

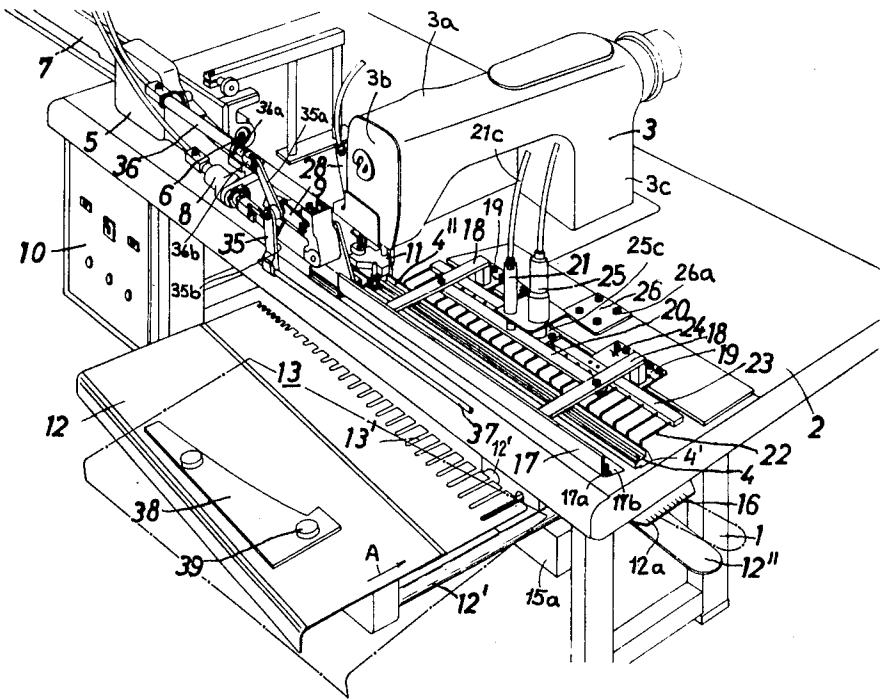
[72] Inventor: **Konrad Pollmeier**  
Bielefeld, Germany  
[21] Application No.: **762,500**  
[22] Filed: **Sept. 25, 1968**  
[45] Patented: **Aug. 4, 1970**  
[73] Assignee: **Durkoppwerke GH**  
Bielefeld, Germany  
**A Corp. of Germany**  
[32] Priority: **Sept. 26, 1967**  
[33] **Germany**  
[31] **No. 1660839**

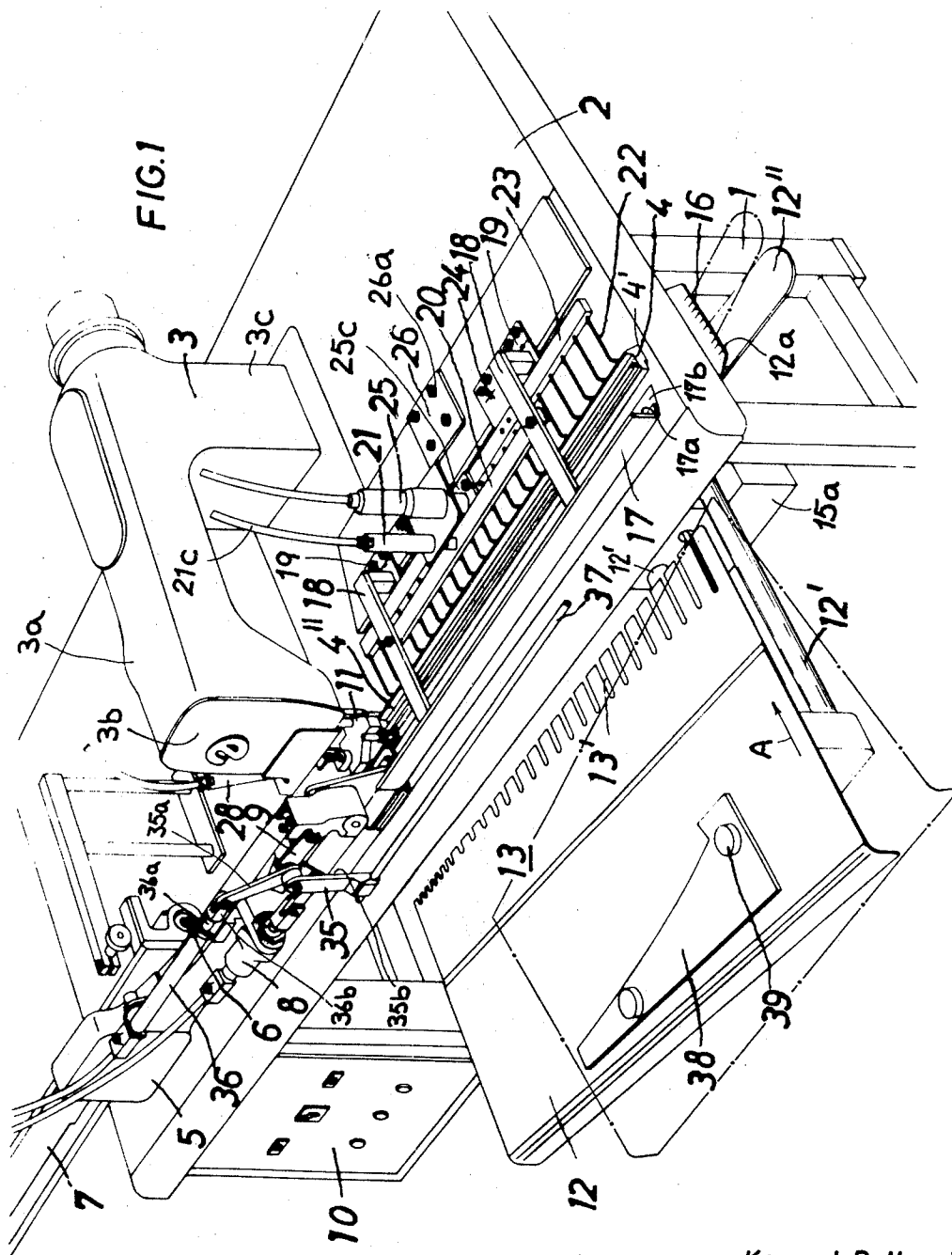
[54] **DART-STITCHING SEWING MACHINE**  
**ARRANGEMENT**  
**12 Claims, Drawing Figs.**

[52] U.S. Cl. .... **112/121.15**  
[51] Int. Cl. .... **D05b 21/00,**  
**D05c 9/10**  
[50] Field of Search ..... **112/121.14,**  
**121.15, 121.29, 121.12**

[56] **References Cited**  
**UNITED STATES PATENTS**  
3,082,715 3/1963 Lofgren ..... 112/121.15  
3,273,522 9/1966 Gore et al. .... 112/121.29  
3,405,670 10/1968 Scholl et al. .... 112/121.12  
*Primary Examiner—* Mervin Stein  
*Assistant Examiner—* George V. Larkin  
*Attorney—* Karl F. Ross

**ABSTRACT:** A system for sewing darts upon a sewing machine wherein a folding blade is inserted beneath a fabric-feed bar and a clamping rail and is angularly adjustable while being insertable to any desired degree, thereby allowing variation of the depth of the dart and the angle thereof. A needle bar behind the fabric-feed bar has an array of needles which transfix the inserted fabric and pass through slots in the folding blade to retain the fabric prior to operation of the feed bar and the clamping rail and after withdrawal of the plate. A stripper rod drives the fabric remaining upon the folding table downwardly into the gap between the folding blade and the sewing table to prepare the folding blade to receive another fabric layer.

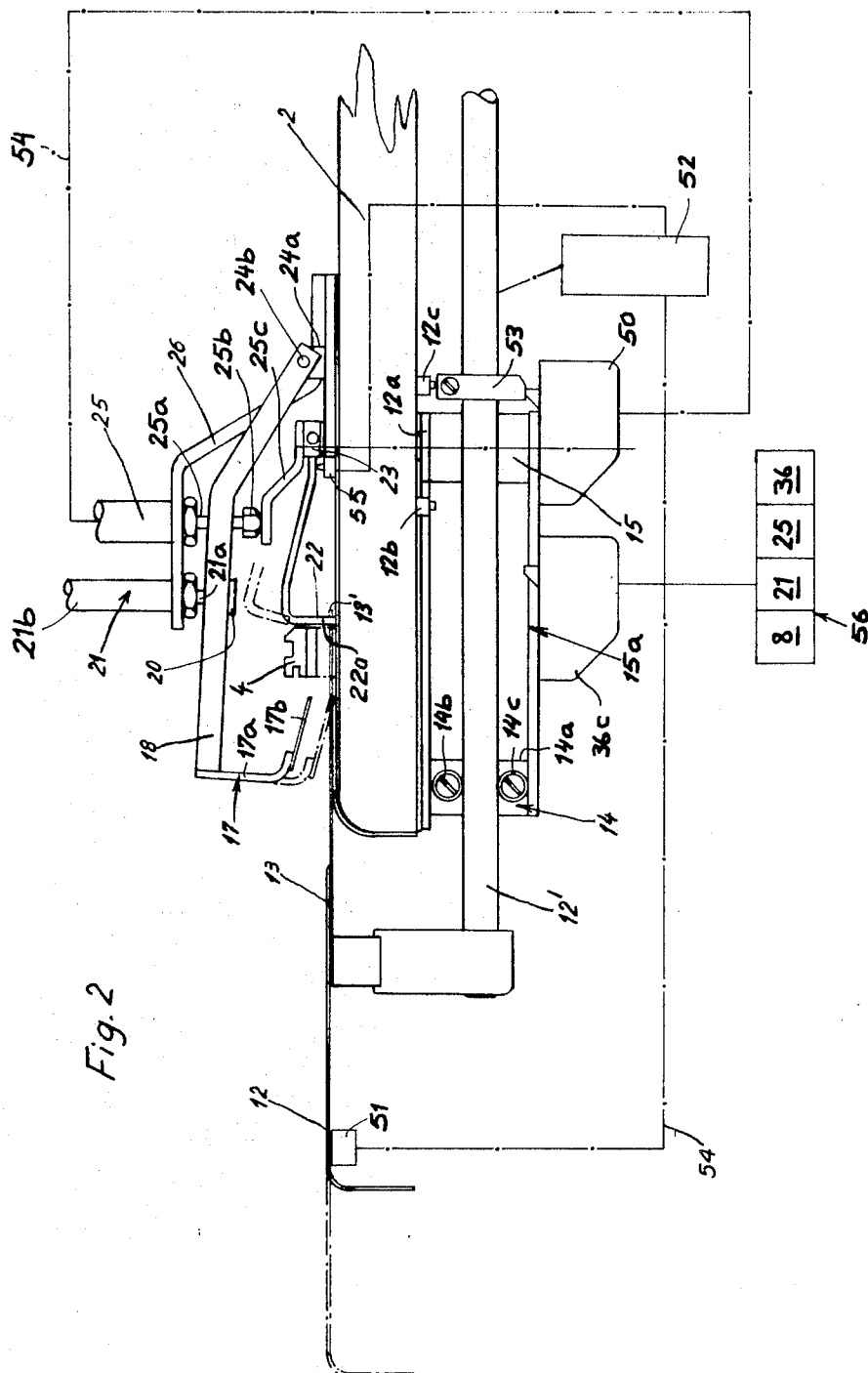




**Konrad Pollmeier**  
INVENTOR.

BY

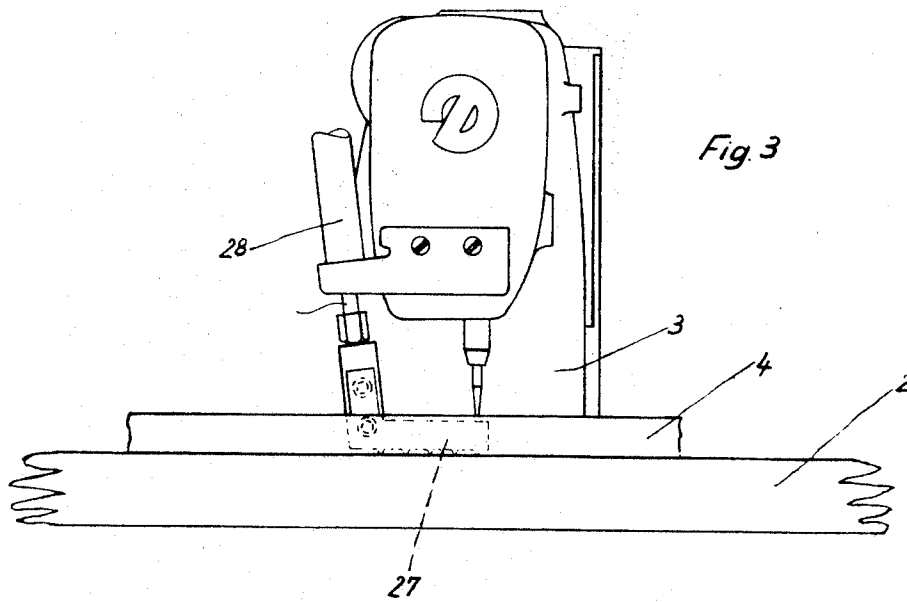
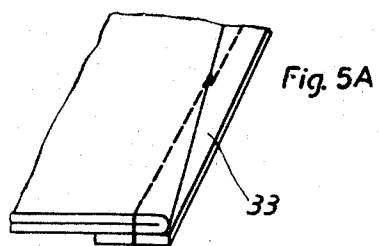
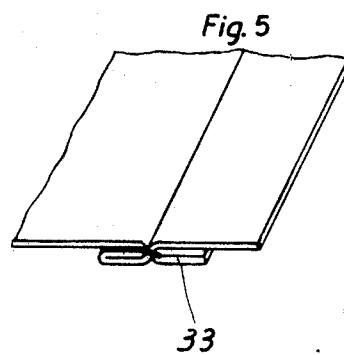
*Karl F. Ross*  
Attorney



**Konrad Pollmeier**  
**INVENTOR.**

**BY**

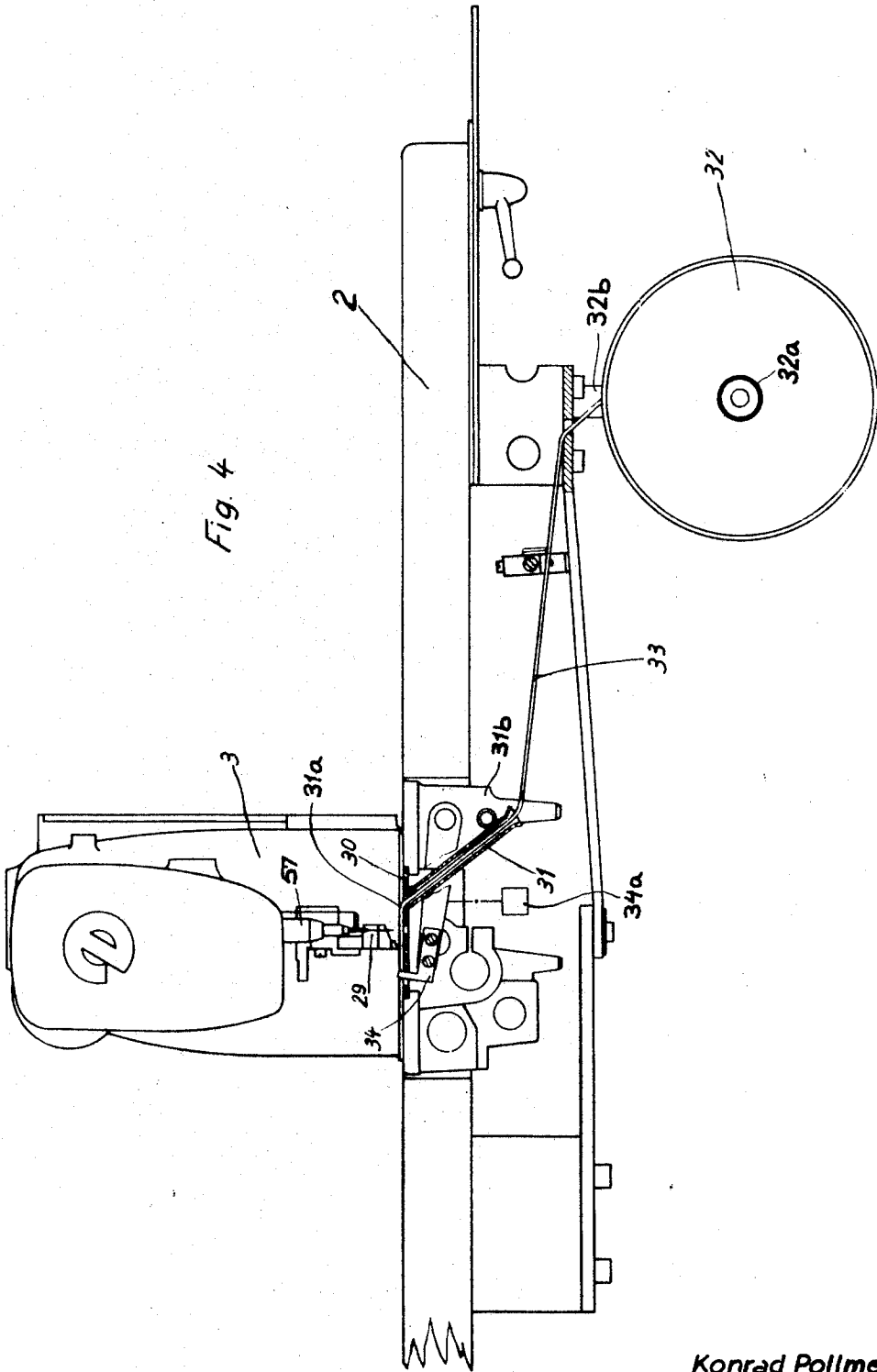
Karl F. Ross  
Attorney



Konrad Pollmeier  
INVENTOR.

BY

Karl F. Ross  
Attorney



Konrad Pollmeier  
INVENTOR.

BY

Karl G. Ross  
Attorney

## DART-STITCHING SEWING MACHINE ARRANGEMENT

My present invention relates to a method of operating a sewing-machine installation for producing darts and the like and to a system for stitching darts at high rate and good reproducibility.

The formation of rows of stitches inclined at a predetermined angle to a fabric fold in the formation of darts or stitched tucks is a common and necessary operation in the manufacture of clothing and especially outer garments. The formation of darts, which is difficult because the angles and depths of the darts must vary within wide ranges and must be formed in fabrics of different weights, has hitherto been a time-consuming and substantially completely unmechanized operation. The quality of the dart, for the most part, was determined by the skill of the operator. In fact, the dart-stitching step has been found to be one of the most time-consuming in the production of the clothing and perhaps the step most susceptible to error or inadequacy with respect to quality. It has been found that the formation of the vertex or apex of the dart is especially difficult and hitherto required a highly qualified worker. Consequently, dart-making operations have retarded the production of garments at high rates, sharply increased the labor cost involved in the production of garments and often lead to the rejection of the garments where the darts are of unsatisfactory quality.

It is the principal object of the present invention to provide a method of operating a sewing machine so as to increase the quality of the darts formed therein, make the darts reproducible from one fabric piece to another, permit darts of a wide variety of angles and depths to be stitched even with fabrics of varying thickness and, generally, to increase the rate of production of such darts and decrease the unit cost of goods containing same.

A corollary object of this invention is to provide a system for the formation of stitched darts wherein relatively unskilled personnel can be used to produce fabric goods containing such darts at relatively high rates.

Still another object of this invention is to provide a sewing-machine installation with improved capabilities in the formation of darts and stitched tucks.

In the following discussion, reference to the expression "dart" is intended to include within its scope substantially all stitching arrangements wherein a stitched seam runs at an angle to a fabric fold whether or not the resulting fold is severed from the completed fabric and whether or not the resulting stitched seam runs fully to the fold line to form a vertex or apex in the most commonly recognized configuration of a dart. Furthermore, the system is applicable to the simultaneous formation of a stitched seam at an angle to a fold with the stitching of the forward or tuck to an underlying fabric layer or strip and to the formation of other patterns in which relatively straight seams are to be stitched at an angle to the fold.

The aforescribed objects are attainable, in accordance with the present invention, in a method of operating a sewing machine having a stitching location, feed means for advancing a fabric linearly past this location and at least one clamping bar parallel to the direction of linear fabric feed and engageable with the fabric for advancing it past the stitching location, the method involving the insertion of a fabric layer beneath the clamping bar by a folding blade having a folding edge angularly adjustable with respect to this direction and substantially linearly shiftable transversely thereof beneath this bar. According to an important feature of this invention, a needle bar carrying an array of needles generally parallel to the direction of fabric feed is located behind the fabric-feed bar and is engageable with the folded edge of the fabric inserted beneath this bar by the folding blade, the folding blade being withdrawn after engagement of the folded edge of the fabric by the needles. As soon as the folding blade is withdrawn, the

feed bar is lowered into clamping engagement with the resulting tuck and, upon withdrawal of the needles from the fabric, can advance the fabric. Of course, the needles can be shiftable with the feed bar so that such withdrawal is not required.

According to a more specific feature of this invention, a folding or retaining rail which is designed to yieldably engage the fabric and also form a guide through which the fold and the blade may be passed, is located parallel to the direction of fabric feed and ahead of the feed bar so that a yieldable apron of this clamping rail retains the fabric in a smooth layer as the fold is inserted and the folding blade withdrawn.

Advantageously, the folding blade is mounted upon a table located at a side of the stitching location, rearwardly in the direction of advance of the fabric for the formation of the same, and co-operating with a stripper rod adapted to clear the table and blade of the trailing end of the fabric after it has been inserted properly beneath the feed bar. The stripper rod may be positioned above the folding blade, between the latter and the stitching table and can be swung downwardly to carry the remaining portion of the fabric overhanging the stitching blade downwardly and allow this portion of the fabric to overhang down vertically along the edge of the stitching blade. To this end, the folding table and blade are affixed to the stitching table only at the edge of the folding table remote from the stitching location while a gap is provided between the folding edge and the stitching table to accommodate the stripper rod.

According to a further feature of this invention, the folding edge of the blade is formed with slots extending in the direction of movement of the blade transversely of the direction of the fabric-feed with a spacing corresponding to the spacing of the fabric-engaging needles. The latter thus transfix the fabric and pass through the slots in the folding blade.

The clamping bar, the fabric-feed bar, the needle bar, the stripper rod and even the folding table and blade may be shifted, in accordance with the present invention, by fluid-responsive servomotors, preferably pneumatic piston-and-cylinder arrangements controlled by solenoid valves and sensitive switches or photocells.

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

FIG. 1 is a perspective view of a sewing machine for the stitching of tucks to form darts in piece goods for the production of garments and the like;

FIG. 2 is a partial side view of the device;

FIG. 3 is a detail view of the stitching-forming region;

FIG. 4 is a partial front view with parts broken away of the machine; and

FIGS. 5A and 5B are views of the fabric product.

In FIG. 1, I show a sewing machine for the formation of darts in a fabric by the stitching of a tuck at an angle to the edge of the fabric which comprises a stand 1 supporting a sewing-table plate 2 upon which the sewing machine 3 is mounted. The sewing machine 3 has a horizontal arm 3a carrying the sewing head 3b and cantilevered on the post 3c.

Beneath the table 2, I provide the drive system for the sewing machine 3 with a clutch (not illustrated) for retaining the needle assembly of the sewing machine and the other device co-operating therewith in substantially any of their operative positions when the machine is brought to a standstill. The feed mechanism for the fabric includes a mechanically movable feed bar 4 which can be straight or slightly curved and which serves to guide the fabric to form the fold or tuck to be stitched into the dart. The feed bar 4 is provided with a fabric-engaging sole surface having a gripping layer thereon, preferably foam rubber, felt or velvet. The bar 4 is coupled with a slide 5 driven by a threaded spindle 6 and displaceable linearly in a fabric-feed direction in a guide rail 7. A pneumatic motor 8 presses the bar 4 downwardly against the fabric to move it along the table via a bellcrank lever 9. A switch panel 10 is provided to control the operating sequence of the

several parts via pneumatic servomotors, as will be described in greater detail hereinafter.

As can be seen from FIG. 1, the sewing machine 3 is disposed more or less centrally of the rectangular table 2 with its major axis orthogonal to the long side of the table. The feed bar 4 lies generally parallel to the longitudinal edge of the table, and its feed direction runs approximately perpendicular to the major axis of the sewing machine, the feed bar 4 co-operating with a guide member 11 in the region of the stitch-forming location. Member 11 is received in a longitudinally extending channel 4' in the upper side of the rail 4. The system is illustrated in FIG. 1 in its insertion position prior to the introduction of the fabric, the bar 4 being disposed predominantly to the right-hand side of the machine 3 in this position for movement from right to left to transport the fabric past the stitching location.

Ahead of the plate or table 2 in the plane of the fabric-receiving surface and to the right-hand side of the machine 3, (facing the machine in FIGURE 1), I provide a small platform 12 carrying a folding blade 13. The table 12 is seated upon two bars 12' extending forwardly from the machine carried slidably in roller supports as shown at 14 in FIGURE 2. The supports 14 each include a vertical bar 14a carrying a pair of spaced-apart ball-bearing rollers 14b and 14c which receive the bars 12' behind them.

The support-roller assemblies 14 are movably mounted on the underside of the table 2 so as to be shiftable in a horizontal plane and swingable about the vertical axis 15 so that the folding blade 13 can be angularly adjusted with respect to the rail 4 in a horizontal plane. This angular adjustment of the folding edge is represented by dot-dash lines in FIGURE 1. A scale 16 mounted on the underside of the plate 2 indicates the angular movement and co-operates with an index mark 12a on a handle 12 engaging the support 15a of the folding table 12. The angular stroke of the table 12 and the handle 12a is limited by a pair of abutments or stops 12b and 12c adjustably positioned below the table 2 (FIGURE 2).

Above the stitching table 2 and ahead of the feed bar 4, I provide a further folding or clamping rail 17 of sheet-metal construction having a rigid angle iron profile of L-section at 17a and an apron 17b adapted to engage yieldably the fabric past below it. The folding or clamping rail 17 is fastened to a pair of cantilever arms 18 which rest upon a pair of single-leaf spring plates (FIGURE 1) retaining the rail 17 yieldably in an elevated position (solid lines in FIGURE 2) in which the apron 17b is removed from the upper surface of table 2. The arms 18 are joined by a transverse bar 20 (FIGURES 1 and 2) while a pneumatic piston and cylinder arrangement 21, carried by a Z-shaped bracket 26 overhangs the feed assembly and bars with its piston 21a upon the transverse bar 20, the cylinder 21b of this arrangement being connected via the pneumatic pressure line 21c with the control panel 10. When the cylinder arrangement 21 is pressurized, rail 17 is driven downwardly (dot-dash lines in FIGURE 2) until only a narrow gap is maintained between the apron 17b and the upper fabric-receiving surface of the plate 2. The sheet-metal apron 17b of the clamping rail 17 is thus able to engage the upper surface of the fabric in an elastic manner and retain the tuck which is to be stitched into the dart.

The folding blade 13 is angularly adjustable as noted earlier to determine the angle of overlap of the fabric forming the tuck and, consequently, the apex angle of the dart. When the fabric is positioned below the feed bar 4 and lead onto the folding table 12, the latter is shiftable together with the fold blade 13 in the direction of arrow A to bring an angular fold of fabric beneath the clamping rail 17 and the elevated feed bar 4 to such an extent that the triangular tuck extends beyond the rearmost edge 4'' (FIGURE 1) of the feed rail, and the dart has both the desired angle and depth.

The feeder bar 4 is flanked along its rearmost edge by a plurality of downwardly turned needle tips 22a of L-shaped needles 22 in longitudinally spaced parallel relationship on the needle bar 23. The needles 22, 22a may be depressed to trans-

fix the fabric passing through the gap between the elevated feed bar 4 (solid lines in FIGURE 2) and carried by the folding blade 13. To ensure that the needles 22 will only engage the fabric and will do so in a positive manner, the leading edge of the folding blade 13 (in the direction A) is formed with a multiplicity of slot-like cutouts 13' increasing progressively in depth from left to right facing the machine. The cutouts, which always remain parallel to the rails 12', permit angular displacement of the table 12 about the axis 15 as previously mentioned and are spaced to correspond to the spacing of the needles 22. As shown in FIGURE 2, the needles 22 pass through the slots 13' of the folding blade 13 when the latter is fully advanced (solid lines in FIGURE 2). By swinging the folding blade 13, it is possible to increase or decrease the apex angle of the dart and thereby its depth to whatever extent is desired. Correspondingly, the needles 22 penetrate more or less deeply in the cutouts 13'.

The needle bar 23 (FIGURES 1 and 2) is carried by the leaf springs 24 previously mentioned and described as yieldably carrying the arms 18 and the apron 17b together with the clamping bar 17. It has been found to be advantageous to permit relative movement about a horizontal axis parallel to the direction of fabric feed between the clamping bar 17 and the needle bar 23. To this end, the leaf spring supports 24 may, as shown in FIGURE 2, be provided with a pair of upstanding lugs 24a (not shown in FIGURE 2) in which the arms 18 are pivotally mounted at 24b but are spring-loaded into the upper or solid-line position shown in the latter FIGURE. The leaf springs 24 retain the needle bar 23 yieldably in its upper position in which (FIG. 2) the needles 22 occupy the dot-dash positions illustrated. A pneumatic servomotor 25, in the form of a piston-and-cylinder arrangement similar to that described at 21, has its plunger 25a provided with a head 25b which bears against a Z-shaped bracket 25c carried by the needle bar 23 to urge the latter downwardly (solid line in FIGURE 2). The pneumatic motors 21 and 25 are mounted upon the Z-shaped bracket 26 bolted at 26a to the table 2.

To ensure proper retention of the fabric in the region of the stitching operation, I additionally provide on the feed rail 4 a presser foot 27 which is vertically adjustable and has been shown in FIGURE 3. The presser foot 27 is vertically shiftable by the pneumatic servomotor 28 whose piston 28a bears downwardly upon this upwardly spring-biased presser foot to urge it against the fabric upon the stitching plate which is shown in FIGURE 4. The presser foot 27 is thus vertically displaceable independently of the feed bar 4 and is applied against the fabric as soon as the folding blade 13 has advanced the tuck beneath the rail 4 and the retaining rail 17 while the feed bar 4 is first brought into engagement with the fabric when the folding blade 13 has been withdrawn to its starting position and after the needles 22 have engaged the fabric.

In the normal formation of a dart, it is the practice to have the dart folds substantially symmetrically diverge from the stitched seam. However, in many cases, it is desirable to sever the dart and I provide in such cases a cutting blade 29 (FIG. 4) which, in a manner known from earlier commonly assigned systems, is adapted to cut the fabric along a line parallel to the stitched seam. A suitable cutting system for this purpose is the one described in the compending application Ser. No. 594,771 filed 16 November 1966 by me jointly with Helmut Froderman (now U.S. patent 3,406,646) or in U.S. patents 2,475,759, 2,642,020, or 2,678,096.

According to another feature of this invention illustrated diagrammatically in FIGURES 5A and 5B, the dart can be stitched to a band or strip 33 of fabric which enables another piece of fabric to be stitched in contiguous relationship to the first dart and/or increases the thickness of the stitched portion (see FIGS. 5A and 5B). This arrangement is also suitable for increasing the width of the dart itself. To this end, the band 33 is fed, as is shown in FIGURE 4, upwardly through a slot 31a in the stitching plate 30 of the sewing machine 3 via a feeding sleeve 31 mounted upon the structure 31b underlying this plate. A supply rail 32 of the band 33 is mounted upon the

shaft 32a held by an arm 32b along the underside of the machine. A blade arrangement 34 severs the band from the supply at the end of the operating step under the control of a pneumatic servomotor represented diagrammatically at 34a.

As noted earlier, the bell-crank lever 9 forces the feed bar 4 downwardly against the fabric upon the table 2. Along the axis of this lever and swingable about the shaft thereof is a further double-arm lever 35, one arm 35a of which is pivotally secured in a bifurcated end 36b of the piston 36a of a pneumatic servomotor 36 shown in **FIGURE 1**. The other arm 35b of the lever 35 carries a stripper rod 37 which extends generally parallel to the holding rail 17 and the feed bar 4 described earlier. After the fabric has been folded and inserted beneath the latter bar by the folding blade 13 and has been clamped thereby against the table 2 and the plate 12 with the folding blade 13 withdrawn, the stripper rod 37 is actuated, e.g. via the control switch 36c (**FIGURE 2**) as the table 12 is brought into its starting position. The rod 37 is thereby swung downwardly to carry the fabric from the blade 13 while the plate 12 is freed for the positioning of a new piece of fabric thereon. The pneumatic servomotors 21, 25 and 8 can be operated in the program sequence via switches such as are shown at 50 in **FIGURE 2** and solenoid-operated valves in the pneumatic circuit.

The machine operator places the goods to be formed with a dart upon the table 12 which has previously been set via handle 12'' at the corresponding dart angle, e.g. via the abutments mentioned earlier or a template 38 held by permanent magnets 39 on the plate 12. The operator then presses lightly against the plate 12 to trigger a switch 51 which may operate the pneumatic servomotor 52 via the usual solenoid valve to draw the plate 12 in the direction of arrow A toward the table 2 and thereby bring the folded layer of fabric beneath the feed rail 4 and the folding bar 17.

In its fully advanced position (shown in solid lines in **FIGURE 2**), an adjustable tripper 53 on the rail 12' operates the sensitive switch 50 which triggers the pneumatic servomotor 25 via a corresponding solenoid-controlled valve and as represented by the dot-dash line 54.

Plunger 25a drives the needle bar 23 downwardly so that the points 22a of the needles pass through the folded portion of the fabric and the slots 13' of blade 15 to retain the fabric in position along the plate 2. Upon completion of this downward movement of the needle bar 23 (e.g. as detected by a sensitive switch 55), the pneumatic servomotor 52 is operated in the opposite direction to return the table 12 to its dot-dash position (**FIGURE 2**) and permit a fresh fabric layer to be positioned thereon.

The tripper 53 then triggers the sensitive switch 36c to operate in sequence the servomotors 8, 21, 25 and 36 as represented diagrammatically at 56 to lower the rail 4 upon the fabric (dot-dash position in **FIGURE 2**), bring the apron 17b of the clamping bar 17 into yieldable engagement with the fabric, withdraw the needles 22 and raise the stripper bar 37 to drive the remaining strip of fabric downwardly beneath the table 12 and thereby prepare the table for receipt of a further fabric layer. Simultaneously, the slide 5 carrying the structure 8, 9, 36, 35 and 37 is set in operation to the left to advance the folded fabric through the stitching location and, via microswitches or photocells in a conventional manner, set the sewing-machine needle holder 57 in operation to stitch the dart during the stitching process; the operator deposits a further fabric layer upon the plate 12 so that, as soon as the slide 5 is returned, the operation can be repeated to produce a further dart.

The improvement described and illustrated is believed to admit of many modifications within the ability of persons skilled in the art, all such modifications being considered within the spirit and scope of the invention.

I claim:

1. A sewing installation for the formation of darts and other stitched seams at an angle to a fabric fold, comprising:
  - a fabric-receiving table;

a sewing machine forming a stitching location along said table;

fabric-feed means on said table including a fabric-feed rail shiftable relatively to said table and disposed thereabove for linearly moving a piece of fabric clamped between said bar and said table in a fabric-feed direction past said location to form a stitched seam therein;

a fabric-folding blade angularly adjustable with respect to said direction and shiftable transversely thereof between said bar and said table for carrying a folded fabric therebetween; and

means for sequentially operating said blade and said bar to clamp the folded fabric against said table by said bar upon the withdrawal of said blade from between said bar and said table.

2. The installation defined in claim 1, further comprising an array of needles extending generally in said direction and movably mounted on said table for displacement between a position wherein said blade shifts a fabric fold beyond said needle array generally transversely to said direction and a position wherein said needles transfix the folded fabric shifted therepast for retaining said fabric upon withdrawal of said blade therefrom.

3. The installation defined in claim 2 wherein said blade has a folding edge formed with a plurality of slot-like cutouts open toward said needles and spaced apart with the spacing of said needles whereby said needles transfix the fabric through said cutouts.

4. The installation defined in claim 2, further comprising a folding rail parallel to said bar and spaced ahead of said bar toward said blade, said rail being vertically shiftable for engagement with the folded fabric inserted beneath said bar for retaining the fabric against said table upon movement of said bar in said direction.

5. The installation defined in claim 4 wherein said rail has a resiliently deflectable apron engageable with said fabric and positionable with a narrow clearance above said table in a lowermost position of said rail.

6. The installation defined in claim 4 wherein said blade has a retracted position defining a clearance between a leading edge of said blade and said table, said installation further comprising a stripper rod movably mounted between said table and said blade for sweeping fabric remaining on said blade therefrom upon advance of the folded fabric past said location to prepare said blade for receipt of a further fabric layer.

7. The installation defined in claim 6, further comprising respective servomotor means for vertically displacing said bar, said array, said rail and said rod and for horizontally shifting said blade.

8. The installation defined in claim 7 wherein said bar is provided proximal to said location with a vertically movable pressure foot engageable with said fabric, and with servomotor means for displacing said pressure foot independently of said bar in vertical direction.

9. The installation defined in claim 4, further comprising a folding table carrying said blade and mounted on said fabric-receiving table, pivot means on said fabric-receiving table swingably supporting said folding table for angular displacement about a vertical axis, and indexing means including a scale for representing the angular position of said folding table.

10. The installation defined in claim 4, further comprising blade means for severing the fabric advanced past said location parallel to said seam.

11. The installation defined in claim 4, further comprising supply means for advancing a band past said location in said direction whereby said band is stitched to the fabric concurrently with the formation of said seam.

12. A method of operating a sewing installation having a sewing machine and a feed bar for linearly advancing a fabric past said location, said method comprising the steps of entraining a folded fabric with a folding edge beneath said bar,

7

retaining the folded portion of the fabric with respect to said bar while said edge is retracted, clamping the folded fabric with said bar upon retraction of said edge, and displacing the

8

clamped folded fabric past said location to stitch a seam parallel to said direction therein.

5

10

15

20

25

30

35

40

45

50

55

60

65

70

75