ZIG-ZAG STITCHING APPARATUS FOR SEWING MACHINES

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4 Sheets—Sheet 1

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The present invention relates to a sewing machine apparatus.

More particularly the present invention relates to a sewing machine apparatus for producing a zig-zag stitching.

Although there are known devices for enabling sewing machines to produce zig-zag stitching, these known devices are very elaborate and expensive and operate in a very complicated way. For example, in one known machine, the whole needle is moved as a unit in order to produce a zig-zag stitching, and the structure for connecting the drive to the needle, while allowing the latter to move as a unit, is exceedingly complicated and expensive.

It is therefore one of the objects of the present invention to provide a zig-zag stitching apparatus which is of relatively simple and inexpensive construction.

A further object of the present invention is to provide a zig-zag stitching apparatus which may conveniently be mounted in conventional sewing machines, whether they are hand or foot operated, or power driven.

Another object of the present invention is to provide a means for adjusting a zig-zag stitching apparatus so as to thereby control the size of the zig-zag stitching.

Yet another object of the present invention is to provide a zig-zag stitching apparatus which does not in any way interfere with the normal operation of a sewing machine.

An additional object of the present invention is to provide a means for conveniently and simply stopping and starting the zig-zag stitching operations.

With the above objects in view, the present invention mainly consists of a sewing machine apparatus for producing a zig-zag stitching, this apparatus including a support means supporting a needle carrying rod for reciprocating movement thereon, and a needle, adapted to pass through the material to be sewn, located to one side of and being parallel to the axis of the rod and extending therefrom. A first drive means is operatively connected to the rod for reciprocating the same along the axis thereof, and a second drive means is operatively connected to the rod for reciprocating the same about said axis, so as to produce the zig-zag stitching.

The novel features which are considered as characteristic for the invention are set forth in particular in the appended claims. The invention itself, however, both as to its construction and method of operation, together with additional objects and advantages thereof, will be best understood from the following description of specific embodiments when read in connection with the accompanying drawings, in which:

Figs. 1–4 respectively show schematic illustrations of the principle of the present invention;

Fig. 5 is a side, fragmentary view of the apparatus with part of the sewing machine housing broken away;

Fig. 6 is a fragmentary side view of the apparatus of Fig. 5 showing the top dead center position of the needle;

Fig. 7 is a fragmentary view of a part of the structure of Fig. 5 taken along the lines VII—VII of Fig. 5 in the direction of the arrows;

Fig. 8 is a fragmentary view of the structure of Fig. 5 taken along lines VIII—VIII of Fig. 5 in the direction of the arrows;

Fig. 9 is a fragmentary view of a part of the structure of Fig. 5 taken along line IX—IX of Fig. 5 in the direction of the arrows;

Fig. 10 is a view corresponding to that of Fig. 6 and illustrating the bottom dead center position of the needle;

Fig. 11 is a fragmentary sectional view taken along line XI—XI of Fig. 6 in the direction of the arrows;

Fig. 12 is a fragmentary, side, partly sectional view of the details of the structure for starting and stopping the zig-zag stitching operations and illustrating the structure in the position where it is disconnected from the needle;

Fig. 13 is a partly sectional plan view of the structure of Fig. 12;

Figs. 14–17 are partly sectional, fragmentary views of the drive for the zig-zig stitching apparatus of the present invention, these figures respectively showing this drive in four different positions thereof;

Figs. 18 and 19 are respectively side and plan views, partly in section, of a detail of the apparatus of the present invention;

Fig. 20 is a sectional view taken along XX—XX of Fig. 18 in the direction of the arrows;

Fig. 21 is a side sectional view of another detail of the apparatus of the present invention;

Fig. 22 is a sectional view taken along line XXII—XXII of Fig. 21 in the direction of the arrows; and

Fig. 23 is a sectional view taken along line XXIII—XXIII of Fig. 22 in the direction of the arrows.

Referring now to the drawings, and in particular to Figs. 1–4 thereof which schematically illustrate the principle of the invention, it is seen that the needle is guided for reciprocating vertical movement in the bearings 2 and 3 by any suitable drive means (not shown in these Figs. 1–4), such as a motor-driven crank or the like. In accordance with the present invention the needle includes a needle carrying rod 1 guided in the bearings 2 and 3 and a needle 4 which is eccentrically connected to the rod 1 by the portion 13, needle 4 being parallel to the axis of rod 1, and extending from the latter. A double lever 5 is connected by a rib and groove means 6 to the rod 1 in such a way as to permit this rod 1 to reciprocate vertically independently of the double arm lever 5 while constraining this rod 1 to turn with the lever 5 about the axis of rod 1. On the two arms of the lever 5, which respectively extend from opposite sides of the rod 1, in a direction normal thereto, there are respectively mounted a pair of rollers 7 and 8. Roller 7 contacts an eccentric disc 9, and roller 8 contacts an eccentric disc 10, when the zig-zag stitching apparatus is operated. During normal sewing operations, the rollers 7 and 8 are not influenced by the discs 9 and 10, as will be more fully described below. The discs 9 and 10 are fixed to a shaft 11 which is turnable mounted in order to turn the discs 9 and 10 in the direction of the arrows shown in Figs. 1 and 2. This rotation of the shaft 11 causes the eccentric discs 9 and 10 to alternately move the rollers 7 and 8 about the axis of rod 1 to cause the needle 4 to reciprocate about this axis and thereby cause the needle itself to reciprocate about this axis so that the needle 4 periodically moves from the position shown in Fig. 1 to that shown in Fig. 2, that is, when the needle moves downwardly from its top dead center position, it makes, e.g., a large part of the stitching a (Fig. 3) and, when the needle moves upwardly and toward the position shown in Fig. 2 and then downwardly from the top dead center position thereof, it makes the right part of the stitching b (Fig. 4) in the material.
Thus, Figs. 1–4 illustrate the main principles of the invention, which reside in mounting the needle 4 eccentrically on the needle rod 1, and reciprocating the needle rod about its axis, while permitting the same to reciprocate along its axis, to produce the zig-zag stitching.

Referencing now to the details of the actual construction of the apparatus of the present invention, it will be seen from Fig. 5 that the fragmentarily illustrated housing 12 carries upper and lower bearings 2 and 3 for the needle carrying rod 1. This rod 1 has fixed to its lower end a clamping device 13 for clamping a needle 4. As is shown in Fig. 11, the clamping device 13 is fixed to the rod 1 by a countersunk screw member 14, and this clamping device is formed with a cutout 15 passing therethrough and having the top end portion of the needle 4 located therein. A screw member 16, having a knurled head, threadedly extends through the member 13 into the opening 15 to releasably clamp the needle 4 to the member 13. As is shown most clearly in Fig. 5 (and Fig. 6), the needle 4 is eccentrically located with respect to the axis M of the needle carrying rod 1.

As is shown in Figs. 5, 6 and 10, the needle carrying rod 1 is provided adjacent to its upper end with a collar 17 and thereto and with a screw 20 threadedly extending into the top end portion of the rod 1. A split sleeve 18, having a pair of ears located opposite each other and traversed by the bolt and nut means 19 (Fig. 5), is loosely located about the top end portion of rod 1 and between the collar 17 and the head of screw 20 so that the sleeve 18 cannot move axially along the rod 1 while the latter may turn about its own axis M within the sleeve 18.

A drive shaft 21 is mounted in bearings 22 and 23 (Figs. 5 and 7) of the sewing machine housing for turning movement about its own axis, this shaft 21 being adapted to be reciprocated back and forth about its own axis. This shaft 21 derives its drive from a member 24, which is reciprocated in a vertical direction by a drive (not shown and not forming part of the present invention). The member 24 is pivotally linked, through the medium of the forked member 25 and a pin passing therethrough, to a link 26 which is fixed to the shaft 21, so that the latter turnably reciprocates about its own axis upon reciprocation of the member 24.

A fork-shaped lever 27 is fixed at one end to the shaft 21 for turning movement therewith and is pivotally connected at its opposite end to a link 28 which is in turn pivotally connected to the bolt and nut means 19 passing through the ears of the split sleeve 18. Thus, upon reciprocation of the member 24, a drive is transmitted to the needle carrying rod 1 and the needle 4 connected thereto, for reciprocating same in a vertical direction during normal operations of the sewing machine.

A carriage 29, the details of which are illustrated in Figs. 18–20, is slidable mounted at one end in guide ways 30 and 31 and has its opposite end 32 freely located in a slot of wall 54 of the housing 12 (Fig. 5). Thus, the carriage 29 is slidably mounted for movement in a horizontal direction to the right and left, as viewed in Fig. 5, along a line normal to the axis of rod 1. In the left end portion of carriage 29, as viewed in Figs. 5, 18 and 19, there is formed a threaded bore 34 which is threadedly engaged by a wing screw 36, passing through a bracket 35, fixedly mounted on the housing 12, on the outside thereof, and extending into an annular groove of the wing screw 36 so as to prevent the latter from moving axially while allowing the same to rotate so as to move the carriage 29 to the right or left, as viewed in Fig. 5, this carriage being shown in its leftmost position in Fig. 5. It is apparent that by turning of the wing screw 36, the carriage 29 may be adjustably located in any position between two extreme end positions.

The double-armed lever 5, which has already been mentioned above in connection with Figs. 1 and 4 and which is provided with rollers 7 and 8 respectively located on the two arms of the lever 5, is supported in the guide ways 37 of the carriage 29 (Figs. 18–20), the arms of the lever 5 respectively extending through the guide ways 37 and the intermediate part of lever 5, located between the arms thereof, being located between the guide ways 37 and in an opening 41 passing vertically through the carriage 29. At this intermediate part of lever 5, the latter is provided with a hollow cylindrical portion 39 through which the needle carrying 1 slidably passes.

This needle carrying rod 1 is provided on opposite sides thereof with a pair of ribs 40 which are fixed to the rod 1 as being formed integrally therewith, and these ribs 40 are slidable located in mating grooves formed in the inner surface of the cylinder 39. As sides of this construction, the rod 1 is capable of freely sliding in a vertical direction through the cylinder 39. The opening 41 in the carriage 29 is large enough to accommodate the cylinder 39 and at its right-hand part, as viewed in Fig. 19, this opening 41 is narrowed to provide the space 42 for a purpose to be described below in connection with Figs. 1–4, the eccentric discs 9 and 10 are fixed to a shaft 11, and the latter is turnably mounted in an opening 43, extending through the carriage 29 across the space 42 and in a direction substantially parallel to the lever 5. A pin 45 fixed to the shaft 11 is on the outer sides of carriage 29 to prevent axial movement of the shaft 11. Within the interior of the space 42, there are located a pair of cams 46 and 47 which are fixed to the shaft 11 (Figs. 14–17) and which include the camming edge portions 48.

The carriage 29 slidably supports a slide member 49 for reciprocating movement in a direction parallel to the axis of rod 1, and the details of this slide member are illustrated in Figs. 21–23 where it is seen that two opposite sheet metal walls 49 are interconnected at their opposite ends by the cap members 50 and 51, these side wall members 49 slidably engaging the outer sides of the carriage 29, as is shown most clearly in Fig. 9. A plate 52 is fixed to the top side of cap 50 and has an extension 53, extending through an opening in the wall 50 into the interior of the slide member 49 where this extension 53 turnably supports a roller 54. Through the lower cap 51, there extends a member 55 of a plate 56 fixed to the outer side of the wall 51, and this member 56 turnably supports a roller 57, the latter and member 56 being located in a suitable opening in the wall of cap member 51. As is evident from Fig. 22, the rollers 54 and 57 are located substantially opposite each other, the rod 58 (Fig. 5) is fixed to and extends through an opening in the carriage 29 and also extends through openings in the caps 50 and 51 so that this guide rod 58 guides the slide member 49 for vertical reciprocating movement. In order to prevent any turning of the slide member about rod 58 and carriage 29, the carriage is formed with a vertical groove 60 in which a guide rib 59 fixed to the inner surface of one of the side walls 49 is slidable located. As is apparent from Figs. 14–17, the rollers 54 and 57 are positioned to engage caps 46 and 47.

The plate 52 carries at a side of the slide member 49 an extension 61 to which a pin 62 is fixed (Fig. 5) and this pin 62 turnably supports a link 63, this pin 62 extending through an opening in the link 63. The link 63 is provided at an opposing end thereof with a bore forming a bearing 64 for a pin 66 fixed to the thread pulling lever 65 which is reciprocated through the guide ways 37 (not shown and not forming part of the present invention), such as a motor-driven crank or the like. The thread pulling lever 65 is fixedly connected to a hollow tubular member 67, through which the shaft 21 freely passes, and this tubular member 67 engages, on one side, a collar 68 fixed to the shaft 21 and, on the opposite side, the lever 26, so that in this way the member 67 is prevented from moving axially along the shaft 21.

Through the above described construction, the slide
means 49' obtains its reciprocation from the movement of the thread pulling lever 65.

Within the part 70 of the bearing 3 (Fig. 5) there is formed a conical opening 71 in which is located a tubular felt member 72. A tubular member 73 is loosely located about the rod 1 and threadedly engages the part 70 so as to press with an adjustable force against the felt member 72 to adjust the degree with which this latter member presses against the rod 1. The described parts 70 to 73 represent brake means for the rod 1 preventing the same from swinging due to inertia.

When the apparatus is in the position illustrated in Figs. 12 and 13, the sewing machine is set for normal operation. That is, the needle rod 1 moves continually up and down and the above-described device for producing a zig-zag stitching is disconnected and inoperative. In order to produce this result, as is apparent from Figs. 12 and 13, the wing screw 36 is turned to locate the carriage 29 well to the right of rod 1 and against the right wall of housing 12 (shown in section in Fig. 12), so that the eccentric discs 9 and 10 do not contact the rollers 7 and 8. It should be noted that when the carriage 29 is in the position shown in Fig. 12 with its right-hand end located against a wall of housing 12, the end surfaces 69 of the guides ways 37 bear lightly against the lever 5 to block the same from sidewise swinging. During this time, the slide means 49' is not disconnected since it is continually moving up and down with the thread pulling lever 65.

To set the zig-zag stitching apparatus into operation, the wing screw 36 is turned to move the carriage 29 to the left, as viewed in Figs. 12 and 13, so as to bring it toward the opposite extreme position which is illustrated in Fig. 5. In this way, the eccentric discs 9 and 10 come into contact with the rollers 7 and 8 and reciprocate the lever 5 and the rod 1 therewith about the axis of the latter, as was described above in connection with Figs. 1-4. In the position of the parts which is illustrated in Figs. 5 and 8, the rod 1 will be reciprocated about its axis M to the greatest degree which is possible with the disclosed apparatus. When the carriage 29 is located between the two above described extreme positions, the reciprocation of the rod 1 about its axis will be less than the maximum reciprocation obtained from the position of the parts shown in Fig. 5, so that by proper adjustment of the carriage 29, through the wing screw 36, a desired size of zig-zag stitching may be obtained. While the rod 1 reciprocates about its axis M, the felt member 72 frictionally bears against the same to prevent the rod 1 from swinging due to inertia, so that the zig-zag stitching will always be accurately controlled by the setting obtained from wing screw 36.

When the needle 4 and the rod 1 connected thereto are in their top dead center position, shown in Fig. 6, the slide means 49' is in the position shown in Fig. 14. When the rod 1 moves down and the thread pulling lever 65 moves up, then the slide means 49' is also moved upwardly with the thread pulling lever from position shown in Fig. 14 toward those shown in Figs. 15 and 16. As is apparent from Fig. 15, the lower roller 57 comes into contact with the camming edge portion 48 of cam 47 and turns the latter and the shaft 11 therewith to the position shown in Fig. 16 which is the topmost position of the slide means 49'. In this way, the other cam 46 is turned in a clockwise direction, as viewed in Figs. 14-17, together with shaft 11 and eccentric discs 9 and 10, so that the cam 46 becomes located beneath the roller 54 to be engaged by the same upon downward movement of the slide means 49', as shown in Fig. 17. The continued downward movement of the slide means 49' to Fig. 17 shown in Fig. 14 causes the cams 46 and 47 in a position which is 180° from that shown in Fig. 14, and then the above operations are repeated so as to continually turn the discs 9 and 10 through a half revolution during the time that needle 4 travels up and down through a complete cycle, so that the lever 5, and the rod 1 and needle 4 therewith, are turned first one way, then the other way, during the next up and down movement of the needle, and then the other way, during the next up and down movement of the needle, about the axis of rod 1.

It is believed to be apparent that the above described construction for producing a zig-zag stitching may be mounted on any conventional sewing machine, irrespectively of whether the machine is hand or foot operated or is power driven.

It will be understood that each of the elements described above, or two or more together, may also find a useful application in other types of sewing machines differing from the types described above.

While the invention has been illustrated and described as embodied in a zig-zag stitching apparatus for sewing machines, it is not intended to be limited to the details shown, since various modifications and structural changes may be made without departing in any way from the spirit of the present invention.

Without further analysis, the foregoing will so fully reveal the gist of the present invention that others can by applying current knowledge readily adapt it for various applications without omitting features that, from the standpoint of prior art, fairly constitute essential characteristics of the generic or specific aspects of this invention and, therefore, such adaptations should and are intended to be comprehended within the meaning and range of equivalence of the following claims.

What is claimed is new and desired to be secured by Letters Patent is:

1. A sewing machine apparatus for producing a zig-zag stitching, comprising, in combination, support means; a needle carrying rod mounted on said support means for reciprocating movement thereon; a needle, adapted to pass through the material to be sewn, located to one side of and being parallel to the axis of said rod and extending therefrom, first drive means operatively connected to said rod for reciprocating the same along the axis thereof; and second drive means operatively connected to said rod for reciprocating the same about said axis thereof, said second drive means comprising a lever connected to said rod, extending transversely thereto, the same, and having opposite arms respectively extending from opposite sides of said rod; and a pair of staggered eccentrics turnably mounted on said support means and respectively located opposite said arms of said lever to successively engage the same for reciprocating said rod about said axis thereof.

2. A sewing machine apparatus for producing a zig-zag stitching, comprising, in combination, support means; a needle carrying rod mounted on said support means for reciprocating movement thereon; a needle, adapted to pass through the material to be sewn, located to one side of and being parallel to the axis of said rod and extending therefrom, first drive means operatively connected to said rod for reciprocating the same along the axis thereof; a two armed lever connected to said rod, extending transversely thereto, and having its two arms respectively extending from opposite sides of said rod; a carriage mounted on said support means for movement toward and away from said rod along a line substantially parallel to said rod and to said axis of said rod; a shaft turnably mounted on said carriage and extending in a direction substantially parallel to said lever; a pair of eccentrics spaced from each other, being located respectively opposite said lever arms, being fixed to said shaft for rotation therewith, and being 180° out of phase with each other; moving means operatively connected to said carriage for moving the same toward and away from said rod so as to control the extent to which said eccentrics move said lever about said axis of said rod and so as to stop and start reciprocation of said rod about said axis thereof; and driving means operatively connected to said shaft for turning the same.

3. A sewing machine apparatus for producing a zig-
zag stitching, comprising, in combination, support means; a needle carrying rod mounted on said support means for reciprocating movement therewith; a needle, adapted to pass through the material to be sewn, located to one side of and being parallel to the axis of said rod and extending therefrom; first drive means operatively connected to said rod for reciprocating the same along the axis thereof; a two armed lever connected to said rod, extending transversely thereof, and having its two arms respectively extending from opposite sides of said rod; a carriage mounted on said support means for movement toward and away from said lever along a line substantially normal to said lever and to said axis of said rod, being formed with an opening through which said rod extends and with a groove extending parallel to the axis of said rod and having said rib slidably located therein; a carriage mounted on said support means for movement toward and away from said lever along a line substantially normal to said lever and to said axis of said rod, said support means being formed with an opening through which said rod extends and a shaft being formed with an opening through which said rod extends, a shaft turnably mounted on said carriage and extending in a direction substantially parallel to said lever; a pair of eccentrics spaced from each other, being located respectively opposite said lever arms, being fixed to said shaft for rotation therewith, and being 180° out of phase with each other; moving means operatively connected to said carriage for moving the same toward and away from said rod so as to control the extent to which said eccentrics move said lever about said axis of said rod and so as to stop and start reciprocation of said rod about said axis thereof; a pair of cams fixed to said shaft between said eccentrics, and extending in opposite directions from said shaft along a line normal to the same; slide means slidably mounted on said carriage for reciprocating movement in a direction parallel to said axis of said rod and having opposite walls respectively located on opposite sides of said shaft and facing said slide; a pair of contact members located opposite said slide means on the sides thereof facing said shaft, respectively; and drive means operatively connected to said slide means for reciprocating the same in said direction parallel to said axis of said rod so that said contact members successively engage and move said slide means to rotate said shaft.

4. A sewing machine apparatus for producing a zigzag stitching and having a thread pulling lever adapted to reciprocate, said apparatus comprising, in combination, support means; a needle carrying rod mounted on said support means for reciprocating movement therewith; a needle, adapted to pass through the material to be sewn, located to one side of and being parallel to the axis of said rod and extending therefrom; first drive means operatively connected to said rod for reciprocating the same along the axis thereof; a two armed lever connected to said rod, extending transversely thereof, and having its two arms respectively extending from opposite sides of said rod; a carriage mounted on said support means for movement toward and away from said lever along a line substantially normal to said lever and to said axis of said rod, said support means being formed with an opening through which said rod extends and a shaft being formed with an opening through which said rod extends, a shaft turnably mounted on said carriage and extending in a direction substantially parallel to said lever forming an opening through which said rod extends and having said rib slidably located therein; a pair of eccentrics spaced from each other, being located respectively opposite said lever arms, being fixed to said shaft for rotation therewith, and being 180° out of phase with each other; moving means operatively connected to said carriage for moving the same toward and away from said rod so as to control the extent to which said eccentrics move said lever about said axis of said rod and so as to stop and start reciprocation of said rod about said axis thereof; a pair of cams fixed to said shaft between said eccentrics, and extending in opposite directions from said shaft along a line normal to the same; slide means slidably mounted on said carriage for reciprocating movement in a direction parallel to said axis of said rod and having opposite walls respectively located on opposite sides of said shaft and facing said slide; a pair of contact members located opposite said slide means on the sides thereof facing said shaft, respectively; and drive means operatively connected to said slide means for reciprocating the same in said direction parallel to said axis of said rod so that said contact members successively engage and move said slide means to rotate said shaft.

5. A sewing machine apparatus for producing a zigzag stitching, comprising, in combination, support means; a needle carrying rod mounted on said support means for reciprocating movement therewith; a needle, adapted to pass through the material to be sewn, located to one side of and being parallel to the axis of said rod and extending therewith; first drive means operatively connected to said rod for reciprocating the same along the axis thereof; a two armed lever connected to said rod, extending transversely thereof, and having its two arms respectively extending from opposite sides of said rod; a carriage mounted on said support means for movement toward and away from said lever along a line substantially normal to said lever and to said axis of said rod, being formed with an opening through which said rod extends and with a groove extending parallel to the axis of said rod and having said rib slidably located therein; a carriage mounted on said support means for movement toward and away from said lever along a line substantially normal to said lever and to said axis of said rod, said support means being formed with an opening through which said rod extends and a shaft being formed with an opening through which said rod extends, a shaft turnably mounted on said carriage and extending in a direction substantially parallel to said lever; a pair of eccentrics spaced from each other, being located respectively opposite said lever arms, being fixed to said shaft for rotation therewith, and being 180° out of phase with each other; moving means operatively connected to said carriage for moving the same toward and away from said rod so as to control the extent to which said eccentrics move said lever about said axis of said rod and so as to stop and start reciprocation of said rod about said axis thereof; a pair of cams fixed to said shaft between said eccentrics, and extending in opposite directions from said shaft along a line normal to the same; slide means slidably mounted on said carriage for reciprocating movement in a direction parallel to said axis of said rod and having opposite walls respectively located on opposite sides of said shaft and facing said slide; a pair of contact members located opposite said slide means on the sides thereof facing said shaft, respectively; and drive means operatively connected to said slide means for reciprocating the same in said direction parallel to said axis of said rod so that said contact members successively engage and move said slide means to rotate said shaft.

6. A sewing machine apparatus for producing a zigzag stitching and having a thread pulling lever adapted to reciprocate, said apparatus comprising, in combination, support means; a needle carrying rod mounted on said support means for reciprocating movement therewith; a needle, adapted to pass through the material to be sewn, located to one side of and being parallel to the axis of said rod and extending therewith; first drive means operatively connected to said rod for reciprocating the same along the axis thereof; a two armed lever connected to said rod, extending transversely thereof, and having its two arms respectively extending from opposite sides of said rod; a carriage mounted on said support means for movement toward and away from said lever along a line substantially normal to said lever and to said axis of said rod, being formed with an opening through which said rod extends and with a groove extending parallel to the axis of said rod and having said rib slidably located therein; a carriage mounted on said support means for movement toward and away from said lever along a line substantially normal to said lever and to said axis of said rod, said support means being formed with an opening through which said rod extends and a shaft being formed with an opening through which said rod extends, a shaft turnably mounted on said carriage and extending in a direction substantially parallel to said lever; a pair of eccentrics spaced from each other, being located respectively opposite said lever arms, being fixed to said shaft for rotation therewith, and being 180° out of phase with each other; moving means operatively connected to said carriage for moving the same toward and away from said rod so as to control the extent to which said eccentrics move said lever about said axis of said rod and so as to stop and start reciprocation of said rod about said axis thereof; a pair of cams fixed to said shaft between said eccentrics, and extending in opposite directions from said shaft along a line normal to the same; slide means slidably mounted on said carriage for reciprocating movement in a direction parallel to said axis of said rod and having opposite walls respectively located on opposite sides of said shaft and facing said slide; a pair of contact members located opposite said slide means on the sides thereof facing said shaft, respectively; and drive means operatively connected to said slide means for reciprocating the same in said direction parallel to said axis of said rod so that said contact members successively engage and move said slide means to rotate said shaft.

7. A sewing machine apparatus for producing a zigzag stitching and having a thread pulling lever adapted to reciprocate, said apparatus comprising, in combination, support means; a needle carrying rod mounted on said support means for reciprocating movement therewith; a needle, adapted to pass through the material to be sewn, located to one side of and being parallel to the axis of said rod and extending therewith; first drive means operatively connected to said rod for reciprocating the same along the axis thereof; a two armed lever connected to said rod, extending transversely thereof, and having its two arms respectively extending from opposite sides of said rod; a carriage mounted on said support means for movement toward and away from said lever along a line substantially normal to said lever and to said axis of said rod, being formed with an opening through which said rod extends and with a groove extending parallel to the axis of said rod and having said rib slidably located therein; a carriage mounted on said support means for movement toward and away from said lever along a line substantially normal to said lever and to said axis of said rod, said support means being formed with an opening through which said rod extends and a shaft being formed with an opening through which said rod extends, a shaft turnably mounted on said carriage and extending in a direction substantially parallel to said lever; a pair of eccentrics spaced from each other, being located respectively opposite said lever arms, being fixed to said shaft for rotation therewith, and being 180° out of phase with each other; moving means operatively connected to said carriage for moving the same toward and away from said rod so as to control the extent to which said eccentrics move said lever about said axis of said rod and so as to stop and start reciprocation of said rod about said axis thereof; a pair of cams fixed to said shaft between said eccentrics, and extending in opposite directions from said shaft along a line normal to the same; slide means slidably mounted on said carriage for reciprocating movement in a direction parallel to said axis of said rod and having opposite walls respectively located on opposite sides of said shaft and facing said slide; a pair of contact members located opposite said slide means on the sides thereof facing said shaft, respectively; and drive means operatively connected to said slide means for reciprocating the same in said direction parallel to said axis of said rod so that said contact members successively engage and move said slide means to rotate said shaft.
arms respectively extending from opposite sides of said rod; a carriage mounted on said support means for movement toward and away from said lever along a line substantially normal to said lever and to said axis of said rod; a shaft turnably mounted on said carriage and extending in a direction substantially parallel to said lever; a pair of eccentrics spaced from each other, being located respectively opposite said lever arms, being fixed to said shaft for rotation therewith, and being 180° out of phase with each other; moving means operatively connected to said carriage for moving the same toward and away from said rod so as to control the extent to which said eccentrics move said lever about said axis of said rod and so as to stop and start reciprocation of said rod about said axis thereof; a pair of cams fixed to said shaft between said eccentrics, and extending in opposite directions from said shaft along a line normal to the same; slide means slidably mounted on said carriage for reciprocating movement in a direction parallel to said axis of said rod and having opposite walls respectively located on opposite sides of said shaft and facing said cams; a pair of contact members located opposite said cams adapted to contact the same and being fixed to said opposite walls of said slide means on the sides thereof facing said shaft, respectively; linkage means connecting said slide means to the thread pulling lever of the machine for reciprocating said slide means in said direction parallel to said axis of said rod when the thread pulling lever reciprocates so that said contact members successively engage and move said cams to rotate said shaft; and brake means operatively connected to said rod to prevent the same from swinging about said axis thereof due to inertia.

8. A sewing machine apparatus for producing a zig-zag stitching, comprising, in combination, support means; a needle carrying rod mounted on said support means for reciprocating movement thereon; a needle, adapted to pass through the material to be sewn, located to one side of and being parallel to the axis of said rod and extending therefrom; first drive means operatively connected to said rod for reciprocating the same along the axis thereof; second drive means operatively connected to said rod for reciprocating the same about said axis thereof; a tubular felt member located in said opening of said member about and against said rod; and compressing means operatively connected to said felt member for compressing the same to regulate the force with which said felt member bears against said rod so as to prevent the latter from swinging about said axis thereof due to inertia.

9. A sewing machine apparatus for producing a zig-zag stitching, comprising, in combination, support means; a needle carrying rod mounted on said support means for reciprocating movement thereon; a needle, adapted to pass through the material to be sewn, located to one side of and being parallel to the axis of said rod and extending therefrom; first drive means operatively connected to said rod for reciprocating the same along the axis thereof; a lever located on said support means, extending transversely to said rod, and being formed with an opening through which said rod extends; rib and groove means interconnecting said lever and rod and extending in a direction parallel to the axis of the latter to permit said rod to reciprocate along said axis thereof while constraining said rod to turn about said axis thereof when said lever is turned about said axis; and reciprocating means operatively connected to said lever for reciprocating the same about said axis of said rod.

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