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Gratsch

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[54] **SEW-OFF MEANS FOR AUTOMATIC SEWING MACHINES**

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[52] **U.S. Cl.** **112/121.15,** 112/205

[51] **Int. Cl.** **D05b 21/00**

[58] **Field of Search** 112/121.15, 121.12, 112/121.11, 2, 203, 210, 212, 204, 205, 121.29, 10

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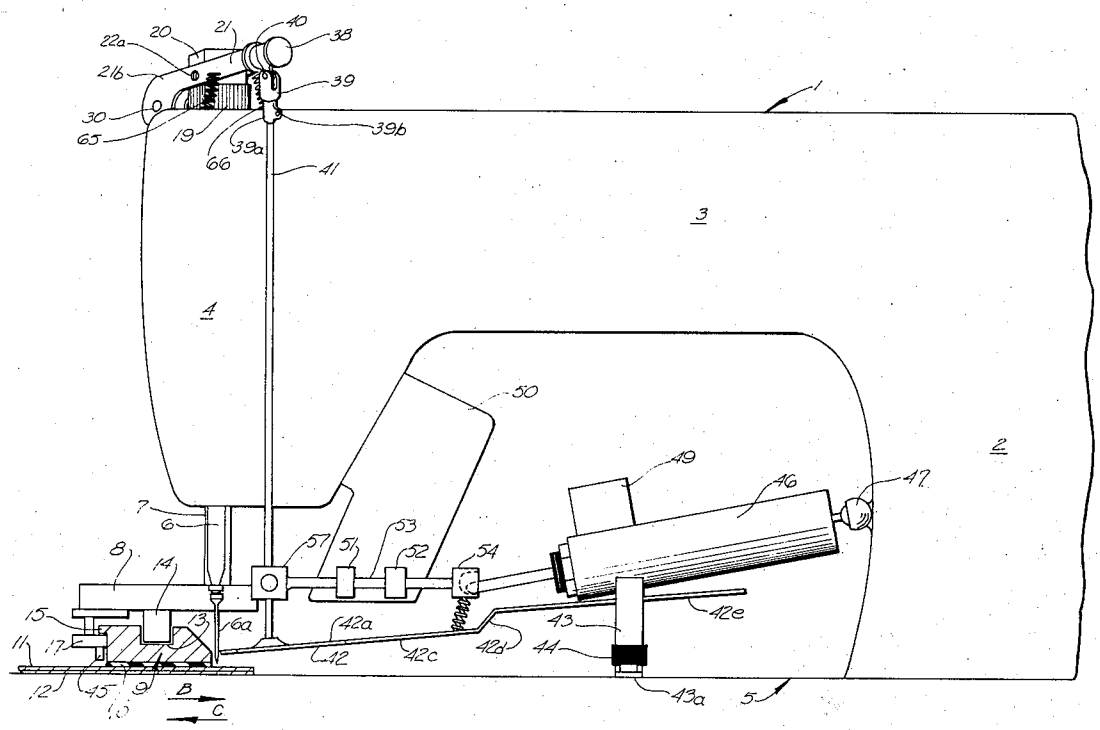
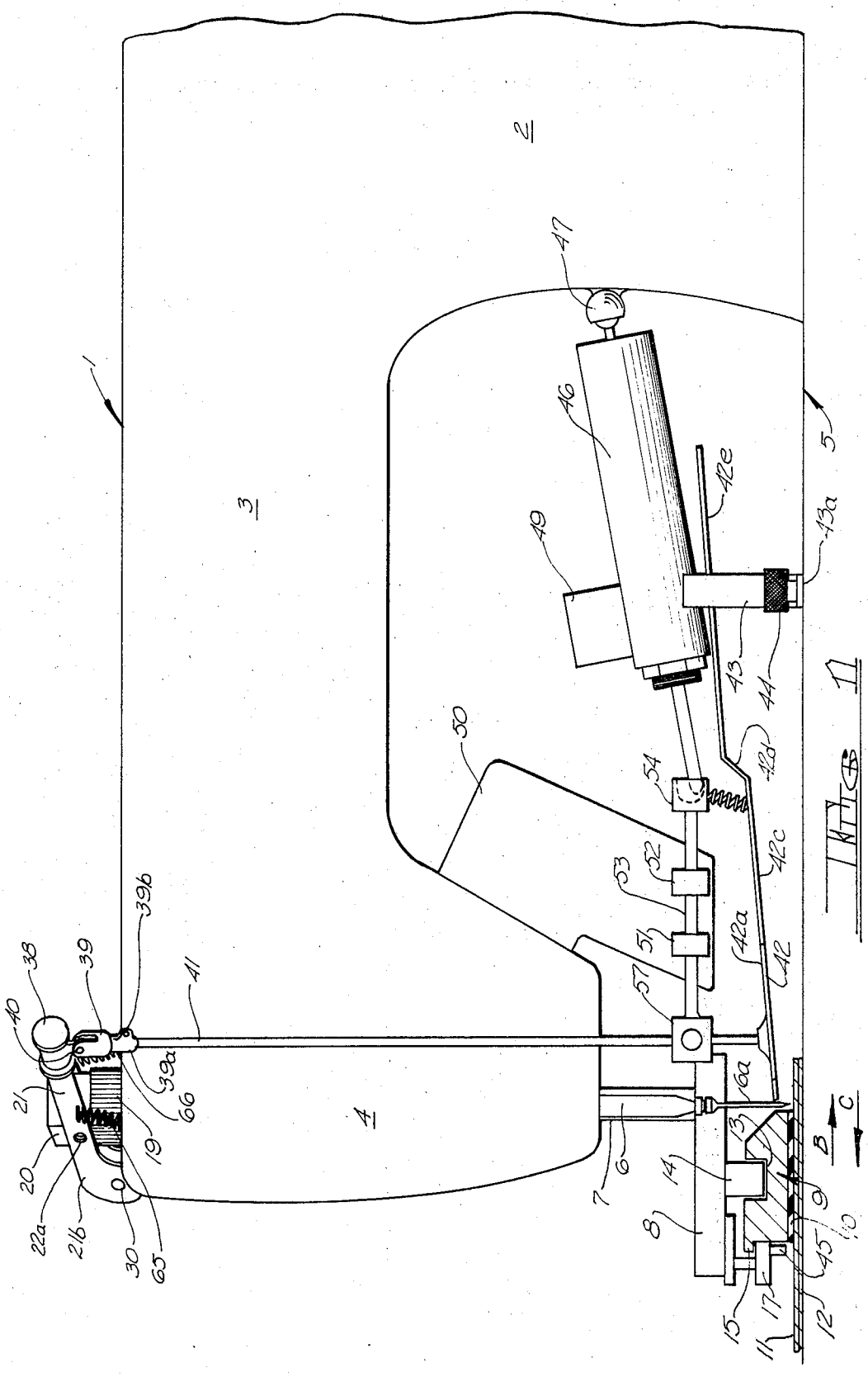
Primary Examiner—James R. Boler
Attorney—John W. Melville et al.

[57] **ABSTRACT**

In an automatic sewing machine of the type having an elongated guide rail for advancing the material being sewn in the sewing direction and guiding the material at the sewing station to produce an elongated seam of predetermined straight or curved contour, means are provided to engage the material being sewn, to lift the guide rail from the material and to shift the material transversely of the sewing direction at a predetermined angularity thereto, whereby at the end of the desired seam sew-off stitches may be formed in the material to the edge thereof at substantially any desired angle to the sewing direction.

15 Claims, 9 Drawing Figures

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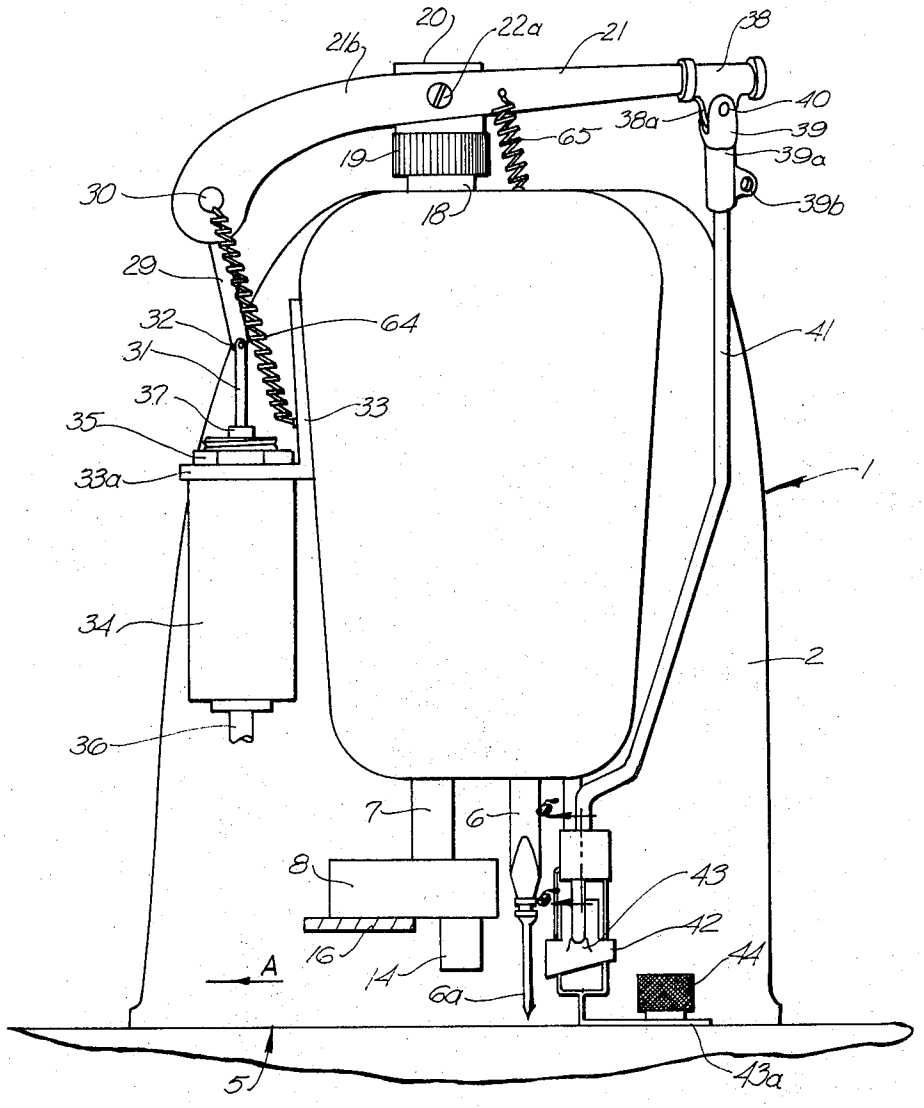
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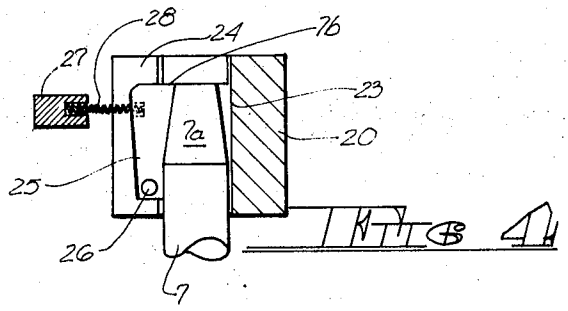

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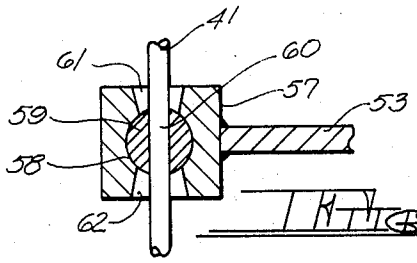


FIG 5

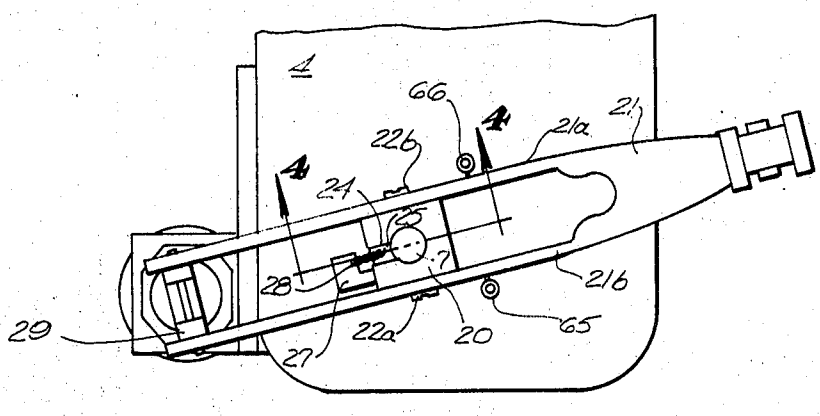
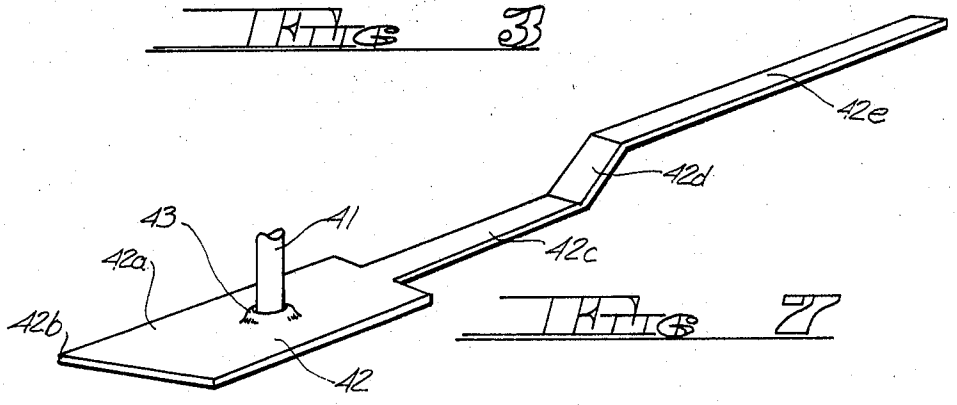


FIG 3



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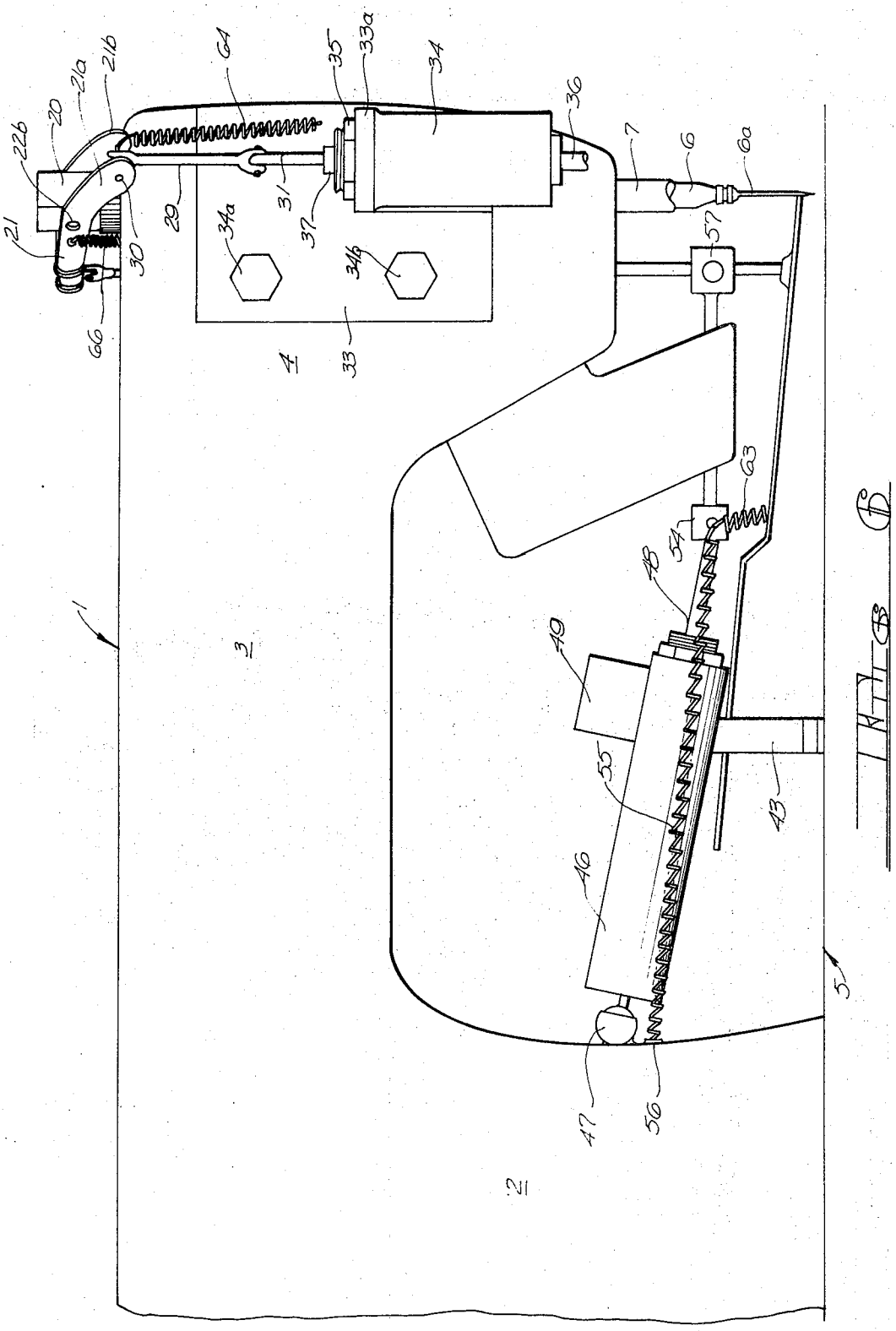
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FIG. 6

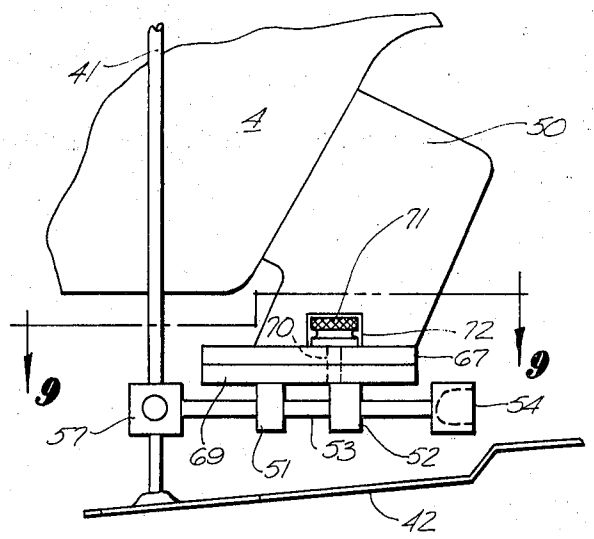
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FIG. 8

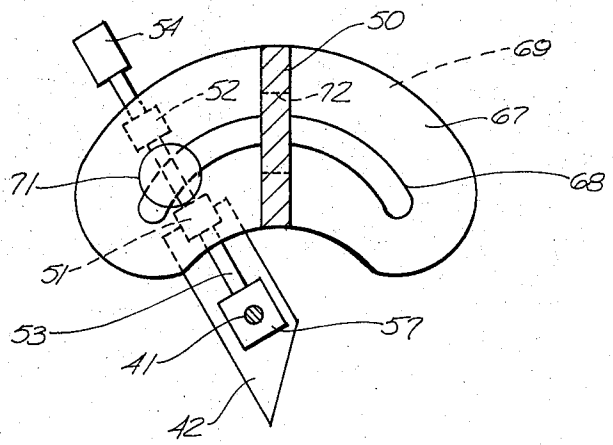
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FIG. 9

SEW-OFF MEANS FOR AUTOMATIC SEWING MACHINES

BACKGROUND OF THE INVENTION

1. Field of the Invention

The invention relates to an improvement in automatic sewing machines of the type having an elongated guide rail for the production of elongated seams of predetermined straight or curved contour, and more particularly to sew-off means for such machines whereby sew-off stitches may be formed at the end of the desired seam at any predetermined angularity to the sewing direction.

2. Description of the Prior Art

Prior art workers have devised many types of automatic, industrial sewing units for performing a myriad of specific sewing tasks. In a number of instances, such sewing units are provided with automatic guide means for the material being sewn whereby a particular seam of predetermined contour may be repeatedly and consistently sewn. In this way, the same seam may be rapidly, accurately and efficiently reproduced again and again.

In an exemplary form of such guided sewing unit, a substantially standard sewing machine is mounted on an elongated table. A framework is provided above the table and extends longitudinally thereof. This framework supports an elongated guide rail. Means are provided to shift the guide rail in the sewing direction from an initial starting position and to return the guide rail to its starting position.

The layers of material to be sewn are placed upon the table at the above noted starting position and the guide rail is located atop the material. The guide rail is longitudinally configured to have the same shape as the desired seam to be sewn. As the guide rail is shifted in the sewing direction, it advances the material through the sewing station, simultaneously guiding the material at the sewing station to produce the elongated seam of predetermined contour therein. An exemplary form of such sewing unit is manufactured by and sold under the designation DURKOPP Sewing Unit 744.

An automatic sewing unit of the type just described is particularly useful in sewing center back seams, side seams, front sleeve seams, rear sleeve seams, center sleeve seams, skirt side seams, skirt center back seams, inside trouser leg seams and the like. Frequently, such sewing units are substantially completely automated, being provided with programming means including means for initiating the sewing operation and terminating it at the end of the seam.

Automatic sewing units of the type just described have, however, heretofore been characterized by one deficiency. In the sewing, for example, of the center back seam of a coat or the rear seam of a sleeve, it is generally desirable to provide sew-off stitches at the end of the seam, i.e., at the coat or sleeve vent. Heretofore sew-off stitches were controlled by the guide rail and it was therefore possible to form the sew-off stitches only at an angularity of about 20° to the sewing direction. Due to this shallow angularity, the sew-off stitches were subject to pulling or ripping.

The present invention is directed to the provision on such sewing units of means whereby uniform sew-off stitches may be formed at the end of the desired seam at any predetermined angularity to the sewing direction.

SUMMARY OF THE INVENTION

The sew-off means of the present invention is intended for use with automatic industrial sewing units of the type having guide means, through the use of which a predetermined stitch of desired contour may be automatically and repeatedly sewn. In an exemplary form of such a unit, an elongated guide rail is provided for advancing the material being sewn in the sewing direction and guiding the material at the sewing station to produce the desired seam. As is known in the art, the head of the sewing machine portion of the unit is provided with a vertically oriented pressure bar. A cam block is mounted on the bottom end of the pressure bar and operatively engages the guide rail so as to maintain the contoured edges of the guide rail at a predetermined distance from the reciprocating needle assembly as the guide rail travels in the sewing direction.

In accordance with the present invention, a lever is mounted at the upper end of the pressure bar. One end of the lever is operatively connected to an air or hydraulic cylinder. The other end of the lever supports a downwardly depending push rod. A foot is mounted for universal movement at the bottom end of the push rod.

Guide means is provided for the foot to maintain its proper orientation. In addition, a second cylinder is mounted on the sewing machine and is operatively connected to the foot to shift the foot transversely of the sewing direction. As will be described hereinafter, the angularity of this transverse motion with respect to the sewing direction can be adjusted as desired.

When the end of the seam being sewn is reached, the programming means of the sewing unit will energize the above mentioned cylinders. When that cylinder operatively attached to the lever is energized, the lever will be caused to pivot about the upper end of the pressure bar lowering the push rod and the foot attached thereto down upon the material being sewn. Once the foot is fully seated, further rocking of the lever by its cylinder will be fulcrumed about the juncture of the lever and the push rod, causing the pressure bar and attached cam block to move upwardly. The operative engagement of the cam block and guide rail is such that the cam block will lift the guide rail with it, thus releasing the material from the guide rail. Actuation of that cylinder operatively connected to the foot will cause the foot and the material it engages to shift transversely of the sewing direction resulting in the production of sew-off stitches at the predetermined angularity to the sewing direction.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a fragmentary side elevational view of the automatic sewing machine, partly in cross section, and illustrates the sew-off means of the present invention.

FIG. 2 is a fragmentary end elevational view, partly in cross section, illustrating the sewing machine and the sew-off means of the present invention as seen from the left of FIG. 1.

FIG. 3 is a fragmentary top plan view of the head of the sewing machine and illustrates the lever means of the present invention.

FIG. 4 is a cross sectional view taken along section 4—4 of FIG. 3.

FIG. 5 is a cross sectional view taken along section line 5—5 of FIG. 2.

FIG. 6 is a fragmentary side elevational view of the machine and the sew-off means of the present invention, illustrating the side of the machine opposite that shown in FIG. 1.

FIG. 7 is a perspective view of the foot of the present invention.

FIG. 8 is a fragmentary elevational view of modified bracket means.

FIG. 9 is a fragmentary cross sectional view taken along section line 9—9 of FIG. 8.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

Referring first to FIG. 1, the basic parts of the prior art sewing unit will be briefly described. The sewing machine itself is generally indicated at 1 and, as is well known in the art, comprises a post 2, an arm 3 and a head 4. The sewing machine is mounted on a table, generally indicated at 5.

The head 4 of the sewing machine is provided with a conventional reciprocating needle assembly 6, the needle being shown at 6*a*. The head further carries a pressure bar 7, the bottom end of which supports a cam block 8. The guide rail is generally indicated at 9. The guide rail is an elongated structure normally made of metal or the like and provided with a layer 10 of rubber or other friction material on its bottom surface. The layer 10 assures a frictional engagement by the guide rail 9 of the layers of material 11 and 12 to be sewn.

As indicated above, the table 5 will have a longitudinally extending framework (not shown) mounted thereon from which the guide rail 9 is supported at its ends. Means in association with the framework will be provided to longitudinally shift the guide rail 9 in the cutting direction. In FIG. 2, wherein like parts have been given like index numerals, the cutting direction is indicated by arrow A. In FIG. 2 the guide rail 9, fabric pieces 11 and 12 and portions of the cam block 8 have been eliminated for purposes of clarity.

The guide rail 9 will be shaped longitudinally to conform to the contour of the desired seam to be sewn. Thus, if the desired seam has an elongated, gentle S curve, the guide rail 9 wil likewise have the same elongated, gentle S curve.

The upper surface of the guide rail 9 has a longitudinal groove therein. The groove 13 will also have the same longitudinal contour as the guide rail and the seam to be sewn. The cam block 8 has a downwardly depending roller or cam follower 14 adapted to ride in the groove 13. The interaction of the cam block roller or follower 14 and the groove 13 in the guide rail 9 will serve to maintain the distance between the needle 6a and the adjacent edge of the guide rail constant regardless of the longitudinal contour of the guide rail.

At this point it will be evident that the guide rail serves two purposes. First of all, since the guide rail 9 frictionally engages the material layers 11 and 12, as the guide rail is advanced in the sewing direction, the material will advance along table 5 with it. By virtue of its longitudinal contour, conforming to the desired contour of the seam, and by virtue of the fact that the distance between the needle 6a and the adjacent edge of the guide rail is maintained constant, the material will (in addition to its movement in the sewing direction) be shifted in the direction of arrows B or C (FIG. 1) whereby the desired contour is imparted to the seam. It will be understood that if a straight seam is to be sewn, the guide rail 9 will simply be a straight rail.

Finally, that edge of the guide rail facing the operator has a longitudinally extending flange 15 thereon. The cam block has a swingable arm 16 mounted on its underside. A locking wheel 17 is rotatably mounted on the arm 16. The arm 16 is swingable to a position wherein the locking wheel 17 engages the guide rail, as shown in FIG. 1. The locking wheel cooperates with the cam follower 14 to assure a constant engagement of the guide rail.

At the end of the sewing operation, the supporting means for the guide rail raises the guide rail (and the cam block and pressure bar therewith) and returns the guide rail to its starting position. Generally, automatic sewing units of this type are provided with programming means (not shown) by which the actions of the sewing machine and guide rail are controlled. The support means for the guide rail, the programming means and other appurtenances with which the unit may be provided do not constitute a part of the present invention.

To describe the improvement of the present invention reference is made to FIG. 2. At the upper end of the head 4, the pressure bar 7 extends through a sleeve 18 provided at its upper end with an adjustment screw 19. Mounted on the uppermost end of the pressure bar 7 there is a block 20 supported by the adjustment screw 19. Pivotally affixed to the block 20 there is a lever 21.

Referring to FIG. 3, it will be noted that the lever 21 has bifurcations 21*a* and 21*b* which lie to either side of the block 20 and are pivotally affixed thereto by any appropriate means. For purposes of an exemplary showing, the lever 21 is shown pivoted to the block 20 by shoulder screws 22*a* and 22*b*.

FIG. 4 is a cross sectional view taken along the section line 4—4 of FIG. 3, and for a better understanding of the block 20, reference is made to both figures. The block 20 has a central perforation 23 through which the pressure bar 7 freely extends. The block is split as at 24 from the perforation 23 to the exterior of the block. Within the split portion 24 a dog 25 is pivotally affixed as at 26.

Just short of its uppermost end, the pressure bar 7 is tapered as at 7*a*, the tapered portion forming a shoulder 7*b* with the end of the pressure bar. The dog 25 is configured as shown in FIG. 4 to lie adjacent the tapered portion 7*a* of the pressure bar and engage the shoulder 7*b* thereof. Therefore, the dog determines the lowermost vertical position of the pressure bar and the cam block 8 that it carries. On the exterior of the block 20 there is an L-shaped arm 27. A compression spring 28 extends between the arm 27 and dog 25 with its ends located in perforations in those elements, respectively. The spring 28 serves to continually urge the dog 25 to its position shown in FIG. 4.

It will be evident from FIGS. 2 and 4 that at the end of the sewing operation when the support mechanism for the guide rail raises the guide rail to shift it to its starting position, the cam block 8 and pressure bar 7 will raise with it. As s clear from FIG. 4, the pressure bar 7 is free to rise upwardly in the perforation 23 of block 20, without disturbing the position of block 20, by virtue of the fact that the dog 25 will be cammed rearwardly out of the way and against the action of spring 28. When the guide rail is in its starting position and is lowered against the pieces of material next to be

sewn, the pressure bar 7 and the cam block 8 it supports will move downwardly with it until the pressure bar shoulder 7*b* is again engaged by the dog 25. Proper vertical positioning of the cam block 8 (see FIG. 2) can be adjusted by means (not shown) at the juncture of the pressure bar 7 and cam block 8 and further by the adjustment screw 19.

A first link element 29 is located between the free ends of the bifurcations 21*a* and 21*b* of the lever 21 and is pivotally affixed thereto by pivot means 30. The pivot means 30 may take any suitable form including a pivot pin, a bolt or the like. A second link element 31 is pivotally affixed as at 32 to the lower end of the first link element 29.

As is most clearly shown in FIGS. 2 and 6, a bracket means 33 is affixed to the head 4 of the sewing machine by any suitable means such as machine screws 34*a* and 34*b*. A portion 33*a* of the bracket 33 is bent upwardly to a substantially horizontal position. The bracket portion 33*a* has a perforation therein so sized as to receive the threaded upper end of a cylinder 34 which is held thereto by a nut 35. The cylinder 34 may be either an air or hydraulic cylinder, but in the preferred embodiment it is an air cylinder connected to a source of compressed air by a line 36 through appropriate valve means (not shown). The cylinder 34 has a piston (not shown) with a piston rod 37. At its upper end, the piston rod 37 has a central, longitudinal bore into which the second link element 31 extends with a sliding fit.

Referring to FIGS. 1 and 2, the non-bifurcated end of lever 21 has a fitting 38 rotatively affixed thereto. The fitting 38 has a downwardly depending extension 38*a* to which a bifurcated member 39 is pivotally affixed as at 40. The member 39 has a downwardly depending, hollow, split shank 39*a* provided with a clamping screw 39*b*. The uppermost end of a downwardly depending push rod 41 is clamped within the hollow shank 39*a*.

At the bottommost end of push rod 41 there is mounted a foot 42 by means of a ball joint 43 or other appropriate universal joint. The foot 42 is most clearly shown in FIG. 7. The foot 42 has a flat body portion 42*a* the forwardmost edge of which is slanted to meet one of its longitudinal sides in a point 42*b*. To the rear of the body portion 42*a* there is an elongated extension having a first portion 42*c* coplanar with the body portion 42*a*, a second upwardly and rearwardly sloping portion 42*d* and a third portion 42*e* lying in a plane parallel to and above the plane of the body portion 42*a*.

As is most clearly shown in FIGS. 1 and 2, the rearwardmost portion 42*e* extends through a loop-like guide 43. The purpose of the guide 43 is to stabilize the foot and prevent its forward end from being dragged into the needle 6*a* during the sewing operation. The guide 43 has a base portion 43*a* which is preferably adjustably affixed to the table 5. While any suitable means may be used, in an exemplary embodiment the base portion 43*a* may have a longitudinal slot therein and may be held to the table by a knurled shoulder screw 44 or the like. Such an arrangement would permit the guide 43 to shift toward and away from the screw 44 and to be rotated thereabout. The reason for the preferred adjustability of the guide 43 will be apparent hereinafter.

Turning again to FIG. 1, in accordance with the present invention the cam block 8 will also carry by appropriate mounting means a lifting wheel 45. The lifting wheel 45 is intended to roll along the underside of flange 15 of the guide rail. The purpose of the lifting wheel 45 will shortly be made apparent.

With respect to the structure thus far described, it will be evident from FIGS. 1 and 2 that if the cylinder 34 is actuated and its piston rod 37 is caused to move upwardly, this upward motion will be imparted to the free ends of the bifurcations 21*a* and 21*b* of lever 21 by the links 29 and 31. The lever 21, in turn, will pivot about shoulder screws 22*a* and 22*b* in block 20 causing the push rod 41 and foot 42 to move downwardly. In FIGS. 1, 2 and 6, the foot 42 is illustrated in its raised position. When moved downwardly by cylinder 34, however, the foot will come to rest upon the material or fabric layers 11 and 12.

Once the foot 42 has been brought firmly down upon the material layers 11 and 12, further upward movement of the piston rod 37 of cylinder 34 will cause further pivoting of lever 21. However, the fulcrum point will shift from the shoulder screws 22*a* and 22*b* to the pivot point 40 at the upper end of the push rod. As a consequence, this further pivoting of the lever 21 about pivot point 40 will cause an upward movement of block 20. Since the uppermost end of the pressure bar 7 is engaged by the dog 25, upward movement of block 20 will cause similar upward movement of the pressure bar 7 and the cam block 8 affixed thereto. At the same time, the lifting wheel 45 mounted on the cam block 8 will cause the guide rail 9 to move upwardly with the cam block 8 and out of engagement with the material layers 11 and 12. With the foot 42 in engagement with the material layers 11 and 12 and the guide rail raised upwardly therefrom, the foot is now free to shift the material transversely of the sewing direction (i.e. toward the operator) enabling the needle 6*a* to make the sew-off stitches.

The means to move foot 42 (so as to shift the material layers 11 and 12 transversely of the sewing direction and accomplish the sew-off step) are most clearly shown in FIGS. 1 and 6. A cylinder 46 is affixed at its rearward end to the sewing machine post 2 by a ball joint 47 or any other suitable universal joint. When desired, the ball joint 47 may be adjustably mounted on the post 2, so that a positioning adjustment of the cylinder 46 may be made depending upon the desired angularity of the sew-off with respect to the sewing direction.

The cylinder 46 may be an air cylinder or a hydraulic cylinder. The cylinder has a piston (not shown) to which is attached a piston rod 48. In a preferred embodiment, the cylinder is air actuated, air (from an appropriate source and through an appropriate control valve) entering behind the piston at the rearward end of the cylinder. The forward end of the cylinder, however, contains hydraulic fluid which, when the cylinder is actuated, is caused to bleed in a controlled manner into a reservoir 49. Such cylinders are well known in the art and they offer the advantage of a particularly smooth and uniform movement of the cylinder piston rod. This, in turn, will assure the formation of uniform and appropriately spaced sew-off stitches.

A bracket 50 is affixed to the rearward surface of the sewing machine head 4. The bracket has a downwardly depending portion supporting a pair of pillow blocks 51 and 52. A shaft 53 is slidably mounted in pillow blocks 51 and 52. At its rearward end, the shaft 53 has a hollow fitting 54 into which the free end of piston rod 48

extends. As is most clearly shown in FIG. 6, a spring 55 is affixed at one end to the fitting 54 and at the other end to the sewing machine post 2 as at 56. The spring 55 assures that the free end of piston rod 48 remain seated in the hollow fitting 54. It will be understood that any other suitable type of universal joint may be used between the rearward end of shaft 53 and the forward end of piston rod 48.

The forward end of shaft 53 is affixed by brazing or the like to a block 57 through which the push rod 41 slidably extends. Reference is made to FIG. 5 wherein the block 57 is most clearly shown. The block has a transverse perforation 58 in which a rod 59 is mounted. The rod 59 is freely rotatable in the transverse perforation 58. The rod 59, itself, has a transverse perforation 60 through which the push rod 41 slidably extends. Finally, the block 57 has a pair of vertically oriented holes 61 and 62 which intersect the transverse hole 68 and which flare outwardly toward the exterior surfaces of the block 57. The push rod also extends through holes 61 and 62. It will be evident from FIGS. 1 and 5 that the block assembly 57 constitutes a universal connection between the push rod 41 and the shaft 53. The push rod is capable not only of vertical movement with respect to the shaft, but also a swinging movement and a rotational movement with respect to the shaft.

Thus, once the foot has been lowered upon the material layers 11 and 12 and the guide rail has been raised out of contact with the material layers, actuation of the cylinder 46 will result in a forward movement of the foot 42 and the material layers 11 and 12 engaged thereby in a direction transversely of the sewing direction, permitting the reciprocating needle structure 6 and needle 6*a* to form the desired sew-off stitches.

As is most clearly shown in FIGS. 1 and 6, a spring 63 is affixed at one end to the fitting 54 and at the other end to the portion 42*c* of foot 42. The purpose of spring 63 is to cause foot 42 to assume the sloping position illustrated in FIGS. 1 and 6 when in its raised position. As a result, when the foot is lowered upon the material layers 11 and 12, the material layers will first be engaged by the forwardmost portion 42*b* of the foot. As the foot is fully seated, it will assume a substantially horizontal position, coming into full engagement with the material layers.

If the sew-off structure of the present invention is intended to always produce sew-off stitches at a right angle to the sewing direction, the bracket 50 may be permanently mounted to the head 4, the universal joint 47 may be permanently mounted to the sewing machine post 2 and the guide 43 may be permanently mounted to the table 5. If, on the other hand, it is desired that the sew-off stitches be formed at an angle to the sewing direction greater or lesser than 90°, additional adjustments may be made. To this end, the attachment of bracket 50 to the head 4 may be an adjustable one so that the bracket 50, and hence the shaft 53, may be set at the desired angularity with respect to the sewing direction. When this angularity is extreme, it may further be desired to shift the ball joint 47 on post 2. When the desired angle of sew-off is established by adjustment of bracket 50, an appropriate adjustment of guide 43 may be made to assure proper orientation of the foot 42.

The operation of the sew-off structure of the present invention may be described as follows. When the end of the desired seam being sewn is reached, the programming means of the sewing unit will actuate both cylinders 34 and 46 simultaneously. Since cylinder 46 is an air-hydraulic cylinder, the movement of its piston rod 48 will lag slightly the movement of piston rod 37 of cylinder 34. While the entire sew-off procedure is very rapid, the steps occur in the following sequence. As indicated above, upward movement of piston rod 37 of cylinder 34 will, through links 29 and 31, pivot lever 21 about shoulder screws 22*a* and 22*b* in block 20. This, in turn, will result in the downward movement of push rod 41 and foot 42 until the foot is fully seated on material layers 11 and 12. Further upward movement of the piston rod 37 of cylinder 34 will further pivot lever 21, but now about pivot point 40 as the fulcrum. This will result in an upward movement of block 20, pressure bar 7 and cam block 8. By virtue of lifting wheel 45, the guide rail 9 will move upwardly with the cam block 8 releasing the material layers 11 and 12.

The material layers 11 and 12 now being engaged only by foot 42, forward movement of the foot (transversely of the sewing direction) will enable the reciprocating needle assembly 6 and needle 6*a* to form the desired sew-off stitches in the material layers. By the adjustments noted above, the sew-off stitches may be formed at any desired angularity to the sewing direction.

Sewing units of the type described are generally provided with electric eye or other sensing means which stop the sewing operation once the material layers 11 and 12 have been shifted out from under the needle 6*a*. The programming means of the unit will then deactivate cylinders 34 and 46 returning the foot to its raised and retracted position and the guide rail 9 will be returned to its starting position.

Turning to FIGS. 2 and 6, it will be noted that a spring 64 is provided, affixed at one end to the pivot point 30 of the lever 21 and at the other end to the bracket 33. The purpose of spring 64 is to assure that upon deactivation of cylinder 34 by the programming means, the bifurcated end of lever 21 and the link elements 29 and 31 will return properly to their starting position. As is further shown in FIGS. 1 through 3, a pair of springs 65 and 66 are provided on either side of lever 21 adjacent the block 20. The springs 65 and 66 are affixed at their lower ends to the machine head 4 and at their upper ends to the lever bifurcations 21*b* and 21*a*, respectively. The purpose of springs 65 and 66 is to assure that upon deactivation of cylinder 34 the block 20 will properly return to its initial seated position against adjustment screw 19.

Modifications may be made in the invention without departing from the spirit of it. For example, other prime moving means may be substituted for cylinders 34 and 46 such as solenoids or the like. Furthermore, the sew-off means of the present invention may be applied to sewing units having types of guide means other than guide rail 9.

When it is desired that the machine be capable of forming sew-off stitches at an angle to the sewing direction greater or lesser than 90°, it would be possible to make pillow blocks 51 and 52 adjustable with respect to the bracket 50, rather than making the bracket 50 adjustable and shiftable with respect to the machine head 4. This is illustrated in FIGS. 8 and 9.

FIG. 8 is a fragmentary elevational view similar to FIG. 1. FIG. 9 is a cross sectional view taken along the section line 9—9 of FIG. 8. In these Figures, push rod

41, foot 42, shaft 53 and block 57 are shown. The bracket 50 is also illustrated. In this instance, however, the bracket is slightly shorter and has affixed to its lowermost end a horizontal azimuth plate 67. The plate 67 has therein an arcuate slot 68.

Pillow blocks 51 and 52 are mounted on a support 69. The support 69, in turn, is provided with a threaded perforation 70. The perforation 70 is adapted to receive the threaded shank of a set screw or adjustment screw 71. The shank of the adjustment screw 71 passes through the arcuate slot 68 and the enlarged head of the adjustment screw rests upon the upper surface of the azimuth plate 67. The bottommost end bracket 50 has a notch 72 therein to permit passage of adjustment screw 71 therethrough.

From FIGS. 8 and 9 it will be evident that a loosening of adjustment screw 71 will permit a shifting of the support means 69 anywhere along the arcuate slot 68. This, in turn, will permit the foot to assume the proper angularity with respect to the sewing direction so that forward axial movement of the foot will be in the desired sew-off direction. When the sew-off angularity is great, the mounting means 47 of piston 46 (see FIG. 1) may also have to be made adjustable, as mentioned above. It is also within the scope of the invention to provide indicia (not shown) on the upper surface of the azimuth plate 67 to assist in the rapid and efficient setting of the foot angularity.

The embodiments of the invention in which an exclusive property or privilege is claimed are defined as follows:

1. In an automatic sewing unit of the type comprising an elongated table, a sewing machine mounted on said table and having a post, an arm and a head with a reciprocating needle assembly and a guide means in contact with the material being sewn for advancing the material in a sewing direction along said table and guiding said material with respect to said reciprocating needle assembly to produce a seam of predetermined straight or curved contour, a sew-off means comprising a foot, means to bring said foot into engagement with said material, means to remove said guide means from contact with said material and means to shift said foot and said material transversely of said sewing direction at a predetermined angularity thereto whereby to produce the desired sew-off stitches in said material at the end of said seam.

2. The structure claimed in claim 1 including a lever pivotally mounted at the top of said sewing machine head and extending substantially transversely thereof, a fluid actuated cylinder mounted substantially vertically on one side of said sewing machine head, said head cylinder having a substantially vertically oriented piston rod, link means connecting said piston rod to one end of said lever, a push rod being pivotally and swingably mounted at its upper end to the other end of said lever, said push rod depending downwardly along the side of said head opposite said side to which said head cylinder is mounted, said foot being connected to the lower end of said push rod by a universal joint, said lever being pivotable by said head cylinder about said pivotal mounting at the top of said head between a first position wherein said foot is located adjacent said needle of said needle assembly and spaced upwardly from said material and a second position wherein said foot is located adjacent said needle of said needle assembly and in contact with said material.

3. The structure claimed in claim 1 wherein said means to shift said foot and said material transversely of said sewing direction comprises a fluid actuated cylinder affixed at its rearward end to said sewing machine post and having a piston and piston rod, means operatively connecting said piston rod to said foot.

4. The structure claimed in claim 1 including adjustment means for determining the angularity of said sewing direction of said shifting of said foot.

5. The structure claimed in claim 1 including a guide for said foot to maintain the proper orientation thereof with respect to said sew-off angularity to said sewing direction and to prevent said foot from being dragged into said needle.

6. The structure claimed in claim 2 wherein said head cylinder is an air actuated cylinder and means to introduce air into said head cylinder at the end of said seam.

7. The structure claimed in claim 2 including means operatively connecting said lever to said guide means, said lever being further pivotable by said cylinder after said foot is in contact with said material about said upper end of said push rod to a third position wherein said guide means is raised out of contact with said material.

8. The structure claimed in claim 2 wherein said guide means comprises an elongated guide rail and said sewing machine is of the type having a cam block operatively engaged with said guide rail and mounted on a pressure bar passing upwardly through said sewing machine head and extending thereabove, said lever being pivotally attached to a block at the top of said sewing machine head, said block having a vertical perforation therethrough, the upper end of said pressure bar extending into said perforation and being slidable therein, said upper end of said pressure bar being notched, said block having a dog pivotally affixed thereto, said dog being pivotable between a position in engagement with said notch in said pressure bar to determine the lowermost position of said pressure bar and a position out of engagement with said notch to permit the free vertical upward movement of said pressure bar with respect to said block, said lever pivoting about said attachment to said block when pivoted from said first position to said second position, said lever being further pivotable by said head piston after said foot is in contact with said material about said upper end of said push rod to a third position wherein said block, said pressure bar engaged by said dog, said cam block and said guide rail engaged by said cam block are raised upwardly removing said guide means from contact with said material.

9. The structure claimed in claim 3 wherein cylinder affixed to said post is an air actuated cylinder, said post cylinder containing hydraulic fluid ahead of said piston and a reservoir therefor for uniform movement of said piston rod upon actuation of said post cylinder, and means to introduce air into said post cylinder at the end of said seam.

10. The structure in claim 7 wherein said means to shift said foot and said material transversely of said sewing direction comprises a fluid actuated cylinder affixed at its rear end to said sewing machine post and having a piston and piston rod, said post cylinder piston rod being operatively connected to said push rod.

11. The structure claimed in claim 8 wherein said means to shift said foot and said material transversely of said sewing direction comprises a fluid actuated cylinder affixed at its rear end to said sewing machine post

and having a piston and piston rod, said post cylinder piston rod being operatively connected to said push rod.

12. The structure claimed in claim **10** including adjustment means for determining the angularity to said sewing direction of said shifting of said foot.

13. The structure claimed in claim **10** including bracket means affixed to said head, a shaft supported by means on said bracket and axially shiftable within said means, one end of said shaft operatively connected to said piston rod of said post cylinder, the other end of said shaft operatively connected to said push rod.

14. The structure claimed in claim **13** wherein said bracket is adjustably mounted on said head, said bracket and said shaft thereon being locatable at the angularity to said sewing direction desired for said sew-off stitches whereby to shift said foot and to form said sew-off stitches at said desired angularity.

15. The structure claimed in claim **14** including a guide for said foot to maintain the proper orientation thereof with respect to said sew-off angularity to said sewing direction and to prevent said foot from being dragged into said needle.

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