Sept. 4, 1956 R. E. JOHNSON 2,761,402

LOOP-TAKERS FOR SEWING MACHINES

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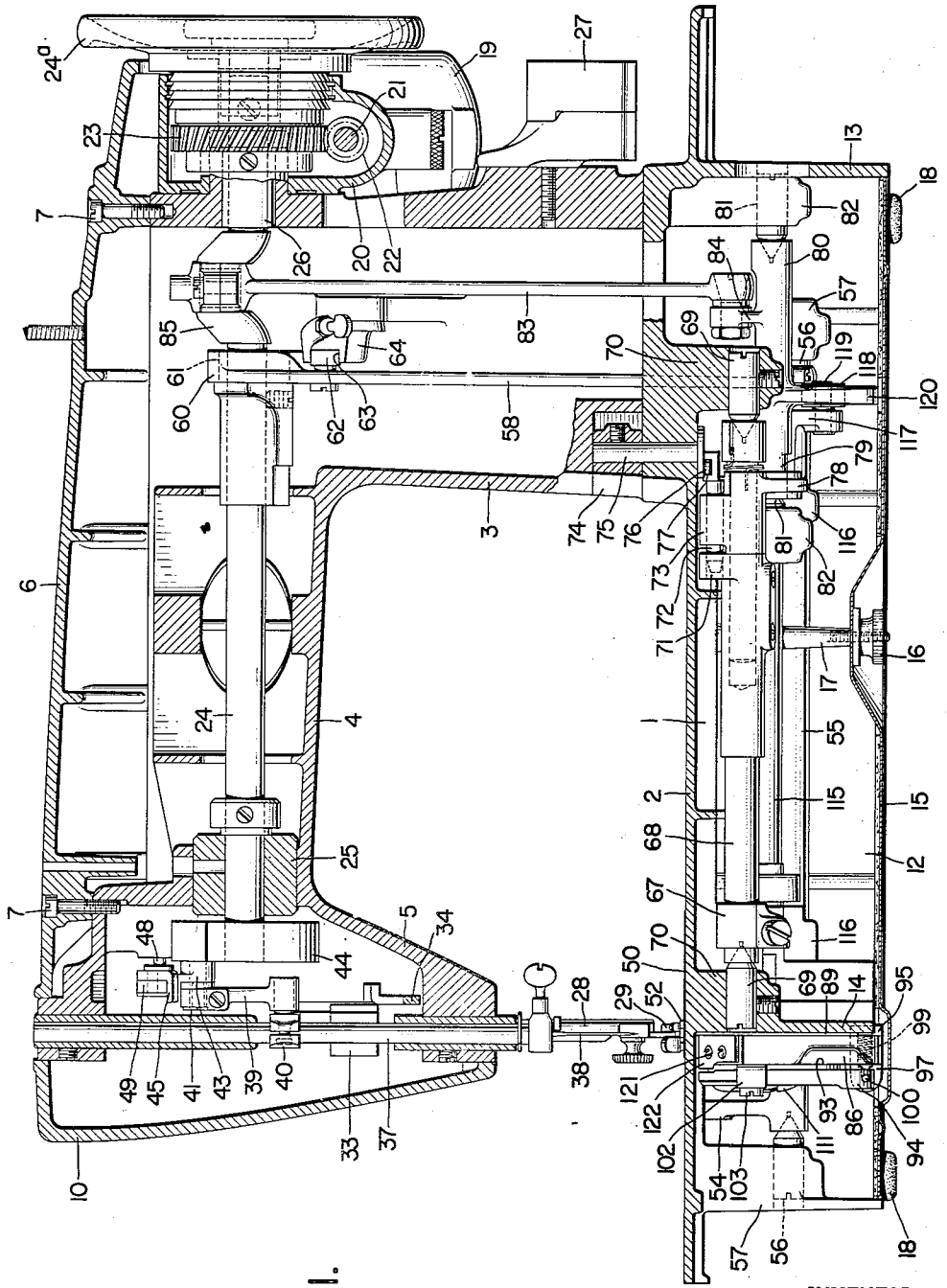


Fig. 1.

WITNESS

William Martin

INVENTOR.

Ralph E. Johnson

BY

J. G. Stamford

ATTORNEY

Sept. 4, 1956 R. E. JOHNSON 2,761,402

LOOP-TAKERS FOR SEWING MACHINES

Filed Aug. 27, 1953 4 Sheets-Sheet 2

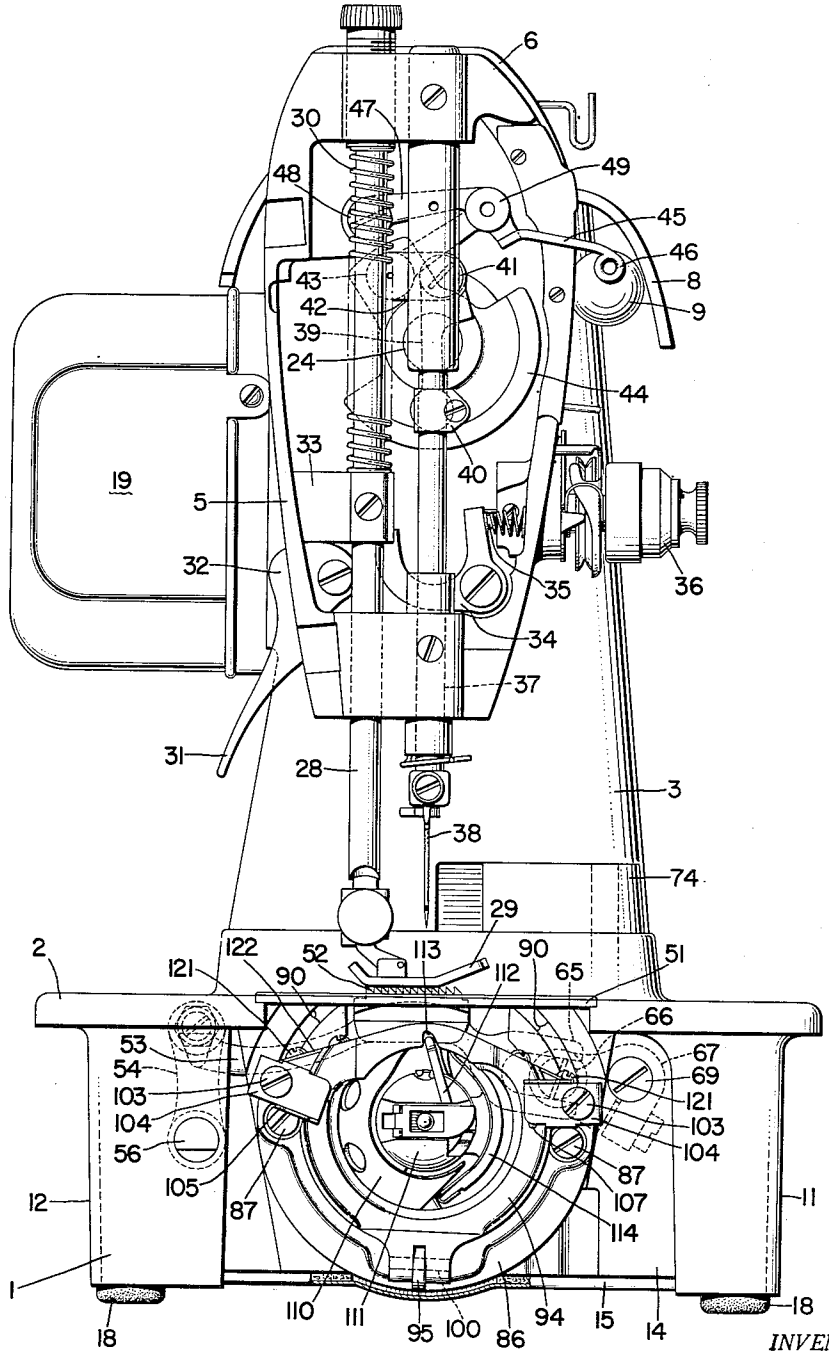


Fig.2.

INVENTOR.
Ralph E. Johnson

WITNESS
William Martins

BY
J. E. Stanford
ATTORNEY

Sept. 4, 1956 R. E. JOHNSON 2,761,402

LOOP-TAKERS FOR SEWING MACHINES

Filed Aug. 27, 1953 4 Sheets-Sheet 3

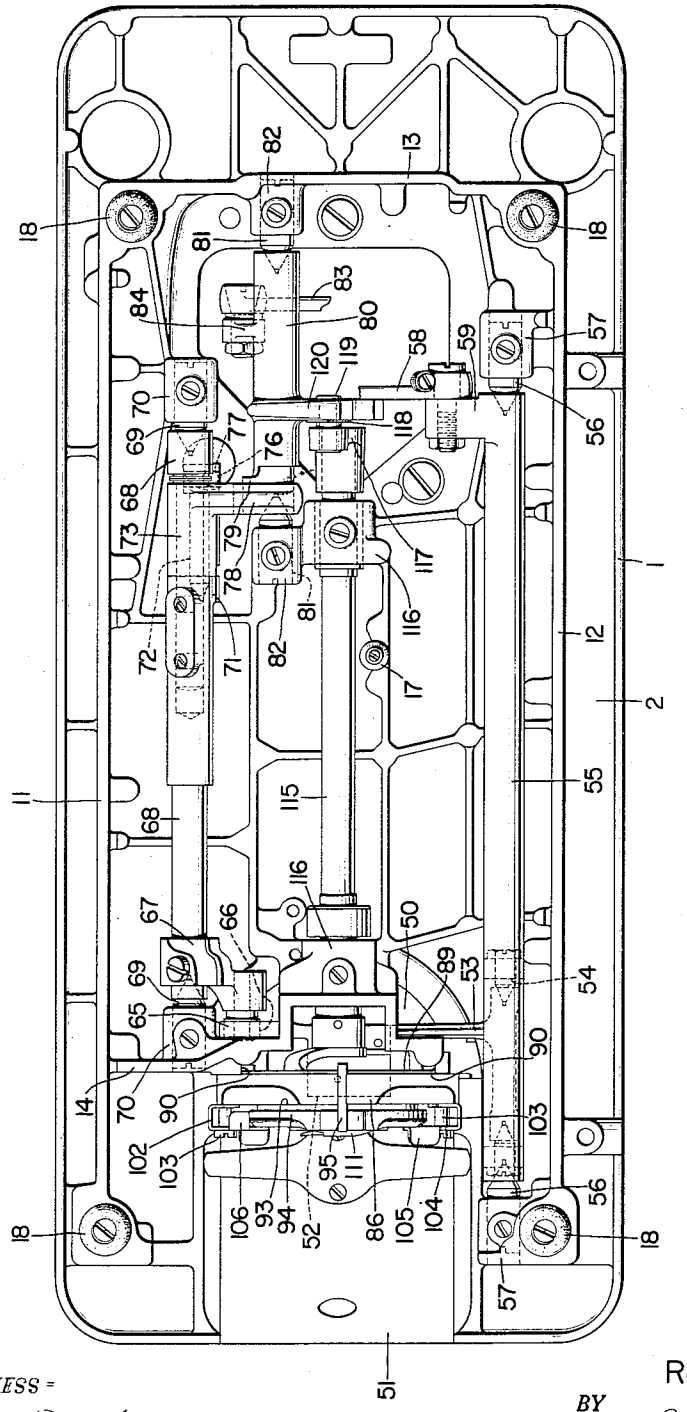


Fig. 3.

WITNESS =

William D. Martin

BY

INVENTOR.

Ralph E. Johnson

J. E. Stanford

ATTORNEY

Sept. 4, 1956 R. E. JOHNSON 2,761,402

LOOP-TAKERS FOR SEWING MACHINES

Filed Aug. 27, 1953 4 Sheets-Sheet 4

Fig.4.

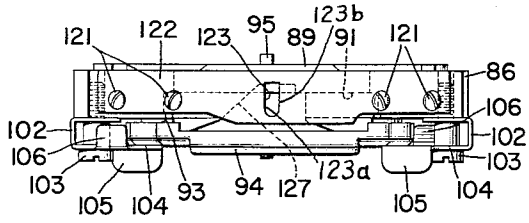


Fig.5.

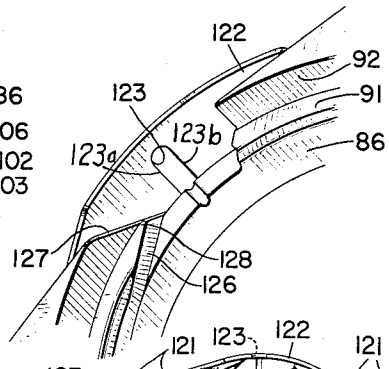
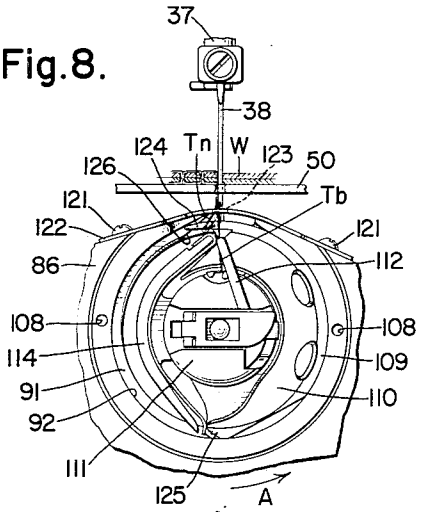


Fig.8.



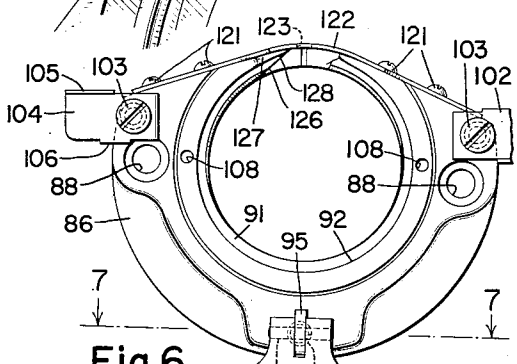
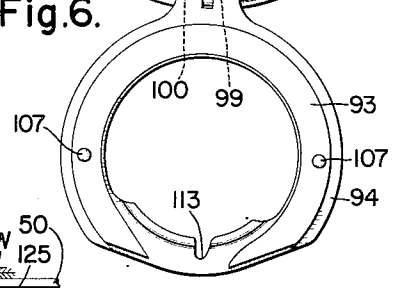


Fig.6.



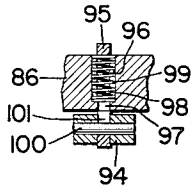
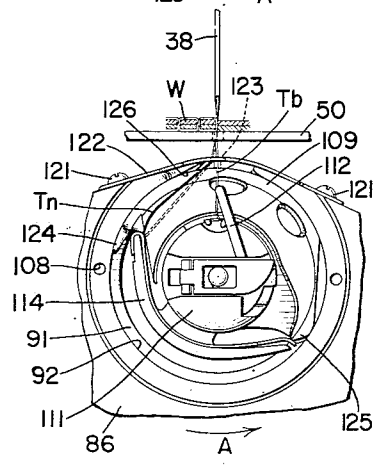


Fig.7.



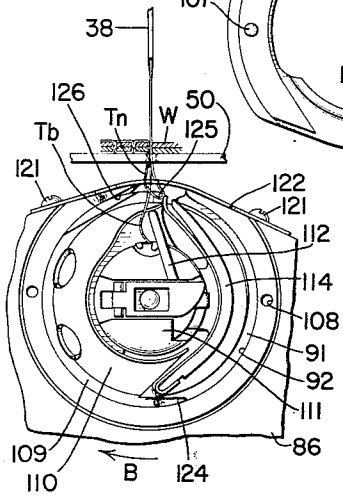


Fig.9.

Fig.10.

INVENTOR.
Ralph E. Johnson

WITNESS
William Martins

BY
J. E. Stanford
ATTORNEY

United States Patent Office

2,761,402

Patented Sept. 4, 1956

2,761,402

LOOP-TAKERS FOR SEWING MACHINES

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

Application August 27, 1953, Serial No. 376,883

9 Claims. (Cl. 112—192)

has for a primary object to provide a loop-taker mechanism having improved thread-handling characteristics.

It is a further object of the present invention to provide an improved loop-taker mechanism which is quieter and more vibration-free in operation, in which the wear has been substantially reduced, and which efficiently performs its intended function.

Having in mind the above and other objects that will be evident from an understanding of this disclosure, the invention comprises the devices, combinations and arrangements of parts as illustrated in a preferred embodiment of the invention which is hereinafter set forth in such detail as to enable those skilled in the art readily to understand the function, operation, construction and advantages of it when read in conjunction with the accompanying drawings in which:

Fig. 1 is a longitudinal vertical section view of a machine embodying the present invention.

Fig. 2 is a head end elevation view of the machine illustrated in Fig. 1 with the face-plate removed to illustrate the underlying mechanism.

Fig. 3 is a bottom plan view of the bed of the machine illustrated in Fig. 1 with the bottom cover-plate removed.

Fig. 4 is a detail view illustrating in top plan the shuttle carrier per se of the machine illustrated in Fig. 1.

Fig. 5 is a fragmentary detail view in perspective and

The present invention relates to sewing machines and on an enlarged scale at the inner portion of the upper end of the shuttle carrier per se, with the cap in open position to show the underlying construction.

Fig. 6 is a front elevation view of the shuttle carrier of Fig. 4 with the cap in open position.

Fig. 7 is a fragmentary sectional view taken substantially on the line 7—7 of Fig. 6.

Figs. 8, 9, and 10 are fragmentary detail views of the stitching mechanism of the machine illustrated in Fig. 1, showing the parts in different positions in the stitching cycle to illustrate the operation of the improved mechanism constructed in accordance with the present invention.

In sewing machines having a cam-type take-up, the thread-handling characteristics can, by so designing the cam, be precisely controlled to provide an optimum of thread as required by the needle and the loop-taker at the various points in the stitching cycle. However, a cam take-up is inherently noisy and generates forces which produce undesirable vibrations and tend to destroy the various elements of the machine as well as increase wear. For this reason, a machine employing a cam take-up is necessarily limited to relatively slow operating speeds and even at lower speeds is relatively noisy and vibrates objectionably. To reduce vibration and noise, and thus to adapt the machine for higher speeds, a link take-up may be used. However, with a link take-up, the same precise degree of thread control cannot be obtained since the action of the links can be made only to approximate the thread requirements of the stitching mechanism.

Therefore, if it is desired to operate the machine at higher speeds, it is necessary to use a take-up other than a cam take-up, such as one of the link-type, but in so doing, a portion of the thread-handling characteristics are sacrificed, which of course, adversely affects the quality of the stitching.

In accordance with the above, there has been provided by the present invention a supplemental means incorporated in the improved loop-taker which will effect a thread-controlling action in conjunction with the take-up and thus aid to approximate more closely the precise thread requirements of the system and improve the stitching quality. In this manner it is possible to obtain in a machine having a link take-up, stitching of a quality comparable to that of machines having a cam take-up, the former of which machines is adapted to be operated at higher speeds than the latter and without the objectionable noise, vibration and wear of the latter.

As illustrated in the drawings, the present invention is embodied in a sewing machine having a bed 1 including a bed-plate 2, a standard 3 rising from one end of the bed and a bracket-arm 4 terminating in a head 5, which bracket-arm extends from the upper portion of the standard 3 and overhangs the bed 1. The upper portion of the bracket-arm 4 is closed by a cover-plate 6 held in place by screws 7, which cover-plate 6 includes an extension 8 projecting forwardly of the machine and overhanging a light bulb 9 to form a shield for the same, as illustrated in Fig. 2. The open end of the head 5 is normally closed by a face-plate 10 pivotally mounted upon the head 5.

The bed 1 includes a front wall 11, a rear wall 12, a standard-end wall 13, and a head-end wall 14 all depending from the bed-plate 2, the head-end wall 14 extending only a portion of the distance between the front and rear walls 11 and 12 as best illustrated in Fig. 2, to provide clearance for elements of the bed mechanism. A bed cover-plate 15 is provided which is normally secured in place by a thumb-screw 16 threaded on a post 17 depending from the bed-plate 1. Rubber feet 18 are provided at both ends of each of the front and rear walls 11 and 12 upon which the machine normally rests when in operative position.

The machine is driven by an electric motor 19 carried by a bracket 20 that is, in turn, fixed to the frame of the machine. The motor 19 includes a shaft 21 carrying a worm 22 that meshes with a worm gear 23 fixed to a main shaft 24 journaled longitudinally of the bracket-arm 4 as in bearings 25 and 26. The usual hand-wheel 24*a* is fixed to the standard end of the shaft 24. A socket 27 is provided which is electrically connected to the light bulb 9 and the motor 19 (connections not shown) and which is adapted to be connected to a source of power.

Vertically journaled for longitudinal reciprocation within the head 5 is the usual presser-bar 28 carrying a presser-foot 29 at its lower end and biased downwardly by the spring 30, which presser-bar can be raised by a hand-lifter lever 31 that includes a cam surface 32 adapted to engage and raise a lug 33 fixed to the presser-bar 28. In the usual manner, upon raising the presser-bar 28, the lug 33 engages one arm of a bell-crank lever 34, the other arm of which contacts a tension-release plunger 35 of a needle thread tension device 36 carried at the front of the head 5.

A needle-bar 37 carrying a needle 38 at its lower end is journaled vertically in the head 5. Longitudinal reciprocation is imparted to the needle-bar 37 by a link 39 pivoted at one end to a collar 40 fixed to the needle-bar and pivoted at the other end to a crank-pin 41 carried by an arm 42 fixed to a second crank-pin 43 that is, in turn, carried by a counterbalanced crank 44 secured to

the end of the main-shaft 24. There is employed a link-type take-up comprising a take-up lever 45 pivoted at one end to the crank-pin 43 and provided with the usual thread-eye 46 at the other end, and an anchor-link 47 pivoted at one end to the head 5 by a pivot-stud 48 and pivoted at the other end to the lever 45 at an intermediate point thereof, as at 49.

Adjacent the point of stitch formation, the bed-plate 2 is provided with a throat-plate 50, see Fig. 3, and a slide-plate 51. The work is fed past the stitching mechanism by a feeding mechanism including feed-dogs 52 that extend through appropriate slots in the throat-plate 50 and into cooperation with the presser-foot 29. The feed-dogs are mounted upon a feed-bar 53 pivoted at one end to an oscillating feed-advance rocker 54 carried by a feed-advance shaft 55 journaled longitudinally of the bed 1 as by cone-shaped end bearings 56 carried by lugs 57 depending from the bed-plate 2. Variable oscillation is imparted to the shaft 55 through a pitman 58 connected at one end to a crank-arm 59 integral with the shaft, which pitman extends upwardly through the standard 3 to where a fork 60 formed upon the opposite end thereof embraces a counterbalanced eccentric 61. At a point intermediate its ends, the pitman 58 carries a slide 62 that cooperates with a slot 63 in a conventional manually adjustable block 64 pivoted to the frame, by means of which block the oscillation imparted to the pitman 58 by the eccentric 61 upon rotation of the main shaft 24 is converted to variable reciprocation of the same, which in turn, imparts oscillation to the crank-arm 59 and shaft 55.

At its other end the feed-bar 53 is provided with a fork 65 that receives a crank-pin 66 carried by an arm 67 fixed to a two-part feed-lift shaft 68 journaled longitudinally of the bed 1 as by cone-shaped end bearings 69 secured in lugs 70 depending from the bed-plate 2. Oscillation is imparted to the feed-lift shaft 68 through a detachable connection that is fully described in the copending patent application of R. E. Johnson et al., Serial No. 360,562 filed June 9, 1953, now Patent No. 2,718,202, dated September 20, 1955. Briefly this connection comprises a lateral arm 71 of a sleeve fixed to the shaft 68 and apertured to slidably receive a coupling pin 72 that is slidably carried by a block 73 loosely journaled on the shaft 68. The coupling pin 72 may be retracted by rotation of a conveniently accessible lever 74 fixed to a vertically journaled rod 75 that carries a crank-pin 76 at its lower end, which pin 76 rides in a slot 77 integral with the coupling 72 and thus retracts the same upon rotation of the rod 75.

The block 73 includes a fork 78 which embraces an eccentric 79 on a countershaft 80 that is journaled longitudinally of the bed 1 as by cone-shaped end bearings 81 fixed in lugs 82 depending from the bed-plate 2. The countershaft 80 may be oscillated by a pitman 83 that is pivoted at its lower end to a crank arm 84 integral with the countershaft and at its upper end is connected to a crank-section 85 formed in the main shaft 24. Thus, upon rotation of the main shaft 24, oscillation is imparted to the countershaft 80 by the pitman 83 and crank-arm 84, which effects oscillation of the block 73 through the eccentric 79 and fork 78. The block 73 may be selectively coupled to the feed-lift shaft 68 by the coupling pin 72 whereby the oscillation of the block 73 may be imparted to the feed-lift shaft 68.

The lower stitching mechanism comprises a shuttle housing 86 that is secured to the head-end wall 14 of the bed 1, as by screws 87 passing through apertures 88 in the housing, see Fig. 6. To facilitate proper orientation of the housing 86 there is provided a rib 89 on the rear face thereof that mates with grooves 90 formed in the face of the wall 14. The opposite face of the housing 86 is machined to form a discontinuous circular raceway including an inner side wall 91 and a bottom wall 92. The outer side wall 93 of the raceway is formed as a machined boss carried by a hinged shuttle cap 94 that is pivoted to the housing 86 in a manner more clearly evident in Fig. 7. This hinge comprises a slide 95 fitted through an aperture in the housing 86, which aperture includes a cylindrical section 96 formed centrally of and for a portion of the length of a rectangular section 97 dimensioned to receive the slide. The slide 95 is provided with a slot 98 to receive a spring 99 that abuts at one end against the end of the slot 98 and at the other end against the shoulder between the cylindrical and rectangular sections of the aperture. The shuttle cap 94 is apertured to receive a hinge pin 100 that extends through a reduced end portion 101 of the slot 98. By the above hinge structure, not only can the shuttle cap 94 by swung to inoperative position but it and the outer side wall 93 of the raceway are resiliently urged into operative position.

The shuttle cap is maintained in operative position by a pair of clips 102 formed from spring metal and substantially into U-shape and pivoted to the housing 86 by screws 103 which pass through the base of both legs thereof. The one leg 104 of the U-shaped clips is substantially longer than the other to overlie the shuttle cap 94 and resiliently bias it toward the housing 86. There are also provided thumb-pieces 105 for rotating the same, and stops 106 which engage the shuttle cap 94 to limit rotation of the clips. To insure that the cap 94 will be seated properly with respect to the housing 86, and that the outer side wall 93 of the raceway carried by the former will cooperate with the raceway walls of the latter, there are provided a pair of pins 107 carried by the cap 94 that are received within recesses 108 on the housing 86, see Fig. 6.

Seated within the raceway defined by the surfaces 91 and 92 of the housing 86 and the surface 93 of the cap 94 is the bearing rib 109 of a conventional oscillating shuttle 110. The shuttle 110 carries the usual bobbin case 111 which is restrained against motion with the shuttle by an arm 112, the end of which is received within a notch 113 in the shuttle cap 94. Oscillation is imparted to the shuttle 110 by a shuttle driver 114 carried upon the end of a shuttle-shaft 115 that is journaled longitudinally of the bed 1 as in bearing lugs 116 depending from the bed-plate 2. At its opposite end, the shaft 115 is provided with an arm 117 that carries a slide-block 118 at the end thereof on a crank-pin 119. The slide-block 118 is fitted between the opposed tines of a fork 120 integral with the countershaft 80, whereby oscillation is imparted to the shaft 115 upon oscillation of the countershaft 80.

Secured to the upper portion of the shuttle housing 86 as by screws 121 is a bridge-piece 122 having a needle-aperture 123 bounded by opposed thread-controlling side-edges 123*a* and 123*b*, Figs. 4 and 5. With reference to Fig. 4, it will be seen that the aperture 123 is transversely elongated in the direction of the side-edges 123*a* and 123*b* and that the side-edges are joined at each end to define a closed slot having a continuous edge completely around the same. However, it would be equally satisfactory if the side-edges were joined to define a continuous U-shaped edge only at the end remote from the shuttle housing 86 and the point where the needle 38 penetrates the bridge-piece or, in other words, adjacent the cap 94. The opposite end of the aperture 123 may be closed by the shuttle housing 86. The function of the side-edges is primarily to perform a controlling action upon the needle-thread passing through the aperture. With reference to Figs. 8–10, during operation of the machine the needle 38 comes down to initiate a stitch-forming cycle. Upon penetrating the work W and passing through the needle-aperture in the throat-plate 50, it passes through the aperture 123 in the shuttle bridge-piece 122 and down adjacent the path of travel of the loop-seizing point or beak 124 of the shuttle 110. After reaching its lowermost point of downward motion, the needle is raised and in the usual manner casts a loop of the needle-thread Tn into the path of travel of the shuttle beak 124. At this time the shuttle is rotating under the action of the shuttle driver 114 with the beak advancing toward loop-seizing

position, or in the direction of arrow A in Fig. 8. The beak **124** passes very close to the needle **38** and enters the loop in the needle-thread Tn. As the beak **124** continues to advance in the direction of the arrow A the loop of thread thereon is forced back on the beak of the shuttle, which position in the cycle is illustrated in Fig. 8. It will be noted that the needle-thread Tn at this point in the cycle extends downwardly substantially vertically from the needle-aperture in the throat-plate **50** to the aperture **123** in the bridge-piece **122** and then at a comparatively large angle about the side-edge **123***a* toward and around the beak of the shuttle. Thus, since the thread is at an angle to the beak of the shuttle, it will be more rapidly urged backwardly upon the beak into its normal position which motion effects the usual loop-spreading.

A further advantage of the closed needle-aperture is that at loop-seizure the thread is angled from the work, about the side-edge **123***a* of the aperture **123** to the beak of the shuttle. This angled thread path, in comparison with the normal shorter straight path from the work to the beak of the shuttle, effects a take-up action upon the thread, which action is equal to the difference between the length of the straight thread path as heretofore used and that of the present angled thread path. It will be recalled that it is an inherent characteristic of a link take-up that the amount of thread available at this portion of the cycle exceeds the thread requirements of the stitching mechanism, which fact adds significance to this take-up action.

The thread-controlling action of the side-edges of the needle-aperture **123** continues throughout the stitch-forming cycle, as illustrated in Fig. 9 in which the shuttle is in an intermediate point in the stitching cycle and still rotating in the direction of the arrow A. In the customary manner, upon reaching cast-off position, the needle-thread slides off the shuttle and completes its travel about the bobbin-case **111**, as the take-up begins to draw thread from the system. A relatively short amount of time is allotted to that portion of the cycle between cast-off and the time the stitch is set in the work. During this interval, the take-up must perform its complete action including the withdrawal of the needle-thread from the shuttle through the opening that appears between the heel **125** of the shuttle and the adjacent end of the shuttle-driver as the shuttle-driver is reversed from rotating the shuttle in the direction of stitch-formation to rotating the same in its return motion. This withdrawal of the needle-thread from the shuttle at precisely the time that the opening appears between the heel of the shuttle and the shuttle-driver, and before the shuttle has been driven in the return direction, indicated by the arrow B, sufficient for the rib **109** of the shuttle to enter the raceway in the casing and thus lock the thread against withdrawal, is one of the most critical portions of the cycle. However, in a machine employing a link-type take-up, the thread in the system at that point immediately preceding reversal of the shuttle can only be made to approximate the optimum which is determined by that amount which would be required so that any further action of the take-up would tend to draw the loop of needle-thread out of the shuttle. In the present device, the use of the thread aperture **123** in the bridge-piece **122** again produces a thread-controlling action since the thread is angled from the work through the thread aperture **123** about the side-edge **123***b* and to the loop within the shuttle as seen in Fig. 10, at which time the shuttle driver **114** is acting to rotate the shuttle **110** in the direction of the arrow B. This angle in the thread lead acts to take up a certain amount of slack thread which brings the amount of thread in the loop to approximately the optimum.

From the above, it will be seen that the side-edges **123***a* and **123***b* of the thread aperture **123** in the bridge-piece **122** not only effect a thread-controlling action at both the time of loop seizure and at the time the loop is withdrawn from the shuttle, but also aid loop-spreading, and act to confine the thread throughout the stitching cycle. In addition, it will be seen that the closed aperture minimizes the possibility that dirt and other foreign matter might fall into the shuttle.

Referring to Figs. 5 and 6 in particular, the raceway for the oscillating shuttle which, as hereinbefore pointed out, comprises the side-wall **91** and bottom wall **92** formed in the housing **86** and the side wall **93** formed on the shuttle cap **94**, is formed to provide an increased bearing surface over similar devices heretofore provided. To accomplish this, the side wall **91** is angled toward the bottom wall **92** as at **126** and the bottom wall **92** is angled toward the side wall **91** as at **127**. Thus, there is formed a contacting point **128** that initially receives the beak **124** of the shuttle as it passes the opening in the raceway. This construction produces an increased bearing surface over devices as heretofore provided without encroachment upon the clearance required for the needle-thread particularly during loop-spreading. In addition it will be noted that, with the use of an angled thread lead to the beak of the shuttle which more rapidly forces the needle-thread loop back on the beak of the shuttle and thus decreases the angular travel of the shuttle required to perform this function, the possibility that the thread will not be properly located back on the shuttle beak as it again enters the raceway is substantially reduced even though the bearing surface has been increased. Of course, the increased bearing surface provides smoother and quieter operation and the provision of the point **128** for initial contact with the shuttle reduces the possibility of collision and also reduces shock to the shuttle. As best seen in Figs. 7 and 8, the side-edges and the end of the rib **109** at the heel **125** are beveled to provide a smoother contact between the same and the end of the raceway opposite the angled point **128**, at which end the side wall **91** and bottom wall **92** are formed at substantially a right angle as seen in Fig. 5. As will be evident, the heel **125** is the point of initial contact between this end of the raceway and the shuttle upon return motion of the shuttle.

The increased bearing surface provided by the angled portions **126** and **127** of the side wall **91** and bottom wall **92**, also acts to hold the shuttle more firmly with its rib **109** in the raceway. It will be evident that, at that portion of the cycle during which the loop in the needle-thread is being withdrawn from the shuttle, the shuttle-driver which is urging the shuttle to rotate in the direction of arrow B is inherently tending to urge the shuttle out of the raceway through the gap therein. Thus, since the bridge-piece **122** completely spans the thread-clearance gap in the raceway, the increased bearing surface, which more securely confines the shuttle to the raceway, tends to preclude the possibility of having the thread pinched and held by the shuttle against the bridge-piece by reducing the possibility that the shuttle might leave its raceway.

Numerous alterations of the structure herein disclosed will suggest themselves to those skilled in the art. However, it is to be understood that the present disclosure relates to a preferred embodiment of my invention which is for purposes of illustration only and not to be construed as a limitation of the invention. All such modifications which do not depart from the spirit of the invention are intended to be included within the scope of the appended claims.

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

1. In a sewing machine having a frame including a bed and a head overhanging the bed, cooperating stitch-forming mechanism carried by said frame comprising an oscillating shuttle journaled in said bed and a reciprocatory needle carried by said head, a link take-up carried by said frame, a work-supporting surface on said bed

having an opening through which said needle passes upon reciprocation thereof, and an element disposed between and in spaced relation to said work-supporting surface and said shuttle, said element being provided with a relatively narrow elongated aperture located within the body of said element and defined by thread-confining side edges between which said needle passes upon reciprocation thereof, said aperture having opposed thread-confining side edges arranged parallel to the axis of oscillation of said shuttle.

2. In a sewing machine having a frame including a bed and a head overhanging the bed, cooperating stitch-forming mechanism carried by said frame comprising an oscillating shuttle journaled in said bed and a reciprocatory needle carried by said head and provided with a needle-thread, a loop-seizing beak formed on said shuttle, a link take-up carried by said frame and constructed and arranged to perform a take-up action on the needle-thread, a work-supporting surface on said bed having an opening through which said needle passes upon reciprocation thereof, and an element disposed between and in spaced relation to said work-supporting surface and said shuttle, said element being provided with an aperture located within the body of said element and defined by opposed thread-confining side-edges between which said needle passes upon reciprocation thereof, said loop-seizing beak being constructed and arranged to pass closely adjacent to the path of reciprocation of said needle and to enter a loop formed in the needle-thread during oscillation of said shuttle in stitch-formation, said loop being forced backwardly upon said beak and being spread about said beak as said shuttle is advanced, and the side-edges of the aperture in said element between which the needle-thread passes serving to confine the needle-thread to an angled path from the opening in the work-supporting surface, through the aperture in said element, and to the loop about said beak as a loop of needle-thread is being seized, and to confine the thread to a similar angled path as the loop is withdrawn from the shuttle.

3. A shuttle mechanism for a sewing machine comprising a housing having a discontinuous circular raceway with a gap therein, a shuttle having a peripheral bearing rib journaled in said raceway for oscillation of said shuttle relative to said housing, the leading end of said bearing rib being transversely inclined to form a loop-seizing beak adjacent to one of the side-edges thereof, a bridge-piece secured to said housing and spanning the gap in the raceway in spaced relation to the path of travel of said bearing rib across said gap, said bridge-piece having a relatively narrow elongated needle-aperture formed therein, said needle-aperture being spaced from the side edges of said bridge-piece and being defined by a pair of parallel opposed thread-confining side-edges arranged perpendicular to and extending transversely across said raceway.

4. A shuttle mechanism for a sewing machine comprising a housing having a discontinuous circular raceway with a gap therein, a shuttle having a peripheral bearing rib journaled in said raceway for oscillation of said shuttle relative to said housing, the leading end of said bearing rib being transversely inclined to form a loop-seizing beak adjacent to one of the side-edges thereof, a bridge-piece secured to the housing and spanning the gap in the raceway in spaced relation to the path of travel of said bearing rib across said gap, said bridge-piece having a relatively narrow elongated needle-aperture formed therein, said needle-aperture being defined by a pair of parallel opposed thread-confining side-edges arranged perpendicular to and extending transversely across the planes defined by the side walls of said raceway, said side-edges being joined to define a continuous U-shaped edge at the end remote from said loop-seizing beak.

5. A shuttle mechanism for a sewing machine comprising a housing having an open-sided discontinuous circular raceway with a gap therein and including a bottom wall and a side wall, a displaceable shuttle-cap including a raceway side-wall cooperating with said housing to close the open side of the raceway, a shuttle having a peripheral bearing rib journaled in said raceway for oscillation of said shuttle relative to said housing, the leading end of said bearing rib being transversely inclined to form a loop-seizing beak adjacent to one of the side-edges thereof, the end of the raceway that initially receives said loop-seizing beak as it passes the gap therein having the bottom wall and side wall within said housing inclined toward each other to form a contacting point that initially receives the loop-seizing beak of said bearing rib, a bridge-piece secured to said housing and spanning the gap in the raceway in spaced relation to the path of travel of said bearing rib across said gap, said bridge-piece having a relatively narrow elongated needle-aperture formed therein, said needle-aperture being defined by a pair of parallel opposed thread-confining side-edges arranged perpendicular to and extending transversely across said raceway.

6. A shuttle mechanism for a sewing machine comprising a housing having an open-sided discontinuous circular raceway with a gap therein and including a bottom wall and a side wall, a displaceable shuttle-cap including a raceway side wall cooperating with said housing to close the open side of the raceway, a shuttle having a peripheral bearing rib journaled in said raceway for oscillation of said shuttle relative to said housing, the leading end of said bearing rib being transversely inclined to form a loop-seizing beak adjacent to one of the side-edges thereof, the end of the raceway that initially receives said loop-seizing beak as it passes the gap therein having the bottom wall and side wall within said housing inclined toward each other to form a contacting point that initially receives the loop-seizing beak of said bearing rib.

7. In a sewing machine having a frame including a bed and a head overhanging the bed, cooperating stitch-forming mechanism comprising an oscillating shuttle mechanism carried by said bed and a reciprocatory needle carried by said head, a link take-up carried by said head and constructed and arranged to perform a take-up action on a needle-thread, a work-supporting surface on said bed having an opening through which said needle passes on reciprocation thereof, said shuttle mechanism comprising a housing secured to said bed, said housing having a discontinuous circular raceway with a gap therein, a shuttle having a peripheral bearing rib journaled in said raceway for oscillation of said shuttle relative to said housing, the leading end of said bearing rib being transversely inclined to form a loop-seizing beak adjacent to one of the side-edges thereof, a bridge-piece secured to said housing across the gap in the raceway and disposed between and in spaced relation to said work-supporting surface and the path of travel of said bearing rib across said gap, said bridge-piece having a relatively narrow elongated needle-aperture therein through which said needle passes upon reciprocation thereof, said needle-aperture being spaced from the side edges of said bridge-piece and being defined by a pair of parallel opposed thread-confining side-edges arranged perpendicular to and extending transversely across said raceway.

8. In a sewing machine having a frame including a bed and a head overhanging the bed, cooperating stitch-forming mechanism comprising an angularly movable loop-taker journaled in said bed and a reciprocatory needle carried by said head, said loop-taker comprising a housing carried by said bed, said housing having an open-sided discontinuous circular raceway with a gap therein and including a bottom wall and a side wall, a displaceable cap including a raceway side wall cooperating with said housing to close the open side of the raceway, a loop-taker having a peripheral bearing rib journaled in the raceway for angular movement of said loop-

taker relative to said housing, said needle being adapted to enter said housing during stitch-formation at substantially a right angle to the axis of movement of said loop-taker and adjacent to a needle-side of the raceway, the leading end of said bearing rib being transversely inclined relative to the center line of said bearing rib to form a loop-seizing beak that passes closely adjacent to the needle during stitch-formation, the end of the raceway that initially receives said loop-seizing beak as it passes the gap therein having the bottom wall within said housing and the side wall at the needle-side thereof inclined toward each other to form a contacting point that innitially receives the loop-seizing beak of said bearing rib.

9. In a sewing machine having a frame including a bed and a head overhanging the bed, cooperating stitch-forming mechanism comprising an oscillating shuttle mechanism carried by said bed and a reciprocatory needle carried by said head, a link take-up carried by said head and constructed and arranged to perform a take-up action on a needle thread, a work-supporting surface on said bed having an opening through which said needle passes upon reciprocation thereof, said shuttle mechanism comprising a housing secured to said bed, said housing having an open-sided discontinuous circular raceway with a gap therein and including a bottom wall and a side wall, a displaceable shuttle-cap including a raceway side wall cooperating with said housing to close the open side of the raceway, a shuttle having a peripheral bearing rib journaled in said raceway for oscillation of said shuttle

relative to said housing, the leading end of said bearing rib being transversely inclined to form a loop-seizing beak adjacent to one of the side-edges thereof, the end of the raceway that initially receives said loop-seizing beak as it passes the gap therein having the bottom wall and side wall within said housing inclined toward each other to form a contacting point that initially receives the loop-seizing beak of said bearing rib, a bridge-piece secured to said housing across the gap in the raceway and disposed between and in spaced relation to said work-supporting surface and the path of travel of said bearing rib across said gap, said bridge-piece being defined by a relatively narrow elongated needle-aperture formed therein through which said needle passes upon reciprocation thereof, said needle-aperture having a pair of parallel opposed thread-confining side-edges arranged perpendicular to and extending transversely across said raceway.

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