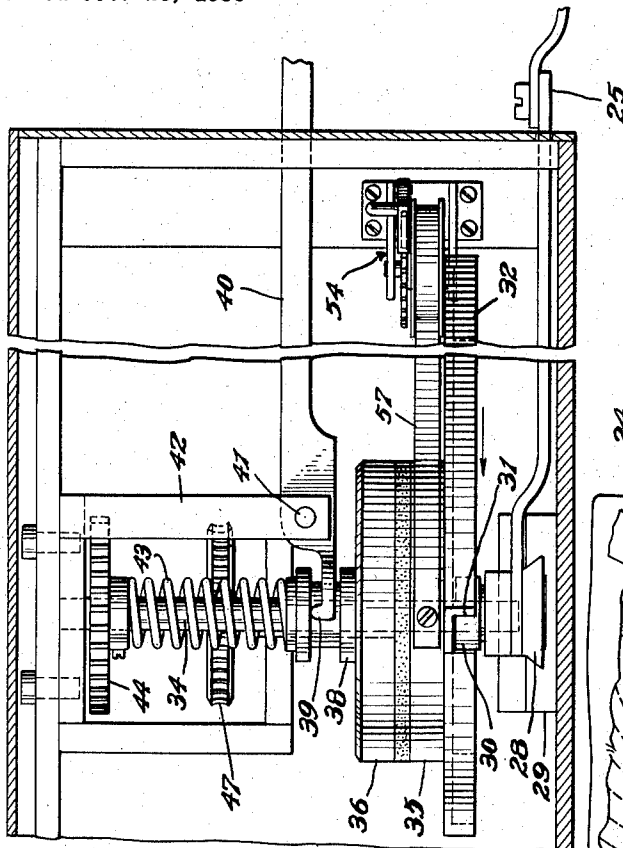


Fig. 8.

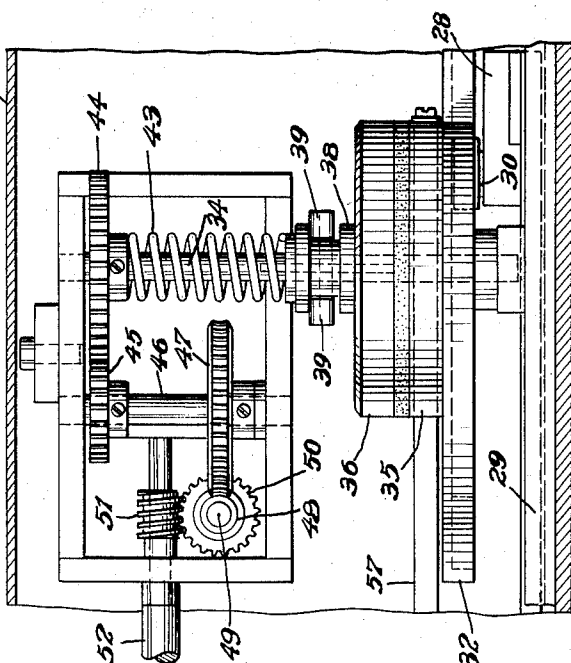
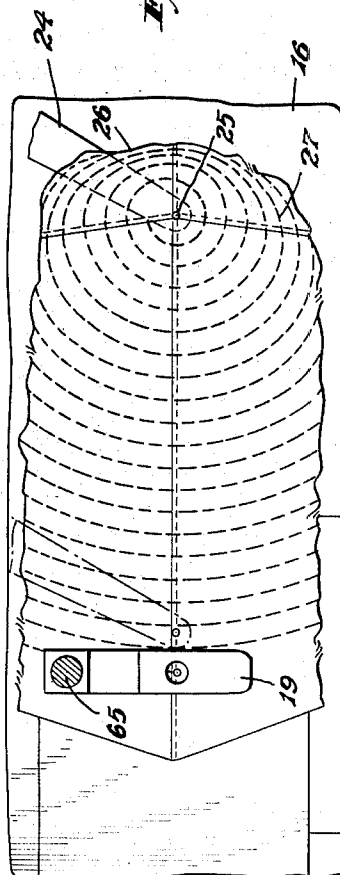


Fig. 10.



INVENTOR.
BY HENRY GEORGE.
Howard P. King
ATTORNEY.

Dec. 9, 1958

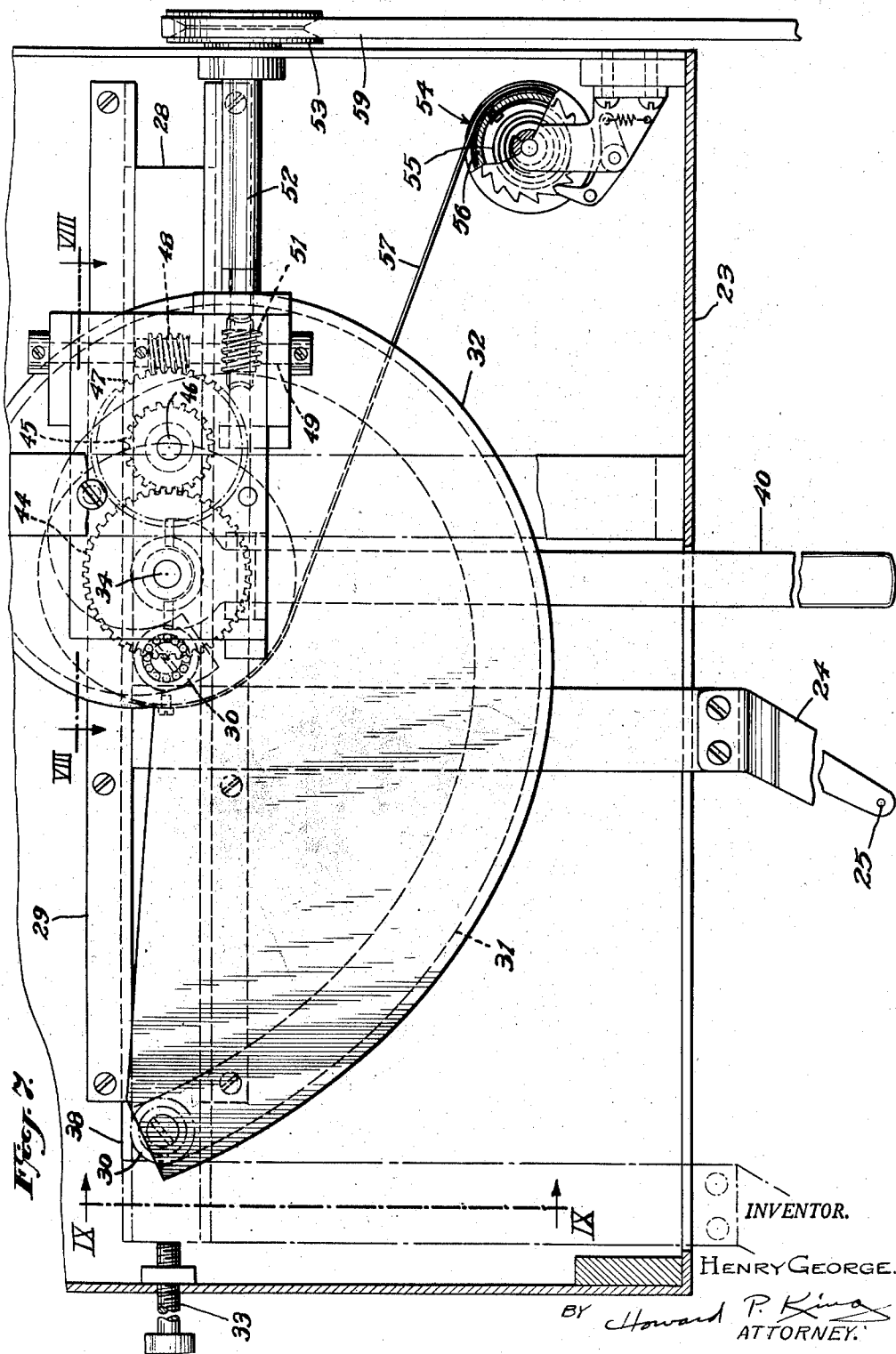
H. GEORGE

2,863,407

SPIRAL SEWING MACHINE

Filed Oct. 20, 1950

3 Sheets-Sheet 3



1

2,863,407

SPIRAL SEWING MACHINE

Henry George, Corona, N. Y., assignor to Automatic Designing Corp., Flushing, N. Y., a corporation of New York

Application October 20, 1950, Serial No. 191,221

7 Claims. (Cl. 112—2)

This invention relates to sewing machines, and more particularly, to an attachment therefor by which a standard sewing machine is adapted to sew spiral convolutions of continuously increasing diameter.

The generic objective of the invention is to provide an improved rugged construction applicable to a sewing machine as procurable on the market without requiring any material reconstruction of or changes in the sewing machine proper.

More specifically, the invention contemplates a unitary attachment of the character recited above, which may be quickly and easily applied to an existing sewing machine for producing work with a continuous spiral row of stitching beginning as a small-diameter convolution and ending as a large-diameter convolution.

Another object of the invention is to provide improved and positive displacement of the work from the needle progressively and uniformly as to spacing between convolutions of the spiral stitching.

A further object of the invention is to provide for prompt resetting of the displacement means upon completion of one spiral stitching on one piece of work ready to repeat the operation on a successive piece of work.

Again, an object of the invention is to provide an attachment of the character mentioned, which not only is attachable without material modification of the machine on which used, but which does not interfere with operator manipulation of the machine or work.

Still further objects and advantages will appear to those skilled in the art to which the invention appertains, both by direct reference thereto as the description proceeds and by implication from the context.

Referring to the accompanying drawings, in which like numerals of reference indicate similar parts throughout the several views,

Fig. 1 is a front elevation of a standard sewing machine to which my invention is shown applied;

Fig. 2 is an end view thereof looking toward the head of the machine or end thereof at which the needle is mounted;

Fig. 3 is a detail sectional elevation showing a means applied to the machine for limiting foot pressure toward the work and feed dog;

Fig. 4 is a fragmentary perspective of the work-centering and retaining means;

Figs. 5 and 6 are respectively a plan and an elevation of the completed work;

Fig. 7 is a plan, with certain parts broken away and in section, of the principal mechanisms exemplifying the invention;

Fig. 8 is a sectional elevation approximately on line VIII—VIII of Fig. 7;

Fig. 9 is a sectional elevation approximately on line IX—IX of Fig. 7; and

Fig. 10 is a sectional plan approximately on line X—X of Fig. 1, and showing a part of the completed work and relative positions of the work guide at start and finish.

In the specific embodiment of the invention illustrated

2

in said drawing, the reference numeral 15 designates a sewing machine in general of standard construction, having the usual goose-neck body one end of which is fixed to a base or bed 16 and the other end having a vertically reciprocating needle bar 17 for carrying a needle 18 and having a foot 19 for holding the work down in the vicinity of the needle and in contact with the usual feed dog 20. Sewing machines of this character for commercial use are now all motor driven and usually are driven by a motor (not shown) located beneath the table on which the machine rests, with the drive connection projecting into the basal portion of the machine. No attempt, therefore, has been made to illustrate this commonly known and prevalent drive for the machine as it can be readily understood as being present. Sewing machines do, however, generally have a flywheel 21 and pulley wheel 22 at the basal end of the goose-neck, and I conveniently utilize the said pulley wheel as the source of drive for my attachment of the present invention.

The mechanism of my attachment is in most part enclosed within a housing 23 located at the rear of the sewing machine and made fast to the same table on which the sewing machine is mounted. Projecting forwardly from this housing closely overlying the bed of the sewing machine, and extending forward as far as the location of the needle under the goose-neck, is an arm 24 which, with an upwardly projecting pin 25 thereon constitutes what may be termed displacement means for the work. This arm and its pin 25 are initially located close to the needle, and the pin projects through the work 26 to provide a center about which the work is to rotate. As the stitching progresses, said arm is moved laterally of itself and longitudinally of the machine toward the basal end of the goose-neck. The pin 25, of course, moves laterally of itself and longitudinally of the machine toward the basal end of the goose-neck along with the said arm, and consequently the work is displaced progressively laterally from the needle. As the sewing machine is simultaneously functioning to stitch the work, the work is also driven toward the rear by feed dog 20. The simultaneous feeding of the work by the feed dog and lateral displacement by the pin and arm, results in the line of stitching 27 following a spiral path.

It should now be brought to attention that with lateral displacement of the center of rotation of the work, namely, pin 25, the convolutions of the spiral get both larger in diameter and greater in length. In view of the greater length of successive convolutions, it requires greater time for the stitching to make each convolution and if the pin were displaced at a uniform rate, the spacing between convolutions would become greater with each successive convolution. A feature of the present invention accordingly is provision of novel means for obtaining equal spacing of the successive convolutions of the stitching. This object is obtained by proportioning the rate of movement of the pin and arm for each complete convolution of stitching inversely to the distance of travel circularly of the work to complete the convolution of the stitching. Thus, the arm is caused to move slower and slower as the distance thereof from the needle increases. The mechanism for accomplishing this desideratum is located in aforesaid housing 23.

In said housing 23 is a longitudinally slidable bar or carriage 28 retained in a track 29 secured to the floor of the housing, said bar and track being parallel to the path of displacement of the pin 25 from the needle, namely, lengthwise of the machine. At the top of this bar or carriage 28, projecting above the level of track 29, is a roller 30, the axis of which is vertical or parallel to pin 25. Said roller rides in a cam groove 31 formed in the underside of a horizontally disposed cam 32, said cam having rotational movement about a vertical axis. In

the specific showing in the accompanying drawings, the roller is near the left end of the carriage and in starting position the carriage is at the left end of its stroke or path of reciprocal movement. The exact starting position of the said carriage is determined by an adjustable stop, shown as a screw 33, opposite the end of the carriage and threaded through the end wall of the housing. Afore-said arm 24 is fixed on the carriage and projects laterally therefrom forwardly from the housing so that adjustment of stop screw 33 determines the initial separation of pin 25 from needle 18. Rotation of the cam actuates roller 30 and carriage 28 on which it is mounted toward the right, and as shown in Fig. 7 more particularly, the cam makes one complete revolution to advance the carriage and pin the requisite amount to complete the desired line of spiral stitching, and in said Fig. 7, the cam has completed its revolution and the carriage and arm are shown in heavy lines in their most advanced position, and are shown in dot and dash lines in their initial position. It will be observed that the cam has a wider sweep at the engaging part of the groove with the roller for initial position and a progressively smaller sweep in position of advancing engagement with the roller, and this variation in sweep is proportioned to advance the roller, carriage, arm and pin at an increasingly slower rate as required and as above explained.

At the axis of rotation of said cam, the cam is mounted on a vertical shaft 34 and is adapted to rotate, as required, upon said shaft. Also, rotatable on said shaft, but fixed on the cam, is a clutch disc 35, which, for distinguishing purposes will be herein termed the driven clutch disc. Above said driven clutch disc and in this instance rotatably fixed on said shaft, is a driving clutch disc 36, both of said discs being coaxial to the shaft. The shaft is preferably provided with a spline or other means to permit movement of the driving clutch disc longitudinally of the shaft and yet rotatably fixed with respect thereto. Above the driving clutch disc and secured thereto is a grooved shift collar 38. Appropriate pintles 39 on a forked shift lever 40 ride in the groove of the shift collar, said lever being suitably fulcrumed at 41 from a bracket 42 and extending forwardly from the housing to convenient position for manipulation by the operator. Pressing the lever lifts the driving clutch plate from engagement with the driven clutch plate and stops rotation of the cam in its driven direction.

The driving clutch plate is held normally in driving engagement with the driven clutch plate by a compression spring 43 on said shaft. Said spring bears at its lower end against the upper end of shift collar 38 and engages at its upper end against the hub of a gear 44 fixed on said shaft. That gear is in mesh with another gear 45 fast on a vertical stub shaft 46 on which also is secured a worm wheel 47 in mesh with a worm 48 integral with a cross-shaft 49 which in turn has a worm wheel 50 thereon driven by another worm 51 fast on a drive shaft 52. These several gears and worms constitute a reduction gearing from the drive shaft 52 to the clutch and are calculated to give the cam one full revolution while the line of stitching is being sewn to complete all of the plurality of convolutions to make the article constituting the work. Said drive shaft 52 has a pulley 53 thereon and is conveniently driven by a belt from the aforementioned sewing machine pulley wheel 22, which has the beneficial purpose of synchronizing the rate of cam movement to the rate of stitching.

When the stitching of one piece of work is finished, it is desired that the centering pin 25 shall be promptly returned to starting position in proximity to the needle. For this purpose, the cam is rotated quickly in reverse direction, and as one means for executing this movement, I provide a spring loaded return mechanism 54 such as are commonly employed for carriage-return in typewriters. As these return mechanisms are well known, further description is deemed unnecessary except perhaps to say

that a ratchet arrangement is provided for applying and/or retaining desired tension to the clock spring 55 within the drum 56 of said mechanism to which said spring is attached. A strap 57 is wound on the drum in the direction of pull by the spring, the other end of the strap conveniently winding on the periphery of the driven clutch disc 35 in direction to be wound therearound as the cam is driven by the aforementioned gearing. When the driving clutch disc 36 is lifted from the driven clutch disc, the spring 55 of the return mechanism is then permitted to rewind the strap 57 on the drum and unwind it from the cam-attached clutch disc by reverse rotation of that disc and cam. The strength of spring 55 is such that the return cycle is very rapid and may be descriptively identified as snap action. Separation of the clutch discs may be accomplished automatically by a suitable trip on the carriage for the clutch operating shift lever 40, or said lever may be tripped by hand.

Means are preferably provided to influence retention of the work on the pin 25 during rotation and sewing of the piece of work, which, being a brassiere cup in the specific showing thereof herein, is not flat and has a tendency at times to jump off of said pin. An illustrative work retainer 60 for the purpose is shown in Fig. 4 and may be compared in configuration to a hockey stick, made of wire and having a horizontally flattened lower end 61 with a pin receiving hole 62 vertically therethrough. The upper end of said work retainer is slidable in a bracket 63 conveniently attached to the machine and which will permit the work retainer to tilt and slide as it follows along with the pin and also will permit said retainer to be lifted by the operator in exchanging work.

Inasmuch as the work rotates on a center at times very close to the needle, it is desirable to allow for the necessary lateral component of movement with respect to the feed dog and foot. Since the work is relatively small and light, the maximum gripping pressure of the foot and dog normally required in sewing machines is neither required nor desirable, but instead, only a light grip which will permit side slip of the work is wanted. This feature is accomplished as indicated in Fig. 3 by providing a head 64 on the top of the pressure bar 65 for the foot such that when the bar and head are in lowered position, said head comes into engagement with a fixed part of the machine to prevent the foot from quite reaching the bed plate of the machine, but just close enough to make light contact with the work and to still assure proper functioning of the feed dog against the work.

I claim:

1. A sewing machine attachment of the character described, comprising a work-advancing arm adapted to extend part way across a sewing machine bed and having a work-receiving centering pin upon which the work rotates as the machine stitches, a cam making operative connection with and for displacing said arm at a predetermined variable rate by rotation of the cam forwardly, and spring-loaded means connected with and tensioned by forward rotation of the cam for rotating the cam in a reverse direction at a different rate for returning the arm and pin to initial position.

2. A sewing machine attachment of the character described, comprising a work-advancing arm adapted to extend part way across a sewing machine bed and having a work-receiving and centering pin, a cam having a cam surface in operative connection with said arm for displacing said arm, a gear train and clutch connected with and for driving the cam in a direction displacing said arm forwardly, and cam-reversing means effective upon said cam and applying force to the cam in opposition to the driving of the gear train and automatically returning said cam and arm to initial position upon release by said clutch of the gear train connection with said cam.

3. A sewing machine attachment of the character described comprising a work-centering and displacing means, a cam in operative engagement with and for dis-

5

placing said means, said cam having a long sweep at the beginning of its operative engagement with said means and a progressively decreasing sweep toward the final position of its operative engagement with said means, whereby said means is displaced at a progressively slower rate, a clutch having a driven disc fast with respect to said cam and having a driving disc releasable from said driven disc, a drive shaft, rotating connection from said drive shaft to said driving disc, means for releasing the driving disc from said driven disc, and spring loaded snap-action return means connected with and tensioned by forward rotation of said cam for returning said cam to initial position on release of the driving clutch disc from the driven disc.

4. A sewing machine attachment of the character described, comprising a work-advancing arm having a centering pin for the work, a cam having operative driving connection with said arm for moving said arm in a forward direction, a drive having a releasable clutch making driving connection to said cam and said drive being continuously in one rotative direction to the clutch, means operatively connected to the clutch automatically releasing the clutch and discontinuing forward driving force to the cam from said drive as the arm reaches a predetermined position of forward movement, and cam-return means operatively connected to the cam applying reverse rotative force to said cam during forward rotation of the cam and effectively and instantly operative on said cam to return the cam to initial position upon release of said clutch, whereby the cam rotatively oscillates and the work-advancing arm correspondingly advances and retracts in a complete cycle.

5. A sewing machine attachment of the character described, comprising a work-advancing arm having a centering pin for the work, a cam having operative driving connection with said arm for moving said arm in a forward direction, a drive having a releasable clutch making driving connection to said cam and said drive being continuously in one rotative direction to the clutch, means operatively connected to the clutch automatically releasing the clutch and discontinuing forward driving force to the cam from said drive as the arm reaches a predetermined position of forward movement, and cam-return means operatively connected to the cam applying reverse rotative force to said cam during forward rotation of the cam and effectively and instantly operative on said cam to return the cam to initial position upon release of said clutch, whereby the cam rotatively oscillates and the work-advancing arm correspondingly advances and retracts in a complete cycle, and manual

6

means for re-engaging the clutch and repeating the cycle.

6. The combination with a sewing machine having stitching mechanism including a needle, a presser foot and work feeder and driving means therefor, of means for guiding the work laterally relative to the direction of the forward feed produced by the stitching mechanism at a progressively varying rate comprising a laterally shiftable work support provided with means adjacent the stitching mechanism for pivotally supporting the work thereon, means for shifting said support laterally comprising a spirally formed flat plate cam element having a camming surface of varying contour mounted for rotary movement about a relatively fixed axis, driving connections between said cam and the driving means of the machine for rotating the cam in timed relation with the operation of the stitching mechanism of the machine, and comprising a slide bar extending beneath said cam and having a roller projecting at the edge of and engaging and responsive to the varying contour of said cam, and an arm fixed on and projecting transversely from said slide bar and having said work support mounted on said arm, said cam, roller, bar and arm cooperating for shifting said work support laterally in a direction parallel to said slide bar at a rate coordinated with the rate of forward feed of the work whereby to produce a line of stitching in the form of a spiral.

7. The combination of claim 6 including clutch means in said driving connections to the cam, means associated with the said clutch operative normally to maintain the clutch engaged and said plate cam in operation, means operative on the clutch for disengaging the clutch whereby to render ineffective said normally operative driving connections to the cam, and additional means effective on the cam for actuating the cam in the reverse direction when said clutch means is disengaged.

References Cited in the file of this patent

UNITED STATES PATENTS

40	1,259,324	Weiss	Mar. 12, 1918
	1,463,116	English	July 24, 1933
	2,161,141	De Voe	June 6, 1939
	2,437,624	Sutker	Mar. 9, 1948
	2,488,095	Myers	Nov. 15, 1949
45	2,521,085	Ogden	Sept. 5, 1950
	2,551,261	Gensheimer	May 1, 1951
	2,674,963	Guide	Apr. 13, 1954

FOREIGN PATENTS

50	411,849	Germany	Apr. 8, 1925
----	---------	---------	--------------