

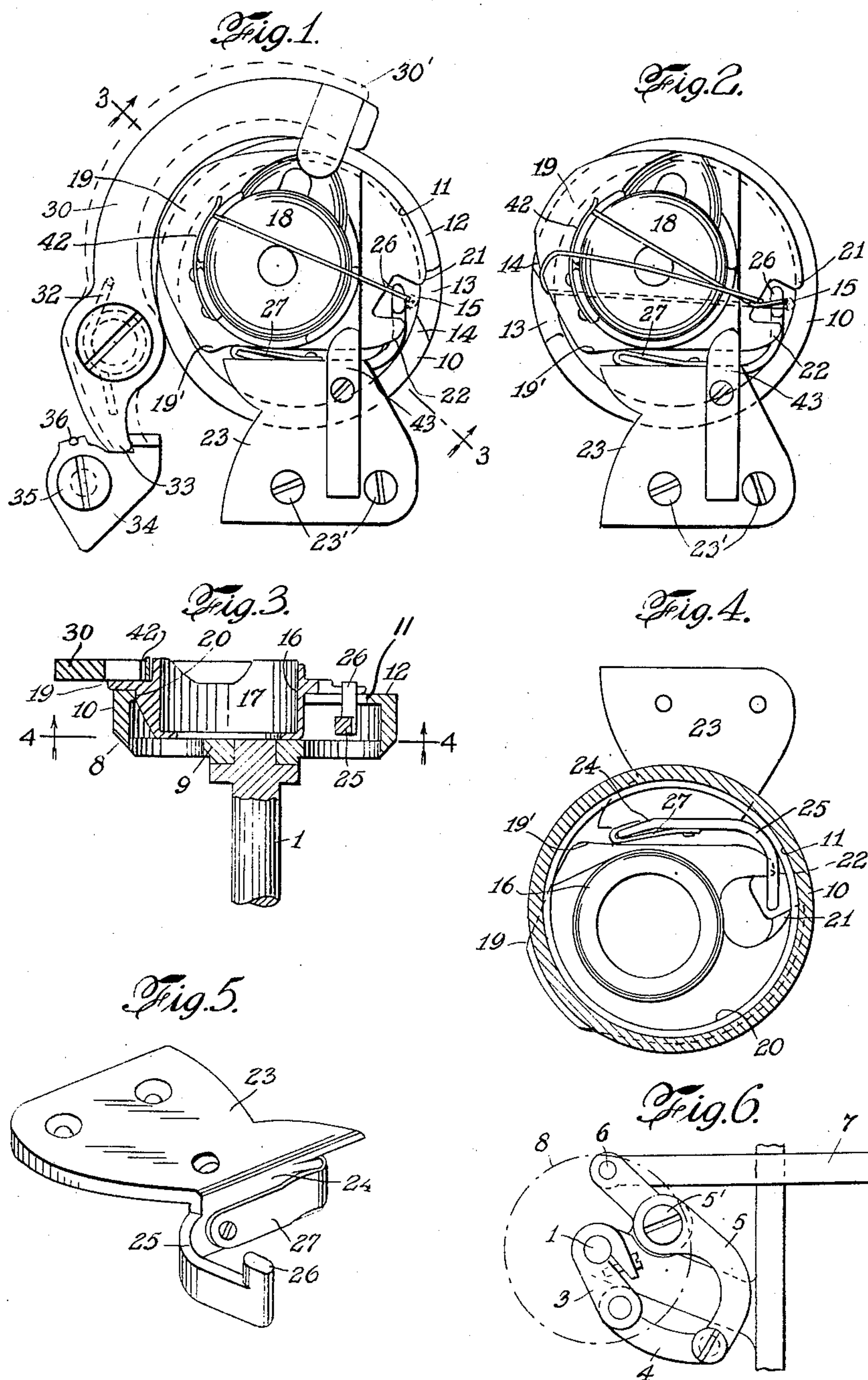
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SEWING MACHINE HOOK MECHANISM

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SEWING MACHINE HOOK MECHANISM

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The general object of the present invention is to provide an improved sewing machine mechanism of the type in which a needle thread loop is passed around a bobbin holder by a rotary hook, and particularly by a so-called oscillating hook which turns back and forth about an axis through an arc which ordinarily is slightly greater than 180°.

More specifically, the general object of the invention is to provide a sewing machine comprising a hook turning about a vertical axis and formed with a chamber open at its upper end and with a horizontal bearing surface at the top of the rim or wall surrounding said chamber, and a guide surface at the inner side of said rim and extending circularly about the hook axis, and comprising a bobbin holder having a body portion extending down into said chamber and having a flange portion extending over an elongated arcuate portion of said rim, and having bearing and guide surfaces respectively engaging the bearing and guide surfaces of the hook, whereby the bobbin holder is normally supported by said hook and may be moved down into and up out of said hook chamber and may be moved horizontally to separate said guide surfaces, and may be moved vertically to separate said bearing surfaces, when thread is caught between the surfaces.

A further object of the invention is to combine with said hook and bobbin holder, a stationary retaining member, including a supporting portion above and at the outer side of the hook, and a portion extending downward into the bobbin holder and having a projecting part extending through a thread notch in the bobbin holder flange, and including a spring engaging the bobbin holder at a distance from said thread notch and cooperating with said projection to yieldingly maintain said bobbin holder in an approximately constant normal position, with its guide surface in engagement with the guide surface of the rotary hook.

Heretofore, it has been customary to provide the hook and bobbin holder or shuttle of rotary hook sewing mechanisms with guide and bearing surfaces comprising a circular rib formed on one element and received in a groove formed in the other element. Such mechanisms, while in extensive use, have always had an objectionable tendency to have thread caught between the rib and groove wall, with the result of clogging or jamming the mechanism. This tendency has been especially pronounced in the operation of domestic sewing machines which are subject to

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less careful operation than factory machines. When such thread clogging of a domestic machine occurs, the ordinary user usually finds it necessary to call in a mechanic to separate the hook and bobbin holder and remove the clogged thread.

It is practically impossible for such clogging and jamming to occur in the operation of a domestic sewing machine constructed in accordance with the present invention. When thread is caught between the guide and bearing surfaces of such a machine, it does not prevent the ordinary user of a domestic sewing machine from readily separating the bobbin holder from the hook. The novel hook and bobbin holder arrangement disclosed herein, has the further advantage that it is less expensive to manufacture than the hook and bobbin holder arrangements heretofore used.

The various features of novelty which characterize my invention are pointed out with particularity in the claims annexed to and forming a part of this specification. For a better understanding of the invention, however, its advantages and specific objects attained with its use, reference should be had to the accompanying drawing and descriptive matter in which I have illustrated and described a preferred embodiment of the invention.

Of the drawings:

Fig. 1 is a plan view of an oscillating hook and associated bobbin holder with the hook in the position occupied at the beginning of its loop drawing movement;

Fig. 2 is a view taken similarly to Fig. 1 but omitting parts shown in Fig. 1 and showing the hook at the end of its loop drawing movement, and with the loop fully expanded;

Fig. 3 is a section on the line 3—3 of Fig. 1;

Fig. 4 is an inverted plan in section on the line 4—4 of Fig. 3;

Fig. 5 is a perspective view of a stationary bobbin holder positioning or retaining element; and

Fig. 6 is an inverted plan view of the mechanism giving oscillating movements to the vertical hook shaft.

In the form of construction shown in the drawing, a vertically disposed hook shaft 1 is given oscillating movements by means comprising an arm 3 secured to the shaft 1 adjacent its lower end, and a link 4 connecting the free end of the arm 3 to one end of an oscillating lever 5. The latter is journaled on a stationary stud shaft 5'. The second end of the lever 5 is connected by a pivot 6 to one end of the link 7. The latter is

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adapted to be given reciprocatory movements in the general direction of its length in timed relation with those of an associated, vertically movable needle and needle reciprocating mechanism. Said mechanism is not illustrated and need not be further described as it forms no part of the present invention and may be of old and well known type.

At its upper end the hook shaft supports and is rigidly connected to a loop-taker or hook member 8. The latter as shown is in the form of a shallow cup shaped body coaxial with the shaft and having an apertured bottom wall 9, and an uprising wall or rim 10. The wall 10 is formed adjacent its upper end with an inwardly facing guide surface 11. The latter extends circularly about the axis of the shaft 1 and is shown as slightly undercut. The upper edge of the rim forms a horizontal bearing surface 12 extending circularly about the shaft 1. The upper portion of the rim is cut away to form a thread notch 13. One end wall of the notch 13 is undercut to form a hook 14 adapted to take a thread loop from the connecting needle when the latter is in the position in which it extends downward through the work and needle hole in the needle plate. The work and needle plate are not shown, but the dotted circle 15 represents the outline of the needle hole in the plate above the rotary hook. The two end walls of the notch 13 diverge from one another and from an intermediate radial plane as the distance from the axis of the shaft 1 increases.

The horizontal bearing surface 12 and the subjacent guide surface 11, provide supporting and guiding surfaces for a bobbin holder 16. The latter is formed with a cup shaped chamber 17 open at its upper end to receive a thread bobbin 18 which may be of conventional form. As shown, the vertical axis of the bobbin chamber 17 is laterally displaced from the axis of the hook shaft 1. The bobbin holder includes an arc shaped flange portion 19 extending radially away from the wall of the bobbin chamber into overlapping engagement with an elongated arcuate portion of the hook bearing surface 12 at the top of the rim 10. The bobbin holder is provided immediately beneath the flange 19 with a shoulder which may be of relatively small vertical extent and which forms a convex guide surface 20, adapted to engage and fit against the upper portion of the inwardly facing guide surface 11 of the hook. The underside of the flange 19 which overlaps the rim 10, is a horizontal bearing surface resting on the upwardly facing bearing surface 12 of the hook 8. The latter thus normally supports the bobbin holder when the latter is in its normal operating position. The engaging surfaces of the hook and bobbin holder are not arranged to prevent movement of the bobbin holder upward and out of the bobbin chamber in the hook, or to prevent movement of the bobbin holder toward the axis of the shaft 1, from the position in which its convex guide surface 20 engages the concave inwardly facing guide surface 11 of the hook.

Adjacent its right side, as seen in Fig. 1, the flange 19 is cut away to form a needle and thread notch with a spaced apart pair of horn portions 21 and 22 at opposite sides of the notch. The horn 21 forms one end of the portion of the flange 19 which overlaps and rests on the surface 12, the horn 22 being shorter and having its tip spaced inwardly away from the inner edge of the surface 12.

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The bobbin holder 16 is prevented from sharing the general angular movements of the oscillating hook 8 by a stationary retaining element 23. The latter comprises a plate-like body portion which extends over and is spaced upwardly away from the hook rim 10 and is held in fixed position by screws 23' at the outer side of the hook. The retaining element 23 comprises an integral depending portion 24 which extends down into the portion of the bobbin holder chamber between the rim of that chamber and the bobbin holder, and includes an elongated arm 25 extending under the horn 22 and terminating in an uprising projection 26. The latter extends up through the thread notch between the horns 21 and 22, alongside the path of needle movement indicated by the dotted circle 15. The projection 26 is thus in position to be engaged by the edge of the horn 21 when the hook is rotating clockwise as seen in Fig. 2, and counterclockwise as seen in Fig. 4, and the rotating hook then exerts a frictional drag in the same direction on the bobbin holder. When the hook is rotating in the opposite direction, i. e., in the counterclockwise direction as seen in Fig. 2 and in the clockwise direction as seen in the inverted plan section shown in Fig. 4, the frictional drag of the hook on the bobbin holder moves the horn 21 away from the projection 26.

The extent of the movement of the bobbin holder under the frictional drag of the hook when the latter is rotating in the counterclockwise direction as seen in Fig. 2, is restricted by a spring 27. The latter is secured to the depending portion 24 of the retaining element 23 and is adapted to engage the edge shoulder 19' of the flange 19, as is shown in Figs. 1 and 4.

The frictional drag of the hook 8 on the bobbin holder 16 has some tendency to move the latter toward the axis of the shaft 1 and thus move the convex guide surface 20 out of engagement with the hook surface 11. However, the spring 27 and projection 26 coact to keep the horizontal movements of the bobbin holder so small that in normal operation their only practical operative effect is to facilitate the movement of the needle thread loop about the bobbin holder. Thus, as explained above, the rotation of the hook in the counterclockwise direction, as seen in Fig. 2, opens a thread space between the projection 26 and horn 21. The reverse rotation of the hook reestablishes the engagement of the horn 21 with the projection 26, and practically eliminates contact pressure between the spring 27 and bobbin holder shoulder 19' and thereby facilitates the movement of the needle thread loop between said shoulder and spring, as said loop is being taken up or contracted.

A lever element 30 journaled on a stationary pivot has a radial finger portion 30' which normally extends over a depression in the top surface of the flange 19 of the bobbin holder, without directly engaging the latter, though it is separated therefrom by a distance too small to permit objectionable movement of the bobbin holder up from its normal position in the hook, as a result of vibration or other abnormal condition which may occasionally develop. As shown, the arm 30 is biased by a spring 32 to turn from the full line position into the dotted line position shown in Fig. 1. In the latter position the arm 30 does not extend over the bobbin holder. The arm 30 is normally held in its full line position by a latch member 34 in engagement with a hook

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portion 33 of the arm 30. The member 34 is mounted on a stationary pivot 35 and biased by a spring 36 for movement into its latching position. The juxtaposed surfaces of the arm 30 and projection 30' and bobbin holder 19 are normally separated by a clearance space through which the thread loop drawn by the beak 14 may freely pass.

In operation, the loop-taker beak or hook 14 engages the needle thread as it moves counterclockwise as seen in Fig. 1 from its position shown in that figure. As the counterclockwise movement of the hook progresses, the needle thread loop is moved through the space between the retainer part 26 and the horn 21, and the upper side of the loop is drawn over the top of the bobbin holder, while the underside is drawn under the bobbin holder. As the counterclockwise movement continues and the hook approaches the position shown in Fig. 2, the needle thread loop is drawn away from the hook by the customary action of the take-up mechanism of the sewing machine which then rapidly contracts the loop and finally pulls it off the horn 22. As has been made apparent, the operative effect of the frictional drag of the hook on the bobbin holder is to move the horn 21 away from the projection 26 at the beginning of the loop forming operation, and thus facilitate the loop forming movement of the needle thread between said horn and projection, and to subsequently eliminate or reduce the contact pressure between the spring 27 and shoulder 19', and thereby facilitate the passage between said shoulder and spring of the needle thread loop as the latter is being contracted. The parts are preferably so proportioned that the ends of the arcuate portion of the hook bearing surface 12 engaged by the bobbin holder flange 19 extends approximately 180° at least about the axis of the bobbin chamber in the bobbin holder as is shown in Figs. 1, 2 and 4. In consequence, the bobbin holder has no gravitational tendency to tilt in the direction to lift the flange 19 out of the position in which its underside bears against the surface 12. The cutting away of the bobbin holder at the side of the latter adjacent the retaining member 23, of itself shifts the center of gravity of the bobbin holder toward the central portion of the guide surface 20 and thus tends to insure the maintenance of the normal contact of the flange 19 with the hook bearing surface 12.

As those skilled in the art will realize, the cutting away of the bobbin holder shown in the drawings not only reduces the bobbin holder weight and effects an advantageous shift in the center of gravity of the bobbin holder, but is desirable for other reasons. Thus it facilitates and expedites the movement of the loop off the bobbin holder and permits the extension of the retaining device parts 24 and 25 into the loop-taker and partly below the horn 22, and the extension of the projection 26 up through the peripheral notch formed in the bobbin holder between the horns 21 and 22.

In the arrangement shown, the needle axis is parallel to the loop-taker axis and between the latter and the path of movement of the loop-taker beak 14. This permits the bobbin to be located at the left side of the needle as seen from the operator's normal position. This makes the bobbin more accessible than it would be if the entire loop-taker were at the right side of the needle, although in the latter case the loop-taker could be smaller in diameter than is inherently

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possible with the arrangement shown. The relatively large size of the loop-taker required with the arrangement shown, augments the desirability of cutting away a relatively large portion of the bobbin holder and for laterally displacing the bobbin axis from the hook axis. To control the movement of the needle thread loop 40 as it is contracted from its form shown in Fig. 2 and is eventually drawn taut about, and then off the horn 22, a thread finger 43 is secured to the upper side of the part 23 and extends over a portion of the bobbin holder adjacent the arm 25 with suitable clearance.

While the bobbin holder is gravitationally biased into position in which the flat underside of the flange 19 rests on the hook bearing surface 12, and the retainer projection 26 and spring 27 cooperate to normally maintain the guide surface 20 of the bobbin holder in engagement with the hook surface 11, the bobbin holder may be readily removed and replaced when necessary or desirable. Such removal and replacement may be desirable to facilitate the insertion of a bobbin in, or its removal from the bobbin holder, or to clear away snarled thread which may wind about the horn 22, or work into the joint between the guide surfaces 19 and 20, or the joint between the flange 19 and the bearing surface 12. With the construction shown, the thread which may pass between the cooperating guide and bearing surfaces of the hook and bobbin holder cannot clog or jam so as to impede the separation of the bobbin holder from the hook, or the removal of the thread which has passed into the joints between said surfaces.

As previously explained, a bobbin holder may be mounted in an open top loop-taker in the general manner shown in the drawing when the loop-taker is of the type revolving continuously in one direction, as well as when the loop-taker oscillates as in the particular construction shown in the drawings. In accordance with the usual practice of the art, the bobbin holder used with a continuously revolving hook would ordinarily have a bobbin chamber coaxial with the hook. It is also desirable, in many cases, to cut away relatively large portions of bobbin holders which are coaxial with the loop-taker for reasons analogous to those making such cutting away desirable with the construction shown. With the continuously revolving hook, however, the frictional tendency of the bobbin holder to share the rotative movements of the looper can not be used to alternately open and close a loop receiving thread passage for a movement of the thread loop over the bobbin holder in the manner above described.

While in accordance with the provisions of the statutes, I have illustrated and described the best form of embodiment of my invention now known to me, it will be apparent to those skilled in the art that changes may be made in the form of the apparatus disclosed without departing from the spirit of my invention, as set forth in the appended claims and that in some cases certain features of my invention may be used to advantage without a corresponding use of other features.

Having now described my invention, what I claim as new and desire to secure by Letters Patent, is:

1. A sewing machine mechanism comprising in combination a loop taker element turning about a vertical axis and having a bobbin holder chamber open at its upper side and a wall surrounding said chamber and formed with an inwardly facing guide surface extending circularly about said

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axis and with a horizontal, upwardly facing bearing surface, a bobbin holder having a body portion smaller in cross-section than said chamber and normally extending down into the latter and formed at one side with a convex guide surface normally engaging the first mentioned guide surface, and including an outwardly extending flange which normally overlaps and is engaged and supported by an elongated arcuate portion of the first mentioned bearing surface, said element and bobbin holder being relatively shaped and arranged to permit limited thread clearing horizontal and vertical movements of said bobbin holder in normal operation, and means operative to restrict the horizontal and vertical movements of said bobbin holder including a stationary retaining member normally engaging said bobbin holder and tending to maintain the latter in an approximately constant position but permitting limited horizontal thread clearing movements of its convex guide surface toward and away from, and angularly along said inwardly facing loop taker guide surface, and including a second member movable between one position in which it extends over the bobbin holder and is spaced therefrom to provide a limited thread clearance space between said second member and the bobbin holder and in which it prevents bodily movement of said bobbin holder upward out of said loop taker chamber and a second position in which it permits such bodily movement.

2. A sewing machine mechanism as specified in claim 1, in which said flange includes spaced apart portions at the inner side of the said arcuate portion of said bearing surface and in which said retaining member and bobbin holder are shaped and arranged for engagement of the retaining member with said spaced apart flange portions.

3. A sewing machine mechanism as specified in claim 1, in which said flange includes spaced apart portions at the inner side of the said arcuate portion of said bearing surface and in which said retaining member and bobbin holder are shaped and arranged for engagement of portions of the retaining member with said spaced apart flange portions, one of said engaging portions of said retaining member being a spring.

4. A sewing machine mechanism as specified in claim 1, in which said flange includes spaced apart portions at the inner side of said arcuate portion of said bearing surface and in which said bobbin holder is formed with positioning surfaces respectively adjacent said spaced apart portions of the bobbin holder flange, and in which said retaining member comprises spaced apart portions, one of which is resilient and engages one of said bobbin holder positioning surfaces and yieldingly presses the convex guide surface of the holder toward the inwardly facing guide sur-

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face of the loop taker element and restricts angular movement in one direction of the bobbin holder about an axis parallel to said vertical axis and a second of said retaining member portion cooperates with a second of said positioning surfaces to restrict angular movement of the bobbin holder about an axis parallel to said vertical axis in a direction opposite to the first mentioned direction.

5. A sewing machine mechanism as specified in claim 1, in which said second member is movable into and out of a position in which it extends over an intermediate portion of said overlapping flange portion of the bobbin holder and prevents the latter from moving up out of said bobbin holder chamber.

6. A sewing machine mechanism comprising in combination a loop taker element oscillating about a vertical axis and having a bobbin holder chamber open at its upper side and a wall surrounding said chamber and formed with an inwardly facing guide surface extending circularly about said axis and with a horizontal, upwardly facing bearing surface, a bobbin holder having a body portion smaller in cross-section than said chamber and normally extending down into the latter and formed at one side with a convex guide surface normally engaging the first mentioned guide surface, and including an outwardly extending flange comprising a portion which normally overlaps and is engaged and supported by an elongated arcuate portion of said bearing surface, and which is cut away between the ends of said overlapping portion to form an opening between the bobbin holder and said wall and which is formed adjacent one end of said overlapping portion with a thread notch, and a horn separating said thread notch from said opening, a stationary retaining member including a depending portion extending downward through said opening and having an extension comprising a portion extending under said horn and a portion extending upward through said thread notch, and a spring carried by said retaining member and acting between the depending portion of said retaining member and a portion of the bobbin holder flange adjacent the end of said opening which is remote from said horn and thread notch.

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