Dec. 29, 1936. B. LIEBOWITZ 2,066,294

METHOD AND APPARATUS FOR FORMING FOLD LINES IN COLLARS AND LIKE ARTICLES

Filed Dec. 17, 1935 3 Sheets-Sheet 1

Fig. 1.

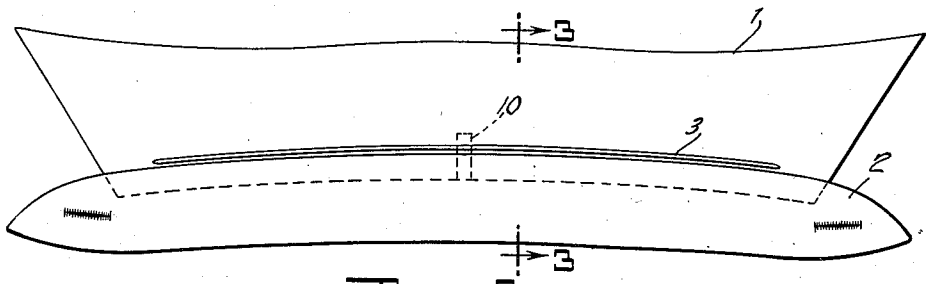


Fig. 2.

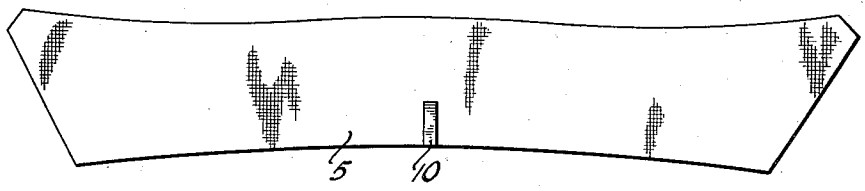


Fig. 3.

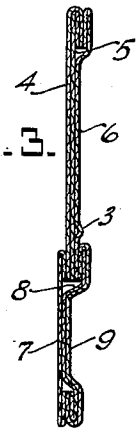


Fig. 4.

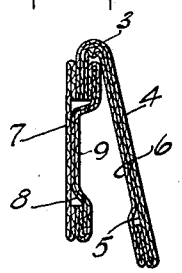


Fig. 5.

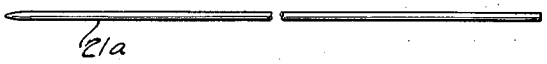


Fig. 6.

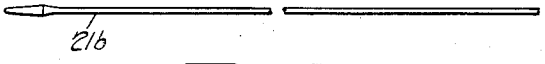
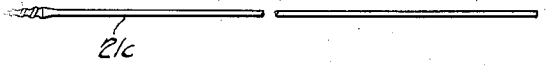


Fig. 7.



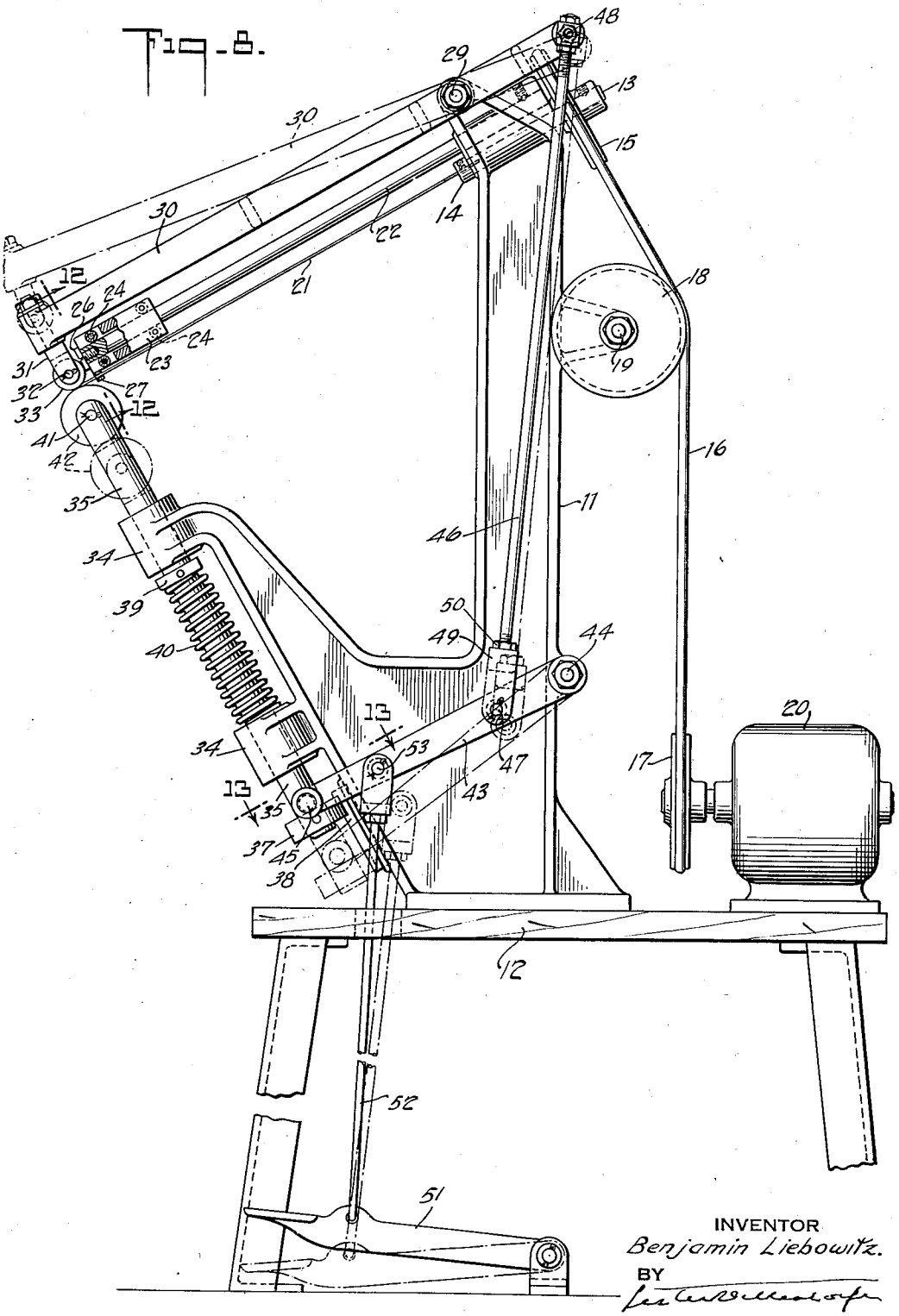
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METHOD AND APPARATUS FOR FORMING FOLD LINES IN COLLARS AND LIKE ARTICLES

Filed Dec. 17, 1935 3 Sheets-Sheet 2

Fig. 8.



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METHOD AND APPARATUS FOR FORMING FOLD LINES IN COLLARS AND LIKE ARTICLES

Filed Dec. 17, 1935 3 Sheets-Sheet 3

Fig. 9.

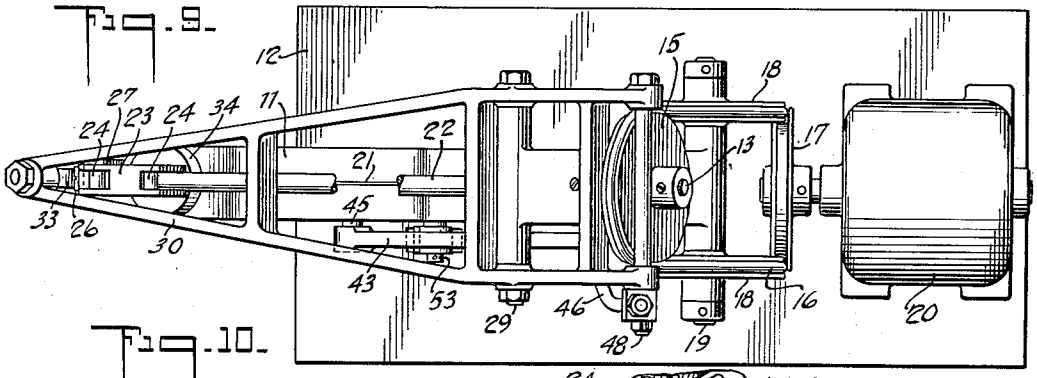
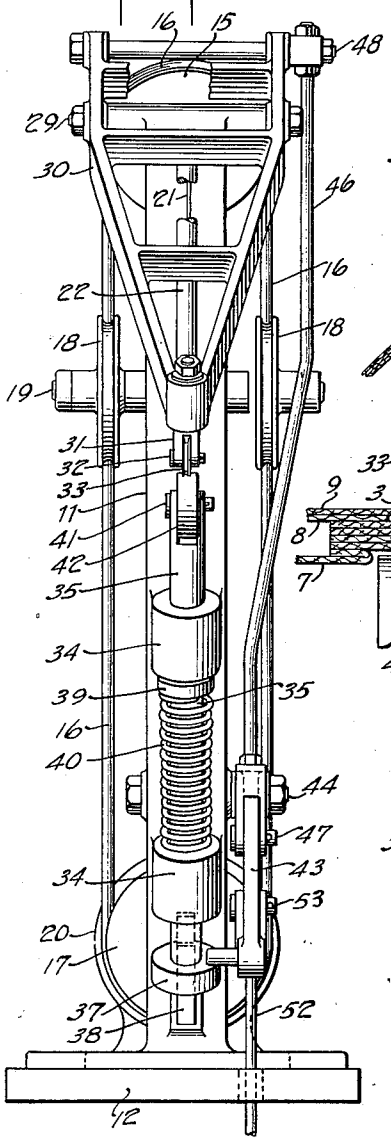


Fig. 10.



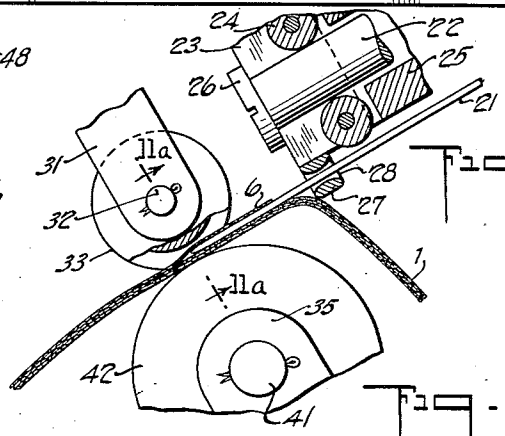


Fig. 11.

Fig. 11a.

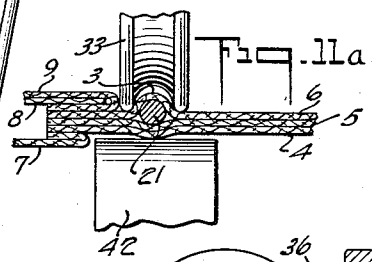
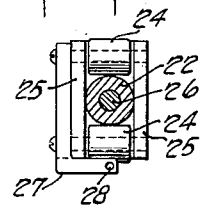


Fig. 12.



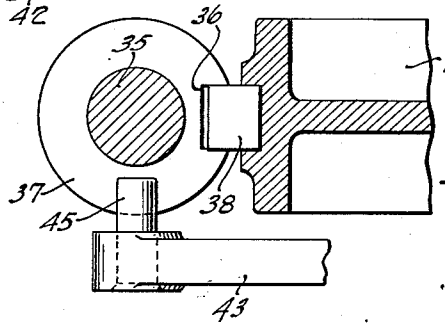


Fig. 13.

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UNITED STATES PATENT OFFICE

2,066,294

METHOD AND APPARATUS FOR FORMING FOLD LINES IN COLLARS AND LIKE ARTICLES

Benjamin Liebowitz, New York, N. Y., assignor to Trubenizing Process Corporation, New York, N. Y., a corporation of New York

Application December 17, 1935, Serial No. 54,801

16 Claims. (Cl. 223—1)

This invention relates to a method and apparatus for forming fold lines in collars and other articles of apparel which comprise a plurality of plies adhesively united, and which are folded over. It relates particularly to a fold line of the type described in my co-pending application, Serial No. 29,817, in which is described a fold line made after the plies have been adhesively united, the flexibility for the fold line being produced by mechanically separating the bottom or inside ply from the intermediate or lining ply along a narrow zone which constitutes the fold line, this separation being effected first by wetting the zone with water, and then pushing into this zone a wire probe.

It has been found that if the probe is rotated, it can be inserted into work much more easily and improves and speeds up the operation. It is also desirable to push the collar onto the probe instead of holding the collar stationary and pushing the probe into the collar because the type of operation in which the work is fed into the machine is more like the type of operation to which operatives are accustomed in factories making such articles of apparel. However, it is to be understood that machines of a kind herein described may be built such that the collar is held longitudinally stationary and the probe fed into the collar, instead of feeding the collar onto a longitudinally stationary probe as herein described.

Among the objects of this invention are to provide an improved means for forming these fold lines; to speed up the operation; and, to provide a simple type of apparatus for the purpose which shall be thoroughly reliable and easy to operate. A further object of the invention is to provide improved means for starting the probe.

A preferred form of the invention as applied to collars is illustrated in the accompanying drawings, in which:—

Figure 1 is a bottom plan view of a collar;

Fig. 2 is a bottom plan view of the interlining of the collar before being incorporated into the collar;

Fig. 3 is a cross-section of the collar on the line 3—3 of Fig. 1;

Fig. 4 is a similar cross-sectional view showing the collar bent over to illustrate the action of the fold line;

Figs. 5, 6 and 7 illustrate different forms of probe;

Fig. 8 is a side elevation of the probing machine;

Fig. 9 is a plan view of the same;

Fig. 10 is a front elevation thereof;

Fig. 11 is a fragmentary view showing how the probe operates to separate the bottom ply from the lining ply, and showing the operation of the guiding mechanism for the probe;.

Fig. 11*a* is a cross-sectional view on the line 11*a*—11*a* of Fig. 11;

Fig. 12 is an enlarged cross-sectional view of a carriage which supports the probe; and

Fig. 13 is a detailed cross-sectional view on the line 13—13 of Fig. 8.

Referring to the drawings, 1 represents the collar top of the finished collar having a band 2. Substantially parallel with the band is the fold line zone 3, with which the present invention deals. The collar is normally made of three plies, namely: a face ply 4, an intermediate lining ply 5, and a back or bottom ply 6. The band may also be of the conventional three ply construction comprising a face or stamped ply 7, an intermediate or lining ply 8, and a back ply 9.

The collars here referred to are those which have linings 5 that contain adhesive material. The adhesive may be in the form of cellulose acetate yarns, although the present invention is not limited to any specific means for adhesively uniting the plies. Fig. 2 shows a cut lining material before the stitching operations are performed. At 10, in Figs. 1 and 2, is shown a small piece of paper, or its equivalent, which is pasted or otherwise attached to the lining, for the purposes which will hereinafter be described.

In Figs. 8–13, inclusive, I have shown one form of apparatus for carrying out my invention in which 11 is a cast iron frame mounted on a base 12. Near its upper end, the frame carries a spindle 13 which is held in position by a collar 14. The spindle carries a pulley 15 and is driven by an endless belt 16 traveling on the pulleys 15 and 17 and passing over the idler pulleys 18 carried on the shaft 19. A motor 20 or other suitable source of power is provided to drive the belt. Carried by the spindle 13 is the probe 21, three different forms of which are shown in Figs. 5, 6 and 7, and which are designated as 21*a*, 21*b*, and 21*c*, respectively. An elongated rod 22 is rigidly mounted in the frame 11 just above the spindle 13. A carriage 23 is mounted to slide freely on the rod 22. The carriage consists of four rollers 24 carried by the frame or housing 25 surrounding the rod 22. The extreme outward limit of the carriage movement is determined by the head of the screw 26. Supported on the carriage is the part 27 which has a hole 28 that acts as a bearing or guide for the probe 21. The entire carriage 23 slides back and forth freely on the

rod 22 as a guide for the probe. The carriage is returned by gravity to its original position, shown in Fig. 8, due to the angle at which the rod 22 is placed. This construction avoids the necessity of using springs for returning the carriage to its initial position at the end of the operation.

Pivoted to the frame at 29 is the arm 30 which arm carries at its outer end a roller support 31 on the pin 32 of which rotates the grooved roller 33. Sliding in the lugs 34 of the frame 11 is the sliding rod 35, which is prevented from rotating by means of a groove 36 (see Fig. 13) in the collar 37, and by the key 38. By means of another collar 39 and the spring 40, the sliding rod 35 is always being pushed upward. At the upper end of the sliding rod 35 is a pin 41, on which rotates the roller 42 which is pressed against the roller 33 by the spring 40. The two rollers meet in such a way that the end of the probe 21 is approximately on the line passing through the centers of the pins 32 and 41, and the probe 21 is approximately tangent to the cylindrical surface of the roller 42. It is to be understood, however, that the relative position of these rollers and of the probe end may be changed.

During the operation of pushing the collar onto the probe, rollers 33 and 42 are pressed together by means of the spring 40. The spring 40, as previously explained, operates directly on the slide rod 35 by pushing against the collar 39. The collar 39, however, is not allowed to abut against the upper lug 34; the spring re-acts on the upper roller 33, through the lever 43, connecting rod 46 and arm 30. The lever 43, pivoted to the frame 11 at 44, carries the pin 45 which is engaged by the collar 37; that is to say, the spring 40 presses on the lever 43 through the medium of the collar 37 and the pin 45, and thereby tends to rotate the lever 43 clockwise in Fig. 8. A connecting rod 46 is pivoted to the lever 43 at 47 and to the lever or arm 30 at 48. By means of the clevis 49 and the nut 50, the effective length of the connecting rod 46 may be adjusted, and thereby we may adjust the position of the meeting plane of the rollers 33 and 42. It will be seen that the action of the spring 40 by tending to rotate the lever 43 clockwise puts a thrust on the connecting rod 46 which thereby tends to rotate the lever 30 counter-clockwise, and hence, tends to press the roller 33 against the roller 42.

In starting the operation of probing, it is necessary to separate the rollers 33 and 42. This is effected by pressing downward on the foot treadle 51 which is connected by the rod 52 to the lever 43 at 53. This action rotates the lever 43 counterclockwise into the position shown by the dotted lines in Fig. 8. This movement of the lever draws down the connecting rod 46 into the position shown by the dotted lines, and rotates the lever 30 into the corresponding position shown by the dotted lines; simultaneously, of course, it pulls down the sliding rod 35 and thereby brings the roller 42 into the position shown by its corresponding dotted lines. It is thus seen that the rollers are separated so that the collar may be entered onto the probe. After the collar has been started onto the probe the foot treadle is released and the parts are returned to the position shown in Fig. 8 by the solid lines, and the spring 40 exerts its force in pressing the two rollers 33 and 42 together. In order to make clear just how the probe works and how the collar or garment part is guided in probing, reference is made to Fig. 11*a*, which shows in an enlarged scale the two rollers 33 and 42 and the collar top plies 4, 5 and 6, and likewise the band plies 7, 8 and 9. The guiding is achieved by holding the turned edge of the band plies 8 and 9 against the flange of the roller 33. Of course, the guiding will vary, depending upon the details of manufacture of the band, but the drawing 11*a* clearly shows a method which has been found very satisfactory for guiding the probe for a certain particular construction of collar top and band.

As shown in Figs. 5, 6 and 7, the point of the probe is not sharp; a sharp pointed probe would be likely to puncture the cloth; and therefore the very end of the probe is preferably rounded, as indicated in these figures. It is therefore necessary to provide an opening for the probe to enter. In order to facilitate this, a thin piece of paper 10, shown in Figs. 1 and 2, is placed on the lining ply 5 at about the center so that this piece of paper 10, after the stitching operations, will contact the bottom ply or back ply 6 of the collar top 1. This paper prevents adhesion over its area between the bottom ply 6 and the intermediate or lining ply 5. Where the intended position of the fold line 3 crosses the paper 10, a sharp pointed awl may be easily entered so as to make a clean opening in the bottom ply 6, so that the probe 21 may be subsequently entered without difficulty. It will be noted that the probe is thereby entered at the middle of the collar, and that two operations are required, one for each half of the collar. The awl must make an opening and a start for the probe towards both ends of the collar.

By preventing adhesion between the bottom ply 6 and the lining ply 5, the piece of paper 10 makes it an easy operation to insert a sharp-pointed awl so as to create a clean opening for the subsequent entry of the probe 21. However, the function performed by the paper 10 may be performed in other ways. Any means which will prevent adhesion in this small area, or which will make the adhesion very weak, may be used. For example, a small amount of wax may be applied to the bottom ply 6 on the side which faces the interlining 5, or a small amount of rather thick starch may be used, which starch may be softened with water at the time of entering the awl. Furthermore, the bottom ply 6 of the collar may be slit before the collar is made or have an opening cut therein at the proper point, and sufficiently large to provide necessary tolerances, so as to still further facilitate entering of the awl; in the latter event, it may be possible to enter the probe directly without using an awl.

In reference to the speed of rotation of the probe 21, I have found that a speed of about 1800 R. P. M. gives satisfactory results. I have further found that it is much easier to push the collar onto the probe if the fold line has first been wetted with water. If desired, the probe may be given a rapid oscillatory motion instead of a continuous rotary one.

Various designs of probe may be used. The probe may be of uniform diameter throughout, as indicated in Fig. 5 at 21*a*; drill rod of diameter .047 inch or somewhat larger has given satisfactory results. It is better, however, to use a probe with an enlarged head such as shown in Fig. 6, the head being in the neighborhood of .062 inch in diameter. The head may also carry a screw thread of rounded cross-section, as indicated in Fig. 7. If the speed of rotation of the probe and the pitch of this thread are such as to create a feeding speed approximately the same

as that at which the collar is fed onto the probe, then the screw thread will act as a power drive and reduce the force necessary to push the collar onto the probe, and perhaps eliminate such force entirely, thereby making the machine self-feeding, and requiring only that the operator guide the work. For example, if the probe runs at 1800 R. P. M., that is, thirty revolutions per second, and the screw thread has a pitch of 1/15 inch, then the screw thread will tend to feed the collar onto the probe at a speed of thirty times 1/15 or at the rate of 2 inches per second. This is a very comfortable feeding speed for this operation, although it could be made higher than this for skilled operators.

Of course, either one of the rollers **33** or **42** may be power operated so as to feed the collar onto the probe, instead of depending on the screw thread; or both of the rollers **33** and **42** may be power operated.

Due to the fact that the fold line **3** is usually more or less curved as indicated in Fig. 1, it is essential that the probe be flexible, and, if guided along its length, the guiding means must be sufficiently flexible so as to permit the necessary curvature. This is accomplished in the machine shown by allowing the carriage **23** freedom to rotate on the rod **22** which supports it.

Additional bearings may be provided for the probe **21** if "whipping" develops.

When the collar is pushed onto the probe it presses against the carriage **23**, which is purposely made fairly light, and moves the carriage along the rod **22**. After the probe has been inserted as far as desired (which may or may not be to the end of the collar), the collar is pulled off the probe and the carriage **23** follows, due to the angular position of the rod **22**.

It is desirable to place a support for the collar just ahead of the rollers **33** and **42** in order to support the collar while it is being pushed onto the probe. It will be understood that such support may be provided if desired.

While I have described in considerable detail one embodiment of my invention, it is to be understood that my invention is not restricted to this particular embodiment.

What I claim is:

1. The method of forming a fold line or hinge in an article of apparel comprising a plurality of plies adhesively united, which comprises inserting a rotating probe between two of the plies to separate the plies along the fold line.

2. The method of forming a fold line or hinge in an article of apparel comprising a plurality of plies adhesively united, which comprises entering a rotating probe between two of the plies, and moving the article lengthwise on the probe to separate the plies along the fold line.

3. The method of forming a fold line or hinge in an article of apparel comprising a plurality of plies adhesively united, which comprises providing an opening in one ply for the insertion of a probe, entering the end of a rotating probe in the opening and between two of the plies, and moving the article lengthwise of the probe to disrupt the adhesion of the plies along a predetermined fold line.

4. The method of forming a fold line or hinge in an article of apparel composed of a plurality of plies adhesively united, which comprises providing an opening in one ply for the insertion of a probe, entering the end of a probe in the opening and between two of the plies, turning the probe about its axis, and directing the article lengthwise of the probe to disrupt the adhesion of the plies along a predetermined fold line.

5. The method of forming a fold line or hinge in an article of apparel comprising a plurality of plies adhesively united, which comprises entering the end of a rotating probe in between two of the plies, and, by relative movement of the article and the probe, disrupting the adhesion between the plies along a predetermined area to provide a flexible fold line.

6. The method of forming a fold line or hinge in an article of apparel comprising a plurality of plies adhesively united, which comprises entering the end of a probe in between two plies, turning the probe rapidly about its axis, and, by longitudinal relative movement of the article and the probe, disrupting the adhesion along a predetermined area to provide a flexible fold line.

7. The method of forming a fold line or hinge in an article of apparel comprising a plurality of plies adhesively united, which comprises forming an opening in one ply for entry of a probe, entering the end of a probe in the opening and between two of the plies, moving the probe about its axis, and, by relative longitudinal movement of the article and the probe, disrupting the adhesion along a predetermined area to provide a flexible fold line.

8. The method of forming a fold line or hinge on a turn down collar comprising a plurality of plies adhesively united, which comprises entering a rotating probe between the back ply and the lining ply, and moving the collar on the probe along a predetermined fold line to disrupt the adhesion between the back ply and lining along said line.

9. The method of forming a fold line or hinge on a turn down collar comprising a plurality of plies adhesively united, which comprises forming an opening in the back ply at a point along a predetermined fold line for entry of a probe therein, entering the end of a rotating probe in the opening and between the back ply and the lining, and guiding the collar on the probe along the predetermined fold line to disrupt the adhesion between the back ply and the lining along said line.

10. The method of forming a fold line or hinge on a turn down collar comprising a plurality of plies adhesively united, which comprises forming an opening in the back ply at a point approximately at the center of a predetermined fold line, entering the end of a rotating probe in the opening and between the back ply and the lining ply, guiding the collar on the probe through substantially half the length of the predetermined fold line, withdrawing the collar from the probe, reversing the collar endwise, and then guiding the collar on the probe through the remaining half of the length of the fold line to disrupt the adhesion between the back ply and the lining ply along the entire length of said fold line.

11. In apparatus of the character described, a flexible rotating probe arranged for guided relative longitudinal movement of the work to be probed relative to the probe, said probe having a screw-threaded head to assist in feeding the work onto the probe.

12. In apparatus of the character described, a flexible elongated probe mounted for rotation, means for rotating the probe, and means for guiding the work onto the probe, said probe having a screw-threaded head to assist in feeding the work onto the probe.

13. In apparatus of the character described, a

flexible elongated probe mounted for rotation, means for rotating the probe, and movable means for flexibly guiding the probe, said probe having a screw-threaded head to assist in feeding the work onto the probe.

14. In apparatus of the character described, a flexible elongated probe mounted for rotation, means for rotating the probe, movable means for flexibly guiding the probe, and means for guiding the work onto the probe, said probe having a screw-threaded head to assist in feeding the work onto the probe.

15. In apparatus of the character described, a flexible elongated probe mounted for rotation, means for rotating the probe, movable means for flexibly guiding the probe, and a pair of rollers between which the work may be fed and guided onto the probe.

16. In apparatus of the character described, a flexible elongated probe mounted for rotation, means for rotating the probe, movable means for flexibly guiding the probe, a pair of rollers between which the work may be fed and guided onto the probe, and means for supporting the rollers to permit of placing the work therebetween.

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