DEVICE FOR USE IN SEWING APPARATUS

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References Cited
UNITED STATES PATENTS
3,696,765 10/1972 Bernewasser 112/130
3,747,545 7/1973 Nicolay et al. 112/68
3,763,800 10/1973 Rockerath 112/130

ABSTRACT

A cutter device for use in a sewing apparatus, especially for the formation of angle incisions at the ends of a pocket slit flanked by a pair of parallel stitch seams comprises a pair of blades forming the angle between them and means for adjusting both the angle and the depth of penetration of the blades into the workpiece and reinforcing strip to control the lengths of the legs of the angle incision and their orientations with respect to the pocket incision.

10 Claims, 9 Drawing Figures
DEVICE FOR USE IN SEWING APPARATUS

CROSS-REFERENCE TO RELATED APPLICATION

The present application is related to the commonly assigned concurrently filed copending application Ser. No. 386,496 and entitled SEWING APPARATUS FOR THE FORMATION OF EDGE-PIPING OPENINGS.

FIELD OF THE INVENTION

The present invention relates to cutter devices for the production of angle incisions at the end of a pocket slit or incision formed between a pair of parallel stitch seams.

BACKGROUND OF THE INVENTION

In the application Ser. No. 244,781 filed 17 Apr. 1972 by myself and another (U.S. Pat. No. 3,747,545), there is described a system for the formation of angle slits at the ends of a pocket slit for a garment.

In general, it has been a common practice to provide a pocket slit for a garment, especially an outer garment, which is flanked by two rows of parallel stitches which secure a binder, reinforcing or piping strip or flap to the workpiece so that the pocket slit is formed through both the binder strip and the workpiece.

An apparatus for this purpose, as described in the aforementioned patent, may comprise a work table upon which a double-needle sewing machine is disposed, and a transport device for entraining the workpiece and the pocket strip past the sewing station at which a pair of needles spaced apart in a direction transverse to the fabric-feed direction, form two parallel rows of stitches in the fabric workpiece and the reinforcing strip. A main blade is provided along the table and cuts a pocket slit through the strip and the workpiece between the stitch seam so that the pocket slit is effectively flanked by two parallel rows of stitching. As described in the aforementioned patent it has been found to be advantageous to provide between the end of the pocket slit and each end of the stitch seams a respective incision so that the incisions running from each end of the slit to the proximal ends of the stitch seams form an angle whose vertex lies at the end of the slit.

The aforementioned patent also discloses a system in which slant or slash pockets may be produced as distinct from straight pockets in which the two stitch seams lie along sides of a rectangle.

In a slant pocket arrangement, the two stitch seams have their starting and ending portion offset from one another so that the seams lie along the sides of a parallelogram having obtuse and acute angles. When a straight pocket or rectangular-seam pattern is provided, the angle incisions are identical but oppositely oriented and have legs of equal length, the angle between them generally being about 90°. However, when the two seams are offset from one another, i.e., have starting and ending termini which are shifted one relative to the other, the angle incision may consist of legs of unequal length which define angles between them which define angles between which differ from 90° and include angles with the main slit which are usually unequal.

For this purpose, the above described earlier system provided each of the angle cutters so that it consisted of two individually swingable blade members designed to adjust the length of cut for each leg of a particular angle incision in accordance with the angle of the main slit and the offset of the two stitch seams. However, with this arrangement the vertical stroke of the cutter had to vary with each adjustment of the length of the angle-incision leg and the pivotal adjustment of the individual blades defining each leg of the angle incision altered the angle of attack of the blade on the fabric and gave rise to problems with respect to clean cutting through the fabric.

OBJECTS OF THE INVENTION

It is the principal object of the present invention, therefore, to provide an angle-cutter device which represents an improvement over the earlier system described above and affords clean uniform cutting at adjustable angles and with adjustable incision lengths for the production of pocket slits in a highly versatile manner.

Still another object of the invention is to extend the principles of the system described in the aforementioned patent still further.

Another object of the invention is to provide a more versatile and reliable device for forming angle incisions at the end of a pocket slit whereby earlier disadvantages may be obviated.

Still another object of the invention is to provide an adjustable-angle, adjustable-orientation and adjustable-length cutter for producing angle incisions in the formation of a pocket slit.

SUMMARY OF THE INVENTION

These objects and others which will become apparent hereinafter are obtained, in accordance with the present invention, in an apparatus for forming pocket slits generally in accordance with the principles set forth in the aforementioned copending application and above-cited patent, wherein the V-shaped incisions or angle incisions at each end of the pocket slit are formed by adjustable blade members such that both the individual lengths of the legs of the angle incision and the angle included between them or between the legs and the pocket slit is adjustable in a convenient manner. According to the present invention, the angle-cutter arrangement comprises a wedge-shaped vertically displaceable barb having a pair of upright cutting blades shiftable thereon and including an angle between them. The blades, preferably of a dagger configuration, are swingable in opposite senses about a common vertical axis with respect to a mean position and by abutment means are raised through equal distances during the incision-forming operation although they may be positioned vertically at different levels to adjust the lengths of the angle incision. With variation in the angle and relative lengths of the legs of the angle incision, the angle of attack of each blade upon the fabric does not change and clean cuts can be made even with non-uniform leg lengths.

DESCRIPTION OF THE DRAWING

The above and other objects, features and advantages of the present invention will become readily apparent from the following description, reference being made to the accompanying drawing in which:

FIG. 1 is a simplified side-elevational view of an apparatus for the formation of pocket slits in a fabric pro-
vided with a binding, piping or slit-reinforcing strip, parts being broken away or foreshortened and other parts of less significance to the invention being omitted;

FIG. 2 is a front-elevational view of an angle-incision device according to the invention;
FIG. 3 is a side-elevational view of the latter device, partly in vertical section;
FIG. 4 is a plan view of the device showing the blades in their mean positions for equal-length legs of an angle incision;
FIG. 5 is a view similar to FIG. 4 but showing the arrangement of the blades for an inclined pocket;
FIG. 6 is a section taken along the line VI — VI of FIG. 2 but with the blades in the position shown in FIG. 1;
FIG. 7 is a detail front-elevational view of a portion of the cutter device showing the abutment for adjustment of the individual blades according to FIG. 6;
FIG. 8 is a projection of the cutting stroke of the blades for a straight pocket; and
FIG. 9 is a projection of the cutting stroke of the blades for an inclined pocket.

SPECIFIC DESCRIPTION

In FIG. 1 I have shown an apparatus for the production of pocket slits in a fabric workpiece adapted to be made into an outer garment and adapted to have a pocket reinforcing strip W (dot-dash lines in FIG. 1) stitched to the workpiece (not shown) so that a pocket slit S can be formed between the two rows of stitching and can terminate in angle incision A as diagrammatically illustrated in FIG. 1. The apparatus of FIG. 1 is shown in greater detail in the aforementioned copending application.

Basically, the apparatus comprises a frame or support 1 having a sewing table or worktable 2 upon which a two-needle sewing machine 3 is mounted in the usual manner. The sewing machine 3 is provided with a pair of needles 4, only one of which can be seen in FIG. 1 since the other lies behind it. Downstream of the needles 4 and disposed between them, there is a vertically displaceable main cutter 5 adapted to form the incision constituting the slit S between the two rows of stitches formed by needles 4 so that each of the angle incisions A can include a respective leg A₁ or A₂ leading from the respective terminus of the pocket slit 4 to the proximal end of one of the stitch seams.

The apparatus comprises a clamp 6 in which the reinforcing strip W may be received in juxtaposition with a workpiece (not shown) lying on the worktable 2 and adapted to be drawn from the position N of the clamp in FIG. 1 to the stitching position wherein the needles 4 engage the strip W and the workpiece to provide two parallel rows of stitches therein. When the needles begin to stitch the seams simultaneously, the two stitch seams lie along the long sides of a rectangle and the pocket slit between these seams terminates in angle incisions A whose legs A₁ and A₂ are of equal length. The result is the so-called straight pocket mentioned previously. On the other hand, when the apparatus is provided with programming means for the individual needles, etc., as described in the cited patent, one needle begins to stitch its seam and terminates the latter before the other needle so that the termini of the two stitch seams are offset one from the other in the sewing direction. In this case, the angle incisions between the pocket slit may have unequal lengths running to the respective stitch seam and the result is a slash or slant pocket.

The clamp 6 is connected by a pair of tie rods 7 to a slide carriage 8 horizontally shifted on the frame 1 on a pair of rails one of which can be seen at 8a while the other is disposed directly behind it perpendicular to the plane of the paper in FIG. 1. In addition, the carriage 8 is guided upon a cylindrical rail 8b which is formed with a longitudinal groove in which a rectangular drag rail 8c is slideable. At its left-hand end, the drag rail 8a is coupled to the slider carriage 8 which is horizontally displaceable by a threaded spindle 9 driven at 9a by a variable-speed reversible drive. Thus the clamp 6, the workpiece and the strip W may be advanced rapidly (to the left) to the stitching location and passed slowly through the latter until the pocket slit is disposed to the left of the stitching location at which the angle cutter arrangement Z is provided.

Each of the angle-cutter devices or elements, described below in connection with FIGS. 2 through 9, is provided with a support structure 10a or 10b guided upon a rail arrangement 10 extending parallel to the rails 8a — 8c. The structure 10a and 10b have abutments 10c and 10d lying in different vertical planes and are drawn to the right by tension springs, not shown, but described in the aforementioned copending application.

In addition, the drag rail 8c carries a pair of entrainers 8d and 8e which may be temporarily locked in their extreme right-hand position by leaf-spring detents as described in the cited pending application. The entrainers 8d and 8e are formed with coupling devices adapted to lock the entrainer to the drag rail 8c upon detection of the leading and trailing edges of the strip W by a photocell arrangement F. Consequently, when the leading edge of the strip W is detected by the photocell F, the entrainer 8d is locked to the drag rail 8c and the latter draws the entrainer into engagement with the first abutment 10c so that the structure 10a and its cutter assembly is positively located with respect to the leading edge of the strip W. When the trailing edge of the latter sweeps past the photocell F, the other entrainer 8e is effective and is locked to the drag rail so that it can engage the structure 10b and positively position the upstream cutter with respect to the strip. Thus, the two angle cutters may be positioned for accurate operation independently of fluctuations in the length of the strip W.

When the two structures 10a and 10b are in position, the cutter assemblies Z are displaced upwardly to pierce the fabric and the strip and are thereafter lowered.

The clamp is now released and the workpiece formed with the completed pocket slit is removed, the spindle 9 is reversed to drive the carriage 8 at high speed to the right and a spring-loaded pressure rod 8f urges the entrainers 8d and 8e to the right into the rest positions as shown in FIG. 1. With the release of the structures 10a and 10b by the entrainers, the springs of the latter draw the members 10a and 10b into their extreme right-hand positions.

As can be seen from FIGS. 2 — 9 the angle-cutter assemblies comprise slide blocks 11 (equivalent to the structures 10a and 10b of FIG. 1) which are horizontally shiftable on the rails 10 on the support frame 1.
The rails 10 pass through horizontal bores 12 of the slide blocks 11. An upper guide sleeve 14 is rotatably received in a vertical bore of the block 11 (FIG. 3) and is rigidly connected by three vertical tubes 16, 17 and 18 with a lower guide sleeve 15, likewise journaled in the slide block 11 for rotation upon a common vertical axis with the sleeve 14.

Screws 19 secure a plate 20, generally of the shape of an alligator head (FIG. 4), to the upper surface of sleeve 14. The latter is held against axial displacement upwardly by an annular shoulder 13 (FIG. 3) seated in a complementary recess 13a of the block 11. Vertical movement of the sleeve 14 downwardly is prevented by the portions 20’ of the plate 20 which overhang and rest upon the upper surface 11’ of the block 11.

In registering vertical bores 14a of the two guide sleeves 14 and 15, there are received vertically shiftable rods 21, 22 and 23. The rod 21 is provided at its lower end with a piston 24 of a pneumatic cylinder which has been partly broken away in FIG. 3 and is mounted on the underside of the lower guide sleeve 15. The upper end of rod 21 carries an upwardly extending guide barb 26 of V-section in a horizontal plane there-through.

At their upper ends, the two other rods 22 and 23 are provided with upwardly pointing upright dagger-shaped cutting blades 27 and 28 (see especially FIGS. 2 and 3), respectively. The cutting edges of these blades diverge downwardly from their respective points and the blades include an angle with one another within the V-slot 26a of the barb 26.

A piston 29 is affixed to the rod 21 in the region of the lower sleeve 15 (FIGS. 3 and 6) and is provided on opposite sides with eyes 30 and 31 which receive respective pins 30’ and 31’ (FIG. 6). One end of each of the two pins 30’ and 31’ serves as an anchorage for a respective tension spring 32, 32’ of a pair of such springs whose lower ends are hooked into bores of a holder plate 33 (FIG. 2) fixed to the pneumatic cylinder 25. This pair of springs serves as restoring means for returning the piston 24 after it has shifted the rod 21 upwardly upon depression of the cylinder 25.

Each of a further pair of tension springs 34, 35 (FIGS. 2, 3 and 7) is anchored to its upper end to one of the pins 30’, 31’, respectively, and at its lower end to the respective eye 22’ and 23’ of the rods 22 and 23.

When the pneumatic cylinder 25 is pressurized with a fluid medium, therefore, the piston 24 shifts the rod 21 with its guide barb 26 upwardly and the tension springs 34 and 35 draw the two rods 22 and 23 upwardly together with their blades 27 and 28 through a distance determined by individually settable abutment means as is described in greater detail below.

On the front of the slide block 11, in appropriate shaped grooves 11a and 11b, there are mounted two mirror-symmetrically oriented abutment plates 38 and 39 (FIGS. 2, 6 and 7) by screws 36 and 37 traversing slots 36a and 37a which enable vertical adjustment of the plates.

The abutment plates 38 and 39 are formed at their lower ends with abutments a - g and a’ - g’ formed as successively off-set steps which cooperate with abutment elements 40 and 41 to limit the upward movements of the rods 22 and 23 (and their respective blades 27 and 28), independently.

The abutment elements 40 and 41 (FIG. 6) are bipartite, bifurcated bars which are clamped to the rods 22 and 23 by screws 42, 42’ and 42’. These abutment elements straddle the tubes 17 and 18 of the guide sleeves 14 and 15 as is best seen from FIG. 6. This prevents any rotation of the abutment bars 40 and 41 on the rods 22 and 23 since even a slight rotation will modify the relative positions of the elements 40 and 41 and cause engagement of the incorrect abutment and hence an improper vertical positioning of the blades.

Between the two abutment plates 38 and 39, the block 11 is provided with a support bar 43 attached by screws 44 (FIG. 2), the lower end of the bar being provided with a yoke 45. This yoke carries two adjusting screws 46 and 47 whose free ends are threaded into sleeves 48 and 49 which are secured to the two abutment plates by means of screws 50. At their heads below the yoke 45, the adjustment screws 46 and 47 are provided with adjustment knobs 46’ and 47’ to enable the individual adjustments of the heights of the blades 27 and 28 when the latter are raised.

In the normal position of the structure (FIG. 4), namely the position in which the two legs of the angle Z to be cut in the fabric (FIG. 8) are equal and the pocket slit is to lie along an extension of the angle bisector (FIG. 8), the blades 27 and 28 and the adjustment plate 20 lie in the positions shown in FIG. 4. In this position, also described as the mean position, a pin 51 (detent) is engaged in a notch 52 of the plate 20 to center the latter (FIG. 4). The rods 21, 22 and 23 are disposed symmetrically with respect to the vertical median plane M and the blades define an angle α between them with each individual blade defining an angle α/2 with this median plane and the main pocket slit.

The pin 51 is connected to the piston of a pneumatic cylinder 51’ which is pressurized when straight pockets are to be formed to lock the plate 20 as described. The projections of the cutting stroke of blades 27 and 28 correspond to the showing in FIG. 8. Both blades are vertically displaced through equal cutting strokes h and h’ since the respective abutment bars 40 and 41 of the rods 22 and 23 engage, upon upward movement, corresponding abutments (d and d’) of the plates 38 and 39.

In FIGS. 5 – 7 and 9, I have shown the adjustment of the blades for the formation of a V-shaped incision Z’ in which the legs are of unequal length (FIG. 9) as is the case for an inclined or slant pocket (a 24º pocket in the embodiment illustrated).

The pin 41 is drawn downwardly to clear the plate 20 and allow the latter to swing about the vertical axis of the sleeves 14 and 15 so that the latter may rotate collectively in the clockwise sense through an angle β under the action of a spring 53 as applied to the piston 54 when the latter is depressurized (see FIG. 5). The piston of this cylinder is pivotally connected to a lobe of plate 20 at 20’.

The pivotal movement of the assembly is limited by a pin 55 fixed in the block 11 and received in a bore 56 of the plate 20 so as to engage a wall thereof. The angle α included between the two blades 27 and 28 is, in this position, subdivided with respect to the median plane M into two unequal angles α/2 – and α/2+. The abutments 40 and 41 are likewise swung through the angle β with the guide sleeves 14 and 15 so that the bar 40 of rod 22 engages a lower abutment step a while the bar 41 of the other rod 23 engages the higher abutment
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7 step g. The rods 22 and 23 move upwardly with a differential displacement represented by the distance from abutment step a to step g so that the blade 28 penetrate deeper into the fabric than the blade 27. The projection of the cutting strokes has been illustrated in FIG. 9 for this case. The more deeply penetrating blade of the angle cutter cuts the longer leg of the incision.

By pressurizing the pneumatic cylinder 54, the assembly may be pivoted through the angle β from its mean position also in the counterclockwise sense, thereby reversing the relative depths through which the blades 27 and 28 penetrate the fabric. This is important for the production of jacket pockets in which the angle incisions may be alternately turned to the right and left. For 16° and 8° pockets, respectively, further stops are provided in the form of pins 57 and 58 with associated bores 59 and 60 in the plate 20. The pins 57 and 58 may be drawn out of engagement by respective pneumatic cylinders 57' and 58'.

1 claim:

1. A cutting device for forming an angle incision at the end of a pocket slit between a pair of parallel stitch seams said device comprising a support pivotal about a vertical axis in opposite directions with respect to a vertical median plane; an upstanding guide barb mounted on said support; a pair of blades arranged at an angle with respect to each other having their vertex at said barb and said blades being guided thereby; means for vertically displacing each of said blades; and abutment means cooperating with said blades for limiting the vertical displacement thereof individually in dependence upon the angular position of said support.

2. A cutting device defined in claim 1 further comprising a block, said support being formed as a pair of vertically aligned sleeves rotatable on said support about said axis, said means for vertically displacing said blades including a fluid-pressurizable cylinder mounted on said support and provided with a piston, a first rod vertically shiftable on said support and carrying said barb operatively connected to said piston for vertical displacement thereof, respective further rods vertically displaceable on said support and tension springs operatively connecting said first rod with said further rods for vertical displacement of the latter upon displacement of said piston, said further rods respectively carrying said blades, said abutment means including respective bars on each of said further rods engageable with mirror symmetrically disposed abutment steps formed on said block.

3. The device defined in claim 2 wherein said abutment steps are formed on a pair of abutment plates, said device further comprising means for adjustably mounting said abutment plate on said block.

4. The device defined in claim 2 further comprising a horizontal plate fixed to said support and means for indexing said plate about said axis in a plurality of selected angular positions to opposite sides of said plate.

5. The device defined in claim 4 wherein said indexing means includes at least one fluid-responsive cylinder.

6. The device defined in claim 5 wherein said abutment means includes a pair of plates vertically shiftable on said block and formed with respective sets of said abutment steps, each of said further rods being formed with a bar selectively engageable with the steps of said plates, and individual adjustment means operatively connected to each of said plates for vertically displacing same.

7. The device defined in claim 6 wherein said indexing means includes a notch formed in said plate, a pin on said block engageable in said notch and retaining said plate in a median position wherein said plate bisects the angle between said blade, and a fluid-responsive cylinder on said block pressurizable for selective withdrawal of said pin from said notch and reinsertion of said pin in said notch.

8. The device defined in claim 7 wherein said indexing means includes a further pin on said block and a bore formed in said plate and receiving said pin with play to define angular displacement of said plate to opposite sides of said plate.

9. The device defined in claim 8 wherein said blades are of dagger configuration.

10. The device defined in claim 9 wherein said block is horizontally shiftable on a sewing machine assembly, said assembly being provided with a pair of such devices and means for individually positioning same at opposite ends of a pocket slit for simultaneously forming respective angle incisions therein.

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