WIDE PACKAGE AND METHOD OF MANUFACTURING SAME

Filed Nov. 28, 1966 4 Sheets-Sheet 1

Fig. 1

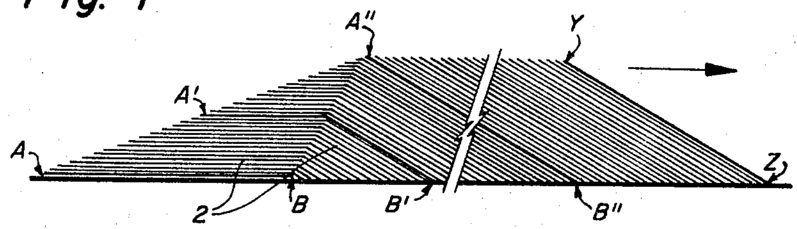


Fig. 2a

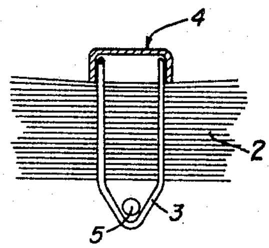


Fig. 2b

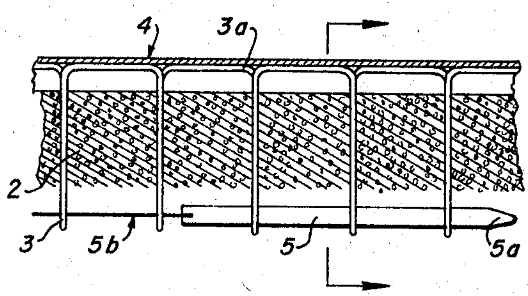


Fig. 3

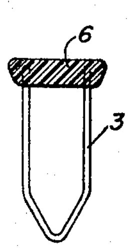
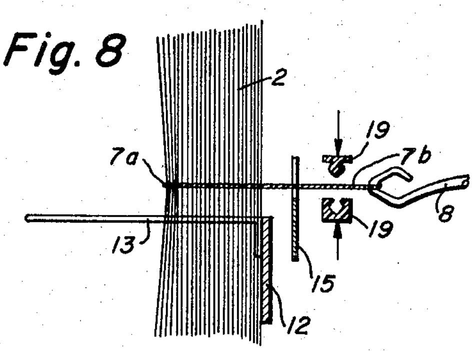


Fig. 8



INVENTOR
ERNST ERB

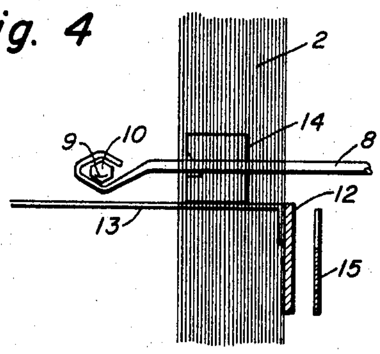
BY Wenderoth, Lind & Ponack
ATTORNEYS

Oct. 8, 1968 E. ERB 3,404,772

WIDE PACKAGE AND METHOD OF MANUFACTURING SAME

Filed Nov. 28, 1966 4 Sheets-Sheet 2

Fig. 4



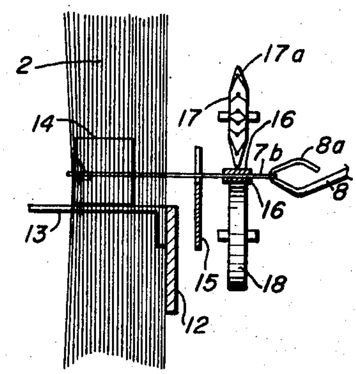


Fig. 6

Fig. 5

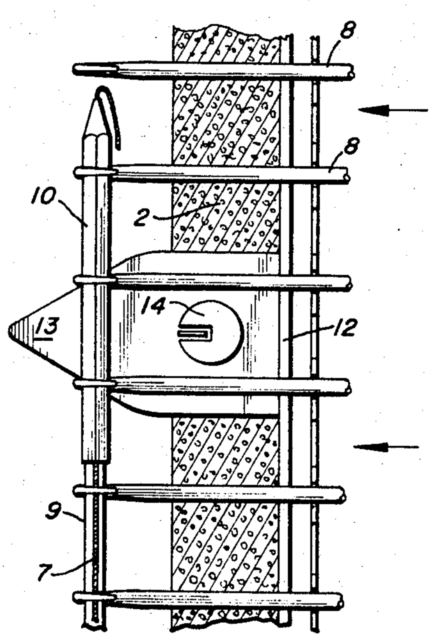
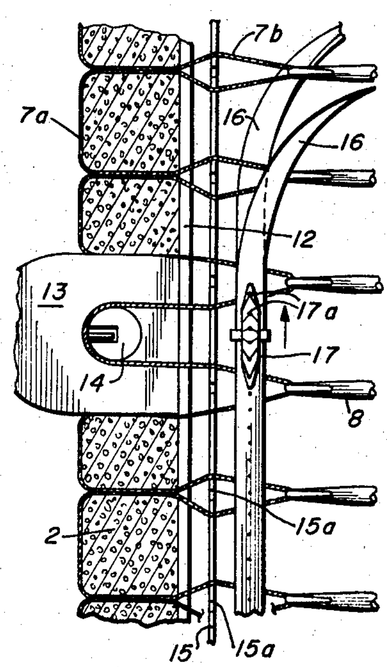


Fig. 7



INVENTOR
ERNST ERB

BY Wenderoth, Lind & Ponack

ATTORNEYS

Oct. 8, 1968 E. ERB 3,404,772

WIDE PACKAGE AND METHOD OF MANUFACTURING SAME

Filed Nov. 28, 1966 4 Sheets-Sheet 3

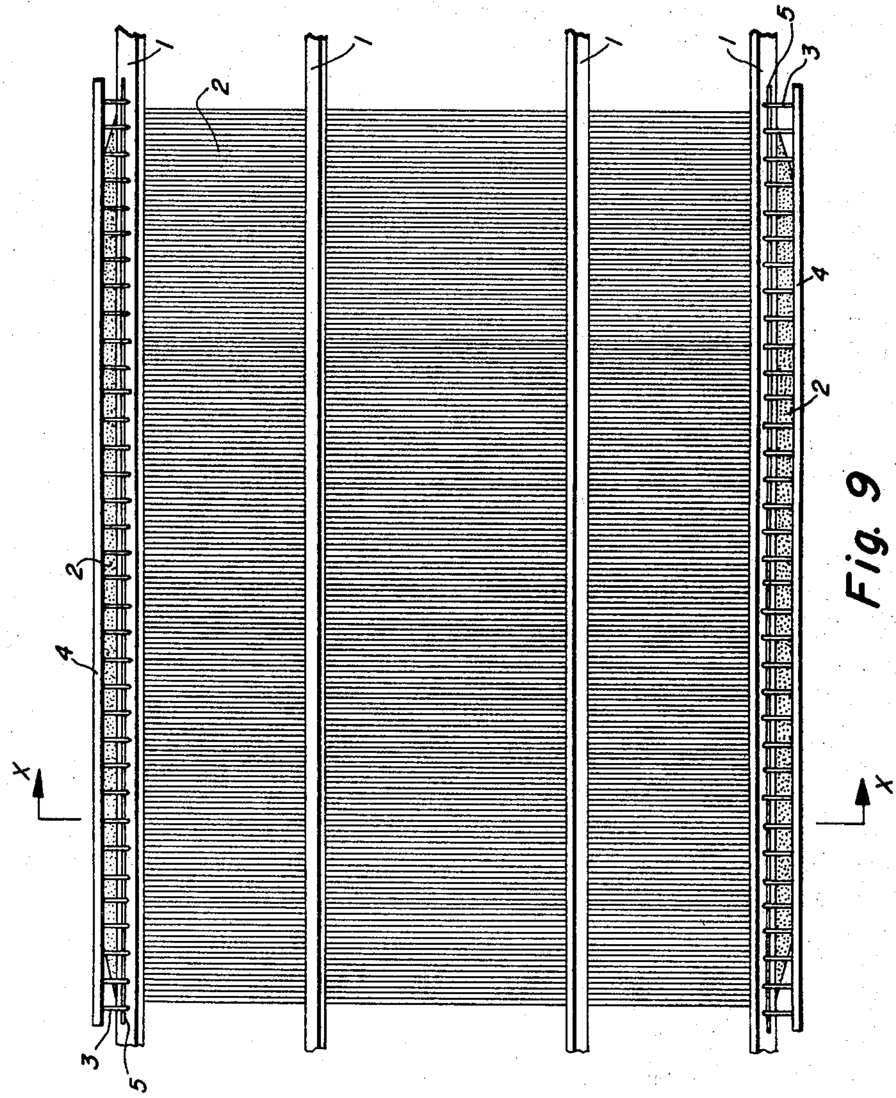


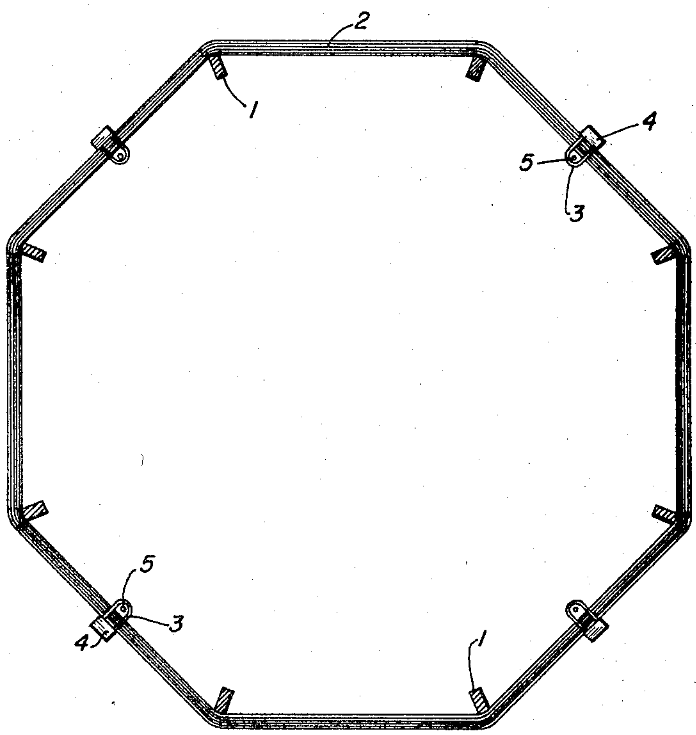
Fig. 9

INVENTOR
ERNST ERB

BY Wenderoth, Lind & Ponack

ATTORNEYS

Fig. 10



INVENTOR
ERNST ERB

BY Wenderoth, Lind & Ponack
ATTORNEYS

3,404,772
WIDE PACKAGE AND METHOD OF MANUFACTURING SAME

Ernst Erb, Basel, Switzerland, assignor to Erba Maschinenbau A.G., Basel, Switzerland, a Swiss corporation

Filed Nov. 28, 1966, Ser. No. 597,408
Claims priority, application Switzerland, Dec. 1, 1965, 16,578/65; Mar. 7, 1966, 3,239/66; June 27, 1966, 9,355/66
6 Claims. (Cl. 206—64)

ABSTRACT OF THE DISCLOSURE

A process for developing and a thread package having built up continuously staggered cross wound layers with narrow pitch lacing securing the layers. A multiplicity of laces are arranged on the periphery of the package by a longitudinally stable system of sub-division. The process for developing consists of arranging a cross winding path and continuously shifting the resultant layer formation to one side so that a conicity in the direction of shift develops and then continuing this point in cross wound fashion. Then the wide package layer is sub-divided over its entire width and also several times over its peripheral extent with divider elements which are attached to a longitudinally stable element over the full width of the package.

Conventional hanks are produced on winding machines, being so wound and divided into a greater or lesser number of skeins that in order to be unreeled from rotatably mounted reels they have to be taken off radially. That is to say, they must be drawn off in a tangential fashion, the reel being caused to rotate by the tension in the unwinding thread. This is the reason why, especially in the case of thinner and therefore weaker yarns, the hank weight has to be limited since otherwise the thread would break; even if the reel were started up very carefully and slowly, due to its small breaking strain the thread would be very liable to rupture if it had to set a large mass rotating. For this reason, the hank weight is limited by the breaking strength of the thread.

Despite this, efforts have been made in a variety of directions towards increasing the hank weight. A certain amount of success has been achieved in this direction, in that reeling machines have been equipped with extremely sensitive start-up and braking arrangements. This has been done on the one hand to get away with fewer tie points and longer operating times, and on the other to reduce the number of manipulations. Again, in order to be able to work with larger hank weights, the number of take-off reels has been increased so that lower velocities can be used.

With artifices of this kind, it has been possible to obtain higher hank weights, especially in the case of stronger yarn such as knitting yarns. In producing twisted yarns, it has been possible to increase the take-off weight per spindle to such an extent that reel weights of two and more kilograms are obtained. For purposes of dyeing and carrying out other finishing processes on the hank, these reels have to be split up into several smaller hanks again, and this means that the large thread length obtained by the aforesaid artifices is broken down into several subsidiary lengths again, with consequent loss in quality.

The subject of the present invention is a large package which is wound in a novel way and can have weights amounting to several kilograms for a single length of thread. The most important feature of this package, however, is that it does not have to be rotated in order to be unwound, it being possible instead for the thread to be drawn off at high speed in an axial direction from the end of the stationary package.

The procedure adopted for producing a wide package of this kind is that first of all a conical start is wound and that from this conical portion onwards, the package is wound width-wise in criss-cross fashion on a continuously shifting conical path. This develops a constant cone as in an ordinary cop, except that here the cone is of large periphery and is wound in criss-cross fashion. This cone then makes it possible to unwind the thread from the stationary, circularly expanded wide package in an axial fashion, winding being carried out from this cone and at high speed.

The start of the cone can be executed in a variety of ways. In the example shown, it is done in the manner which is mechanically the most simple to produce. This will be explained in greater detail in the specific description and in relation to the drawing. Also, the crossing ratio must be adapted to the particular application and to the material being wound, but this will not be dealt with in any detail here.

The most important feature where securing the criss-cross layer for any kind of processing is concerned, is the tie-off arrangement made in this process, tie-off being done at narrowly spaced intervals, over the width, and being done in multiple fashion around the periphery. In this context, it is arranged that the dividing elements of a tie-off, be they solid elements or loops of thread, are associated with a longitudinally stable member in order to ensure that the spacing between said elements is maintained. This protects the winding layer against aberrations in the thread crossing pattern during processing, in order to ensure the best unwinding conditions subsequently. None of the tie-off arrangements so far known satisfy the present purpose, namely that of allowing axial withdrawal of the thread.

This combination of the conically wound hank and the securing of the conical criss-cross winding by the longitudinally stabilised tie-off means constitutes a considerable advance in terms of a saving in work, thanks to higher thread speed on unwinding, and in terms of improved quality due to the substantially longer thread length obtained (i.e. substantially longer intervals between tie points).

Packages of similar appearance but of much smaller diameter are already known, of a kind which are axially unwound, for example the spinning cops produced in rayon spinning techniques. This kind of package, however, is not built up in conical layers, so that it is applicable exclusively to absolutely smooth continuously spun threads. In the case of yarns which are spun from fibres, where the projecting fibres in neighbouring threads can unite with one another during dyeing and washing and may even matt, this kind of package cannot be used at all.

On the basis of the attached drawings, in the following an example of the process of forming and tying off the package will be explained in greater detail.

FIGURE 1 shows a schematic illustration through a layer of the package, illustrating the development of the cone;

FIGURES 2*a*–2*b* show an example of how longitudinally stable tie-off can be effected using a rigid divider;

FIGURE 3 is a variant form, showing a semi-rigid divider;

FIGURE 4 is a radial section through the package layer with the needles pushed through the layer;

FIGURE 5 is an axial section through the package layer in the plane of the needles;

FIGURE 6 is a radial section showing the needles drawn back through the package layer and showing the process of roller spot-welding;

FIGURE 7 is an axial section through the package layer with the latter divided by threads in the form of tie-off loops;

FIGURE 8 is a radial section through the package layer, showing clamping sections;

FIGURE 9 is an interrupted longitudinal section through a wide package of the kind proposed in accordance with the invention; and

FIGURE 10 is a section on the line X—X of FIGURE 9.

In FIGURE 1, it is schematically illustrated how the conical layer is formed. The path of the criss-cross arrangement runs between A and B. This distance must be adapted to the nature of the thread material, and to the layer thickness. To form a cone, this path is continuously displaced towards the right in accordance with the yarn thickness. Each full layer of thread is illustrated schematically in FIGURE 1 by a line of corresponding length. Each further length then runs down towards the right over the preceding layers. At the layer running from A' to B', the cone is about half full, and at the layer running from A'' to B'' the cone is completed, and from that point remains unmodified with the subsequent winding on of further layers. At this taper, the package is then developed width-wise up to the last layer Y–Z and the width is, in fact, arbitrarily determinable.

The formation of the package cone is no doubt similar to that encountered at the start of a cop of the kind produced on a spinning or twisting machine; however the mode of winding cannot be compared with that used in the cop, since the latter is parallel-wound straight onto a sleeve, whereas the wide package of the invention is criss-cross wound. In this cross-wound state, and with its longitudinally stable tie-off arrangements, this winding must subsequently be self-supporting, i.e. be capable of maintaining its form alone, without any core piece or mandrel.

A package layer of such large diameter would not stand up to any kind of processing if no provision were made in the course of its construction for the inclusion of a longitudinally stable narrow-pitch system of sub-division. The term "pitch" designates the distance between the different laces. Such division should mean the provision, width-wide, of at least three divider elements **3** per crossing path (see FIGURE 2), and should be repeated a plurality of times around the periphery. The divider elements can be made of stable material such as wire of high grade steel or plastic, or may also take the form of cords or threads. The divider elements **3**, as FIGURES 2*a* and 2*b* indicate, have a substantially U-shaped cross-section and the individual elements **3** are, in fact, linked together through linking elements **3***a*, forming a cohesive tie-off arrangement.

The most important feature of this tie-off arrangement is that the divider elements are linked together to form a longitudinally stable structure. In FIGURES 2*a*–2*b*, a rigid divider element **3**, **4** is illustrated in which the elements **3** of high grade steel wire are in the form of cohesive wire hoops. These hoops **3** are spot-welded to rigid channel sections **4**. The entire arrangement **3**, **4** can be inserted with its hoops from the outside through the package layer in the direction of the arrows, whilst the package is still on the fingers of the winder.

By introducing a more or less pencil-shaped closure element **5** through the aligned ends of the dividers **3** inside the cavity surrounded by the package layer, the elements **3** are prevented from falling out. In this example, as FIGURES 2*a* and 2*b* indicate, the closure element consists of a guide piece **5***a* which carries a flexible high grade steel wire **5***b*. The closure element could equally well be some other device, however, such as a cord.

In FIGURE 3, a different embodiment of a divider element, having a flexible backing **6** of synthetic material such as polypropylene, is shown. Here, the same wire hoops **3** are used, but this time they are formed in situ in a plastic injection moulding. Numerous embodiments of such rigid or flexible divider elements can be provided. These are exclusively for use on non-automatic winding machines, however. As mentioned in the introduction, in the case of modern automatic machines the divider elements are formed by threads or cords, using special needles, being attached via the form loops to longitudinally stable elements and thus maintained at the proper spacings.

FIGURES 4 to 7 schematically indicate an example of how a tie-off arrangement of this kind can be produced. The procedure here is that over the complete finger length of the winding machine, needles **8** with special hooks and butts are provided (being located in a needle bed like that of a flat-bed knitting machine, although this is not shown), and by means of a needle cam (not shown) the needles are actuated through their butts and forced thus from the outside through the package layer **2** so that their hooked heads **8** project in a straight line into the internal cavity. Through these special hooks, a tie-off thread **7** coming from a reel is then passed, by means of a special leader element **9**, and this is then attached to a clamping device (not shown) at the end of the row of needles. Then, from this end, the cam is moved back in order to draw one needle after the other back through the package layer, as shown in FIGURE 7 so that each needle draws a loop of thread **7***a* (FIGURE 7) around the part of the package layer situated between it and its neighbours. In this way, each needle forms a loop **7***b* around the package layer, and these loops are then commonly attached to flexible but longitudinally stable elements **16**. These longitudinally stable elements prevent the package layer from distorting in the manner which would occur with any conventional kind of tie-off arrangement.

In the example of FIGURES 6 and 7, the loops are held in place between special upper and lower strips **16** of synthetic material which are progressively spotwelded together, in order to achieve a longitudinally stable connection. The roller spot-welding mechanism consists of a welding roller **17** and a mating roller **18** (FIGURE 6).

The entire welding device and the supply reels carrying the tapes **16**, are guided on a slide along the row of needles or loops, and special head guides in slot form ensure that the two tapes at either side of the loops are in exact alignment with one another. The welding roller is provided at specific intervals around its periphery with electrically heatable pipe **17***a*, which, by a combination of pressure and heat, produce the welds between the tapes. These weld points are at such intervals from one another that within each loop at least one weld is bound to occur. In order to ensure that this requirement is in fact met, the loops are previously spread out by a spreader plate **15** provided with teeth **15***a*. The section of the welding tapes is so chosen that the tapes can be easily torn apart, rupturing the weld points, without themselves suffering any damage. In this way, when the package has been set up for unwinding, these more or less stiff tapes can easily be ripped apart. The tie-off thread **7** can then be pulled out of the package in one piece from one end. The welding together of the two tapes can equally well be effected using the dielectric principle.

The tapes could be connected together by sticking. Again, instead of the tapes **16**, clips **19** of a suitable synthetic material could be employed, as FIGURE 9 shows. In this case, the loops **7***b* are picked up on teeth at the precise proper intervals, and clamped in place by means of laterally disposed beads.

In order that the tie-off thread can be looped and picked up on the stabilising element at the ends of the package too (and in order, equally, that it can be removed in the same way), on the abutment strip **12** (FIGURES 5 and 7) between the ends of the package, separating wedges **13** associated with a cutter device **14** are provided. The wedge **13** is arranged so that when the strip **12** is urged in the direction of the arrow (FIGURE 5) first of all the hank ends are parted from one another to such an extent that the two end needles pass through freely when offered up. In this way, they each draw between package layer and cutter device similar loops **7***b* (FIGURE 7), the threads passing around the cutter device. Once all the loops **7***b* are on the longitudinally stable elements, the tie-off thread **7** passing along the full width of the winder machine is cut at the cutter devices so that the hanks are ready for separate removal. Using special elements, the start and end threads of each package are also fastened to the stabilising elements. These stabilising elements holding the ends are distinguished from the other stabilising elements of the package by a special colour coding. In this way, when the time for unwinding the package arrives, the start and end threads can be found straight away.

FIGURES 9 and 10 show the finished wide package on the fingers **1** of a winding machine, and in this example the rigid elements **3**, **4** and **5** illustrated in FIGURES 2*a* and 2*b*, have been used for tie-off purposes. The wide package is here still in the tensioned state, therefore. Here too, as in the known winding machines, several tied packages may be arranged adjacent to one another. The finished packages 2 shown in FIGURE 9, are detached by radial retraction of the fingers **1**, and removed from said fingers. As already mentioned, thanks to the narrow-pitch winding and attachment of the longitudinally stable elements, the result is achieved that the package remains stable throughout all process stages, the package layer not shifting or deforming, so that after processing the thread can be drawn off from the cone end in the axial direction, without any trouble at all.

I claim:

1. A thread package comprising built up continuously staggered cross-wound layers, narrow-pitch lacing securing said layers, and a multiplicity of laces arranged on the periphery of said package by a longitudinally stable system of sub-division.

2. Process for developing a wide thread package comprising arranging a cross-winding path and continuously shifting the resultant layer formation to one side so that a conicity in the direction of shift develops, then continuing

the layer formation beyond this point in cross-wound fashion, and then sub-dividing the arbitrarily wide package layer thus formed over its entire width and also several times over its peripheral extent with divider elements which are attached to a longitudinally stable element over the full width of the package.

3. Process as claimed in claim **2** wherein said divider elements are formed directly on the package layer by threads, forcing a row of needles equipped with special hooks through the package layer from the outside into the internal cavity, passing a tie-off thread through said hooks, pulling said thread through the package layer in the form of loops by the progressive withdrawal of said needles and then attaching said loops to said longitudinally stable elements.

4. Process as claimed in claim **3** wherein first of all, in each case between the ends of the package layers, the threads of the package are parted from one another using a wedge so that the end needles loop the tie-off thread directly around a cutter device and thus form between the latter and the package layer separate loops, cutting the tie-off thread at this point since the process of division has ended, and then attaching the ends of the tie-off thread in each package in loop form to said longitudinally stable element.

5. Process as claimed in claim **4** wherein the start and end of the package thread are attached in loop form to said stabilizing element and said element is marked with a special color coding.

6. Process as claimed in claim **4**, wherein the loops at both start and end of the thread package are attached between two tapes of synthetic material by spot-welding.

References Cited

UNITED STATES PATENTS

460,665	10/1891	Simon	28—21
903,642	11/1908	Wardwell	242—175
2,268,727	1/1942	Taylor et al.	28—21

MARTHA L. RICE, *Primary Examiner.*