United States Patent

Cochran et al.

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[45] **Aug. 15, 1972**

[54] **APPARATUS AND METHOD FOR MAKING SEED TAPE AND THE RESULTING SEED TAPE**

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[22] Filed: **Nov. 10, 1969**

[21] Appl. No.: **875,301**

[52] **U.S. Cl.** **53/28,** 47/50, 53/180

[51] **Int. Cl.** **B65b 9/06**

[58] **Field of Search**.....53/28, 180; 47/50, 53–177

[56] **References Cited**

UNITED STATES PATENTS

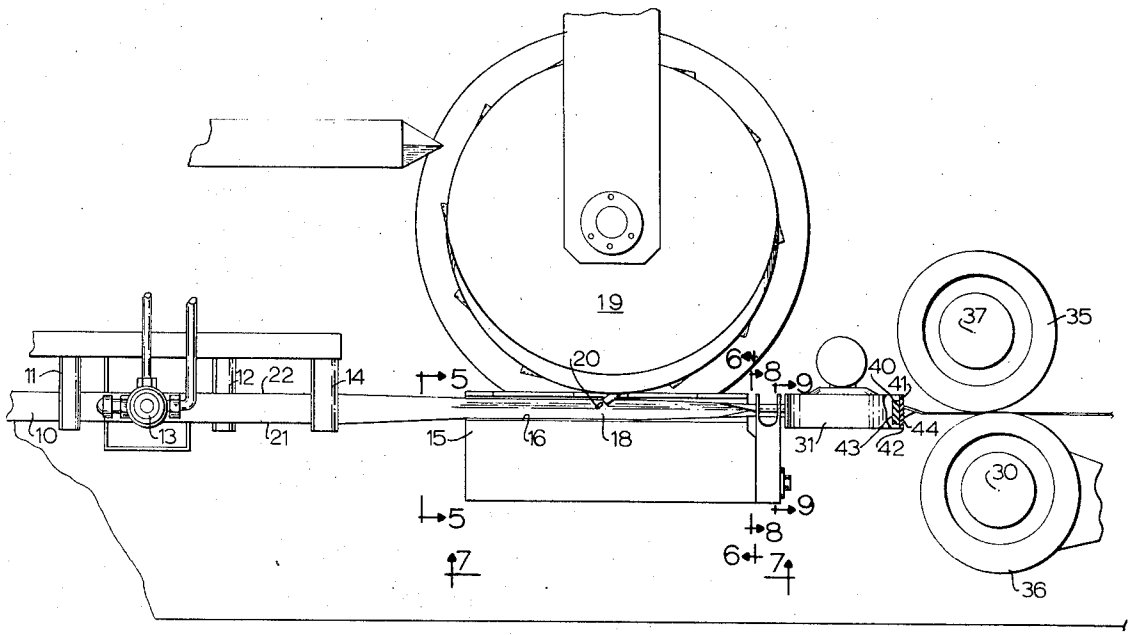
3,561,187	2/1971	Rohnert et al.	53/28
1,160,278	11/1915	Gray et al.	53/180

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[57] **ABSTRACT**

A single strip passes while under tension and with a portion moistened through a generally V-shaped mandrel channel with a rounded lower end, and seeds are dropped into place on the tape. Then the tape is guided along a gradually deepened channel with widened lower portion and through a pair of generally circular eyes, each having a step. These eyes form the tape into an overlapped circular shape. A pair of rollers then flatten the tape and seal it closed, while retaining the overlap.

4 Claims, 10 Drawing Figures



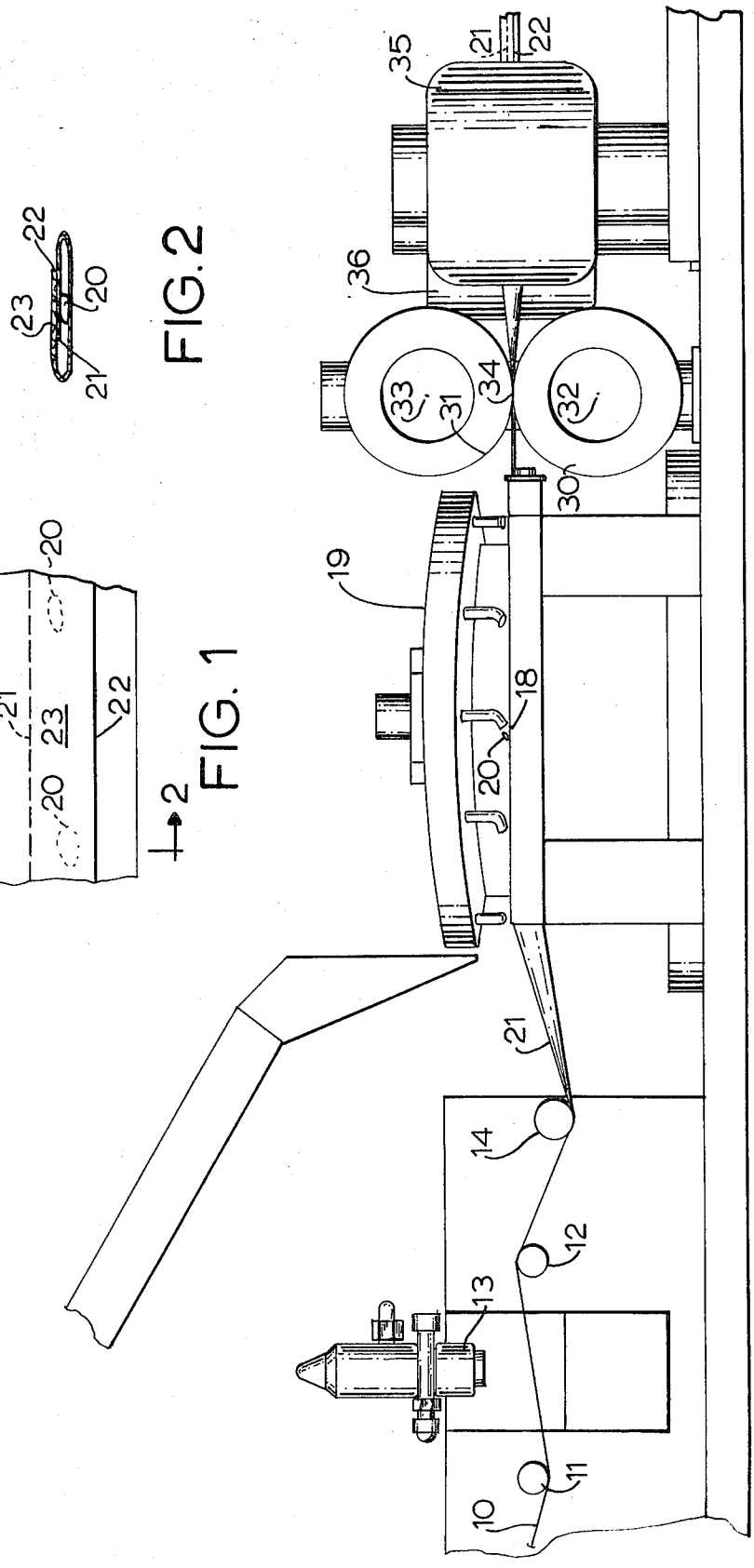


FIG. 3

FIG. 1

FIG. 2

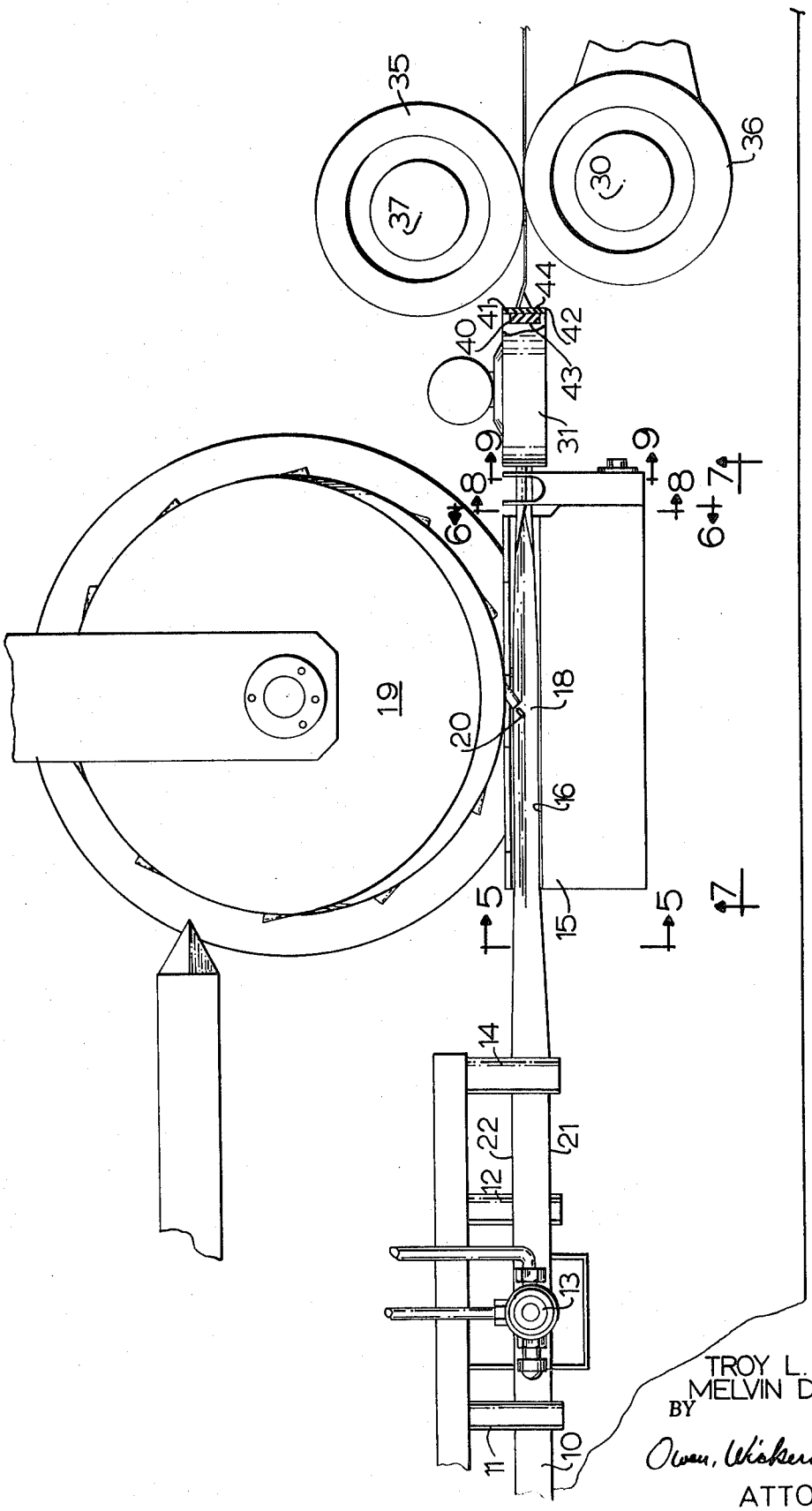


FIG. 4

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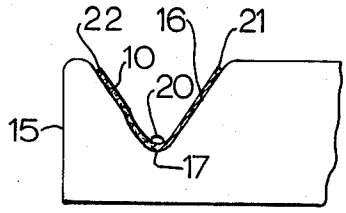


FIG. 5

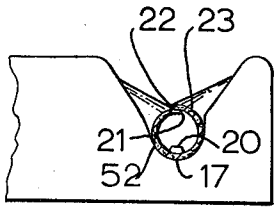


FIG. 6

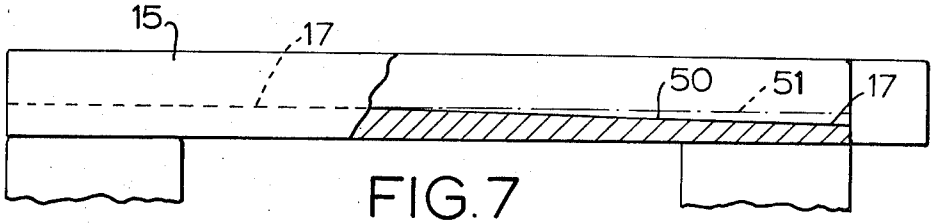


FIG. 7

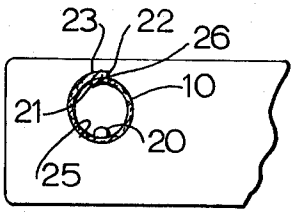


FIG. 8

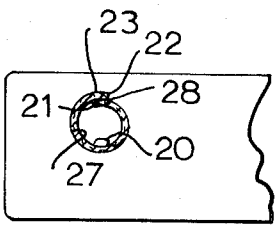


FIG. 9

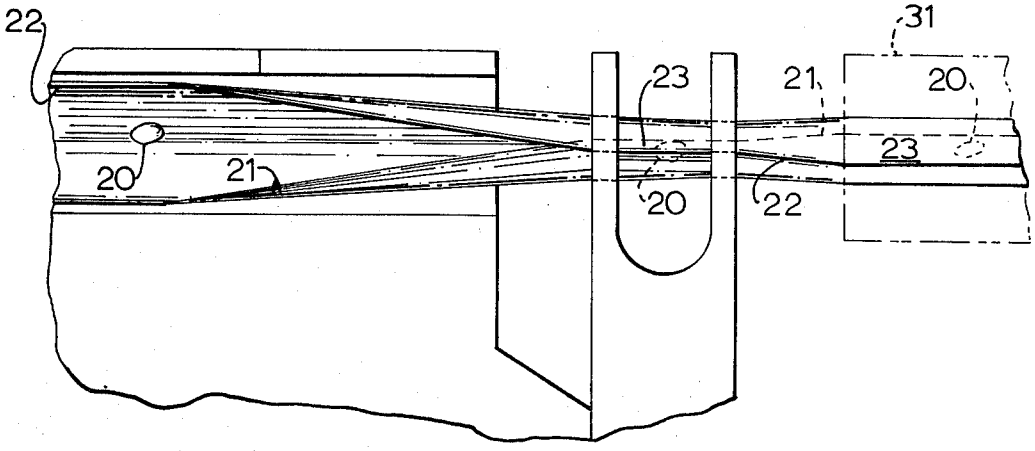


FIG. 10

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APPARATUS AND METHOD FOR MAKING SEED TAPE AND THE RESULTING SEED TAPE

This invention relates to apparatus and method for making seed tape and to the resulting product.

Seed tape has recently been manufactured successfully from polyoxyethylene, and successful machines have been described in earlier-filed patent applications. However, a special problem arises with some relatively large seeds, for then it is not satisfactory merely to place the seeds individually in a vee-shaped configuration of tape and simply to close the moistened side edges of the tape together. Large seeds exert so much pressure that they tend to break open the seam and to fall out.

The present invention overcomes this problem by providing a seed tape closed by and sealed with an overlap so that the seed is not merely held together by the welding together of the side edges of the tape, but also by the overlap; thus, even though the seam itself may not be perfectly sealed, it is difficult for the seeds to fall out. Also, it becomes easier to make a better seam. The product is thus superior to other seed tapes, especially when large seeds are used. The invention provides not only a superior product, but method and apparatus for making it.

It is important for seed tape to be manufactured quite rapidly in order to be economical, and the present invention enables rapid manufacture of seed tape having an overlapping seam.

Other objects and advantages of the invention will appear from the preferred embodiment described in detail below.

In the drawings:

FIG. 1 is a fragmentary top plan view of a seed tape embodying the principles of the invention.

FIG. 2 is a view in section taken along the line 2—2 in FIG. 1.

FIG. 3 is a fragmentary view in side elevation of a portion of a seed tape manufacturing machine embodying the principles of the present invention.

FIG. 4 is a top plan view of the apparatus of FIG. 1.

FIG. 5 is an enlarged view taken in section along the line 5—5 in FIG. 4, looking at one end of the mandrel with its V-shaped groove.

FIG. 6 is an enlarged view in section taken along the line 6—6 in FIG. 4, looking at the other end of the mandrel.

FIG. 7 is an enlarged view in side elevation and in section of the mandrel, along the line 7—7 in FIG. 4.

FIG. 8 is an enlarged view in section taken along the line 8—8 in FIG. 4.

FIG. 9 is an enlarged view in section taken along the line 9—9 in FIG. 4.

FIG. 10 is an enlarged top plan view of the tape during manufacture according to this invention showing how the tape is overlapped and its progress in closing and flattening.

A continuous strip 10 of polyoxyethylene tape or other suitable material (from a suitable supply, as a reel of spool) enters from the left of FIGS. 3 and 4 as a flat tape passing under a flat cylindrical pin 11, over a flat cylindrical pin 12, and, in between the pins 11 and 12, beneath a moisture applicator 13, which sprays a desired pattern of moisture, along the edges only or along one edge or over one entire face. The moistened tape 10 then passes over the pin 12 and under a pin 14,

which guides it on to a mandrel member 15. The mandrel member 15 is preferably provided with a generally V-shaped slot 16 having a rounded bottom portion 17, shown greatly enlarged in FIG. 5. The tape 10 is constrained to follow this shape by virtue of the tension exerted on it by its guide pins and drive rollers. While the tape 10 is on the mandrel 15, it passes a seed depositing station 18. A seed placement machine 19 like that shown in U.S. Patent application Ser. No. 721,542 filed, now U.S. Pat. No. 3,561,187, Mar. 20, 1968, may be used, or one like that shown in U.S. Patent application Ser. No. 710,014, now U.S. Pat. No. 3,511,016, filed Mar. 4, 1968, may instead be used.

In any event, seeds 20 are deposited one group at a time, sometimes in pluralities but usually one seed at a time, on the tape 10 while the tape 10 is approximately over the longitudinal center of the mandrel 15. Heretofore, the next step would have been to force the two side edges 21 and 22 of the tape 10 together to provide a seam, but in the present invention an overlap 23 is achieved by sending the tape 10 with its seed 20 through a first eye 25, which is generally circular, but is provided with a short step 26 near its uppermost portion. As a result, one side edge 22 is held along a larger radius than the other edge 21, as shown in FIG. 8, so that the edge 21 of the tape 10 is forced under the edge 22 to provide a short overlap 23. This eye 25 is carefully aligned relatively to the V-shaped groove 16 of the mandrel 15 and is located directly at its end.

Next, the tape 10 passes through a second eye 27 which is shaped substantially like the first eye 25, but is somewhat smaller in diameter; again there is a step 28, and this eye 27 increases the amount of the overlap 23. From here, the rounded and overlapped tape 10 passes, in as short a distance as possible, between two rollers 30 and 31 which are positioned on horizontal axes 32 and 33 to engage the tape 10 at a meeting point 34 and to flatten it, thereby forcing the moistened portions of the tape 10 to engage other portions of the tape and to seal along the overlap 23. The second eye 27 and the short distance between it and the rollers 30 and 31 counteract the tendency of the tape 10 to loosen and resume its original shape, and the tape 10 is able only to loosen to about the extent of the dimensions of overlap set in the first eye 25. The flattening by the rollers 30 and 31 retains the amount of overlap set by the eye 25, as shown in FIG. 8. From the point 34, the tape passes between a pair of final closing rollers 35 and 36 which exert somewhat more pressure. These rollers 35 and 36 are preferably mounted on vertical axes 37 and 38 and the tape is preferably turned 90° between the two sets of rollers.

The rollers 30, 31, 35 and 36 are preferably made with an indentation 40 lying between two shoulders 41 and 42. Within the indentation 40, is provided a soft rubber backing member 43 and on top of the shoulders 41 and 42 is an elastomeric ring 44, preferably of rubberband stock, to provide a soft seat for closing against the seeds 20 without damaging them.

An important feature of the invention, not mentioned heretofore, is that the bottom 17 of the groove or slot 16 is not precisely horizontal across the full length of the mandrel 15. Instead, it is horizontal for its first half and then, from about its midpoint at the see-depositing station 18 it gradually drops, along an

inclined path **50**, which diverges at a relatively flat angle from the horizontal, shown by a broken line **51** in FIG. **7**. At the same time, as may be seen by comparing FIG. **6** with FIG. **5**, the bottom portion **52** only of the slot **16** is widened and rounded. We have found that this inclination and rounding of the bottom portion **52** both enables better and smoother introduction to the first eye **25** (so that the tape **10** hugs the walls of the eye **25** rather than bridging across chords and introducing defects in the final tape) and prevents carry-back of the encirclement by the tape to the seed-depositing station **18** where it would cause trouble. The eyes **25** and **27** are mounted for ready adjustment relative to the mandrel **15**, to accommodate differences in tape thickness and so on.

To summarize, the flat tape **10** is first formed into a V-shape, the seed **20** is deposited, the tape **10** is then formed into a circle with an overlap **23**, and then the circle is flattened out with the seed **20** remaining in the center of the flattened-out portion and the overlap **23** thereby retained; then the tape is forced with somewhat more pressure to full closure at the seams along the overlap **23**.

To those skilled in the art to which this invention relates, many changes in construction and widely differing embodiments and applications of the invention will suggest themselves without departing from the spirit and scope of the invention. The disclosures and the description herein are purely illustrative and are not intended to be in any sense limiting.

We claim:

1. A method for making seed tape for relatively large seeds so as to prevent undesired opening of the seam by the action of the seed on the tape, comprising the steps of:

making one surface only of the tape tacky,

forming a flat tape into a V-shape with straight upstanding sides and the tacky surface directed inwardly,

dropping the seeds into the V at spaced intervals,

guiding one side edge of the tape and directing the other side edge thereunder to form a substantially circular shape enclosing the seeds with a substantial overlap of one side edge by the other side edge,

while contacting only the non-tacky surface during said forming, guiding, and overlapping, and

then flattening the circle to provide two flattened faces with the overlap in the middle of one face sealing the tape closed and the seed substantially against the middle of the other face, thereby bringing the overlapped portion down against the seed.

2. The method of claim **1** wherein the step of making the one surface tacky is done by moistening portions of one face of said tape, said tape being of a material made tacky by discreet moistening, and said flattening step includes closure of the moistened portion of the tape against another portion of the tape, so as to seal the tape closed at the overlapped portions.

3. The method of claim **1** wherein the tape, after being brought to its circular shape is brought into a smaller circle with more overlap, so that the tendency of the tape to depart from the circular shape before it can be flattened is restrained sufficiently to retain substantially the original degree of overlap provided when the tape is first brought into its circular shape.

4. A method for making seed tape for relatively large seeds from polyoxyethylene strip, so as to prevent undesired opening of the seam by the spreading action of the seed on the tape, comprising the steps of:

moistening a portion of said strip while it is flat,

forming the flat strip into a generally V-shape, with a rounded vertex,

dropping the seeds into the vertex at spaced intervals,

further deepening and rounding the vertex,

bringing the side edges of the strip directly from the V-shape around to provide a generally circular shape with an overlap of one side edge over the other side edge,

increasing the overlap while decreasing the diameter of the circle so that relaxation before the next step results in restoring substantially the dimensions of the bringing step,

then flattening the circle to provide two flattened faces with the overlap in the middle of one face and the seed substantially against the middle of the other face, thereby bringing the overlapped portion down against the seed, while sealing the moistened portion against another portion of the tape at the overlap.

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