Dec. 11, 1962 SABURO SHIMADA 3,067,702

AUTOMATIC AND HAND-OPERATED APPARATUS FOR USE IN ROTARY TYPE ZIGZAG SEWING MACHINES

Filed June 10, 1959 6 Sheets-Sheet 1

Fig. 1

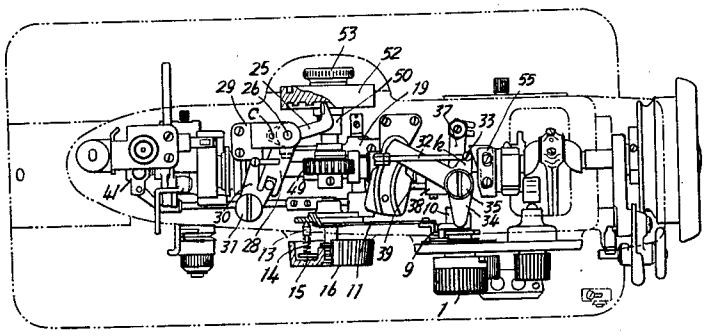
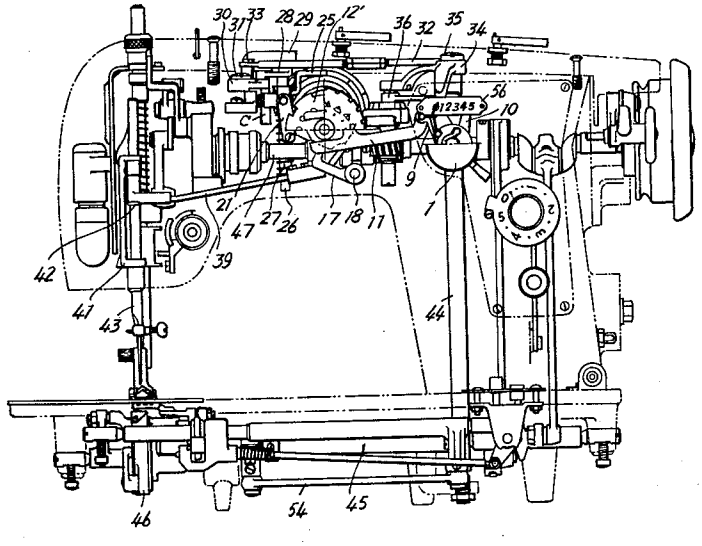


Fig. 2



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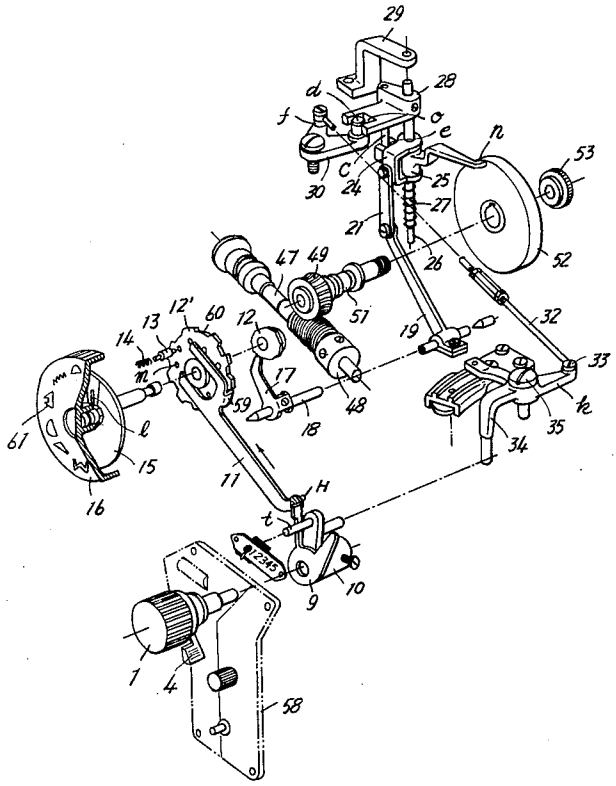
Dec. 11, 1962 SABURO SHIMADA 3,067,702

AUTOMATIC AND HAND-OPERATED APPARATUS FOR USE IN ROTARY TYPE ZIGZAG SEWING MACHINES

Filed June 10, 1959 6 Sheets-Sheet 2

Fig. 3



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AUTOMATIC AND HAND-OPERATED APPARATUS FOR USE IN ROTARY TYPE ZIGZAG SEWING MACHINES

Filed June 10, 1959 6 Sheets-Sheet 3

Fig. 4

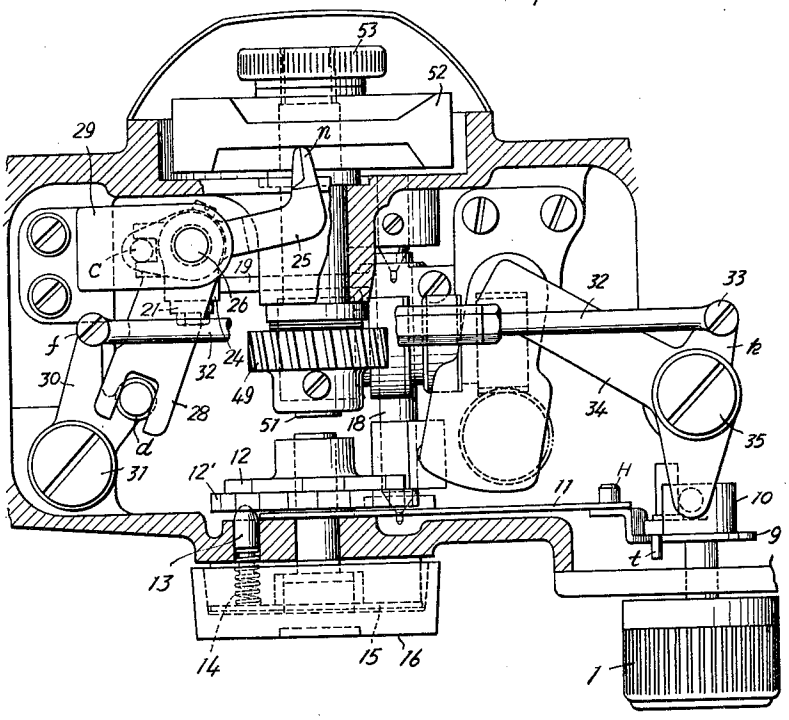


Fig. 6

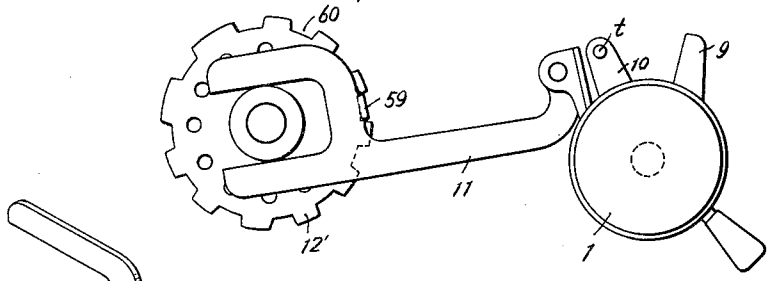
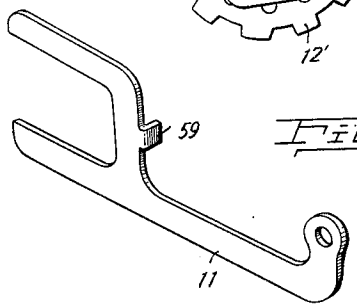


Fig. 7



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Dec. 11, 1962 SABURO SHIMADA 3,067,702

AUTOMATIC AND HAND-OPERATED APPARATUS FOR USE IN ROTARY TYPE ZIGZAG SEWING MACHINES

Filed June 10, 1959 6 Sheets-Sheet 4

FIG. 5

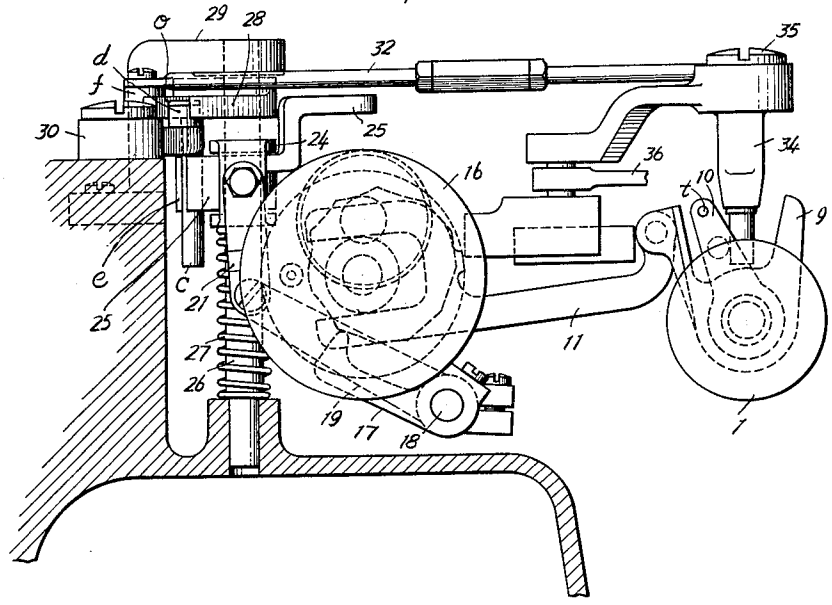
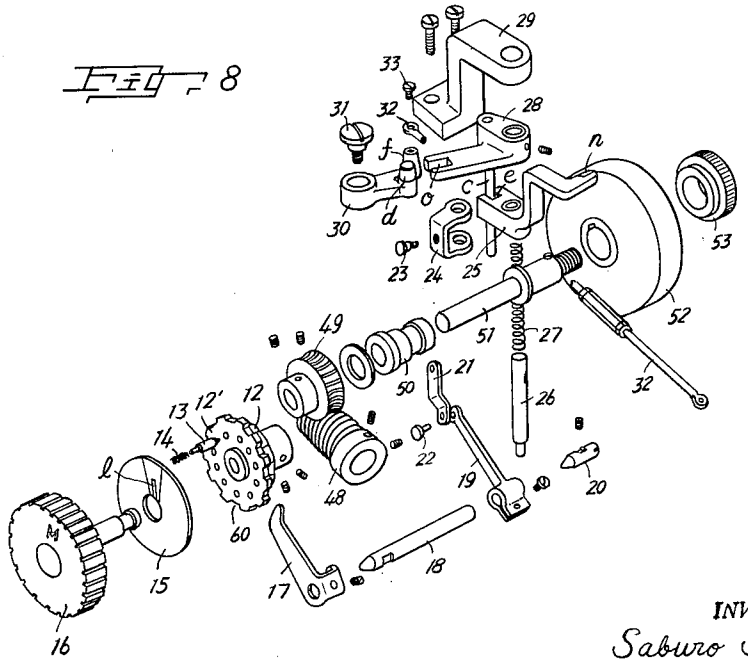


FIG. 8



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Dec. 11, 1962 SABURO SHIMADA 3,067,702

AUTOMATIC AND HAND-OPERATED APPARATUS FOR USE IN ROTARY TYPE ZIGZAG SEWING MACHINES

Filed June 10, 1959 6 Sheets-Sheet 5

Fig. 9

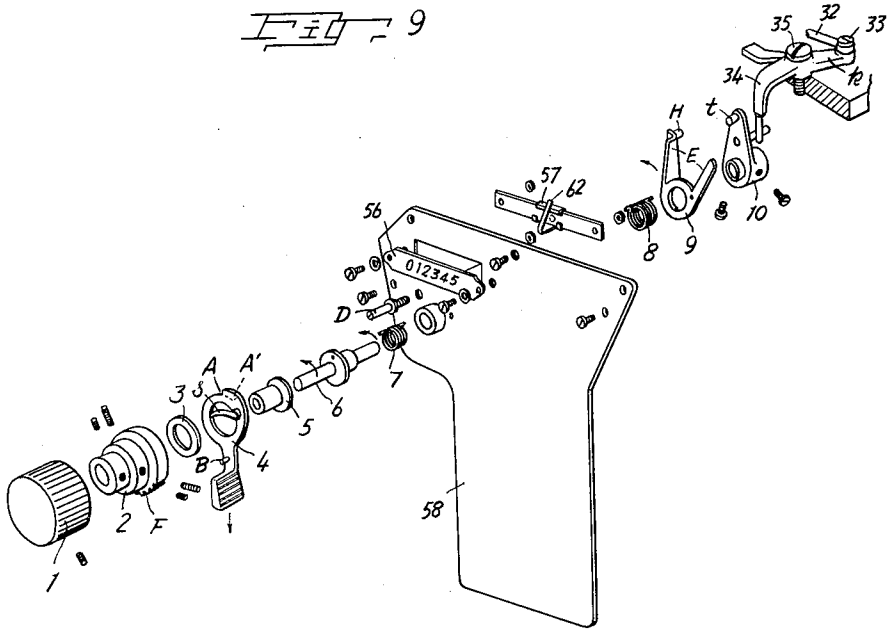


Fig. 11

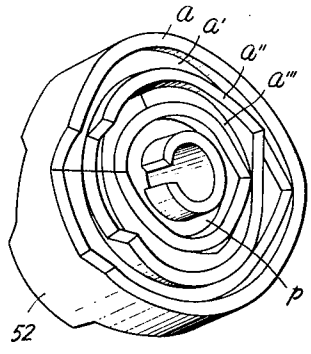
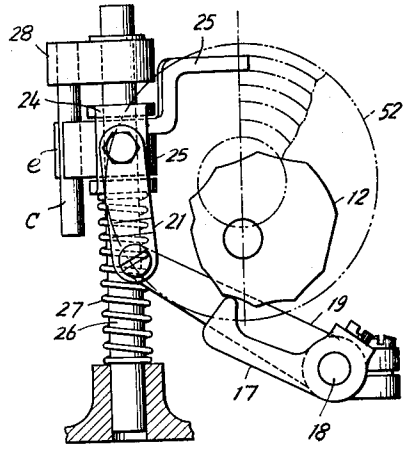


Fig. 10



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Dec. 11, 1962 SABURO SHIMADA 3,067,702

AUTOMATIC AND HAND-OPERATED APPARATUS FOR USE IN ROTARY TYPE ZIGZAG SEWING MACHINES

Filed June 10, 1959 6 Sheets-Sheet 6

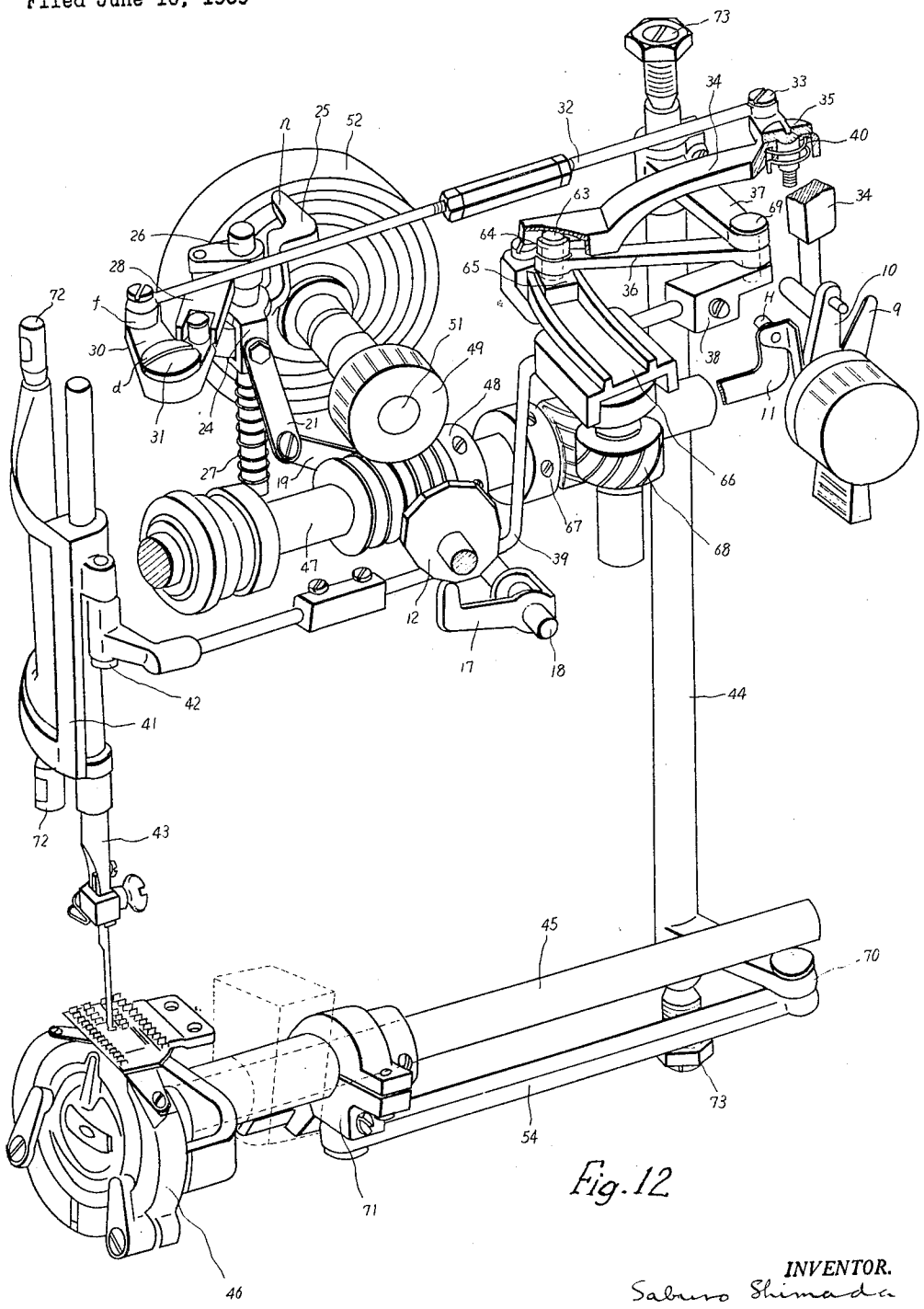

Fig. 12

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United States Patent Office 3,067,702 Patented Dec. 11, 1962

3,067,702

AUTOMATIC AND HAND-OPERATED APPARATUS FOR USE IN ROTARY TYPE ZIGZAG SEWING MACHINES

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Claims priority, application Japan Jan. 27, 1959
5 Claims. (Cl. 112—158)

This invention relates to an automatic and hand-operated apparatus for use in rotary-type zigzag sewing machines characterized in that there is provided a rotary cam member having cam tracks on both sides and comprising short cylinders which are of gradually different diameters and which are joined together integrally. Sewing of patterns is carried out by turning a zigzag width dial knob in clockwise direction to release a locking device and then turning a selector dial to make a cam follower engage a cam track, said locking device at this time setting the cam member so that it will not shift. For sewing a different pattern in automatic operation, a zigzag width dial knob is turned to disengage the locking device and the selector dial is turned to make a selection on the rotary cam member, while for manual operation, contact between the rotary cam member and the follower is disconnected and the zigzag width dial knob is operated by hand to obtain zigzag stitches of varying width.

In the accompanying drawings wherein an embodiment of this invention is shown:

FIG. 1 is a plan view of the present apparatus;

FIG. 2 is a front view thereof;

FIG. 3 is a perspective view which illustrates the operation of the apparatus;

FIG. 4 is an enlarged plan view of the principal part of the apparatus;

FIG. 5 is an enlarged front view of one part of the apparatus;

FIG. 6 is a front view showing a locking mechanism;

FIG. 7 is an enlarged perspective view of a locking rod;

FIG. 8 is a perspective view illustrating in order the component parts of the principal part of the apparatus;

FIG. 9 is a perspective view illustrating in order the component parts of the zigzag width dial part;

FIG. 10 is an enlarged front view showing a part of the principal part of the apparatus; and

FIG. 11 is an enlarged perspective view of a rotary profiling member;

FIG. 12 is a perspective view of a drive mechanism for effecting zigzag sewing.

Description will now be made with reference to an embodiment of this invention as shown in the drawings. A zigzag width dial knob **1** fixed to a zigzag width dial shaft **6** is turned in the righthand direction as far as it will go, that is, said knob **1** is turned until the indicator **62** fixed to an indicator guide **57** points to FIGURE 5 of zigzag width dial plate **56**, and this turns a zigzag width dial shaft crank **10** fixed to the zigzag width dial shaft **6** in the same direction. A selector stopper arm **9** is connected to the front plate **58** by the protruding pin portion of a spring **8** and loosely engages said shaft **6** (FIG. 9). Thus, the selector stopper arm **9** is constantly being urged in the direction of the arrow by said spring **8**. Further, said selector stopper arm **9** is connected to a selector stopper **11** by means of the pin H. Being urged in the same direction as the arm **9**, the pawl **59** of the selector stop **11** engages a recess **60** in the periphery of a locking member **12'** (FIGS. 3 to 7). The pin *t* of zigzag width dial shaft crank **10** which is fitted into the indicator guide **57** moves the indicator **62** (FIG. 9). When the indicator **62** points to 4, the pin *t* of the zigzag width dial shaft crank **10** touches the right leg of selector stopper arm **9**,

and when the indicator **62** is at a position nearer 5 while moving from 4 to 5, the right leg of the selector stopper arm **9** is pushed in the clockwise direction. Consequently, the arm **9** opposing the spring **8** turns to the right and as the selector stopper **11** is moved in the same direction, the pawl **59** of said selector stop **11** disengages the recess **60** of the selector locking member **12'** (FIG. 6). At this time, by turning a selector dial **16** a selector setting pin **13** which is being urged by a selector setting spring **14** slips out of one of the perforations *m* and goes into the next perforation (FIG. 4, 8). A cam follower **25** having a contact part *n* which contacts a rotary cam member **52** for producing patterns is fitted between the legs of a guide **24** and is slidably mounted on a shaft **26** (FIGS. 4, 5 and 12). The follower **25** is urged upward from under the guide **24** by a spring **27** surrounding the shaft **26**, and the bottom end of said shaft **26** is loosely received in a recess provided in the arm of the machine. The upper part of shaft **26** passes through a turnable arm **28** and is loosely received in an aperture provided in the bracket **29**. The lower end of the spring **27** is sustained at the recess provided in the arm of the machine. The guide **24** is connected to a selector link **21** by a pivot screw **23**, and said selector link **21** is in turn connected to a selector arm **19** by a pivot screw **22**. **21** and **19** together form an obtuse angle (FIGS. 8, 12). A selector cam follower **17** and the selector arm **19** are secured by means of screws to a selector shaft **18** which is rotatably mounted to the arm of the machine (FIGS. 5, 8, 12). One end of said shaft **18** is mounted on a center pin **20** (FIG. 8). Thus, the spring **27** constantly urges the guide **24** upward whereby the selector link **21** is lifted up, the arm **19** connected thereto swings upward with the shaft **18** as an axis, and through said shaft **18** the selector cam follower **17** constantly engages the surface of the selector cam **12** (FIG. 10). As described above, when after turning the zigzag width dial knob **1** to the right as far as it will go to disengage the pawl **59** of the selector stop **11** the selector dial **16** is turned with cam **12'** the selector cam follower **17** which is constantly in contact with the selector cam **12** moves and turns the shaft **18**, and arm **19** secured to said shaft **18**, and through the link **21** the guide **24** is moved vertically, and accordingly the follower **25** moves vertically across the cam tracks of cam **52**. A pin *c* attached to the arm **28** engages the recess *e* of the follower **25**, and said arm **28** is secured to the shaft **26**. Into the recess *o* of arm **28** is inserted the stud *d* of an arm **30** movably mounted on the machine by a pivot screw **31** (FIGS. 4, 12). A connecting rod **32** is movably attached at one end to the stud *f* of the arm **30** by a pivot screw **33**, and is movably connected at the opposite end to a zigzag width regulator **34** by a pivot screw **33**. The zigzag width regulator **34** is movably mounted on the machine by a screw **35**, and has an arm with a pin crossing a pin or arm **10** as shown in FIGS. 3, 4 and 12. Accordingly, if the zigzag width dial knob **1** is turned to the right until the indicator points to 5, the arm *k* of the zigzag width regulator **34** swings to the left with **35** as a central axis, the connecting rod **32** moves to the left and the arm **30** swings to the left with **31** as its axis. Consequently, the arm **28** engaged with the stud *d* of the arm **30** swings to the right, and this motion moves follower **25** engaging the pin *c* which is integral with the arm **28**, whereby the end part *n* of follower **25** disengages from the rotary cam member **52**. A worm **48** mounted on shaft **47** transmits the rotary motion of shaft **47** to a worm gear **49**. The worm gear **49** in turn transmits said motion to a cam shaft **51** fixed thereto. The rotary cam member **52** is secured to the shaft **51** by a lock nut **53**. Thus, the rotary motion of the arm shaft rotates the rotary cam member **52**.

As explained above, when the zigzag width dial knob is turned to the right as far as it will go, the pawl 59 of the selector stop 11 disengages the recess 60. While holding the knob in this position, a desired pattern of the selector dial patterns 61 indicated on the selector dial 16 is set to the indicator *l* of a selector plate 15 (FIGS. 3, 11). This turns the selector cam 12, and the selector cam follower 17 in contact therewith is held in a selected position, that is, the curved surface of the selector cam 12 corresponding to the patterns 61 of the selector dial selects the cam track of the rotary cam 52. This motion positions the follower 25 on the selected cam track of cam member 52 through the selector arm 19, selector link 21 and guide 24. The end part *n* of follower 25 is spaced from the surface of the rotary cam 52 at this time as the zigzag width dial knob 1 is being held turned to the right. When the zigzag width dial knob 1 is released, arm 9 will push stop 11 to the left and the pawl 59 will engage a recess of the selector locking member 12', thereby making the selector dial 16 and cam 12 immovable. At the same time the end part *n* of follower 25 engages with the selected cam track of cam 52 by the return motion of spring-loaded regulator 34, connecting rod 32, arm 30 and arm 28. The oscillatory motion of follower 25 is transmitted through members 28, 30, 32 to regulator 34. As shown in FIGS. 1, 2 and 12, the zigzag width regulator 34 actuates the needle bar 43 through zigzag width rod 36, needle bar connecting rod stud 38, needle bar connecting rod 39 and needle bar supporter 41. The shuttle race 46 makes a reciprocating motion in axial direction by the swing motion of the zigzag width regulator 34 through vertical shaft crank 37, vertical shaft 44, shuttle race connecting rod 54 and oscillating shaft 45. As best seen in FIG. 12, a cylindrical roller 64 which is rotatably mounted on a shaft 63 fixed to one end of a zigzag width rod 36 slides in a groove under the end of the zigzag width regulator 34, and a block 65 at the bottom part of said shaft 63 is provided so as to slide along a curved groove on the upper surface of a swingable guide lever 66. The zigzag width rod 36 is swingably mounted on pin 69 together with one end of an arm 37, which is mounted on the upper part of a vertical shaft 44, and a stud 38. The arm 36 oscillates on pin 69 by action of the zigzag width regulator 34. The guide lever 66 oscillates by means of a cam provided on the upper end of a shaft having a spiral gear 68 which meshes with a spiral gear 67 on the shaft 47, and transmits a reciprocating motion to the arm 36. When the center of the pin 63 which supports the roller 64 and block 65 is at the center of the oscillation of the guide lever 66, arm 36 does not oscillate. The motion increases as the center of the pin 63 departs from said center. Consequently, the arm 36 receives the motion of the zigzag width regulator and the oscillatory motion of the guide lever 66. The motion of arm 36 then oscillates arm 37 and vertical shaft 44 which is pivoted on a center 73, and a reciprocating motion is transmitted to a rod 54 which is movably mounted to an end of an arm 70 which is integrally mounted to the bottom part of the vertical shaft.

The rod 54 connects with a block 71 which fits on the shaft portion of a shuttle race 46, and transmits a reciprocating motion to an oscillating shaft 45 which is concentric with the shuttle race 46. Connected to the stud 38 is a connecting rod 39, the end of which is connected to a needle bar support 41 by means of a connecting pin 42. The needle bar support 41 oscillates on a center 72. As a result, an oscillatory motion is transmitted to a needle bar 43 which is inserted into the needle bar support 41 and synchronized with the reciprocating motion of the shuttle race 46, zigzag sewing is effected.

In case of sewing by manual operation, the zigzag width dial knob 1 is turned to the right as far as it will go and while maintaining said dial knob at this position, the selector dial 16 is turned until the letter "M" thereof sets upon the indicator *l* of the selector plate 15. At this time the end part *n* of the follower 25 drops into the recess *p* which does not constitute a part of the cam tracks of the rotary cam member 52. Since the rotary cam member does not function in this position, the zigzag width dial knob is operated manually and thus any desired zigzag pattern may be produced.

In the drawings, numeral 50 indicates a bushing on the shaft of cam member 52. As shown in FIG. 11, the cam member 52 for producing patterns comprises a plurality of coaxial cylinders which are of different diameters and are successively fitted together intimately and has cam tracks *a*, *a'*, *a''*, *a'''*, . . . on both sides, and at its center is inserted a short cylinder which does not have a cam track on either side. It goes without saying that the rotary cam member 52 may be made of a single member instead of comprising a number of coaxial cylinders.

As explained hereinbefore, the selector stopper arm 9 operates in the direction of the arrow by the spring 8, and the pin *t* of arm 10 is positioned in the space E between both legs of said arm 9. The pawl 59 of the selector stopper 11 slips into the recess 60 of selector locking member 12', so that the arm 9 is held in this position. When the pin *t* of the member 10 moves the arm to the right, the pawl 59 of the selector stopper 11 disengages the recess 60 of the selector looking member 12'. This takes place when the indicator 62 moves from 4 to 5 and at a position nearer 5. As this apparatus is so designed that the maximum lift of the rotary cam member 52 will not disengage the pawl 59 from the recess of selector locking wheel 12', the selector dial 16 will be immovable while the rotary cam member is working.

FIG. 9 shows the relation between the zigzag width dial knob 1 and parts related thereto. The zigzag width dial knob is used for changing the selector dial in automatic sewing and for effecting sewing by manual operation. The dial shaft 6 is rotatably mounted in the front plate 58. To the forward part of said shaft is mounted a knob portion which comprises a bushing 5, which supports a set lever 4 and a washer 3, secured to a dial base 2. The turning of this knob is transmitted via the dial shaft 6 to the selector stopper arm 9 and arm 10. The zigzag width dial knob 1 is first of all turned and held at a position where the indicator 62 points to any desired position between 0–5. A pin B of the set lever 4 which inserts into a groove of the groove F of the dial base 2 which correspond to the scale of zigzag width dial plate 56 is released from the groove by pulling its knob in the direction of the arrow, and the knob is turned until the locking part A of set lever 4 comes in contact with the pin D secured to the front plate 58. When the knob of the set lever is released, the pin B will slip into a selected groove of the grooves F by the action of a spring S mounted on the set lever, and the zigzag width dial knob will be set at the indicated position. This setting of the zigzag dial knob to any selected position from 0–5 sets the block 65 of the zigzag width rod 36 connected to the zigzag width regulator to a position corresponding to 0–5 of the zigzag width dial plate, thereby enabling to sew a continuous zigzag pattern.

When sewing by automatic operation, the pin B of the set lever 4 is made to continuously engage the foremost left groove of the grooves F of dial base 2, namely the position where the indicator 62 points to zero. If, however, the indicator should be set to, say, 2 or 3 in this case, the pattern will merely get out of shape as it will begin from 2 or 3, but there will be no damage to the sewing machine. When the pin B of set lever 4 is moved, for example, from the foremost right groove to the foremost left groove of grooves F, the indicator moves from the position 5 to the position 0. At this time, the needle bar will produce zigzag widths corresponding to 0–5 when knob 1 is manually turned.

To effect sewing from automatic operation to manual operation, the zigzag width dial knob 1 is turned as far

as it will go, and the selector dial **16** is turned so that the follower **25** opposes *p* which does not constitute a cam track of the rotary cam member **52**, after which a pattern is sewn by operating the zigzag width dial knob at will. By moving the zigzag width dial knob and shifting the indicator to a figure from 0–5 of the zigzag width dial plate, it is possible to vary the zigzag width of the needle, the position 0 being straight line sewing and the position 5 being the greatest oscillation of the needle. Therefore, by setting the pin B of the set lever **4** to the foremost left groove of the grooves F (position 0), a desired pattern can be sewn by manipulating the zigzag width dial knob **1** in the range of 0–5. Further, by setting the set lever **4** to the grooves of the dial base **2** corresponding to the numerals 1, 2, 3 and 4, zigzag sewing of widths corresponding to the respective numeral can be effected. The manipulating range of zigzag width dial knob **1** is 1–5, 2–5, 3–5, and 4–5, respectively. Thus, by turning the zigzag width dial knob **1** to any desired position and setting the set lever and then manipulating the said dial knob **1**, a desired pattern can be sewn. Further, when the zigzag width dial knob **1** is turned to position **5**, the zigzag width regulator **34** oscillates by way of dial shaft **6** and arm **10** and comes to a stop by means of a stop **55**. At this position when the pin B of set lever **4** engages the foremost right groove of dial base **2**, the locking part A of the set lever **4** comes into contact with the pin D fixed to the front plate **58** and the dial knob **1** and zigzag width regulator become immovable, thereby enabling to obtain a zigzag sewing corresponding to numeral 5. Thus, by the insertion of the pin B of set lever **4** into groove F, sewing widths can be obtained assuredly. Manipulation is simple, and no changes in sewing width will occur by the set lever **4** getting out of place when sewing by manual operation as the pin B is set into the groove. Further, in case a sewer should erroneously set the set lever to a figure other than 0, that is 1, 2, 3, 4 or 5 when sewing by automatic operation, the pattern produced will merely be out of shape and no breakdown will occur in the machine.

As described above, according to this invention, sewing of a selected pattern is simple as it is achieved by releasing the locking action of the selector stopper and setting a desired pattern indicated on the selector dial to the rotary profiling member by means of the rotary profiling member contact. While sewing the selected pattern, the selector dial is held in position, that is, a locking device has been provided. Switchover from automatic operation to manual operation or vice versa is simple. The rotary profiling member is suitable for accommodation in a narrow place such as in a sewing machine as it does not comprise discs having rugged guiding surfaces on their peripheries disposed in parallelism but is of a shape consisting of rugged surfaces on both sides of a cylinder. In addition, it is convenient as a very wide range of patterns can be produced. Also it is simple to change the rotary profiling member.

What I claim is:

1. In a zigzag sewing machine having a needle bar, in combination, a rotary cam member having an axis of rotation and a surface including a plurality of cam tracks respectively having different cam track patterns corresponding to different zigzag stitch patterns, said surface further including a recessed circular guide track, said tracks being concentric with said axis; cam follower means cooperating with said cam member; means supporting said cam follower means for movement between a plurality of positions located opposite different tracks of said tracks, and for turning movement so that said cam follower means oscillates when engaging one of said cam tracks, and does not oscillate when engaging said recessed circular guide track in a terminal turned position; selector means connected to said cam follower means for shifting the same between said positions; locking means for locking said cam follower means in each of said positions; a driven member rockable about a pivot axis and having a guide means performing an angular movement; turnable regulator means including a first part operatively connected to said cam follower means and a second part including a slide guided in said guide means so that said slide performs different oscillations along said guide means toward and away from said pivot axis of said driven rockable member when said cam follower means is oscillated by different cam tracks; a manually operated stitch width adjustment member operatively connected to said regulator means for turning the same so that said slide can be manually moved along said guide means to positions differently spaced from said pivot axis when said cam follower means is located opposite said recessed guide track, said adjustment member being operatively connected to said locking means to release the same when turned to a predetermined position so that said selector means can be operated for shifting and setting said cam follower means; and linkage means for connecting said slide with the needle bar of the sewing machine whereby different stitch patterns are produced by said driven rockable member when said cam follower means is placed on different cam tracks of said cam tracks, and whereby a zigzag stitch of uniform width is produced when said cam follower means engages said guide track, and whereby the width of the zigzag stitch produced when said cam follower means engages said guide track, can be varied by operation of said adjustment member.

2. An apparatus as set forth in claim 1 and wherein said selector means include a turnable selector cam, a cam follower cooperating with said cam and being operatively connected to said cam follower means, and a selector knob connected to said cam for turning the same between different positions in which said cam follower is displaced to shift said cam follower means between positions located opposite different tracks of said cam member, said locking means including a locking member secured to said selector cam for turning movement therewith, and a locking pawl cooperating with said locking member for locking the same and thereby said cam follower means in a selected position; and means operatively connecting said locking pawl with said adjustment member so that said locking pawl releases said locking member in a selected position of said adjustment member permitting turning of said selector knob and setting of said cam follower means to a selected position.

3. An apparatus as set forth in claim 2, wherein said adjusting member is operatively connected to said regulator means for turning the same to a releasing position in which said cam follower means is retracted from said surface of said cam member to permit shifting across said tracks, said regulator means assuming said releasing position when said adjustment member is in said selected position.

4. An apparatus as set forth in claim 2, wherein said adjustment member includes a first arm having a coupling pin, and a second arm operatively connected to said locking pawl for releasing the same in a selected position of said adjusting member, and wherein said turnable regulator means has a third part including a coupling pin crossing said first mentioned coupling pin so that said regulator means is turned when said adjustment member is turned.

5. In a zigzag sewing machine having a needle bar, in combination, a rotary cam member having an axis of rotation and a surface including a plurality of cam tracks respectively having different cam track patterns corresponding to different zigzag stitch patterns; cam follower means cooperating with said cam member; means supporting said cam follower means for movement between an inoperative position and a plurality of positions located opposite different tracks of said tracks, and for turning movement so that said cam follower means oscillates when engaging one of said cam tracks; selector means connected to said cam follower means for shifting

the same between said positions; locking means for locking said cam follower means in each of said positions thereof; a driven member rockable about a pivot axis and having a guide means performing an angular movement; turnable regulator means including a first part operatively connected to said cam follower means and a second part including a slide guided in said guide means so that said slide performs different oscillations along said guide means toward and away from said pivot axis of said driven rockable member when said cam follower means is oscillated by different cam tracks; a manually operated stitch width adjustment member operatively connected to said regulator means for turning the same so that said slide can be manually moved along said guide means to positions differently spaced from said pivot axis when said cam follower means is in said inoperative position, said adjustment member being operatively connected to said locking means to release the same when said adjustment member is turned to a releasing position so that said selector means can be operated for shifting and setting said cam follower means when said adjustment member is held in said releasing position; and linkage means for connecting said slide with the needle bar of the sewing machine whereby different stitch patterns are produced by said driven rockable member when said cam follower means is placed on different cam

tracks of said cam member, and whereby a zigzag stitch of uniform width is produced when said cam follower means is in said inoperative position, and whereby the width of the zigzag stitch can be varied by operation of said adjustment member when said cam follower means is in said inoperative position.

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