

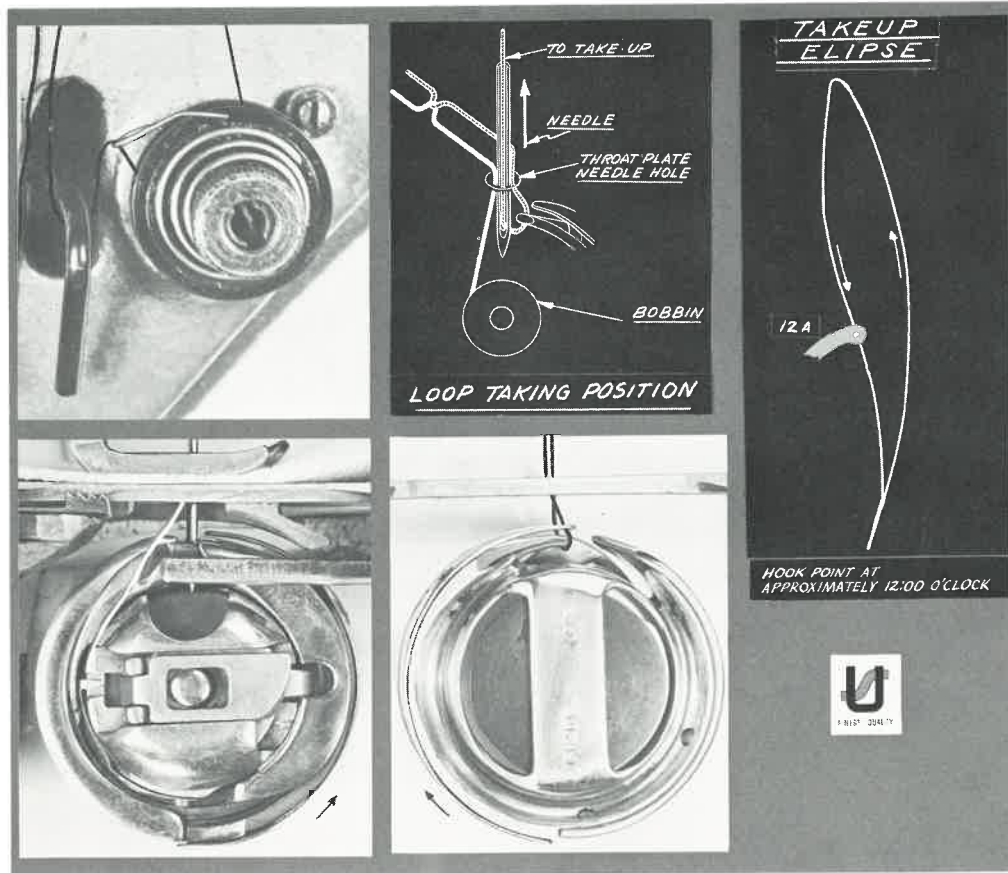
3.

3. In the next ten views we are going to show you the relationship between the take-up, check spring, feed-dog, needle, and the rotary hook assembly when forming the 301 stitch.

This particular view showing the end of the sewing machine is merely to acquaint you with the method used to show the relationship of these various parts. The take-up eyelet on a lockstitch machine does not move up and down in a straight line, but actually travels in an ellipse as shown in the upper right corner of this picture. The ellipse pattern is caused by the linkage of the take-up. An ellipse travel rather than a straight up and down movement is necessary in order to allow the take-up to deliver thread more slowly to the hook on the down-stroke and actually travel faster on the up-stroke as it takes the needle-loop out of the hook assembly, as we will see in the later views. While the check spring action does not show here, it will be shown in the subsequent views.

In the sewing area the throat plate has been cut away to expose one row of the feed-dog teeth in the lower left hand corner, and approximately 3/8 of an inch of the projection on the positioning finger has been removed to allow a clear view of the action of the bobbin thread and the needle thread as it is handled by the rotary hook assembly.

In the views that follow we will show only the thread handling revolution of the hook assembly, and not the revolution that occurs while the machine is feeding. We will refer to the front view of the hook as the face of a clock, indicating the hook point position is 12:00, 6:00, etc. The arrow or reference point on the take-up ellipse indicates its position in relation to the hook point.

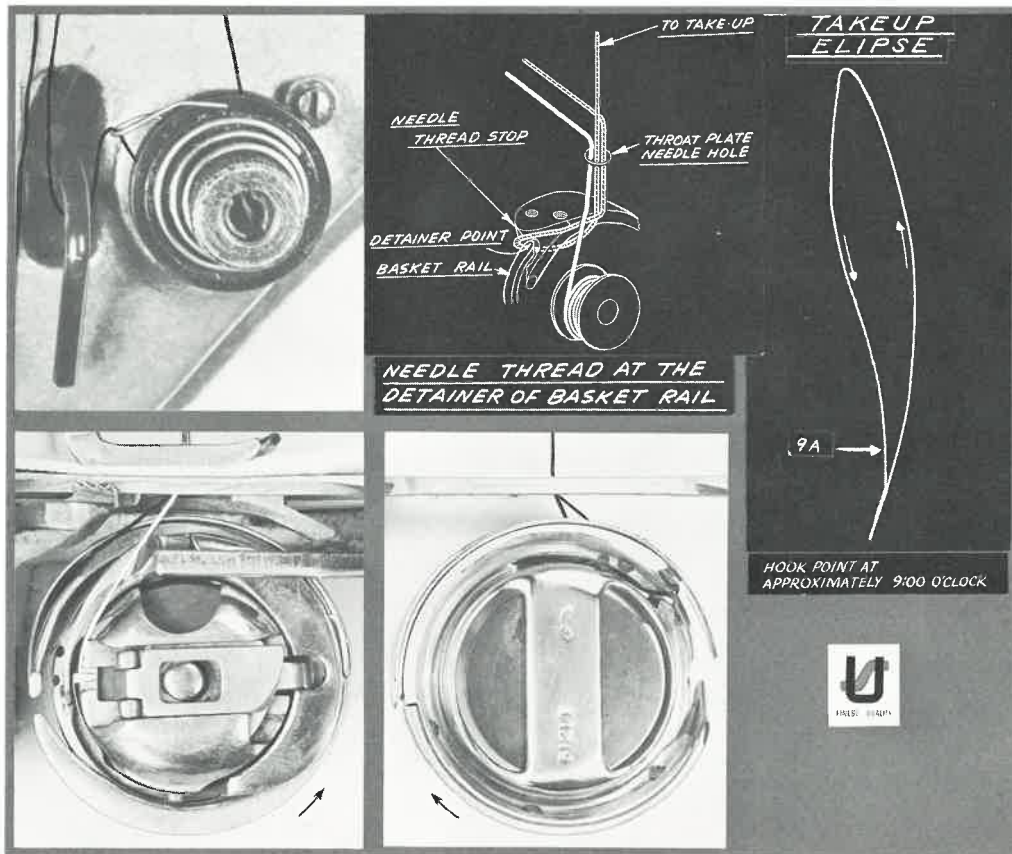


4.

4. Here we have the five views that will enable you to see the check spring, the front view of the hook assembly, a back view of the basket in the hook assembly, and line drawings of the needle, hook, and bobbin, and also the take-up ellipse. In this view we show the take-up eyelet and its position on the ellipse. In subsequent views, as the eyelet moves, it will be indicated only by a horizontal arrow.

Now let's get down to what actually happens in forming the 301 stitch.

- (a) You will note the hook point is at 12:00.
- (b) The needle has started to rise, throwing out a loop which the point of the hook point is just entering. This can be seen clearly in the upper center view, and also in the two lower views where the hook point has just entered the needle loop.
- (c) The take-up is descending and is at this 12A position in relation to the hook point position. The needle thread is loose at this point in the stitch forming cycle, since the take-up is giving thread to the hook.
- (d) The check spring is completely relaxed since there is no tension on the needle thread.
- (e) The feed dog is returning to the feeding position beneath the throat plate. The feed dog teeth are visible in the lower left-hand view.



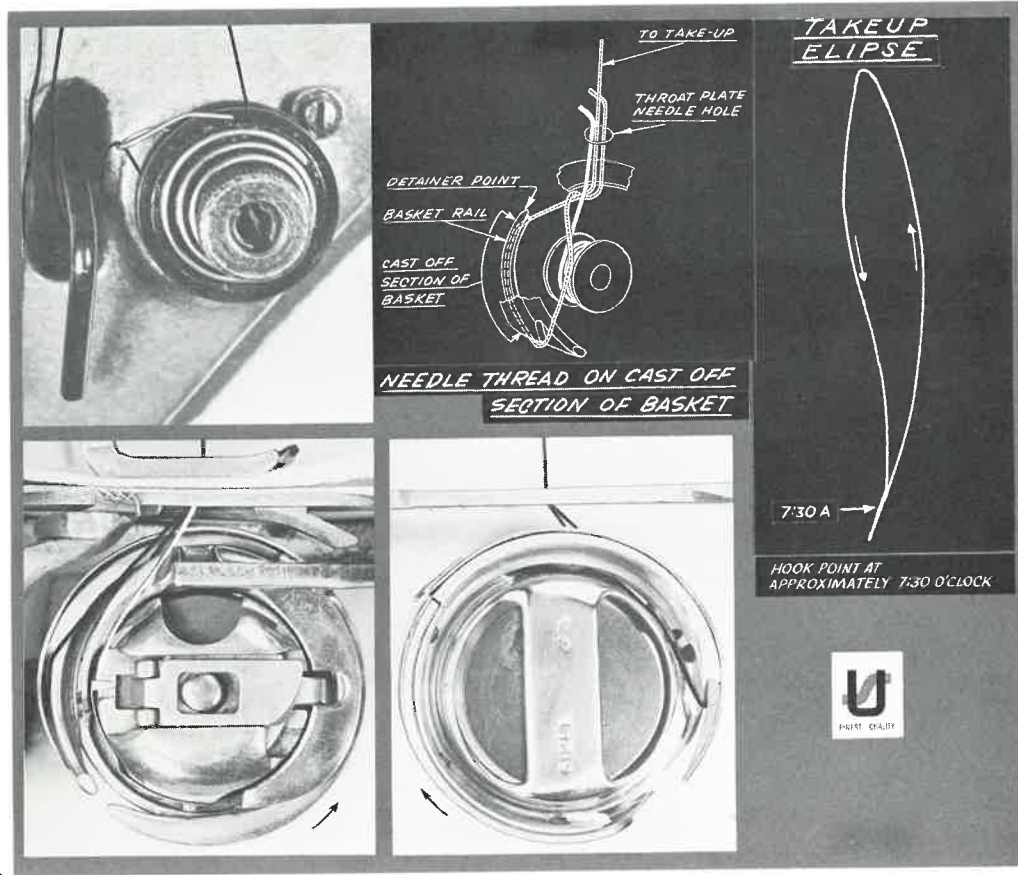
5.

5.

- (a) The hook point is at 9:00.
- (b) The needle is rising almost out of the throat plate. The needle loop has drawn back over the hook point. The upper side of the loop is drawn against the thread stop above and behind the hook point itself, as you can see in the back view of the hook and also in the line drawing in the center upper picture. This side of the needle thread loop passes across the hook point beneath the thread deflector, as you can see in the lower left picture. This strand of the needle thread is connected to the previous stitch in the material.

The underside of the needle loop passes under the hook point and across the race-way. This places the needle thread directly in front of the retaining end of the rail on the bobbin case holder. Note carefully the position of the needle thread on the underside of the hook point in the back view of the hook. If you look carefully, you will notice the needle loop just in front of the detainer on the rail.

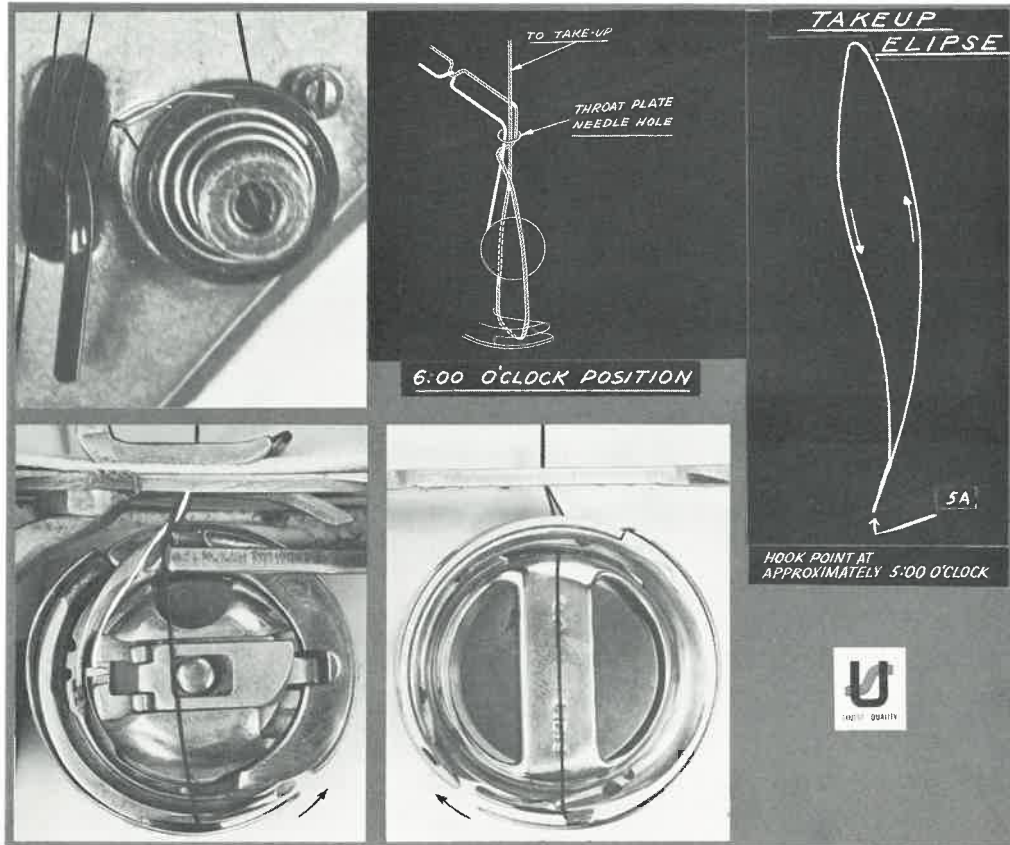
- (c) The take-up is descending and allows the needle thread to become very slack. Again this slack is to allow the hook to draw enough thread to make its loop around the bobbin case holder as we continue in the stitch forming cycle.
- (d) The check spring is still inactive.
- (e) The feed dog is still returning beneath the throat plate.



6.

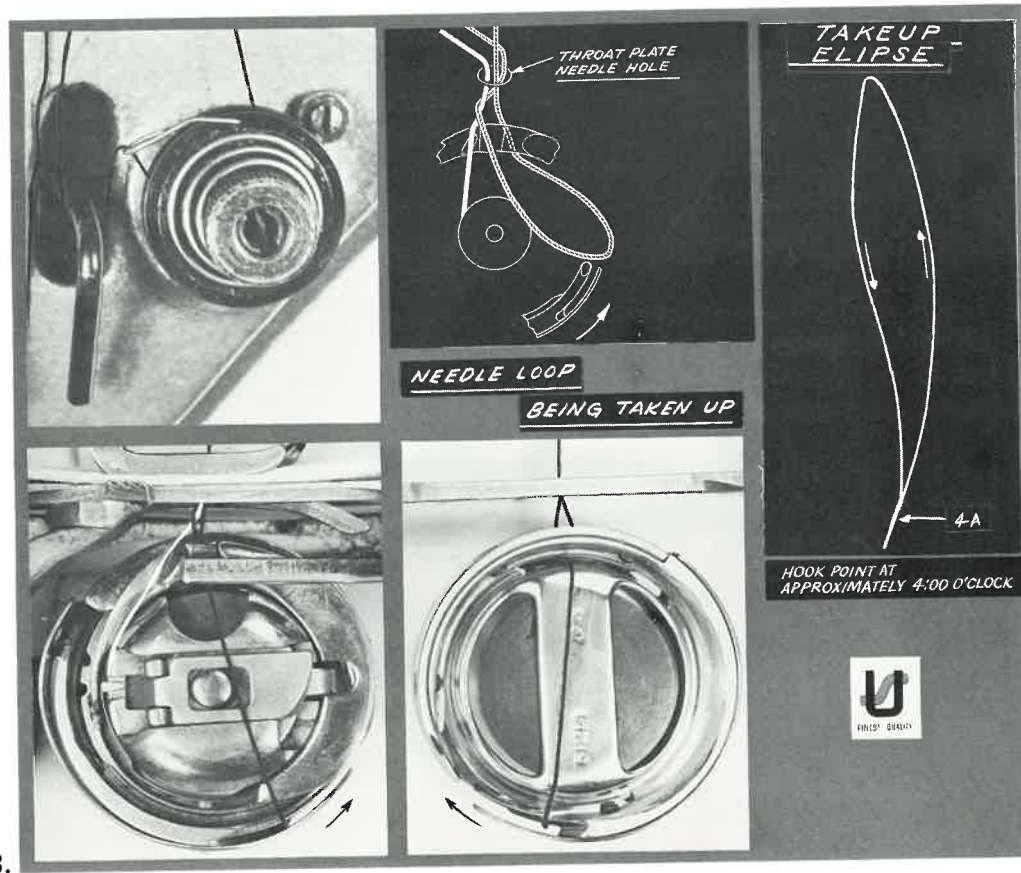
6.

- (a) The hook point is at 7:30. The slack thread delivered by the take-up is being used by the downward movement of the hook point. The bottom side of the needle loop has contacted the thread detainer on the rail and is now starting to be drawn around the bobbin case holder by the movement of the hook point. This portion of the thread is laying alongside the back of the rail. This is clearly illustrated in the lower center picture showing the rear view of the basket.
- (b) The needle is rising and is well out of the throat plate.
- (c) The take-up is still descending at 7:30A.
- (d) The check spring is still inactive.
- (e) The feed dog has returned its full distance beneath the throat plate. You will note in the lower left-hand view and in the upper center view that the action of the thread deflector on the hook assembly is lifting the front side of the needle loop over the bobbin thread and placing it in a position where it can easily slip into the positioning finger recess on the bobbin case holder.



7.

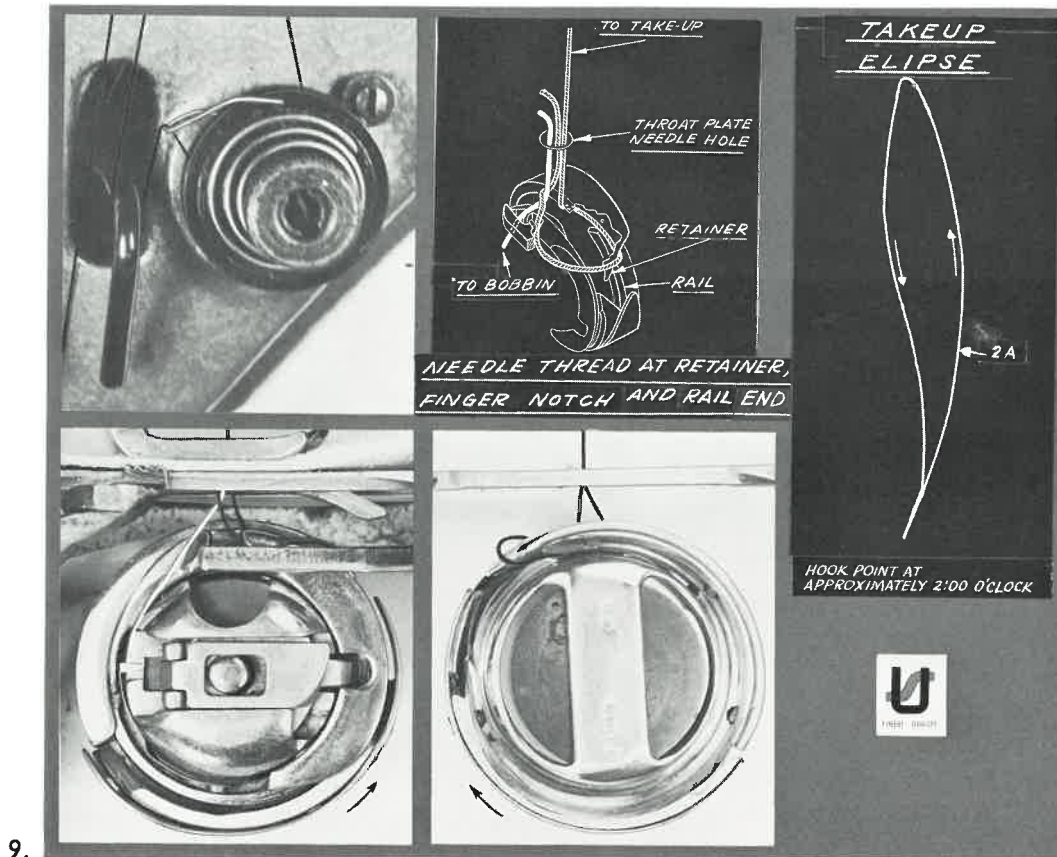
- (a) The hook point is now at 5:00. The front side of the needle loop has been drawn down to the 6:00 position by the thread carrying notch behind the hook point. This 6:00 position is one to remember since it is essential in the proper adjusting of a lockstitch machine. At the same time the top front side of the needle loop is now behind the bobbin case holder. Notice that one strand of the needle loop is now behind the bobbin thread. This can be seen very clearly in the upper center view and also in the lower left-hand view where the black needle thread is clearly behind the white bobbin thread. The front side of the needle loop has now crossed over in front of the bobbin thread, as shown in the lower left-hand view
- (b) The needle is still on its upward travel.
- (c) The take-up is at the 5: A position in relation to the hook point, and this is the bottom of the take-up travel. The take-up will start to rise at this point. All of the needle thread slack is gone from the system.
- (d) The check spring should just begin to engage the needle thread at this time and will be depressed slightly. As the needle loop passes the 6:00 position and becomes slack, the check spring will wink back to its relaxed position. This is the time in the cycle that the most thread is being used to form the stitch, and there should be no undue strain on the thread before the 6:00 position is reached, nor should there be unnecessary slack afterward. We will see the proper way to make this adjustment of the check spring in later views.
- (e) The feed dog is rising to the point where the teeth are even with the top of the throat plate.



8.

8.

- (a) The hook point is at the 4:00 position. The upper portion of the needle loop has passed into the positioning finger recess as you can see in the lower left-hand view. The front side of the needle loop is at the 5:00 position and ready to start moving ahead of the thread carrying notch behind the hook point. This action is more clearly indicated in the center lower view showing the back of the bobbin case holder.
- (b) The needle is still rising.
- (c) The take-up eyelet is at the 4: A position in relation to the hook point. Actually at this point the take-up begins to rise rapidly. This action is necessary in order to keep the needle loop ahead of the hook point later in the sewing cycle.
- (d) The check spring which held tension on the thread momentarily has winked and returned to its relaxed position.
- (e) The feed is rising against the material.



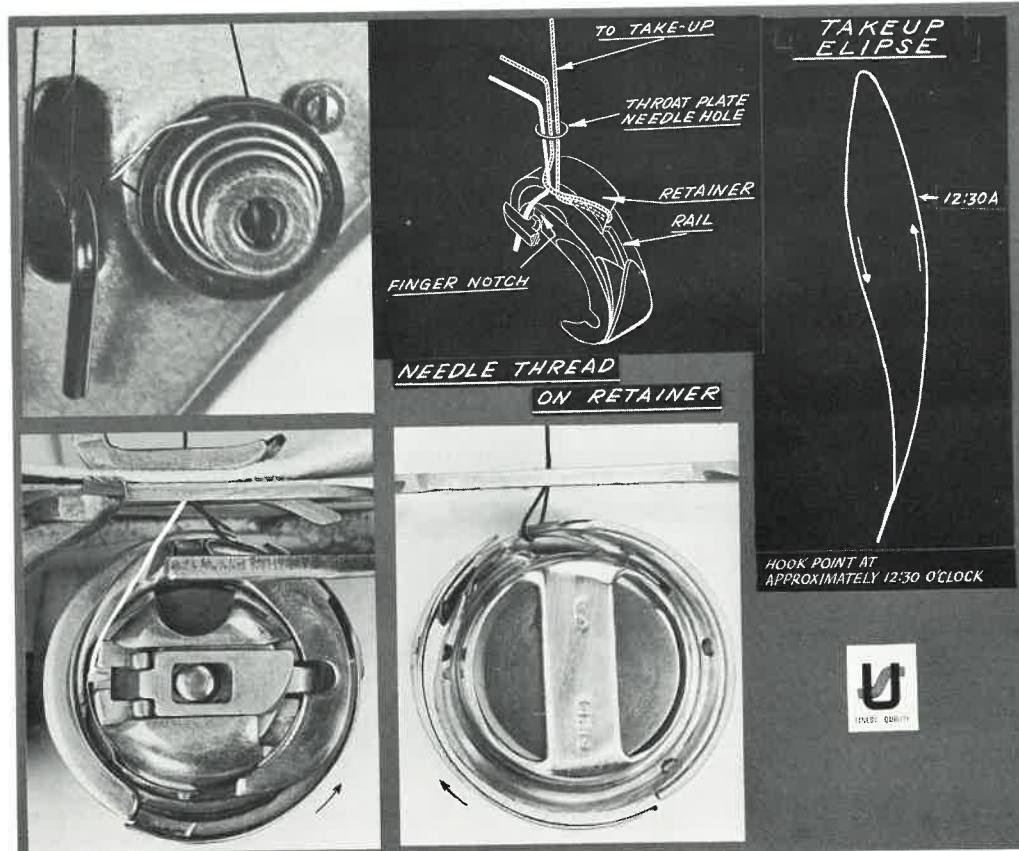
9.

9.

- (a) The hook point is now at the 2:00 position.
- (b) The needle is still rising.
- (c) The take-up is at the 2:00A position. It is rising rapidly and drawing the needle loop back up through the throat plate, material, and the eye of the needle. This decreases the size of the needle loop still engaged in the hook assembly. This needle loop has now drawn up around the hook thread retainer well ahead of the hook point as seen in the upper and lower center views.

The hidden side of the needle loop is still being retained by the end of the rail on the bobbin case holder. This is barely visible in the lower left view as you notice the strand of needle thread behind the positioning finger. At this point the front side of the needle loop is ready to be pulled out of the positioning finger recess.

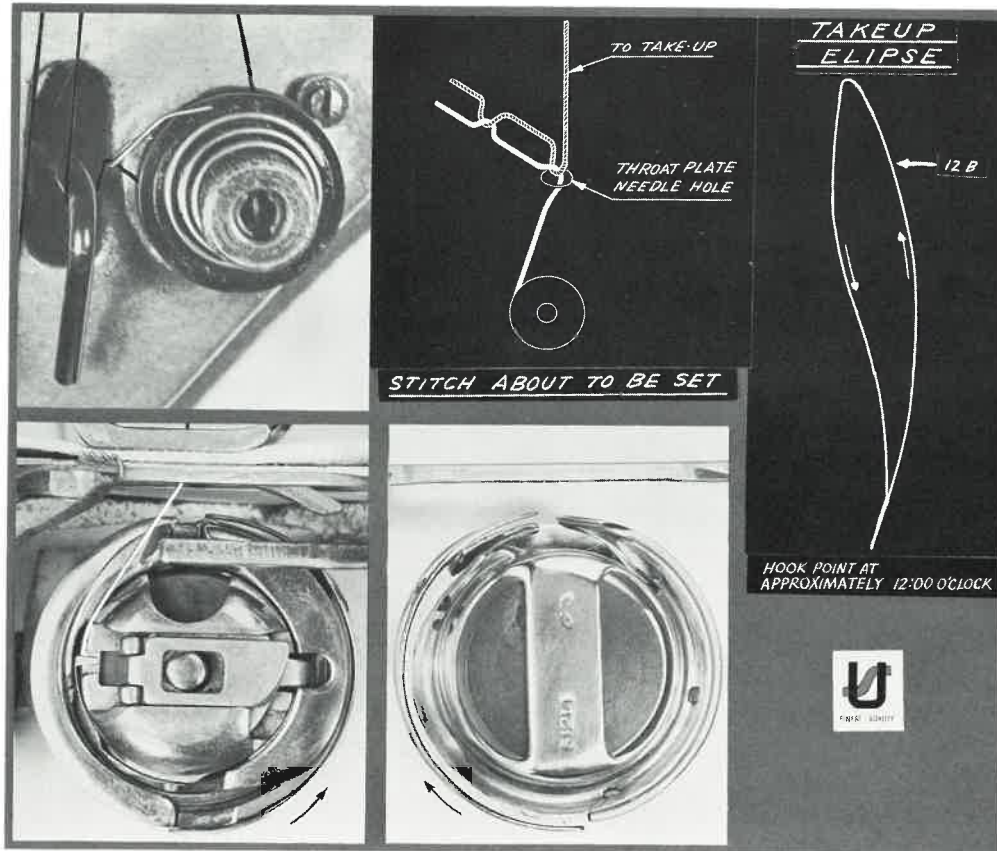
- (d) The check spring again is just ready to engage the needle thread as the take-up removes the slack.
- (e) The feed dog is starting to move the material for the next stitch length.



10.

10.

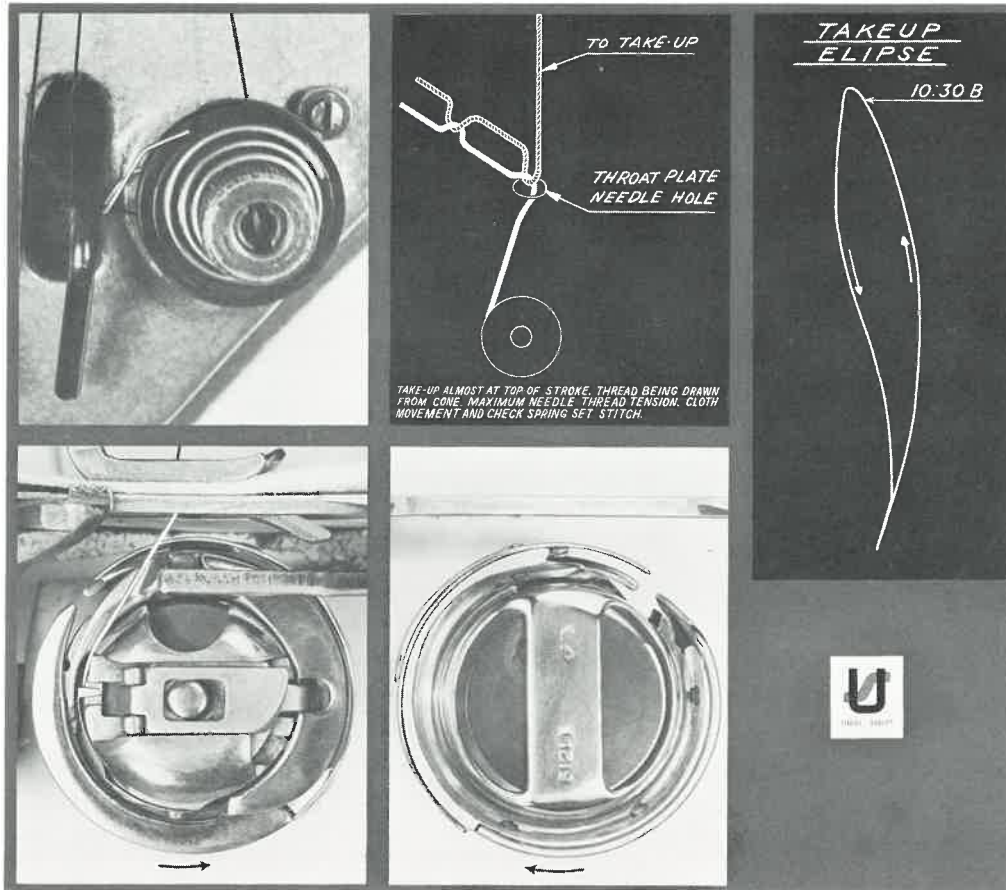
- (a) The hook point has reached the 12:30 position. The size of the needle loop has greatly decreased because of the rapid acceleration of the take-up. In other words, there is very little needle loop left beneath the material at this point.
- (b) The needle has reached the top of its stroke.
- (c) The take-up is rising rapidly at 12:30 A. The needle loop has slipped out of the positioning finger recess, out from behind the rail on the basket and is now held by the tip of hook thread retainer.
- (d) The check spring is depressed by the holding action of the needle loop on the hook thread retainer. This acts as a cushion between the holding action of the retainer and the action of the take-up eyelet in drawing the needle thread out of the hook. The check spring will wink slightly as the needle loop slips off the hook thread retainer a moment or two later.
- (e) The feed dog is moving the material.



11.

11.

- (a) Here the hook point is at the 12:00 position. The hook will not handle any thread during the revolution about to begin, since this will be the revolution during which the feed dog feeds the material.
- (b) The needle is descending.
- (c) The take-up is rising at 12:00B. Its action at this point is starting to tighten the stitch in the material against the action of the feed.
- (d) The check spring has been partly depressed by the action of the take-up on the needle thread. One might say it acts as a shock absorber against the positive action of the take-up at this time since the take-up is setting the stitch in the material and the check spring is providing a small amount of tension on the needle thread.
- (e) The feed dog has risen to its full height and has moved the material about half way through its stitch length. This feeding action is also starting to draw a supply of bobbin thread for the next stitch.



12.

12.

- (a) The hook point is now at the 10:30 position in the feeding revolution. As previously indicated, the hook is not carrying any thread.
- (b) The needle is descending.
- (c) The take-up is rising at 10:30 and is now ready to draw needle thread for the next stitch. Drawing of needle thread occurs at this time because the previous needle loop has pulled up tight in the material around the bobbin thread. About this time the take-up begins to exert a pull on the needle thread which is greater than the resistance of the needle thread tension adjustment. As a result, a supply of needle thread to replace the thread used in the last stitch is being drawn from the needle thread cone. All of the thread required will be drawn by the time the take-up reaches the top of its travel.
- (d) The check spring is fully depressed and will remain depressed until all of the needle thread is drawn for the next stitch.
- (e) The feed dog is continuing to feed the material and draw the balance of the bobbin thread needed for the next stitch.