Dec. 27, 1960 R. E. JOHNSON 2,966,130

SEWING MACHINE AND LOOP-TAKER MECHANISMS THEREFOR

Original Filed Nov. 29, 1954 5 Sheets-Sheet 1

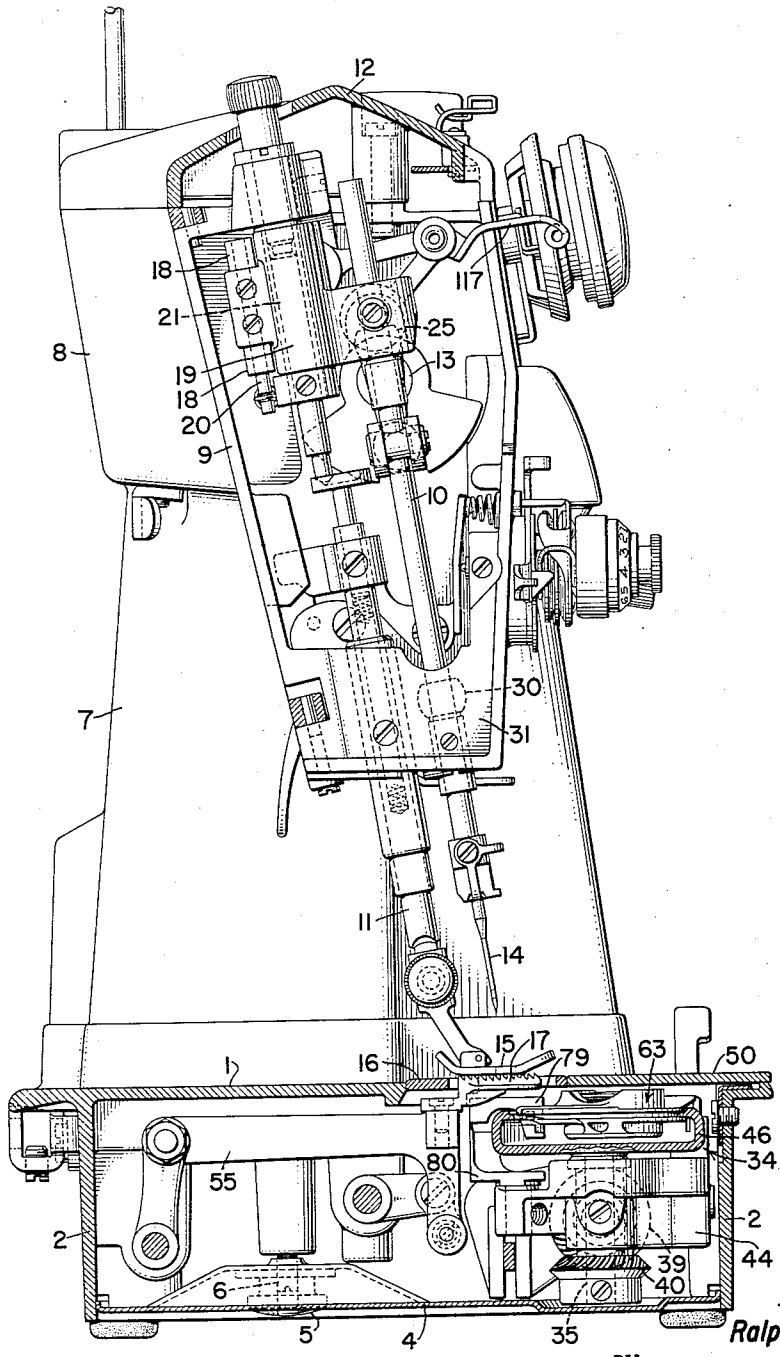


Fig. 1.

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SEWING MACHINE AND LOOP-TAKER MECHANISMS THEREFOR

Original Filed Nov. 29, 1954 5 Sheets-Sheet 2

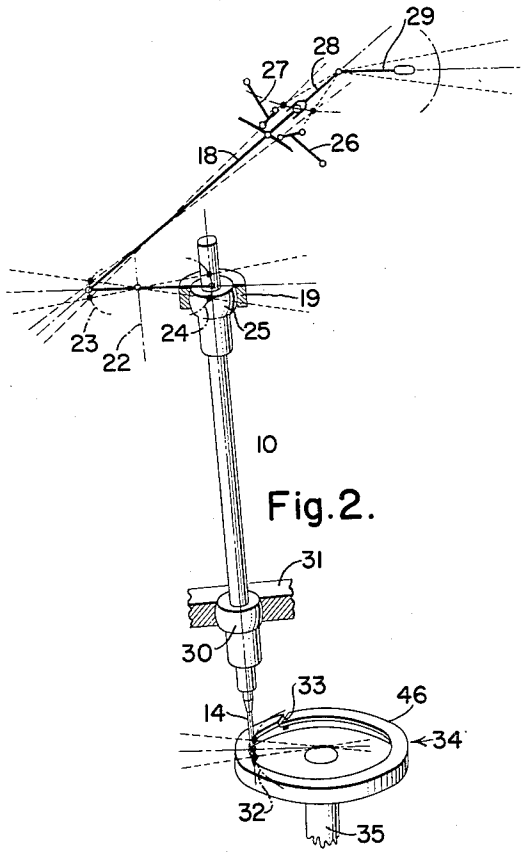


Fig.2.

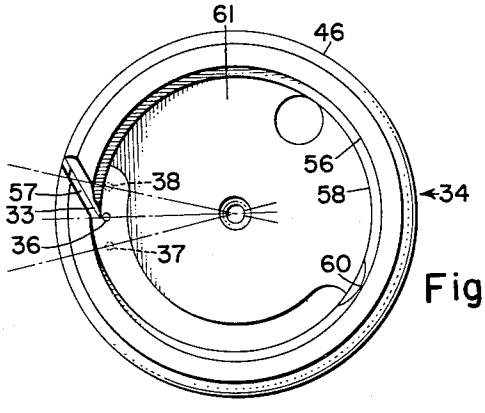


Fig.3.

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SEWING MACHINE AND LOOP-TAKER MECHANISMS THEREFOR

Original Filed Nov. 29, 1954 5 Sheets-Sheet 3

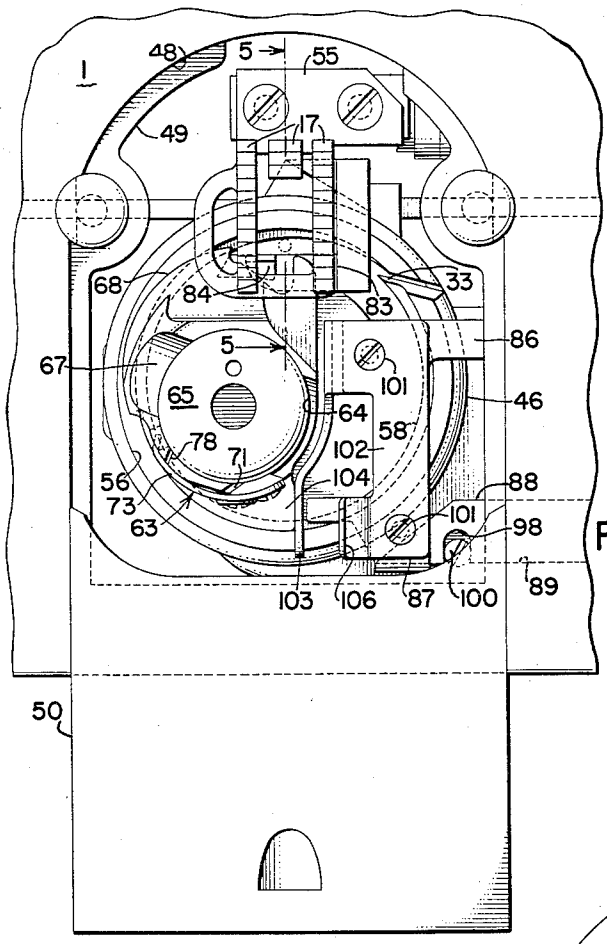


Fig.4.

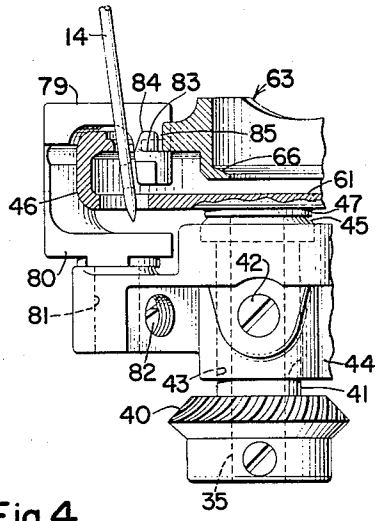


Fig.5.

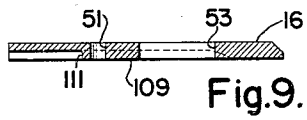


Fig.9.

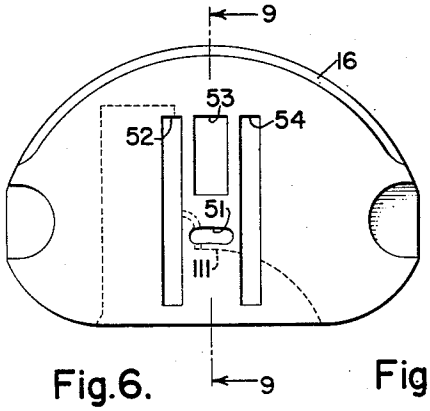


Fig.6.

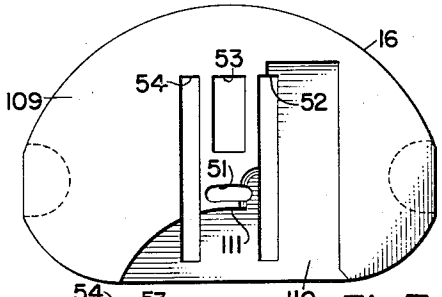


Fig.7.

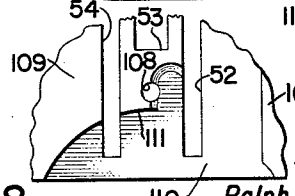


Fig.8.

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SEWING MACHINE AND LOOP-TAKER MECHANISMS THEREFOR

Original Filed Nov. 29, 1954 5 Sheets-Sheet 4

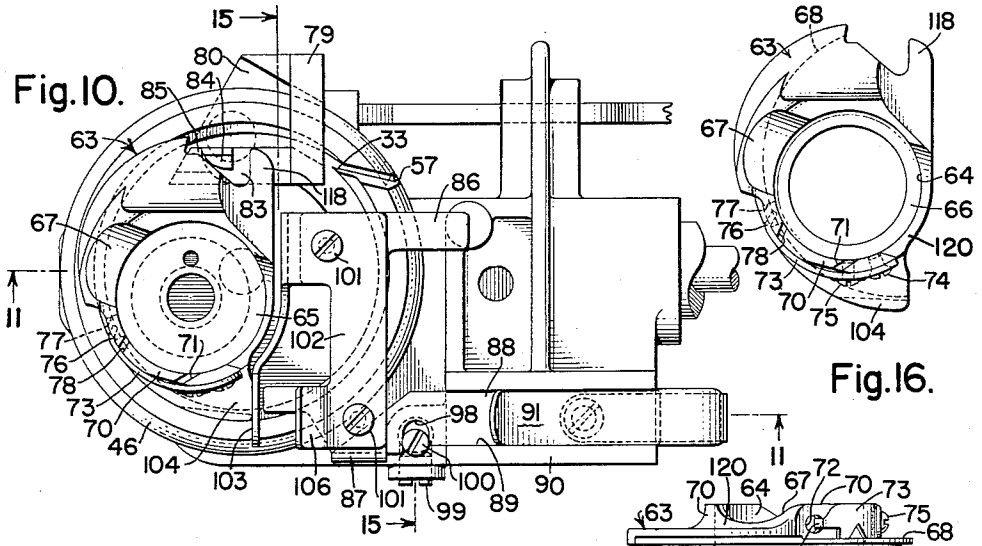


Fig.10.

Fig.16.

Fig.17.

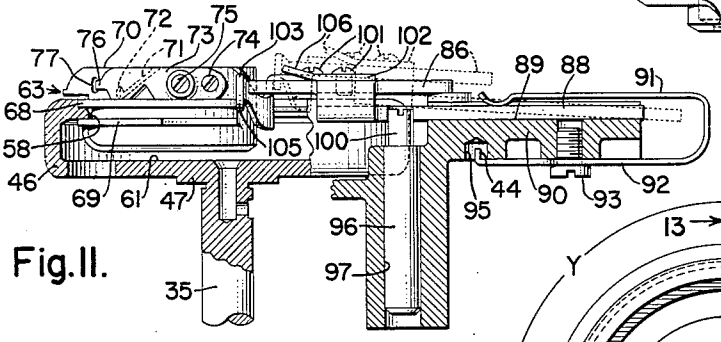


Fig.11.

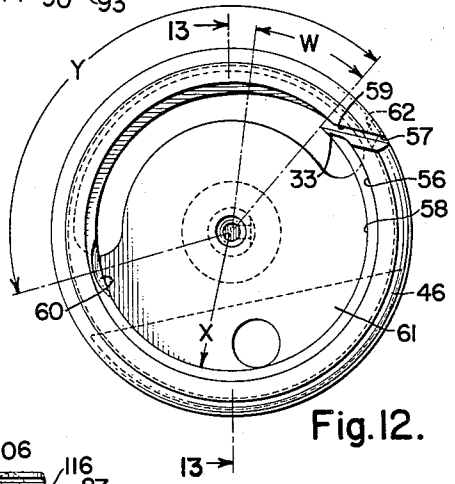


Fig.12.

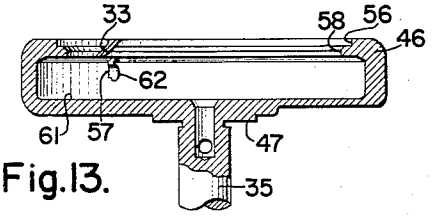


Fig.13.

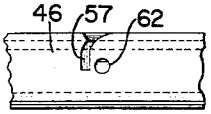


Fig.14.

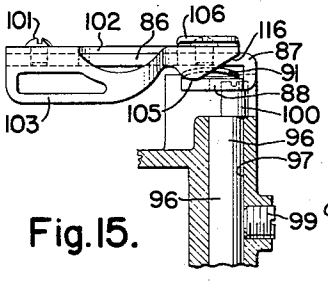


Fig.15.

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SEWING MACHINE AND LOOP-TAKER MECHANISMS THEREFOR

Original Filed Nov. 29, 1954 5 Sheets-Sheet 5

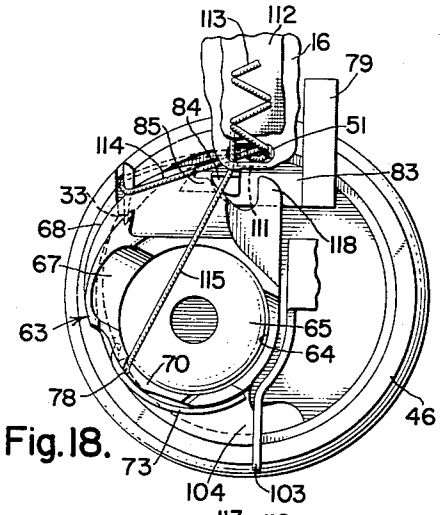


Fig. 18.

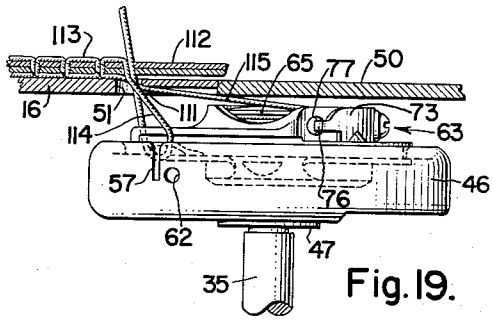


Fig. 19.

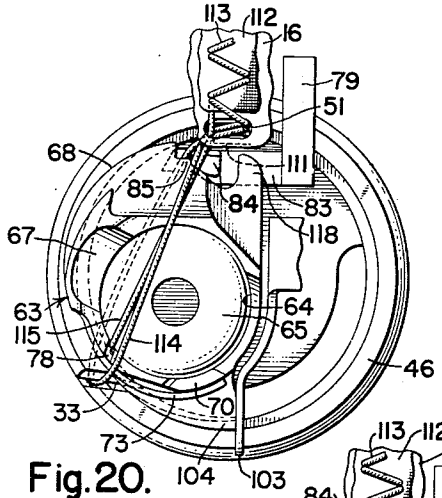


Fig. 20.

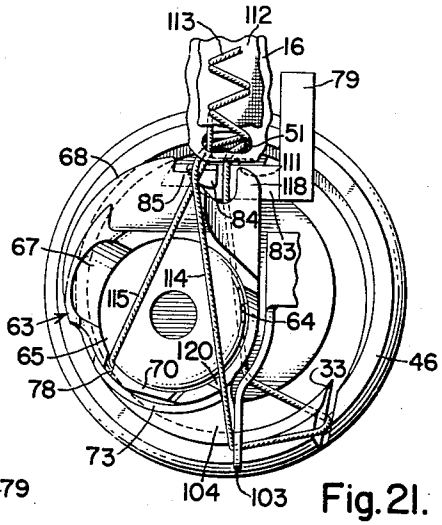


Fig. 21.

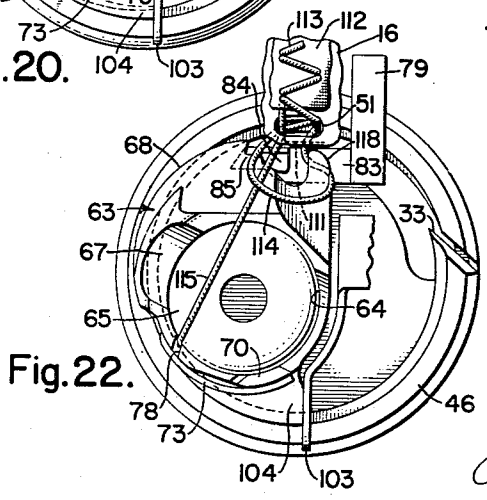


Fig. 22.

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United States Patent Office 2,966,130 Patented Dec. 27, 1960

2,966,130

SEWING MACHINE AND LOOP-TAKER MECHANISMS THEREFOR

Ralph E. Johnson, Mountainside, N.J., assignor to The Singer Manufacturing Company, Elizabeth, N.J., a corporation of New Jersey

Original application Nov. 29, 1954, Ser. No. 471,766, now Patent No. 2,862,468, dated Dec. 2, 1958. Divided and this application Jan. 18, 1957, Ser. No. 634,904

13 Claims. (Cl. 112—184)

This invention relates to improvements in sewing machines and more particularly to loop-taking mechanisms adapted for use in lock-stitch sewing machines.

The primary object of the present invention is to provide a lock-stitch sewing machine with an improved loop-taking mechanism of the type which rotates about a vertically disposed axis and cooperates with a substantially vertically disposed needle which reciprocates back and forth in a path circumscribed by the body of the loop-taker.

A more specific object of the present invention is to provide a zigzag stitch type sewing machine with a vertical axis rotary loop-taker which is capable of properly cooperating in the formation of lock stitches with a needle which is reciprocated lengthwise of itself and is laterally shifted crosswise of the direction of work feed.

With the above and other objects in view the invention comprises the devices, combinations and arrangements of parts hereinabove described with the accompanying drawings which illustrate a preferred embodiment of the invention from which the several features of the invention and the advantages attained thereby will be readily understood by those skilled in the art.

In the drawings:

Fig. 1 represents a vertical sectional view taken through the head and base portions of a sewing machine in which the present invention is incorporated.

Fig. 2 represents a diagrammatic view illustrating the patterns of movement through which the sewing machine needle-bar is operated with respect to the rotary loop-taker.

Fig. 3 represents a plan view of the rotary loop-taker with its internal mechanisms removed therefrom.

Fig. 4 represents a top plan view of a fragmentary portion of the sewing machine bed illustrating such portion with its slide plate partially removed and with its throat-plate entirely removed so as to expose the loop-taker mechanism.

Fig. 5 represents a sectional view taken substantially along the line 5—5 of Fig. 4.

Fig. 6 represents a top plan view of a throat-plate which is provided with an aperture adapted for the reception of a laterally vibratory needle.

Fig. 7 represents a bottom plan view of the throat plate illustrated in Fig. 6.

Fig. 8 represents a fragmentary bottom plan view comparable to Fig. 7 but illustrating a throat-plate of the type having a circular aperture adapted for the reception of a needle which is not shifted laterally.

Fig. 9 represents a sectional view taken substantially along the line 9—9 of Fig. 6.

Fig. 10 represents a top plan view of the rotary loop-taking mechanism, together with the means whereby the bobbin carrier is maintained in proper position with the rotary loop-taker.

Fig. 11 represents a sectional view taken substantially along the line 11—11 of Fig. 10.

Fig. 12 represents a top plan view of the rotary loop-taking element.

Fig. 13 represents a sectional view taken substantially along the line 13—13 of Fig. 12.

Fig. 14 is a fragmentary view of a portion of a rotary loop-taker illustrating the manner in which the hook beak is formed.

Fig. 15 represents a fragmentary sectional view taken substantially along the line 15—15 of Fig. 10.

Fig. 16 represents a top plan view of the bobbin carrier.

Fig. 17 represents a front elevation view of the bobbin carrier disclosed in Fig. 16.

Fig. 18 represents a top plan view of the rotary loop-taker and illustrating a portion of the work-supporting bed and a piece of work material with the loop-taker being shown as having just caught the needle-thread loop.

Fig. 19 represents an elevation view taken of the left side of the loop-taker as illustrated in Fig. 18.

Fig. 20 is similar to Fig. 18, but illustrates the rotary loop-taker as being rotated about the bobbin-carrier so as to expand the needle-thread loop about the latter element.

Fig. 21 represents a top plan view similar to that disclosed in Figs. 18 and 20 and illustrating the loop-taker in that position wherein the needle-thread loop has been expanded about the bobbin-carrier and is in a position where it is about ready to be cast off from the bobbin-carrier.

Fig. 22, like Figs. 18 to 21 inclusive, illustrates a top plan view of the rotary loop-taker and shows the loop-taker in that position it assumes just after the needle-thread loop has been cast off the bobbin-carrier and is being taken off by the needle-thread take-up mechanism.

The following detailed description relates to sewing machine loop-taking mechanisms of the type disclosed in my copending application Serial No. 471,766, filed November 29, 1954, now Patent No. 2,862,468, granted December 2, 1958, of which this application is a division:

As illustrated in the drawings, the frame of the sewing machine in which the present invention is incorporated comprises a substantially rectangular shaped base 1 forming at its upper side a work-supporting surface or bed plate and provided at its under side with a plurality of downwardly extending side walls 2—2 and end walls (not shown) forming a box-like enclosure, the downwardly facing opening of which is normally closed by a bottom cover plate 4 held in place by a thumb nut 5 threaded over a stud 6 extending downwardly from the under face of the base 1.

Suitably secured upon the hollow bed 1 is a vertically disposed hollow standard 7 which carries an overhanging bracket-arm 8 terminating in a hollow head 9 in which is mounted a reciprocatory needle-bar 10 and presser-

bar 11. The upper part of the bracket-arm 8 is closed by a cover-plate 12 held in place by screws not herein shown. A main driving shaft 13 is disposed within and lengthwise of the overhanging bracket-arm 8.

The needle-bar 10 is provided with a conventional eye-pointed needle 14 which is adapted to cooperate in the formation of lock-stitches with a rotary loop-taker disposed beneath the bed-plate 1. Mounted upon the lower end of the presser-bar 11 is a conventional type of presser-foot 15 which cooperates with a throat-plate 16 and a feed-dog 17 in the feeding of the work over the work-support 1 and away from the operator. The throat-plate 16 is carried by the work-support 1.

The needle-bar 10 is adapted to be shifted laterally of the direction of work feed by means of a plurality of rotary cams (not herein shown), and a pitman member 18, of which the latter is pivotally connected to the needle-bar supporting crank or gate 19 by means of a vertical pin 20. From this it is to be understood that the endwise movements of the pitman 18 will effect an oscillation of the needle-bar gate 19 to the end that the upper portion of the needle-bar will be swung through an arc whose center coincides with the axis of a pivot member 21 about which the gate 19 oscillates. This needle-bar action is diagrammatically illustrated in Fig. 2, wherein the axis of oscillation of the gate 19 is represented by the line 22. The dotted arc 23 represents the path of movement taken by the axis of the pin 20 while the arc 24 represents the path of movement traversed by an upper cylindrical bearing 25 of the needle-bar 10. By the same token, the pitman 18 is diagrammatically illustrated as are also cam followers 26 and 27, a needle bight and field selector member 28 and its associated handle 29.

Still referring to Fig. 2, it is to be understood that with the upper spherical bearing 25 of the needle-bar 10 shifting about a path designated by the arc 24 and with a lower spherical bearing 30 being bodily fixed in the lower machine frame portion 31, the needle 14 will be swung substantially through a path corresponding to an arc 32 which is designed to correspond substantially with the arc of movement of a loop-seizing hook 33 carried by a rotary loop-taker 34 mounted upon a substantially upright shaft 35. It is to be particularly observed that the needle 14 is arranged to descend inside of the circular path of movement of a loop-seizing hook 33 at a location rearwardly of the loop-taker body with reference to the direction of normal work feed which is from right to left as viewed in Fig. 5. From this, it is manifest that within certain optimum limitations the needle will properly cooperate with the loop-seizing hook 33 no matter whether the needle is given endwise reciprocations or a combination of reciprocating movements and lateral sidewise movements since the needle 14 in its lateral movements follows a path 32 which substantially coincides with the circular path of movement of the loop-seizing hook 33.

Referring particularly to Fig. 3 there is illustrated a top plan view of the rotary loop-taker 34, and cooperating with this rotary loop-taker is a needle 14 which is shown in three different positions such as its central or normal position 36, its extreme left-hand position 37, and its extreme right-hand position 38, and in each one of these positions it will properly cooperate with the loop-seizing hook beak 33 in the formation of stitches due to the fact that the needle 14 is shifted along the path as represented substantially by the arc 32.

Thus, the gate 19 has one end pivotally mounted about a fixed axis and its other end pivotally connected by a ball joint structure 25 with the upper end of the needle-bar 10. Means are provided with oscillating the gate about its axis thereby to swing the upper end of the needle-bar through an arc of a circle, as represented in Fig. 2 by the number 24. Also means are provided in the form of a second ball joint structure 30 slidably associated with an intermediate portion of the needle-bar and carried by the frame for constraining the lower end of the needle-bar to swing through an arc of a circle, as represented in Fig. 2 by the number 32, which is eccentric to the other circle when such circles are projected upon the work-supporting surface 1.

The present machine is provided beneath the work support 1 with a rotary shaft, not shown, which is driven from the upper rotary shaft 13 in a conventional manner. As is best shown in my copending application Serial No. 471,766 the lower rotary shaft is connected to the vertical loop-taker shaft 35 by way of gears 39 and 40. The vertical shaft 25 is rotatably journaled within a bearing bushing 41 which in turn is mounted by means of a set screw 42 within a cylindrical bore 43 provided in a rotary hook support 44 which forms a part of the machine frame. The upper portion of the bearing bushing 41 is provided with a shoulder 45 which is adapted to support an annular loop-taker ring 46 which is integrally formed with the hook shaft 35. More specifically, the lower portion of the annular loop-taker ring is provided with a seat 47 which engages the top portion 45 of the bushing 41.

The rotation of the lower shaft will, through the medium of the gears 39 and 40, rotate the vertical loop-taker shaft 35 and the lower drive mechanism is so designed that the lower shaft will rotate at twice the speed of the upper shaft 13 thereby to provide the usual two rotations of the rotary loop-taker for the one complete reciprocatory cycle of the needle 14.

Thus, it is to be understood that the rotary loop-taker mechanism is located beneath the work-supporting plate or surface 1 and entirely within the enclosed sewing machine base formed by the depending walls and the lower removable cover plate 4.

Referring particularly to Figs. 1 and 4, the work supporting surface 1 is provided above the rotary loop-taker with an opening generally designated by the numeral 48, which opening is defined by a recessed ledge 49 which supports the conventional type of slide-plate 50 which may be shifted back and forth so as to cover the loop-taker in a manner as is disclosed in Fig. 1 or to give access to the loop-taker in a manner as is disclosed in Fig. 4. The rear portion of the opening 48 beneath the presser-foot 15 is adapted to be covered by means of the throat-plate 16 which, as is shown in Fig. 6, is provided with a needle aperture 51 and apertures 52, 53 and 54 which receive a feed-dog 17.

As is best illustrated in Figs. 1 and 4, the feed-dog 17 is carried by a feed-bar 55 and extends over the loop taker ring 46. From this, it is to be understood that the rotary loop-taker mechanism is disposed substantially in front of the feeding mechanism as well as in front of the reciprocatory needle 14 so that the operator may have access to the loop-taker mechanism.

Referring particularly to Figs. 10 to 15, inclusive, the present loop-taker comprises an angular loop-taker ring 46 provided with an interior circular wall 56 formed concentrically with the vertical axis of loop-taker rotation which, of course, coincides with the longitudinal axis of the loop-taker shaft 35. As is particularly illustrated in Fig. 12, the ring 46 is provided with a gap 57 in the form of a scarf-like narrow channel which cuts through the interior wall 56. The annular loop-taker ring 46 is also provided with an interior circular rib 58 disposed adjacent and extending inwardly from the interior wall 56 with the rib having a gap therein coinciding with the interior wall gap 57 to provide at one end and as a part of such rib a loop-seizing beak 33 which is disposed closer to the center of the ring than and in substantial overlapping relation with the other end portion 59 of the rib. From this, it is to be understood that the gap 57 forms a scarf-like narrow channel which cuts through the interior wall 56 and the rib 58 to form two bias-cut overlapping end portions of the ring and an internal loop-seizing beak 33 at

one end of the rib 58. Thus, the width of the channel and the angle between the longitudinal axis of the channel and an intersecting radius formed about the ring axis are dimensioned so as to insure the overlapping of the rib ends.

Referring particularly to Fig. 12, the interior rib 58 extends about the interior portion of the ring 46 for substantially 360° and the end portion 59 of the rib 58 opposite to the loop-seizing beak 33 is, throughout an angle represented by the letter W and equivalent to substantially 30°, formed with its interior peripheral surface spaced a greater distance from the ring center than the remaining portion of the rib thereby to form needle-thread loop clearance. In other words, the radius of the internal rib 58 is substantially constant throughout its major portion and the radius is indicated by the letter X, while during the last 30° of the rings as represented by the angle W the radius becomes increasingly greater until the inner peripheral portion of the rib substantially vanishes at a location 59 adjacent the loop-seizing beak 33. Since, as is illustrated in Fig. 3, the eye-pointed needle 14 reciprocates within the confines of the loop-taker ring 46 so as to have its loop seized by the beak 33, the tail portion of the rib 59 is given clearance so that the needle may throw out its thread loop as the needle is withdrawn upwardly through the work in a conventional manner.

Still referring to Fig. 12, the rib 58 is provided on its upper surface with an indentation 60 which is located directly adjacent the needle as the latter descends within the confines of the loop-taker ring 46, and this indentation 60 functions to deflect the needle inwardly in the event that the needle would otherwise strike the peripheral portion of the rib 58. Actually this indentation is located substantially 146 degrees in a counterclockwise direction from the hook beak 33, which angle in Fig. 12 is represented by the letter Y. From the above, it is to be understood that the rotary loop-taker comprises a substantially cup-shaped member having an annular ring 46 which is formed integrally with a vertically disposed shaft 35 and which is secured to such shaft by means of a bottom web designated by the numeral 61.

As is best illustrated in Figs. 12, 13 and 14, the gap or scarf-like channel 57 extends downwardly through the ring 46 so that the loop-seizing beak 33 may properly grasp the needle-thread loop. In order to provide a proper throat in the lower portion of the channel 57 the ring 46 is provided with an aperture 62 which is formed by drilling through the ring from the outside so that the inner portion of the aperture 62 will communicate with the interior of the channel 57 in a manner as is best disclosed in Figs. 12 and 13. This aperture is so employed because of the difficulties in forming such a channel throat by conventional machining methods.

Cooperating with the rotary loop-taker is a thread-case generally designated by the numeral 63 which is provided in the usual manner with an aperture 64 for receiving therein a thread-carrying bobbin 65, the lower portion of which is maintained within the thread-case aperture 64 by means of an inwardly extending annular thread-case shoulder 66. This aperture is defined by the upwardly projecting wall 70 provided at its upper surface with a notch 120 formed in part by a surface sloping downwardly and in the general direction of ring rotation.

Adjacent the bobbin-receiving aperture 64 the thread-case is provided with an indentation 67 which permits the operator readily to remove the bobbin 65 with the fingers. The thread case 63 is formed with a peripheral rib 68 formed as an arc of less than 180° about a radius substantially equal to that of the interior wall 56 of the ring 46. As best disclosed in Figs. 10 and 11, the thread-case 63 is disposed within and eccentrically of the ring 46 with its rib 68 being vertically supported upon the upper side of the ring rib 58 and in sliding peripheral engagement with the interior circular wall 56 of the ring. Referring to Figs. 11 and 17, the thread-case has a second peripheral rib 69 vertically spaced below the first rib 68 and disposed in sliding engagement with the under side of the ring rib 58 thereby to assist in maintaining the thread-case in its proper relation within the ring 46.

The wall 70 of the thread-case above the peripheral rib 68 is formed with a downwardly inclined thread slit 71 terminating in an enlargement 72 (see Fig. 11), the slit 71 being covered by a conventional type of tension spring 73 secured to the wall 70 by a fastening screw 74 and an adjusting screw 75 in a conventional manner. The tail portion 76 of the tension spring projects into an aperture 77 formed in the wall 70. The thread-case is threaded by drawing the thread from the bobbin upon the top of the side wall of the case through the slit 71 and under the tension spring 73 from beneath which it issues through the notch 78 in the upper edge of the bobbin cavity wall.

Referring to Figs. 5 and 10, the present rotary loop-taker has cooperating with it an inverted U-shaped member 79 disposed in straddling relation with the loop-taker ring 46 with one limb of the member disposed outside of the ring and supported beneath the ring on a base portion 80 which projects into a bore 81 formed within the loop-taker support 44. A set screw 82 secures the base portion 80 within the bore 81. The other limb of the member 79 is disposed within the confines of the ring and adjacent the thread-case and provides a substantially horizontally disposed thread-supporting bar 83 from which projects upwardly an abutment member 84 which functions to engage a portion 85 of the thread-case thereby to prevent the thread-case from shifting in a clockwise direction as viewed in Fig. 10.

As is best illustrated in Figs. 10, 11, 13 and 15, the loop-taking mechanism is provided with a second means for restraining the thread-case and this second means prevents the thread-case from turning in a counterclockwise direction in synchronism with the loop-taker as viewed in Fig. 10. This second thread-case restraining means comprises a platform member 86 which is bent downwardly as at 87 to provide an arm 88 which is slidably received within a channel 89 formed in the frame portion 90 of the sewing machine base. The platform member 86 is supported in a substantial horizontal position by means of a leaf spring whose upper limb 91 bears downwardly upon the member 88 of the platform, while an under limb 92 is secured by means of a screw 93 to the under portion of the frame 90. In order to prevent the spring member from shifting, its one end portion 94 is confined within an aperture 95 formed in the under side of the frame portion 90.

The platform member 86 is normally locked in the position as illustrated by solid lines in Fig. 11 by means of a vertically disposed pin 96 mounted within a bore 97 formed in the frame portion 90. The upper end portion of the pin 96 is adapted to be received within a notch 98 formed within the platform arm 88 thereby to lock the arm and platform member in position.

As is best disclosed in Fig. 15, the vertical pin 96 is secured within the frame bore 97 by means of a set screw 99 and the upper portion 100 of the pin 96 is formed eccentrically of its body portion so that by turning the pin 91 within the bore 97 the arm 88 of the platform member 86 may be effectively adjusted back and forth from left to right as viewed in Fig. 10.

Mounted upon the platform member 86 by means of screws 101, 101 is an abutment member 102 which is formed with a substantially vertically disposed arm 103, the free end portion of which is adapted to engage the flange portion 104 of the thread-case thereby to prevent the latter from turning in synchronism with the rotary loop-taker ring as the same rotates in a counterclockwise direction as viewed in Fig. 10. As may be seen in Fig. 15, the arm 102 of the abutment member is formed at its front portion with a downwardly depending lobe 105

which partakes of the thread-handling functions in a manner as will hereinafter be described.

The platform member **102** is provided with an upwardly inclined finger piece **106** which permits an operator to grasp the member and lift the same along with the platform **86** so that the latter will clear the upstanding locking pin **100** to the end that the operator may then shift the entire assembly in a right-hand direction as viewed in Fig. 10, thereby to remove the platform member from the vicinity of the thread-case so that the entire thread-case may be removed from the loop-taker ring **46**. In Fig. 11, the dotted lines represent the position assumed by the platform member **102** when it is in its so-called retracted position.

From the above, it is to be understood that the operator may readily pull back the slide-plate **50** to gain access to the entire upper portion of the loop-taking mechanism and with the slide-plate in this retracted position, as is illustrated in Fig. 4, the bobbin **65** may be readily removed and replaced with a fresh bobbin and, furthermore, the abutment member **102** may be shifted from its operable position to a retracted position thereby to permit the thread-case **63** to be readily removed from the hook ring. Naturally, the removal of the thread-case **63** is greatly facilitated due to the fact that the present loop-taking mechanism is located entirely at the front of the inclined needle **14** and, thus, there are no obstructions to hinder the removal of the thread-case or the inspection of the entire loop-taking mechanism.

Referring to Figs. 6 to 8, inclusive, the throat-plate **16** is provided with a laterally elongated needle-receiving aperture **51** which is elongated so as to receive a laterally vibrating needle. Fig. 8 illustrates a similar throat-plate **107** provided with a circular aperture **108** which is adapted to receive a needle which is restrained from shifting laterally of the direction of work-feed so that straight stitching may be performed. In all other respects these two throat-plates **16** and **107** are similar.

Referring particularly to Figs. 7 and 8, the under surface **109** of the throat-plates **16** and **107** are milled away as at **110** so as to provide a bobbin-thread retaining means in the form of an abutment shoulder **111** for maintaining a work limb of the bobbin thread at the extreme left-hand side of the needle aperture as viewed in Fig. 6 to the end that a proper stitch formation will be effected. It is to be understood that the thread-retaining abutment shoulder **111** is formed upon the under surface of the throat-plate adjacent the needle aperture and it extends crosswise of the feed-dog receiving slots **52** and **54**. The described location of the thread-retaining abutment shoulder functions to maintain the bobbin-thread at the left-hand side of the needle aperture thereby to insure that whenever two needles are simultaneously employed they will uniformly descend at the same side of the interlocking bobbin thread thereby to insure that no hitch stitches will be formed during the forward feeding of the work. Even when a single needle is employed the retaining shoulder **111** will tend to maintain the bobbin thread at the left-hand side of the needle aperture in a manner as is shown in Figs. 18 to 22 inclusive.

Figs. 18 to 22, inclusive, illustrate the formation of zigzag lock-stitches on a machine of the type described in my above noted application Serial No. 471,766 when employing a single needle. Referring particularly to Fig. 18, there is disclosed a fragmentary portion of a throat-plate **16** which supports work-pieces **112** in which zigzag stitches **113** are being formed. The loop-taker ring **46** is adapted to rotate in a counterclockwise direction, and as viewed in Fig. 18, the hook beak **33** has just seized the loop of the needle thread **114** and has commenced to carry the thread in a counterclockwise direction so as to concatenate it with the limb of the bobbin-thread **115** which leads from the bobbin **65** to the work-piece **112**.

Fig. 20 illustrates the loop-taking mechanism with the loop-seizing beak **33** advanced from the position shown in Fig. 18 to a location where the needle-thread loop **114** just begins to be drawn over the bobbin-thread limb **115**. In this figure, it is to be particularly observed that that portion of the needle loop which lies beneath the thread-carrier **63** is maintained upon the upper surface **83** of the thread-supporting bar of the inverted U-shaped member **79** to the end that this limb of the thread will be prevented from dropping below the thread-carrier restraining member **84** and thus becoming fouled thereunder.

Referring now to Fig. 21, it is to be seen that the loop-seizing beak **33** has passed through 180° from its loop-seizing position and that the upper limb of the needle thread **114** extends from the loop-seizing beak **33** in a left-hand direction to be retained between the lower wall **116** (see Fig. 15) of the depending lobe **105** of the thread-case abutment member **103** and the flange **104** of the thread-case for the purpose of controlling the needle-thread loop so that the latter will not loop over the thread-case **63**. It is to be particularly understood that the lobe **105** and the thread-case flange **104** will maintain control over the needle thread **114** until a conventional take-up arm **117** commences to draw up the needle thread as the needle is withdrawn from the work. As soon as the take-up arm **117** commences to raise in the usual fashion it will draw the needle thread **114** upwardly through the needle and as a consequence the thread will be drawn off the loop-seizing beak **33** and from between the lobe **105** and the thread-case flange **104** until it assumes the position as illustrated in Fig. 22 wherein the needle-thread loop is illustrated as being controlled by a finger **118** which is formed upon the thread-case.

In other words, the normally stationary abutment member **103** is formed with a vertical face aligned diametrically of the ring **46** with its lower edge **116** sloping upwardly (see Figs. 11 and 15) from a location within the ring and below the level of the upper thread-case rib **68** to be disposed adjacent and in overlying relation with the top surface of the ring at a location diametrically opposed to the upright needle path whereby rotation of the ring will bias one terminus of the thread-case rib toward the abutment face. Furthermore, it will be observed (see Fig. 22) that the thread-case in the area of such rib terminus is provided with a straight shoulder surface **114** extending inwardly from a location adjacent the inner wall **56** of the ring thereby normally to engage in flat butting relation the abutment face to provide in cooperation with such face, opposed surfaces which will releasably clamp and restrain the needle-thread whenever the beak **33** carries the needle-thread loop **114** past the said terminus of the thread-case rib until further rotation of the beak past the abutment face **113** pulls the needle-thread free of such opposed surfaces **103—104**.

Referring to Figs. 19 and 21, it will be observed that the thread-case notch **120** is engaged by one limb of the thread **114** so that as the beak **33** pulls the thread between the surfaces **103—104** the thread-case will be biased in a direction counter to that of the rotation of the ring and thereby assist the beak in getting the thread past such two surfaces.

In Fig. 22, it is to be particularly observed that the needle-thread loop **114** is fully concatenated about the bobbin thread **115** and at the same time it extends about the controlling finger **118** so that the loop will have little or no tendency to loop about with the possibility of becoming fouled.

From the above, it is to be appreciated that the inverted U-shaped member **79** has two functions of which the first is to prevent the thread case from turning in a clockwise direction as viewed in Fig. 22, while the second function is to control the under thread portion of the needle thread in a manner as is disclosed in Fig. 20 wherein the under limb of the thread **114** is supported upon the member **83**. By the same token, it is to be understood that the thread-case restraining arm **103** has a double function, of which the first is to prevent the thread-case from revolving in a

counterclockwise direction as viewed in Fig. 4, while its second function concerns its depending lobe **105** which has an inclined surface **116** which cooperates with the flange **104** of the thread-case in maintaining control over the needle thread prior to the time that the take-up arm **117** withdraws such thread from the vicinity of the hook.

Thus, the present invention has provided a novel vertical-axis rotary loop-taker which is particularly adapted to cooperate with a substantially vertically disposed needle which reciprocates back and forth in a path circumscribed by the body of the loop-taker.

Having thus described the nature of the invention, what I claim herein is:

1. A sewing machine having in combination, a frame, a vertical axis loop-taker ring mounted upon the frame and provided with a circular wall concentric with the vertical axis of loop-taker rotation and an internal loop-seizing beak, a thread-case having a peripheral rib formed as an arc of less than 180° about a radius substantially equal to that of the ring wall, said thread-case being normally disposed within and eccentrically of the ring with its rib in sliding engagement with the ring wall, and means preventing the thread-case from rotating with the ring and for releasably maintaining the thread-case rib in sliding engagement with the ring wall, said last mentioned means including an arm extending over the ring to be mounted upon the frame, an abutment member normally engaging one side of the thread-case and being carried upon the arm, and means shiftably mounting the arm upon the frame whereby the abutment member may be manually shifted away from the thread-case thereby to permit the latter to be removed from the ring, said last mentioned means including a finger piece formed on said arm whereby the latter may be manually maneuvered relative to said frame, and spring biased locking means formed on said arm and said frame for releasably maintaining said arm in a predetermined operative position wherein said abutment member engages one side of the thread case.

2. A sewing machine having in combination, a frame, a vertical axis loop-taker ring mounted upon the frame and provided with a circular wall concentric with the vertical axis of loop-taker rotation and an internal loop-seizing beak, a thread-case having a peripheral rib formed as an arc of less than 180° about a radius substantially equal to that of the ring wall, said thread-case being normally disposed within and eccentrically of the ring with its rib in sliding engagement with the ring wall, and means preventing the thread-case from rotating about the axis of loop-taker rotation and for releasably maintaining the thread-case rib in sliding engagement with the ring wall, said last mentioned means including a first abutment member fixed upon the frame and engaging the thread-case adjacent one terminus of the thread-case rib, an arm which extends over the ring to be mounted upon the frame, a second abutment member normally engaging the thread-case adjacent the second terminus of the thread-case rib and being carried upon the arm, and means shiftably mounting the arm upon the frame whereby the second abutment member may be manually shifted away from the thread-case thereby to permit the latter to be removed from the ring, said last mentioned means including a member shiftably securing said arm upon said frame, a finger piece formed on said arm whereby the latter may be manually maneuvered relative to said frame, and spring biased locking means formed on said arm and said frame for releasably maintaining said arm in a predetermined operative position wherein said second abutment member engages one side of the thread-case.

3. A sewing machine having a frame, an annular vertical-axis loop-taker ring supported upon the frame and provided with an interior loop-seizing beak, an upright reciprocating needle carried by the frame and arranged to descend within the confines of the ring and at one side of the ring axis, means to rotate the ring continuously in one direction and twice for each complete needle reciprocation, a thread-case having a peripheral rib formed as an arc of less than 180° about a radius substantially equal to that of the interior surface of the ring, the thread-case being disposed within and eccentrically of the ring at that side of the ring axis toward which the loops of needle thread are first carried by the beak in spreading the loops over the thread case with the thread-case rib being vertically supported upon the inner surface of the ring, a normally stationary abutment member carried by the frame and formed with a vertical face aligned diametrically of the ring with its lower edge sloping upwardly from a location within the ring and below the level of the thread-case rib to be disposed adjacent and in overlying relation with the top surface of the ring at a location diametrically opposed to the upright needle path whereby rotation of the ring will bias one terminus of the thread-case rib toward the abutment face, and with the thread-case in the area of such rib terminus being provided with a straight shoulder surface extending radially inwardly from a location adjacent the inner wall of the ring thereby normally to engage in flat butting relation the abutment face to provide in cooperation with such face opposed surfaces which will releasably clamp and restrain the needle-thread whenever the beak carries the needle-thread loop past the said terminus of the thread-case rib until further rotation of the beak past the abutment face pulls the needle thread free of such opposed surfaces.

4. A sewing machine as claimed in claim 3 and wherein means are provided for shiftably mounting the abutment member upon the frame whereby the abutment member may be manually shifted away from the thread-case thereby to permit the latter to be removed from the ring.

5. A sewing machine as claimed in claim 3 and wherein the abutment member is carried upon an arm extending over the ring to be mounted upon the frame at a location outside the confines of the ring, and means are provided for shiftably mounting the arm upon the frame whereby the abutment member may be manually shifted away from the thread-case thereby to permit the latter to be removed from the ring.

6. A sewing machine having a frame, an annular vertical-axis loop-taker ring supported upon the frame and provided with an interior loop-seizing beak, an upright reciprocating needle carried by the frame and arranged to descend within the confines of the ring axis, means to rotate the ring continuously in one direction and twice for each complete needle reciprocation, a thread-case having a peripheral rib formed as an arc of less than 180° about a radius substantially equal to that of the interior surface of the ring, the thread-case being disposed within and eccentrically of the ring at that side of the ring axis toward which the loops of needle thread are first carried by the beak in spreading the loops over the thread-case with the thread-case rib being vertically supported upon the inner surface of the ring, a normally stationary abutment member carried by the frame and formed with a vertical face aligned diametrically of the ring with its lower edge sloping upwardly from a location within the ring and below the level of the thread-case rib to be disposed adjacent and in overlying relation with the top surface of the ring at a location diametrically opposed to the upright needle path whereby rotation of the ring will bias one terminus of the thread-case rib toward the abutment face, and with the said rib terminus being formed with a straight shoulder surface extending radially inwardly from a location adjacent the inner wall of the ring thereby normally to engage in flat butting relation the abutment face to provide in cooperation with such face opposed surfaces which will releasably clamp and restrain the needle thread whenever the beak carries the needle-thread loop past the said terminus of the thread-case rib until fur-

ther rotation of the beak past the abutment face pulls the needle thread free of such opposed surfaces.

7. A sewing machine having a frame, an annular vertical-axis loop-taker ring supported upon the frame and provided with an interior loop-seizing beak, an upright reciprocating needle carried by the frame and arranged to descend within the confines of the ring and at one side of the ring axis, means to rotate the ring continuously in one direction and twice for each complete needle reciprocation, a thread-case having a bobbin-receiving aperture therein defined by an upwardly projecting cylindrical wall, a peripheral rib formed about the thread-case as an arc of less than 180° about a radius substantially equal to that of the interior surface of the ring, the thread-case being disposed within and eccentrically of the ring at that side of the ring axis toward which the loops of needle thread are first carried by the beak in spreading the loops over the thread-case with the thread-case rib being vertically supported upon the inner surface of the ring, a normally stationary abutment member carried by the frame and formed with a vertical face aligned diametrically of the ring with its lower edge sloping upwardly from a location within the ring and below the level of the thread-case rib to be disposed adjacent and in overlying relation with the top surface of the ring at a location diametrically opposed to the upright needle path whereby rotation of the ring will bias one terminus of the thread-case rib toward the abutment face, the thread-case in the area of such rib terminus being provided with a straight shou'der surface extending radially inwardly from a location adjacent the inner wall of the ring to terminate adjacent the upwardly projecting cylindrical wall thereby normally to engage in flat butting relation the abutment face to provide in cooperation with such face opposed surfaces which will releasably clamp and restrain the needle thread whenever the beak carries the needle-thread loop past the said terminus of the thread-case until further rotation of the beak past the abutment face pulls the needle thread free of such opposed surfaces, and the upstanding cylindrical wall being provided in its upper surface adjacent the straight shoulder with a notch defined in part by a surface sloping downwardly and in the general direction of the ring rotation thereby to provide a surface which when engaged by the limb of needle thread extending from the work to the clamping surfaces defined by the straight shoulder and the abutment face will bias the thread-case in a direction counter to that of the rotation of the ring.

8. A rotary vertical-axis loop-taker comprising an annular loop-taker ring provided with an interior circular wall concentric with the vertical-axis of loop-taker rotation, an annular rib formed upon and extending inwardly from said interior wall, said wall and said rib having a scarf-like narrow channel cutting through said wall and said rib, said channel being disposed on the bias with respect to any intersecting radius formed about said axis with the width of said channel and the angle between the longitudinal axis of said channel and the intersecting radius being of such dimensions to provide at one end and as a part of said rib a loop-seizing beak which is disposed in substantially overlapping relation with the other end portion of said rib and a thread-case having a peripheral rib formed as an arc of less than 180° about a radius substantially equal to that of said interior ring wall, said thread-case being disposed within and eccentrically of said ring with its rib being vertically supported upon the upper side of the ring rib and in sliding peripheral engagement with the interior circular wall of said ring.

9. A rotary vertical-axis loop-taker as claimed in claim 8 and wherein the thread-case has a second peripheral rib vertically spaced below the first mentioned thread-case rib and disposed in sliding engagement with the under side of the ring rib thereby to assist in maintaining said thread-case in its proper relation within said ring.

10. A rotary vertical axis loop-taker as claimed in claim 8, and in which the interior wall rib extends about interior portion of said ring for substantially 360°, and in which the end portion of such rib opposite to the loop-seizing beak is throughout its last 30° formed with its inner peripheral surface spaced a greater distance from the ring center than the remaining inner peripheral portion of such rib thereby to form needle-thread loop clearance.

11. A sewing machine having in combination, a frame providing a substantially horizontally disposed work-supporting surface, a vertical axis loop-taker ring mounted upon the frame beneath the work-support and provided with an internal loop-seizing beak, a thread-case supported by said ring, means mounted upon the frame and restraining said case from rotating with the loop-taker and for releasably maintaining the thread-case in sliding engagement with the loop-taker ring, said last mentioned means including an arm mounted upon the frame, an abutment member normally engaging one side of the thread-case and being carried upon the arm, and means shiftably mounting the arm upon the frame whereby the abutment member may be manually shifted away from the thread-case thereby to permit the latter to be removed from the ring, said last mentioned means including a finger piece formed on said arm whereby the latter may be manually maneuvered relative to said frame, and spring biased locking means formed on said arm and said frame for releasably maintaining said arm in a predetermined operative position wherein said abutment member engages one side of the thread-case, an endwise reciprocable needle-bar mounted within the frame above the work-supporting surface, a needle carried by the bar and arranged to descend inside the circular path of movement of said loop-taker ring at a location rearwardly of the loop-taker axis and with reference to the direction of normal work-feed, and work-feeding mechanism disposed beneath the work-supporting surface and including a feed-dog arranged to extend over the loop-taker ring at a location adjacent the path of needle reciprocation and directly behind the loop-taker axis with respect to the direction of normal work-feed.

12. A sewing machine having in combination, a frame providing a substantially horizontally disposed work-supporting surface, a vertical axis loop-taker ring mounted upon the frame beneath the work-support and provided with an internal loop-seizing beak and an internal circular bearing surface concentric with the loop-taker axis, an endwise reciprocable needle-bar mounted within the frame above the work-supporting surface, a needle carried by the bar and arranged to descend inside the circular path of movement of said loop-taker ring at a location rearwardly of the loop-taker axis with reference to the direction of normal work-feed, work-feeding mechanism disposed beneath the work-supporting surface and including a feed-dog arranged to extend over the loop-taker ring at a location adjacent the path of needle reciprocation and directly behind the loop-taker axis with respect to the direction of normal work feed, a thread-case having a peripheral bearing surface formed as an arc of less than 180° about a radius substantially equal to that of the internal circular bearing surface of the ring, said thread-case being normally disposed within and eccentrically of the ring with its peripheral bearing surface in sliding engagement with the internal circular bearing surface of the ring, and means preventing the thread-case from turning about the axis of loop-taker rotation and for maintaining the thread-case rib in sliding engagement with the ring, said last mentioned means including a first abutment member fixed upon the frame beneath the feed-dog and engaging the thread-case adjacent one terminus of the thread-case rib, and a second abutment member carried upon the frame and normally engaging the thread-case adjacent the second terminus of

the thread-case rib, said two abutment members being horizontally spaced from each other and disposed in substantial fore and aft alignment with respect to the normal direction of work-feed.

13. A sewing machine as claimed in claim 12 and wherein there is provided means shiftably mounting the said second abutment member upon the frame whereby such abutment member may be manually shifted away from the thread-case thereby to permit the latter to be removed from the ring.

References Cited in the file of this patent

UNITED STATES PATENTS

678,947	Diehl et al.	July 23, 1901
845,092	Jacob et al.	Feb. 26, 1907
990,131	Hemleb	Apr. 18, 1911
1,595,245	Rader	Aug. 10, 1926
2,028,016	Schweiger	Jan. 14, 1936
2,505,523	Robert	Apr. 25, 1950
2,544,227	Hohmann	Mar. 6, 1951