Nov. 3, 1942. T. D. THOMPSON ET AL 2,301,092

APPARATUS FOR SPOTTING STRIPS

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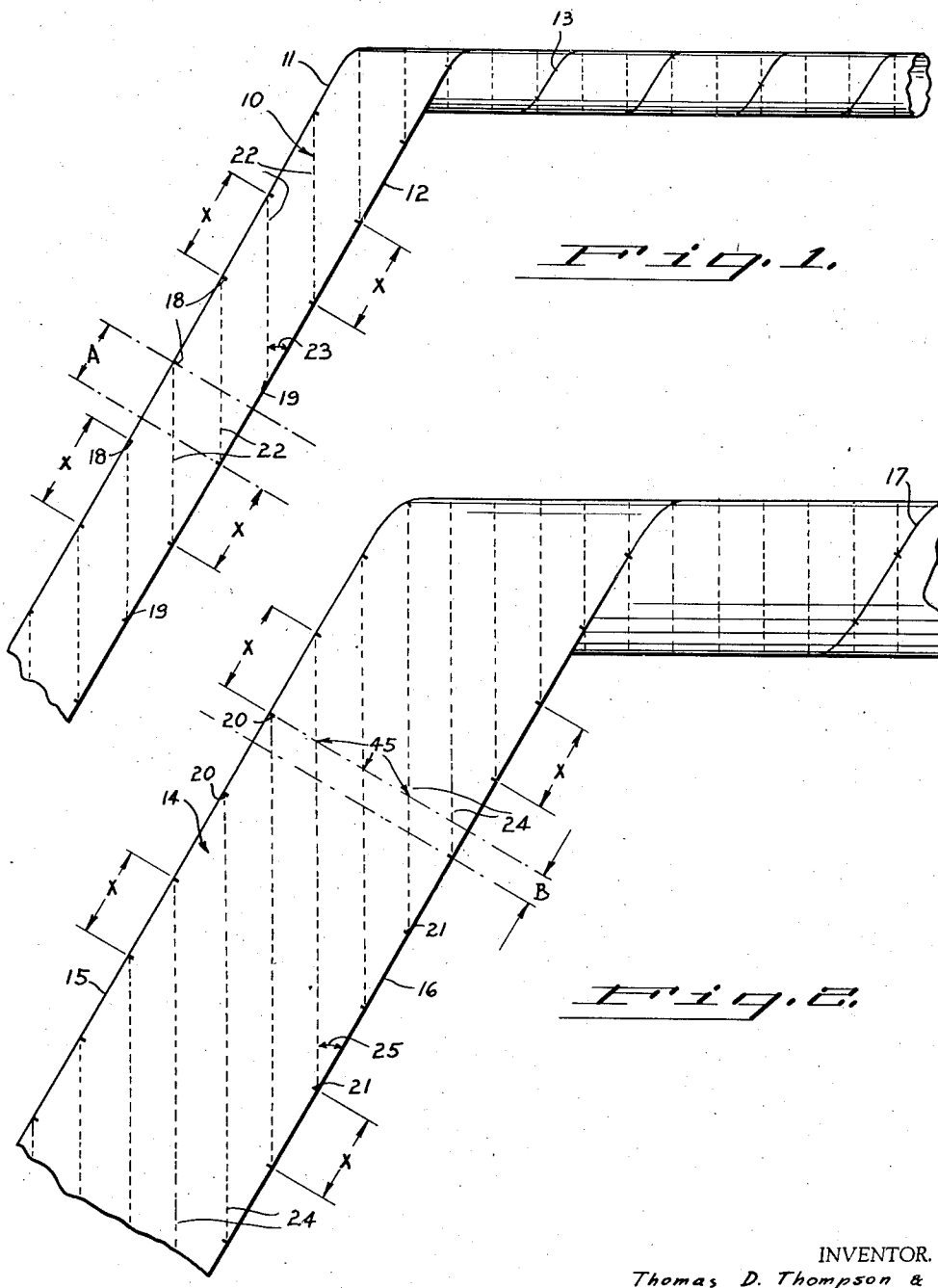


Fig. 1.

Fig. 2.

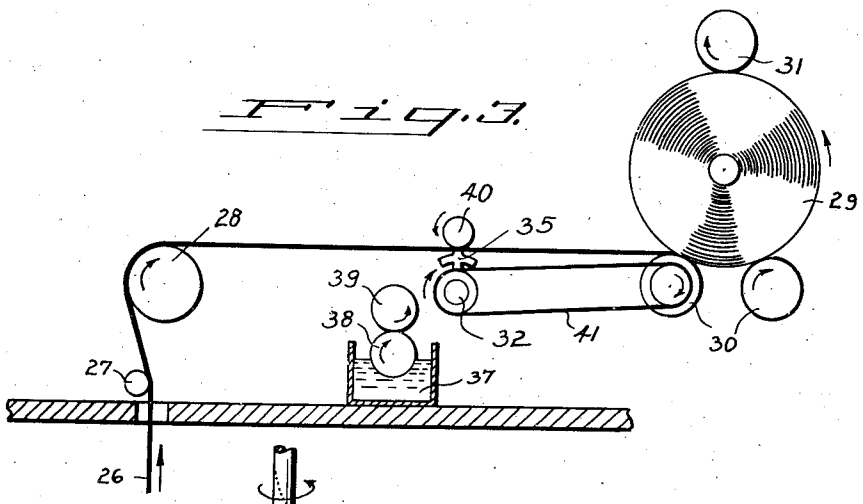
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Fig. 3.



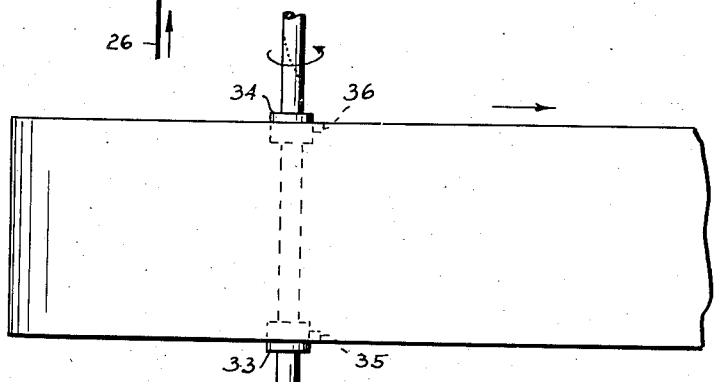


Fig. 4.

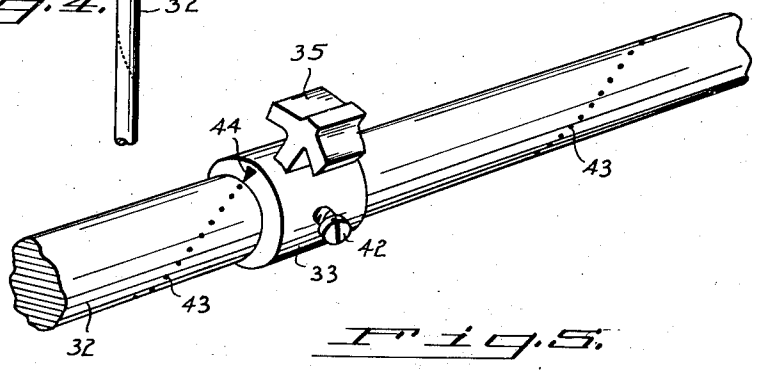


Fig. 5.

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Filed Oct. 15, 1940 3 Sheets-Sheet 3

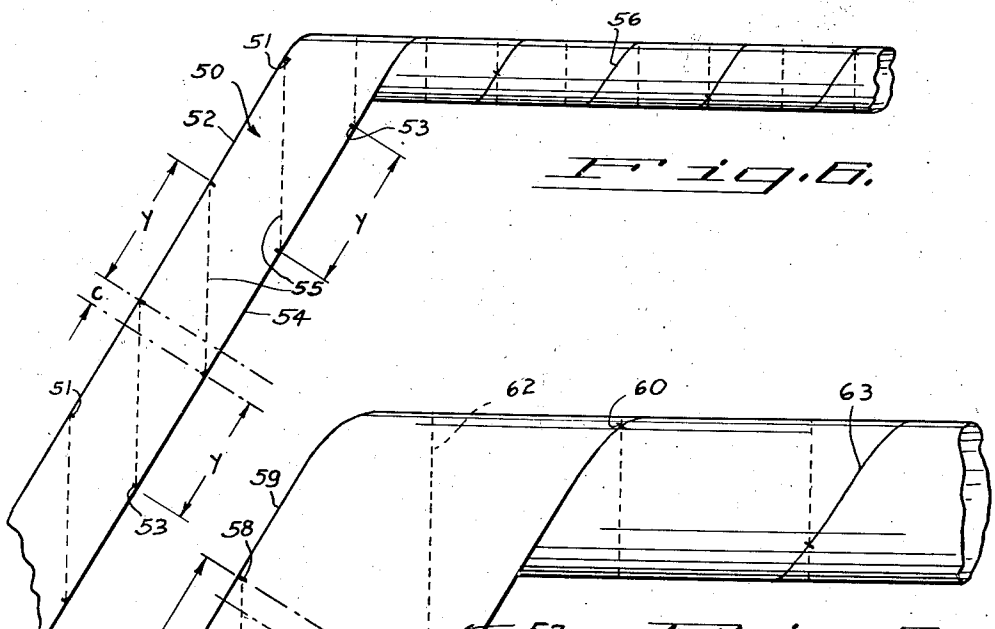


Fig. 6.

Fig. 7.

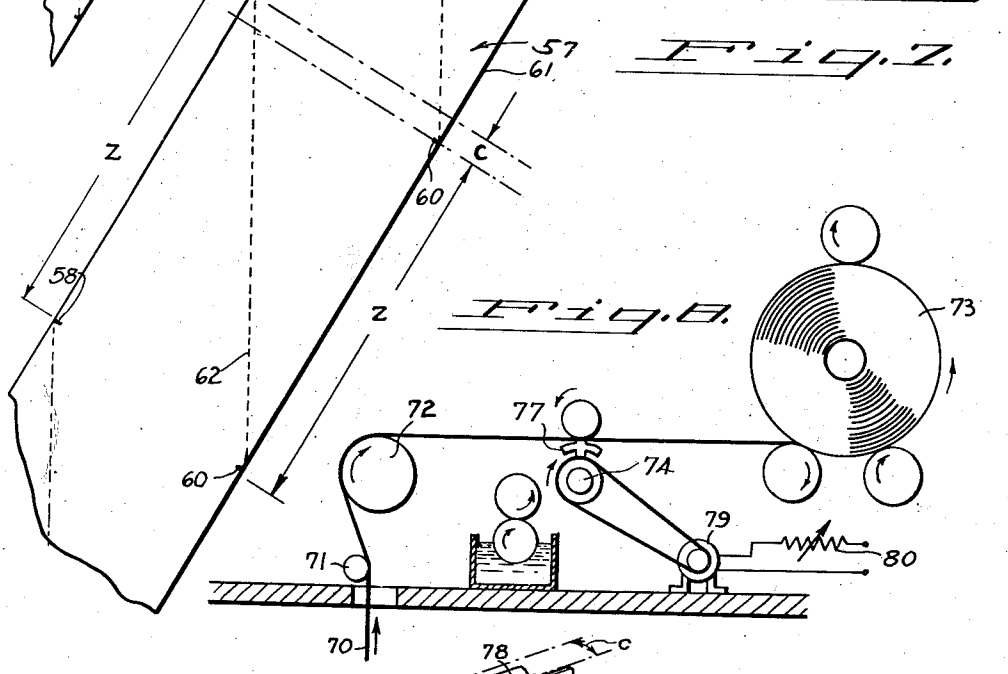


Fig. 8.

Fig. 9.

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UNITED STATES PATENT OFFICE

2,301,092

APPARATUS FOR SPOTTING STRIPS

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Application October 15, 1940, Serial No. 361,285

7 Claims. (Cl. 101—228)

Our present invention relates generally to the manufacture of tubular material, and has particular reference to the art of making a tube by spiraling a strip of material upon itself and joining its longitudinal edges along a helical seam.

While our invention is directed primarily to the manufacture of a tube made of fabric, such as burlap, and intended for wrapping purposes, it will be understood that numerous phases of our invention may have wider applicability.

The general procedure involved in the manufacture of such a tube is more fully described and illustrated in our co-pending patent application, Serial No. 361,284, filed October 15, 1940. Briefly, it involves the steps of spiraling a continuous strip of material so as to bring one longitudinal edge into registry with the other along a helical line, and joining these longitudinal edges by suitable means, for example, by stitching.

To insure uniformity of diameter of the resultant tube, it is desirable to mark or spot the longitudinal edges of the strip in a predetermined manner prior to the spiraling operation, thereby enabling the operator to keep the marks on one longitudinal edge in predetermined relation to the corresponding marks on the other edge as the tube is created. Our present invention relates specifically to this preliminary spotting procedure, and to improved apparatus for producing the desired spots.

Tubing of the present character is generally required in various sizes, i. e., of different diameters, especially where it is intended to be used for wrapping purposes. With a strip of given width, tubes of different diameters can be produced by varying the slope of the helical seam. Similarly, if the slope of the helical seam is to remain constant, then tubes of different diameters can be produced only by utilizing strips of correspondingly different widths. In the case of burlap tubing, for example, it is often desirable to arrange the helical seam at an angle of substantially 45° to the axis of the tube, or at some other particular angle, regardless of the diameter of the tube, so as to arrange the bias of the goods in coincidence or other predetermined relation with the longitudinal axis of the tube, thereby imparting the desired stretchability to the resultant tubular structure, both longitudinally and transversely.

Accordingly, a spotting apparatus of the present character, to be commercially practical, must be so constructed that it may be readily adapted for use with strips of different widths. It is a general object of our invention to provide an apparatus having this capability.

Furthermore, the spotting apparatus should be of such a character that it may be adjusted to produce different arrangements of spots or marks, as called for by the width of the strip being treated, and by the slope of the helical seam in the tube for which that particular strip is intended. The provision of an apparatus having this type of adjustability is included within the general objects of our invention.

Our present apparatus is capable of producing a series of evenly spaced distinguishing marks on one longitudinal edge of the strip, and a corresponding series of evenly spaced marks along the other longitudinal edge. In one embodiment of our invention, different widths of material, and different slopes of helical seam, are compensated for by varying the spacing between the spots.

For various reasons, to be explained more fully hereinafter, it is preferable to retain the spacing between the spots at a fixed predetermined amount, regardless of the width of the strip that is being spotted, or the slope desired in the ultimate helical seam. To accomplish this result, we have evolved a novel procedure; and in the preferred embodiment of our invention a spotting apparatus is provided which retains the advantage of fixed predetermined spacing between the spots, and which is nevertheless readily adjustable for different widths of strips, and for varying slopes of helical seam.

We achieve the foregoing objects and advantages, and such other objects and advantages as may hereinafter appear or be pointed out, in the manner illustratively exemplified in the accompanying drawings in which:

Figure 1 is a diagrammatic view of the general procedure involved in spiraling a strip of material upon itself to form a tubular structure, the preferred system of spotting being employed;

Figure 2 is a view similar to Figure 1, in which a relatively wider strip, spotted in accordance with the same preferred system, is formed into a tubular structure;

Figure 3 is a schematic elevational view illustrating a preferred form of spotting apparatus for producing the results indicated in Figures 1 and 2;

Figure 4 is a fragmentary plan view of a portion of Figure 3;

Figure 5 is an enlarged fragmentary perspective view showing a detail of the construction of Figures 3 and 4;

Figures 6 and 7 are views similar to Figures 1 and 2 illustrating another system of spotting;

Figure 8 is a schematic elevational view of a spotting apparatus adapted to accomplish the results indicated in Figures 6 and 7; and

Figure 9 is a fragmentary perspective view of certain details of the construction of Figure 8.

In Figure 1 we have shown a strip of material which is intended to be spiraled upon itself to bring its longitudinal edge 11 into registry with the opposite longitudinal edge 12 along a helical line 13, whereby the provision of a seam along the line 13 will produce the tubular structure shown.

In Figure 2 we have shown a similar strip 14 intended to be spiraled so as to bring its longitudnal edge 15 into registry with the opposite longitudinal edge 16 along a helical line 17. The strip 14 is wider than the strip 10, and if the slope of the helices 13 and 17 is the same, then the diameter of the resultant tube in Figure 2 is greater than the diameter of the resultant tube in Figure 1.

In accordance with our invention, the strips 10 and 14 are subjected to a preliminary process or treatment whereby certain predetermined distinguishing marks or spots are provided along the longitudinal edges, so that a maintenance of predetermined relation between these spots, during the spiraling operation, will maintain a uniform diameter in the tube that is produced. We have illustratively shown a series of evenly spaced marks or spots 18 along the longitudinal edge 11, a second series of evenly spaced marks 19 along the edge 12, a series of evenly spaced marks 20 along the edge 15, and a series of evenly spaced marks 21 along the edge 16.

It will be observed that the spacing between the spots or marks of each series (designated as X) is the same as the spacing between the spots of the other series.

In accordance with our invention, the series of spots 19 is applied to the strip 10 of Figure 1 in such a manner that a diagonal line drawn from any mark 18, at an angle equal to the slope desired in the helical seam 13, will intersect one of the marks 19. To illustrate this we have shown a series of diagonal lines 22 extending across the strip 10. It will be understood that these lines are not actually produced on the strip, but are shown in Figure 1 (as in the other similar figures of the present drawings) merely for the purpose of explaining the nature of the present procedure and of the basic principles upon which the improved apparatus is designed. The angle 23, formed between each diagonal line 22 and the longitudinal axis of the strip, measures the slope of the resultant helix 13. While this angle, as shown in Figures 1 and 2, is substantially less than 45°, it will be understood that, in the practice of our invention in connection with the manufacture of fabric tubing for wrapping purposes, this angle may be of any selected larger or smaller magnitude.

It will be observed that the spots 19 happen to be offset, longitudinally, with respect to the spots 18, by an amount designated as A. The amount of this offset depends upon the angle 23 and upon the width of the strip 10. It may be any amount between zero and the distance X. But whatever this offset may be, if the spots 19 have been arranged in the manner described, the resultant tubing will have a predetermined uniform circumference, and the helix 13 will have a predetermined uniform slope, provided that each spot 18 is brought into substantial registry with the corresponding spot 19 during the spiraling operation. By the term "corresponding spot 19," we refer to the spot at the other extremity of the imaginary diagonal line 22.

Incidentally, the length of the line 22 is equal to the circumference of the resultant tube.

The arrangement of the spots 21 of Figure 2 is determined in a similar manner. These spots are arranged so that a diagonal line drawn from any mark of the series 20, at an angle equal to the slope desired in the helix 17, will intersect one of the marks 21. To illustrate this we have shown a series of imaginary diagonal lines 24 extending across the strip 14 at an angle 25 to the longitudinal axis of the strip. The lines 24 determine the relative positioning of the spots 20 and 21, and if the slope of the helix 17 of Figure 2 is to be the same as that of the helix 13 of Figure 1, then the angle 25 is made equal to the angle 23 of Figure 1.

It will be observed that the spots 21 of Figure 2 happen to be offset, longitudinally, with respect to the spots 20, by an amount designated B. This offset happens to be less in Figure 2 than in Figure 1, but it need not necessarily be so, and may in fact be the same as or greater than the offset A in Figure 1. The amount of the offset B is determined by the magnitude of the angle 25 and by the width of the strip 14. But whatever this offset may be, the resultant tube will have a predetermined uniform circumference, and the helical seam 17 will have a predetermined uniform slope, provided that each spot 20 is caused to register with the corresponding spot 21 during the spiraling operation.

The ability to produce tubes of uniform predetermined diameter, regardless of the widths of the strips from which the tubes are made, is the direct result of the spotting procedure hereinbefore described, and is independent of the spacing X which may be selected. This spacing may, therefore, be advantageously chosen to be a standard unit of length, such as one yard, whereby the markings on the edges of the strips may serve the additional purpose of indicating or measuring yardage.

Reference will now be made to Figures 3, 4, and 5, in which we have shown an illustrative form of spotting apparatus for carrying out the procedure indicated in Figures 1 and 2.

In Figure 3, we have shown a strip of material 26 traveling from a supply (not shown), over the guide rollers 27 and 28, and ultimately onto a wound bundle 29. The advancement of the strip may be accomplished in any desired manner, and we have illustratively shown two driving rollers 30 upon which the roll 29 is formed and supported. The rollers 30 may derive their power from any suitable source, such as an electric motor or the like. A dancing roller 31 may be advantageously arranged over the roll 29, and the roller 31 will be suitably mounted in the framework of the apparatus to allow it to be moved upwardly as the diameter of the roll 29 increases.

During its passage from the roller 28 to the winding portion of the apparatus, the strip 26 is subjected to the spotting operation. This is accomplished by a pair of spotters arranged in the path of travel of the strip and in operative relations to the opposite longitudinal edges of the strip. Each spotter is adapted to apply a distinguishing mark to the corresponding edge of the strip, and means are provided for operating

each spotter so as to bring it into contact with the fabric strip intermittently and at the same rate of intermittence as the other.

One method of accomplishing these results lies in providing a rotating shaft **32**, arranged across the path of travel of the strip **26**, and in controlling the operation of the spotters by means of this shaft. In the illustrated construction, we provide a pair of collars **33** and **34** upon the shaft **32**, each collar carrying a spotter or marking device. Thus, we have shown a marking device **35** on the collar **33** (shown most clearly in Figure 5) and a similar marking device or spotter **36** on the collar **34**.

The spotters **35** and **36** may be of any suitable character, adapted to apply a distinguishing mark to the strip as it passes by them. One convenient way of marking or spotting the strip is to construct the spotters **35** and **36** in the form of inking devices, a suitably shaped printing surface being adapted to encounter an inking roller during the rotation of the shaft **32**. Thus, in Figure 3, we have illustratively shown an ink receptacle **37** within which a roller **38** is partially immersed, this roller being in continuous contact with the inking roller **39**, the latter being positioned so that the spotter **35** encounters it during the rotation of the spotter. Either the same receptacle **37**, or a corresponding one, is associated with similar means for inking the spotter **36**.

Because of the fact that the spots applied to the strip are always spaced by a fixed predetermined amount, it is possible and advantageous to operate the shaft **32** in predetermined timed relation to the speed of travel of the strip **26**, so that the speed of travel of the strip is substantially equal to the peripheral speed of the spotters **35** and **36**. This assures the application of a clean-cut distinguishing mark on the strip that passes over the spotters. The procedure may be further enhanced by employing a backing roller **40** which holds the strip against the spotters as the latter transfer their impressions to the strip.

The timed operation of the shaft **32**, with respect to the travel of the strip **26**, may be accomplished in any desired manner. The simplest way is to drive the shaft **32** from the same source of power that drives the rollers **30**, with suitable gearing or other transmission means serving to impart the correct relative speeds to the various elements. For example, the shaft **32** may be driven, by means of a belt **41**, directly from one of the driving rollers **30**. It will be understood, however, that the belt device shown in the drawings is merely illustrative.

By virtue of the fact that the spotting apparatus is intended to function with strips of differing widths, the spotters are so arranged that their relative proximity may be varied. We have illustratively shown each of the collars **33** and **34** provided with a set screw or equivalent element **42** (Figure 5), whereby the collar may be axially shifted along the shaft **32**. It is not necessary, however, that both collars be adjustable along the shaft; and the variation in the proximity of the spotters, to take care of varying widths of strips, could be effected by having only one of the collars **33—34** shiftable axially with respect to the other.

To provide for the proper placing of the spots along one of the longitudinal edges of the strip with respect to the spots on the other, depending upon the angle desired for the slope of the ultimate helix, and upon the width of the strip, at least one of the collars **33—34** is also adjustable rotatively with respect to the shaft **32**. We have illustratively shown both collars adjustable in this rotative manner, although it will be understood that the desired result can be accomplished by having only one of them rotatively adjustable.

Where a series of strips of different widths are to be spotted, for the purpose of making tubes of various sizes but of uniform slope—as in the manufacture of fabric tubing having always a particular slope of helical seam—the rotative adjustments of the spotters may be facilitated by providing the shaft **32** with the helical indicia **43**. The collars which are to be rotatively adjusted (such as the collar **33** of Figure 5) are then provided with an indicating marker **44** adapted to be brought into predetermined alignment or other relationship with respect to the helical mark **43**.

The pitch of the helix **43** is determined by the spacing between the spots, i. e., by the distance designated X in Figures 1 and 2, and by the angle of the slope desired in the ultimate seam that is to be formed. This will be made apparent from a consideration of Figure 2. The pitch of the helical indicia **43** must be equal to the distance between the points **45**, and this distance is obviously dependent upon the spacing X and upon the angle **25**.

If desired, there may be several helical marks provided on the shaft **32**, e. g., one for each of several slope angles for which adjustments may be wanted.

In designing the apparatus, it should be noted that the spacing X is dependent upon the speed of rotation of the shaft **32**, the distance of the strip **26** from the axis of the shaft **32**, and the speed of travel of the strip **26**. If the apparatus is to be designed so that the speed of travel of the strip **26** is equal to the peripheral speed of the spotters, then the distance X is dependent solely upon the radial distance from the axis of the shaft **32** to the strip **26**. This radial distance is therefore chosen accordingly. With the distance X thus determined, the helical indicia **43** determines the slope which the helical seam will ultimately have, and each indicia **43** is formed on the basis of a particular angle that is desired in this helical seam.

Once the apparatus has been designed and constructed in accordance with the foregoing principles, strips of material of any desired width may be subjected to treatment, and the longitudinal edges will always be suitably spotted to provide for ultimate tubes of predetermined uniform slope of helical seam. Before treating each strip, the only adjustment that is necessary is in one or both of the spotters to bring them into proper spaced relation so that they will operate on the opposite longitudinal edges of the strip. If, in adjusting the spotters toward or away from each other, they are at the same time adjusted rotatively with the aid of the guiding indicia **43**, then the series of spots that are formed on one edge of the strip, regardless of its width, will automatically be in proper positional relation to the series of spots formed on the other longitudinal edge.

The apparatus may be slightly modified in various obvious respects. For example, instead of having both spotters functioning on the underside of the strip, they might be arranged in a manner whereby one of them operates on the underside, while the other operates on the upper side of the strip. In such a case, a separate rotating

shaft would be required for each of them, but by gearing the shafts together so as to rotate at the same speeds, the two shafts can be made to function as one.

Similarly, the spotters might be of a character which, while not rotating with the shaft, might nevertheless be caused to function intermittently by means of cams mounted on the shaft. For example, each of the collars 33—34 might carry a cam or the like, cooperable as the shaft rotates, with a spotter or spotting mechanism arranged in the path of action of the cam.

In Figures 6 and 7 we have illustrated a modified procedure. The strip 50 is provided with a series of spots 51 along its longitudinal edge 52, and with a series of corresponding spots 53 along its opposite longitudinal edge 54. The spots are evenly spaced by a distance Y, and the series of spots 53 are so arranged that a diagonal line 55, drawn from any one of the spots 51, at an angle equal to the desired slope of the helix 56, will intersect one of the spots 53.

In Figure 7 the wider strip 57 is provided with a series of spots 58 along its longitudinal edge 59 and a series of similar spots 60 along the opposite longitudinal edge 61. Again, the series 60 is so arranged that a diagonal line 62 drawn from any mark 58, at an angle equal to the slope desired in the helix 63, will intersect one of the marks 60. This result is achieved, however, not by varying the offset C, which remains the same, but by varying the spacing between the spots. Thus, in Figure 7, the spots of each series are spaced apart by a distance Z, which is different from the spacing Y of Figure 6.

The amount of the offset C is entirely immaterial. It could, if desired, be zero, in which case each spot on one edge would be directly opposite one of the spots on the other edge.

This procedure may be carried out by means of an apparatus, shown most clearly in Figures 8 and 9, which is in some respects simpler than the apparatus hereinbefore described, but in some respects less desirable.

In the apparatus of Figure 8 the strip 70 passes, as before, around guide rollers 71 and 72, and is caused to wind up on the roll 73. A rotating shaft 74 is again arranged across the path of travel, and on this shaft are arranged two collars 75 and 76, carrying spotters 77 and 78 respectively. Each of the collars 75 and 76 is adjustably mounted on the shaft 74, as in the previously described embodiment, but in adjusting the spotters toward or away from each other, they are scrupulously maintained in predetermined angular relation to each other. Thus, for the purpose of achieving the results indicated in Figures 6 and 7, one of the spotters is angularly offset from the other by a slight amount equal to the distance C shown in Figures 6 and 7, and during all adjustments of the spotters in an axial direction with respect to the shaft 74, this angular relationship is maintained.

The production of spots at spaced intervals Y, as in Figure 6, or at spaced intervals Z as in Figure 7, or at any other spaced interval, depending upon the width of the strip being treated and the slope of seam that is wanted, is effected by varying the speed of rotation of the shaft 74. We have illustratively shown a driving source in the form of an electric motor 79, whose speed is capable of variable control by means of any suitable mechanical or electric device such as that indicated at 80.

In other respects, the apparatus of Figure 8 may be substantially the same as that of Figure 3.

In general, it will be understood that the details herein described and shown, for the purpose of explaining the nature of our invention, are purely illustrative, and may be modified by those skilled in the art without departure from the spirit and scope of the invention as expressed in the appended claims.

Having thus described our invention, and illustrated its use, what we claim as new and desire to secure by Letters Patent is:

1. In a spotting apparatus, means for continuously advancing a strip of material to be spotted, a rotating shaft arranged across the path of travel of the strip, a pair of spotters carried on said shaft, means for shifting at least one of said spotters along said shaft so that they may be arranged in operative relations to the opposite longitudinal edges of strips of varying widths, each spotter being adapted to apply a distinguishing mark to the corresponding edge of the strip, each spotter functioning intermittently as the shaft rotates and at the same rate of intermittance as the other so as to produce a series of evenly spaced marks on each edge, means for rotatively adjusting at least one of said spotters to vary the relative timing of operation of said spotters, and helical indicia on said shaft for guiding said shifting and rotative adjustments.

2. In a spotting apparatus, means for continuously advancing a strip of material to be spotted, a rotating shaft arranged across the path of travel of the strip, a pair of collars mounted on the shaft in a manner which permits both axial and rotative adjustments thereof, a spotter on each collar, whereby axial adjustments of the collars allow said spotters to be arranged in operative relations to the opposite longitudinal edges of strips of varying widths, each spotter being adapted to apply a distinguishing mark to the corresponding edge of the strip, and helical indicia on said shaft for allowing the axial and rotative adjustments of said collars to be effected in predetermined relationship.

3. In a spotting apparatus, a rotating shaft, a collar mounted thereon to allow both axial and rotative adjustment, a spotter carried by said collar and adapted to apply a distinguishing mark to a strip of material traveling past it, and helical indicia on the shaft for guiding said axial and rotative adjustments of said collar along a predetermined helical path.

4. In a spotting apparatus, means for continuously advancing at a uniform rate of speed a strip of material to be spotted, a pair of spotters arranged in the path of travel of the strip in operative relations to the opposite longitudinal edges of said strip, each spotter being adapted to apply a distinguishing mark to the corresponding edge of the strip, means for operating each spotter to act on the material intermittently and at the same rate of intermittance as the other so as to produce a series of evenly spaced marks on each edge, and means for varying the speed of operation of said spotters so that the spacing between said marks may be correspondingly varied.

5. In a spotting apparatus, means for continuously advancing at a uniform rate of speed a strip of material to be spotted, a pair of spotters arranged in the path of travel of the strip in operative relations to the opposite longitu-

dinal edges of said strip, each spotter being adapted to apply a distinguishing mark to the corresponding edge of the strip, means for operating each spotter to act on the material intermittently and at the same rate of intermittence as the other so as to produce a series of evenly spaced marks on each edge, said last-named means comprising a rotating shaft, collars mounted on said shaft, each collar carrying one of said spotters, at least one of said collars being axially shiftable on said shaft so that the interval between said spotters may be varied, and means for rotating said shaft at varying speeds, so that the spacing between said marks may be correspondingly varied.

6. In a spotting apparatus, the combination with means for effecting a longitudinal advancement of a fabric strip of indefinite length whose longitudinal edges are to be spotted, a pair of spotters alongside the path of travel of said strip and arranged to apply distinguishing spaced marks to said strip as it passes by, and means for varying the relative proximity of said spotters so that they may be set at any desired spacing within a predetermined range, the field of operation of said spotters being unimpeded throughout the entire extent of said range whereby said spotters may be arranged to spot the longitudinal edges of any selected one of an indefinite number of strips of varying widths, of means for operating said spotters so that each one will apply a series of longitudinally spaced marks to the corresponding edge of the strip, said means comprising a rotating shaft, a pair of collars on said shaft, each collar controlling the operation of one of said spotters, at least one of said collars being mounted for both axial and rotative adjustment on said shaft, and helical indicia on said shaft for guiding said axial and rotative adjustment along a predetermined helical path.

7. In a spotting apparatus, the combination with means for effecting a longitudinal advancement of a fabric strip of indefinite length whose longitudinal edges are to be spotted, a pair of spotters alongside the path of travel of said strip and arranged to apply distinguishing spaced marks to said strip as it passes by, and means for varying the relative proximity of said spotters so that they may be set at any desired spacing within a predetermined range, the field of operation of said spotters being unimpeded throughout the entire extent of said range whereby said spotters may be arranged to spot the longitudinal edges of any selected one of an indefinite number of strips of varying widths, of means for operating said spotters so that each one will apply a series of longitudinally spaced marks to the corresponding edge of the strip, said means comprising a rotating shaft, a pair of collars on said shaft, each spotter being carried by one of said collars, at least one of said collars being mounted for both axial and rotative adjustment on said shaft, and helical indicia on said shaft for guiding said axial and rotative adjustment along a predetermined helical path.

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