In carrying out my invention I provide for cooperation with a sewing machine A, a table or support B on which material is fed to the sewing machine. On this table are material gripping and feeding rollers C and C' disposed close to and in advance of the needle and presser foot of the needle assembly of the sewing machine and in such angular relation thereto that upon driving at least one roller at such a speed that the feed action thereof is slower than that of the sewing machine, the material between the rollers and the presser foot is placed under longitudinal tension and thus caused to be fed in a straight line to the sewing machine but at an angle to the axes of said rollers. This angular disposition of the rollers tends to feed the material so that the adjacent edge thereof will move laterally or obliquely outward instead of in a straight line as aforesaid, and although the "pull" of the sewing machine feeder on the material between it and the rollers acts to correct this lateral feed, it becomes necessary to limit and control the feed action of the rollers from time to time in order that the material as it passes to the needle is stitched in a straight line which at all times is parallel to the adjacent edge of the material.

Accordingly, I provide a control and guide means D which is operated by the material before it passes between the rollers. This control means operates in response to pressure of the edge of the material before it passes the rollers, to bring about a release of the material between the rollers so that the pull on the ungripped material as effected by the sewing machine feeder, will shift the material inwardly or in the opposite direction to that in which it is angularly forced when gripped and fed by the rollers. As soon as the edge of the material moves clear of the control means sufficiently to remove the pressure which actuated it, the rollers will automatically grip the adjusted material, and the feed of material to the machine continues in the straight path as necessary to insure stitching parallel to the material edge. This shifting of the material takes place automatically, and intermittently during the sewing operation, and thus correctly positions the material before the incorrectly disposed portions thereof reach the sewing machine needle. These provisions make it possible to insure an accurate feed automatically after once positioning the material and setting the machine and apparatus into operation.

Referring more specifically to the apparatus of my invention and in particular to the feed roll-
ers C and C', it is seen with reference to Fig. 8, that the rollers are adapted to contact one an-
other at or slightly above the plane of the up-
per side of the table B, there being an opening
11 in the latter for accommodation of the rollers.
These rollers are positioned in front and close to
the needle and feed assembly 12 of the sewing
machine A, but at an angle to the normal line of
feed as effected by the feeder of such assembly.
The roller C is driven by a shaft 13 mounted in
a table supported bracket 14, and is mounted or
spined on the shaft as at 15 so as to be adjust-
able axially for purposes to be hereinafter set
forth. The shaft 13 is driven by a gear train 17
which is operated by gear connected shafts 18
and 19 the latter of which is driven from a re-
duction gear unit 20 operated by the pulley and
belt drive 21 for the sewing machine. The drive
means for the roller C is geared so that the
feed action of the rollers is slower than that of
the sewing machine, whereby the material be-
tween the rollers and the machine is placed un-
der tension.
As here provided, the lower roller C' is mov-
able into and out of contact with the roller C,
wherefore the material may be gripped and re-
leased in accordance with this invention, al-
though it is obvious that any relative movement
of the rollers affording such gripping and releas-
ing action may be employed. In the present
embodiment, the roller C' is supported on a stub
shaft 23 carried by a lever 24 fulcrumed at one
end as at 25 on the bracket 14 and pivoted at its
other end to an actuating lever 27 by means of
a link 26. The lever 27 is fulcrumed as at 28
beneath the table B and arranged to be rocked
by a solenoid 29 fixed to a bracket 30 depending
from the table B.
Normally, the weight of the lever 27 and ar-
mature 31 of the solenoid 29 serve to hold the
roller C' against the under side of the roller C
so that the longitudinally ribbed surfaces of the
rollers will grip and feed the sewing machine.
When, however, the solenoid is energized the
lever 27 is rocked to the dash line position shown in Fig. 7 and the roller C' is thereby lowered from contact with roller C, as indicated by the dash line position shown in Fig. 5, where the gripping and feeding of
the material by the rollers ceases. Upon deen-
ergization of the solenoid the lever 27 and as-
associated parts will gravitate to normal position
and thereby lift the roller C' into gripping and
feeding position.
It should be noted that the link 28 is adjust-
able to regulate the throw of the lever 24 and
the extent of movement of the roller C'. The
shaft 23 is detachably secured to the lever 24 by
means of a screw 32, and the roller C' is remov-
ably held for free rotation on the shaft by means
of a flanged screw 24. It should be noted that the
roller C' has a longer bearing or peripheral
surface than roller C so that proper coaction of
the rollers will take place in all positions of axial
adjustment of roller C.

The control and guide means D also includes a switch 35 for an electrical circuit 36 (see Fig. 3)
embodying the solenoid 29. As here provided, this
switch (see Fig. 4) includes a fixed contact
37 and a movable spring contact arm 38 which
latter is normally spaced from the contact 37.
The movable arm 38 is positioned for free move-
ment in an opening 39 in the table B so that it
may be engaged by an edge of the material, as
shown in Fig. 4, and thereby moved into engage-
beneath the sewing assembly 12 of the sewing machine.

With the material positioned as illustrated in dash lines in Fig. 1, my apparatus and the sewing machines are now set into operation. Under the feed action of the sewing machine resisted by the feed action of the rollers, the intervening marginal edge of the material is placed under an edge tension, with the maximum tension exerted on a line intersecting the right hand end of the rollers, and hence at a point spaced from the extreme edge of the material. Although the sewing machine feed tends to feed the material straight to the machine, this tensioning of the material just in advance of the presser foot insures, at all times, a straight line of feed of the material. This function is essential to maintain a line of stitching at all times parallel to the edge of the material.

Due to the angularity of feed of the material to the rollers in relation to the line of tension exerted on the marginal edge of the material by the sewing machine feeder, the material in the rear of the rollers constantly tends to swing or shift its position in the direction of the presser foot as viewed in Figs. 1 and 2. As a consequence, the material is urged or biased to the left, thus urging or biasing the edge to be stitched in the general direction of the switch 35. This biasing action is confined to certain limits by the action of the belt 43, in the following manner:

The belt 43 is driven at such a speed that its upward stretch in its rearward movement exerts, on the material, a tractive force rearwardly on the material, thereby to keep the swinging or shifting movement of the material to the right as imparted thereto by the sewing machine feed. This action is such that the material is maintained generally in a position on the table wherein the edge to be stitched extends substantially diagonally of the belt so as to be fed to the rollers on a line substantially at right angles to the axes of the rollers. The belt performs the added function of maintaining the material flat on theTable, and prevents the material from being fed to the rollers in a folded or gathered condition, and placing the material in such a position as would tend to cause the feed action of the sewing machine feed to be biased to the left. It is necessary that the belt 43 be adjusted so as to exert on the material a tractive force of lesser degree, in order that biasing of the material edge to the right under the tension exerted by the sewing machine feed be less resisted, and, hence, in effect greater. With this increased biasing action, the edge of the material will, from time to time, move against the switch 38 to close the switch and operate the control means, but the resultant shifting of the material is not such as to cause the stitching to deviate from a line parallel the straight edge. Where the control means is dispensed with as in straight edge stitching, increased thicknesses of material are taken care of by increasing the number of stitches per inch of material through acceleration of the stitching action of the sewing machine, while maintaining the same feeding action of the rollers. This increases the tension of the material between the rollers and the sewing machine so that the material in the rear of the rollers is shifted to the right the same amount as with lighter materials, and thus the material is maintained in the same feeding position on the belt 43.

The operation of the control means and the resultant effects, are as follows:

Whether the material edge to be stitched be straight, curved or angular, so long as such edge in its travel past the switch does not engage the arm 38, the rollers remain closed to feed the material as described with its marginal edge tensioned and so drawn to the sewing machine as to cause it to be stitched on a line parallel to the straight edge. However, whenever the tensioned material edge moves against the switch arm the latter is actuated to close the switch, thereby causing the solenoid to be energized and the rollers opened by lowering of the roller C'. With opening of the rollers the material therebetween is released to subject the marginal edge of the material to the full feed action of the sewing machine feed. This results in the marginal edge being straightened from the edge in which it was positioned, and as a consequence, shifted to the left and out of contact with the switch arm. The instant this occurs, the switch opens to deenergize the solenoid and thus cause the rollers to close and regrip the material at a new point along its edge.

The new point of gripping, depends upon how long the rollers remain open, for this in turn determines the degree of shift of the material to the left. Manifestly, where the material edge is straight, the shift is negligible, while where the straight edge progresses to another straight edge at an angle thereto, the shift is considerable momentarily to compensate for such change in angle. Once the material has passed to the second straight edge in its travel between the rollers, the latter regrip the material and the biasing action thereon is resumed.

Where an edge of convex form is encountered the switch is repeatedly and rapidly closed and opened due to the protruding curvature of such edge. This produces a corresponding opening and closing of the rollers and, this result in a rapid intermittent shifting of the material edge in its line of feed to the presser foot. As a consequence, the material is shifted on a curved line which exactly parallels such convex edge.

Where a concave edge is encountered, the switch is only occasionally closed, and, hence, the rollers only occasionally opened so that there is little shifting of the material to the left. Shifting of the material edge to the right there-
fore predominates in order that the material as drawn to the sewing machine be guided in a manner to cause it to be stitched on a curved line exactly parallel to and not convexly curved edge.

In case of extreme or abrupt curvatures in the edge of a material to be stitched, the control means can be rendered more sensitive to so shift the material as to cause it to be stitched on a curved line exactly parallel to such extreme or abruptly curved edge. This is effected by an adjustment of the roller C axially to the left from the position shown in Fig. 1. This causes a greater width of material to be extended from the right hand end of the roller which in turn produces a more frequent operation of the switch and, hence, such frequent shifting of the material as to cause the line of stitching to accurately follow the edge.

When it is desired to change the spacing of the line of stitching from the edge of the material, the switch $S$ is adjusted forwardly or rearwardly in the manner previously described herein.

Although I have herein shown only one form of material feed control apparatus for feeding machines embodying my invention, it is to be understood that various changes and modifications may be made herein without departing from the spirit of my invention and the spirit and scope of the appended claims.

I claim:

1. In apparatus for feeding and guiding material to a sewing machine, feed rollers positioned obliquely to the normal straight line of feed of the material to the needle of the sewing machine for gripping between them and controlling the feed of material to the needle, and means operated by pressure engagement of the material therewith for controlling the feed action of the rollers so as to effect stitching of the material on a line paralleling an adjacent edge of the material.

2. In apparatus for feeding and guiding material to a sewing machine for effecting the stitching of the material on a line paralleling an adjacent edge of said material, feed rollers positioned obliquely to the normal straight line of feed of the material to the needle and feeder of the sewing machine, and control means adapted to be operated responsive to pressure of an edge of the material for effecting relative movement of said rollers to release the material while said edge is engaged with said control means and to move said rollers back into material gripping and feeding position upon cessation of the pressure of said edge.

3. An apparatus for feeding and guiding material to a sewing machine for effecting a line of stitching which is parallel to an adjacent edge of the material, comprising: a device for gripping and feeding material toward the sewing machine at a slower rate than the feed action of the sewing machine, to place the material under tension; control means operating responsive to the pressure of an edge of the material when the latter is disposed at a definite position relative to said device, for causing the feed device to release the material, and for causing the feed device to grip the material when said edge is clear of said control means, said feed device being obliquely positioned to bias the feed of material toward said control means; and means operating in advance of said control means for maintaining the edge of the material in advance of said control means at an angle to the edge of the material which is disposed between said device and said sewing machine.

4. An apparatus for feeding and guiding material to a sewing machine for effecting a line of stitching which is parallel to an adjacent edge of the material, comprising: a device for gripping and feeding material toward the sewing machine at a slower rate than the feed action of the sewing machine, to place the material under tension; control means operating responsive to the pressure of an edge of the material when the latter is disposed at a definite position relative to said device, for causing the feed device to release the material, and for causing the feed device to grip the material when said edge is clear of said control means, said feed device being obliquely positioned to bias the feed of material toward said control means; and means operating in advance of said control means for maintaining the edge of the material in advance of said control means at an angle to the edge of the material which is disposed between said device and said sewing machine.

5. An apparatus for feeding and guiding material to a sewing machine for effecting a line of stitching which is parallel to an adjacent edge of the material, comprising: a device for gripping and feeding material toward the sewing machine at a slower rate than the feed action of the sewing machine, to place the material under tension; control means operating responsive to the pressure of an edge of the material when the latter is disposed at a definite position relative to said device, for causing the feed device to release the material, and for causing the feed device to grip the material when said edge is clear of said control means, said feed device being obliquely positioned to bias the feed of material toward said control means; and means operating in advance of said control means for maintaining the edge of the material in advance of said control means at an angle to the edge of the material which is disposed between said device and said sewing machine.

6. An apparatus for feeding and guiding material to a sewing machine for effecting the stitching of the material on a line paralleling an adjacent edge of said material, comprising: a device for gripping and feeding material adapted to grip and feed the material between them at an angle to the normal straight line of feed toward the needle and feeder assembly of the sewing machine; means for driving at least one of said rollers at a speed such that the feed action of the rollers is slower than that of the feeder of the sewing machine; control means adapted to be operated responsive to the pressure of an edge of the material for effecting relative movement of said rollers to release the material while said edge is engaged with said control means, and to move said rollers back into material gripping and feeding position upon cessation of the pressure of said edge.

7. An apparatus for feeding and guiding material to a sewing machine for effecting the stitching of the material on a line paralleling an edge of said material, comprising: obliquely positioned feed rollers adapted to grip and feed the material between them at an angle and toward the needle and feeder assembly of the sewing machine; means for driving at least one of
said rollers at a speed such that the feed action of the rollers is slower than that of the feeder of the sewing machine; control means in advance and to one side of said rollers adapted to be operated responsive to the pressure of the marginal edge of the material; means operating responsive to the operation of said control means for effecting relative movement of said rollers to release the material while said edge is engaged with said control means, and to move said rollers back into material gripping and feeding position when said edge is moved clear of said control means; and said endless belt moving in the direction opposite to that in which the material is fed, mounted adjacent and in advance of said control means and over which the material passes and is urged laterally to one side of said control means while feeding to said rollers; and a similar endless belt operating in the direction of feed of the material through the sewing machine for moving the material at the same rate of speed as and in a direction parallel to said edge as it passes from the feed rollers to the sewing machine feeder.

8. An apparatus for feeding and guiding material to a sewing machine for effecting a line of stitching which is parallel to the adjacent edge of the material, comprising: a device for gripping and feeding material toward the sewing machine at a slower rate than the feed action of the sewing machine, for placing the material under tension; control means operating responsive to the pressure of said edge of the material when the latter is disposed at a definite position to one side and in advance of said device for causing the feed device to release the material and for causing the feed device to grip the material when said edge is free of said control means, said feed device being obliquely positioned to bias the feed of material toward said control means; and means for adjusting said control means to vary the spacing thereof from said rollers for varying the spacing of the line of stitching from the marginal edge of the material.

9. An apparatus for feeding and guiding material to a sewing machine for effecting the stitching of the material on a line paralleling an adjacent edge of said material, comprising: obliquely positioned feed rollers adapted to grip and feed the material between said rollers to the normal straight line of feed of the material toward the needle and feeder assembly of the sewing machine; means for driving at least one of said rollers at a speed such that the feed action of the rollers is slower than that of the feed of the sewing machine; control means adapted to be operated responsive to the pressure of the marginal edge of the material, for effecting relative movement of said rollers to release the material while said edge is engaged with said control means and to move said rollers back into material gripping and feeding position when said edge is moved clear of said control means; and means for adjusting at least one of said rollers bodily toward and away from said control means.

10. An apparatus for feeding and guiding material to a sewing machine for effecting a line of stitching which is parallel to an adjacent edge of the material, comprising: a device for gripping and feeding material toward the sewing machine at a slower rate than the feed action of the sewing machine for placing the material under tension; control means operating responsive to pressure of an edge of the material when the latter is disposed at a definite position to one side and in advance of said device for causing the feed device to release the material and for causing the feed device to grip the material when said edge is free of said control means, said feed device being obliquely positioned to bias the feed of material toward said control means; and means for effecting relative adjustment of said feed device and control means for varying the spacing of the line of stitching from the edge of the material.

11. An apparatus for feeding and guiding material to a sewing machine for effecting a line of stitching which is parallel to an adjacent edge of the material, comprising: a device for gripping and feeding material toward the sewing machine for placing the material under tension; control means operating responsive to the pressure of said edge of the material when the latter is disposed at a definite position to one side and in advance of said device for causing the feed device to release the material and for causing the feed device to grip the material when said edge is free of said control means, said feed device being obliquely positioned to bias the feed of material toward said control means; and means for adjusting said control means to vary the spacing thereof from said rollers for varying the spacing of the line of stitching from the marginal edge of the material.

12. An apparatus for feeding and guiding material to a sewing machine for effecting a line of stitching which is parallel to the adjacent edge of the material, comprising: a device for gripping and feeding material toward the sewing machine at a slower rate than the feed action of the sewing machine, for placing the material under tension; control means operating responsive to the pressure of said edge of the material when the latter is disposed at a definite position to one side and in advance of said device for causing the feed device to release the material, and for causing the feed device to grip the material when said edge is free of said control means, said feed device being obliquely positioned to bias the feed of material toward said control means; and means for bodily adjusting and setting the control means for operation at points variously spaced from said feed device.

13. An apparatus for feeding and guiding material to a sewing machine for effecting a line of stitching which parallels an edge of the material, comprising: a power operated feed device for gripping and feeding the material toward the sewing machine at a slower rate than that of the feed action of the sewing machine itself, whereby to place the material between the sewing machine and said device under tension; control means disposed in advance and to one side of the feed device adapted to be operated by pressure of an edge of the material; said feed device being positioned for biasing the material angularly toward said control means as it is fed toward the sewing machine; and means operating responsive to actuation of said control means for effecting the release of the material by said gripping device when said edge is engaged with said control means and for restoring the gripping operation of said feed device when said edge is moved clear of said control means.

14. An apparatus for feeding and guiding material to a sewing machine so as to effect a line of stitching thereon wherein the latter is parallel to an adjacent edge thereof, comprising: a device for gripping material at a definite point spaced from
the edge to be stitched and feeding the material to the sewing machine at a slower rate than the feed action of the sewing machine so as to place the material under tension, said device being positioned at an oblique angle to the line of feed of the material from the device to the sewing machine, so that the feeding action of the sewing machine operates to bias that portion of the material in advance of the device laterally in the direction of the edge of the material to be stitched; and control means responsive to the pressure exerted by said edge as developed by said biasing action, for causing the device to release the material and thus allow the feed action of the machine to so move the material that its marginal edge is shifted in the opposite direction to that in which it was biased and out of contact with the control means thereby causing the device to regrip the material at the same definite point along the edge of the material.

15. In combination; a sewing machine having a needle, and means for feeding material beneath the needle so as to be sewed thereby; a feed device in advance of said needle for feeding the material to the sewing machine at an angle to the normal straight line of feed; and control means for causing said feed device to intermittently grip and release the material responsive to variational positioning of one edge of the material with respect to a definite point which is out of line with a normal straight line of feed between said device and the sewing machine, said control means including a member constructed and arranged to be actuated by the edge of the material at a point in advance of the needle of the sewing machine for controlling the release of the material by said device.

18. In combination; a sewing machine having a needle, and means for feeding material beneath the needle so as to be sewed thereby; a feed device in advance of said needle for feeding the material to the sewing machine at an angle to the normal straight line of feed; and control means for causing said feed device to intermittently grip and release the material responsive to variational positioning of one edge of the material with respect to a definite point which is out of line with a normal straight line of feed between said device and the sewing machine, said control means including a member constructed and arranged to be actuated by the edge of the material at a point in advance of the needle of the sewing machine for controlling the release of the material by said device.

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