

### [54] KNIT YARN PACKAGE

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[51] Int. Cl. .... **D04b 21/00, D04b 19/00**

[58] Field of Search ..... **66/195-197, 66/202, 87; 28/72.16; 139/116**

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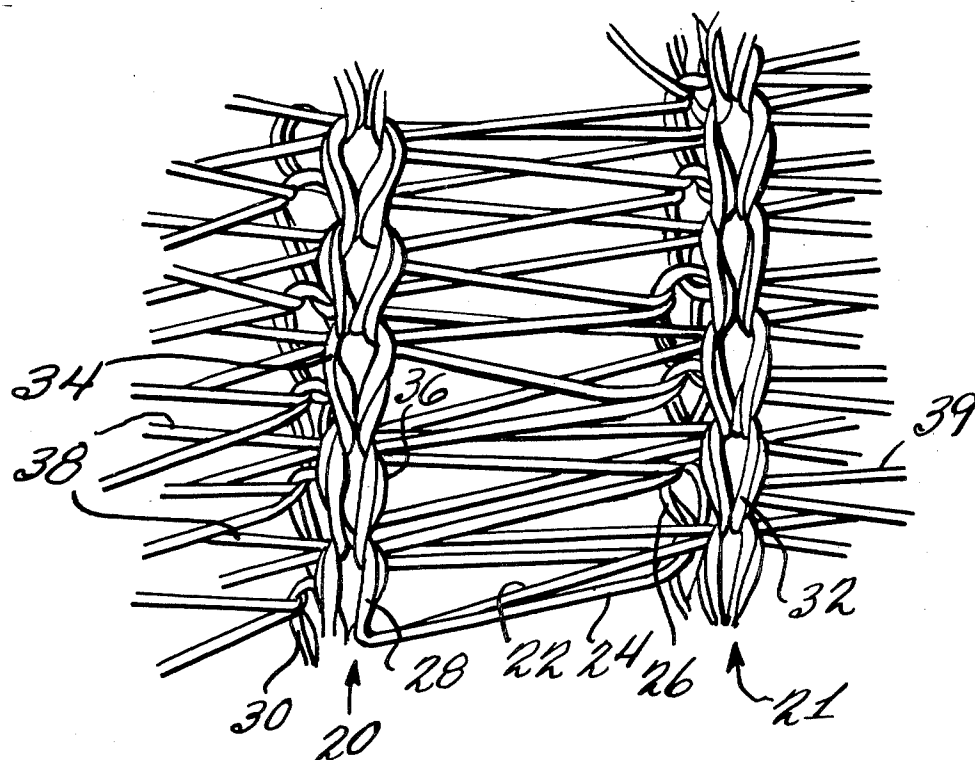
Primary Examiner—James Kee Chi

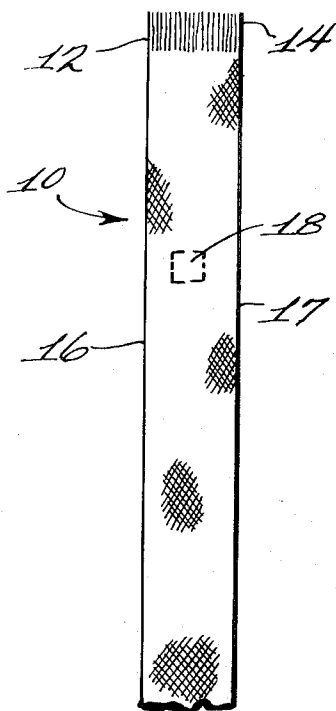
Attorney, Agent, or Firm—Cushman, Darby & Cushman

### [57] ABSTRACT

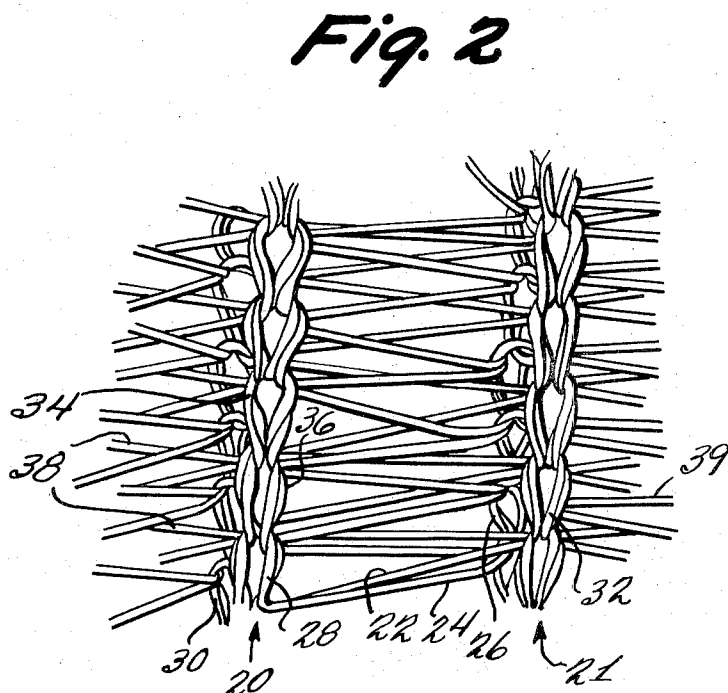
The disclosure relates to a yarn package that is knitted with spandex yarns in the form of a strip which is narrow in width compared to its length. The strip is formed on a flat bed, warp knitting machine to provide a double knit fabric with two matching faces and from an end of which a plurality of individual yarn strands can be unravelled.

2 Claims, 4 Drawing Figures

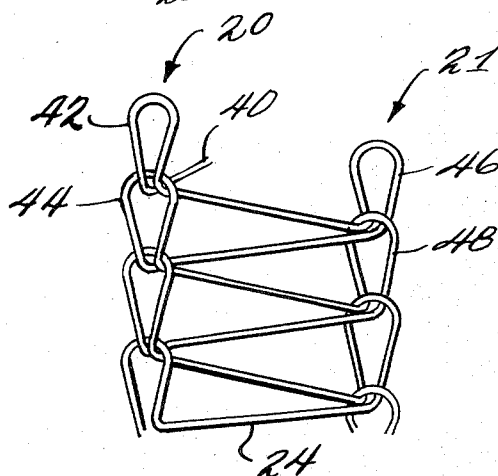




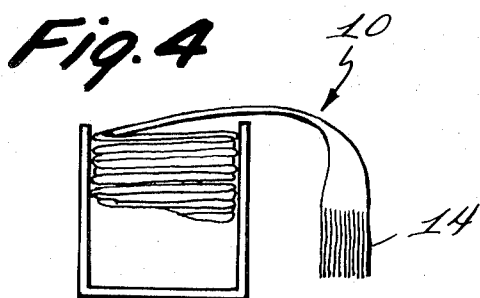
**Fig. 1**



**Fig. 2**



**Fig. 3**



**Fig. 4**

## KNIT YARN PACKAGE

## BACKGROUND AND BRIEF DESCRIPTION OF THE INVENTION

The present invention relates to yarn packages and, more specifically, to a strip or tape like package of highly stretchable yarns such as spandex.

In a variety of fabric structures and corresponding knitting and weaving techniques in present use, it has been necessary to simultaneously feed a plurality of yarn ends to a textile machine such as the conventional circular knitting machine. It has commonly been the practice as a result to locate large creel frames adjacent to the textile making machine to provide a supply of yarns from a number of individual packages mounted on the frames. Each package has consisted of a single yarn end wound on a support such as a pirn or cop. In setting up a machine for a run, care would have to be taken to assure that the individual yarn ends would not become entangled with other strands as the knitting or weaving operation progressed or in replacing an exhausted yarn supply source. To lessen the possibility of the yarns becoming interentangled, the creel frames have generally tended to be manufactured so as to permit ample space between the yarn packages so that the machine operator could more easily monitor and replace each package on the frame.

In order to reduce the amount of floor space required for the yarn supply arrangement, the use of tubular knitted yarn packages which present a single end or multiple yarn ends to the machine and which unravel as the ends are pulled from the package has been suggested. For examples, reference may be had to U.S. Pat. Nos. 3,540,492 issued Nov. 17, 1970 and 3,542,084 issued Nov. 24, 1970.

In addition to the advantage of saving valuable mill floor space, knitted yarn packages of the unravelling type also greatly facilitate transport of the knitted packages since more yarn can be confined per unit volume and with substantially reduced gross weight by virtue of the elimination of the previously necessary pirns or cops.

Prior to the present invention, however, it has been the practice to construct knitted yarn packages in the form of either single end flat strips and tapes or in the form of knitted tubes. While the strip or tape form of the package has been generally satisfactory for some types of yarns, where such packaging methods have been employed for highly elastic materials such as spandex, difficulties have been encountered in attempting to uniformly feed the strip package and, correspondingly, uniformly unravel the yarn end or ends for presentation to the textile machine. These problems are due, at least, in part, to the tendency of the elastic, compressive knit structure to curl on itself. Moreover, where high speed textile machinery is being operated, it is evident that proper feeding of the yarn ends must be maintained to avoid costly delays caused by yarn breakage or yarn entanglement. As a result, it has been necessary to provide specially constructed equipment to handle the package material to assure proper feeding and unravelling of the yarn ends thus, to some degree at least, thereby offsetting the previously noted advantageous saving economies of storage compactness and reduced weight.

A problem that is specific to the tubular knit package has been found in the utilization of such a package form where high speed delivery is required together with endeavors to supply a plurality of ends to a machine from a single tubular package. In particular, it has been found that the yarn ends fail to separate or release properly from the package when high speed multiple ends deliveries are attempted since the courses of the tube package must unravel in close proximity to one another thus frequently causing the ends to entangle with each other.

The yarn package of the present invention will obviate the foregoing problems and will provide a yarn supply for a multiple of yarn ends of elastic thread that is of compact structure for shipping and easily adaptable to supply a variety of textile machines.

More specifically, the spandex package of this invention is obtained by knitting together a desired number of yarn strands to form a double knit flat web which can be of any convenient length. The purpose of double knitting on two sides is to minimize or eliminate the tendency of the highly elastic spandex to curl on itself. By knitting the spandex in the form of a double faced tape, strip or web (these terms being used synonymously) as opposed to a single knit strip or a tube, it has been found that unravelling or releasing of the multiplicity of yarn ends can be uniformly achieved.

In a preferred embodiment, the double knit flat web is formed with each yarn end being knitted in two adjacent wales of the web. One wale of knitted loops of each yarn end is located on and forms part of one side of the web while its adjacent wale of knitted loops is located on and forms part of the opposite side of the web. Of course, it will be evident that the width of the web will be determined primarily by the number of yarn ends selected to constitute the package and that any desired number from a very few to hundreds of yarn ends can be incorporated into the type of yarn package of this invention.

## BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a plan view of one side of the yarn package of the present invention;

FIG. 2 is a greatly enlarged view of a portion of the package that is enclosed within the dotted line rectangle in FIG. 1;

FIG. 3 is a diagrammatic illustration of the knit pattern of a portion of a single yarn end of the package illustrated in FIG. 2; and

FIG. 4 is a schematic illustration of one manner of packing the yarn package.

## DETAILED DESCRIPTION OF THE INVENTION

Referring now to the drawings, there is shown in FIG. 1 a flat fabric 10 which at one end 12 has a plurality of loose yarn ends 14 extending therefrom. The fabric 10 may be knitted in the form of a strip or tape on a warp knitting machine such as the Raschelle type having two needle bars for making a double knit type of fabric used in the yarn package of the present invention.

By using a double needle bar machine as mentioned above, a balanced fabric can be obtained where the sides 16 and 17 of the fabric 10 will remain stable and will not curl or roll inwardly toward the center of the fabric 10 so that the fabric will lie flat. The type of knit used, which will be described in detail below, is of the kind that will permit the knit structure to unravel as the

yarn ends 14 are pulled from the fabric 10 which is at the same time restrained as between squeeze rolls or by a suitable weight.

A greatly enlarged illustration of the type of knit employed in a preferred embodiment is shown in FIG. 2 which corresponds roughly to the section of the fabric 10 within the dotted line rectangle 18 of FIG. 1. It should be understood, of course, that the fabric illustrated in FIG. 2 is expanded as by stretching in the width and length directions to more clearly show the knit structure of the spandex fabric 10. FIG. 2 shows a plurality of wales, two of which are indicated at 20 and 21. When the fabric is not stretched, the loops in each wale on the two faces of the fabric will be generally parallel and not offset as shown in FIG. 2 for purposes of illustration. To more clearly show the knit pattern, a single yarn end or strand is shown in FIG. 3 at 24 with the other strands omitted for clarity. The knit pattern is similar to that used in tricot fabrics and consists of alternating loops for each yarn end from one wale to an adjacent wale which loops, in the finished web fabric 10, will be positioned on the opposite sides or faces of the web 10. This can be seen in FIGS. 2 and 3 where for yarn strand 24, a loop 26 is formed in wale 21 whereas the preceding loop 28 is in wale 20. As can also be seen with the yarn strand 22, the loops as at 30 in wale 20 are located on the side or face of the web 10 opposite to that shown in FIG. 1 while the loops as at 32 in wale 21 are located on the side or face of the web 10 shown in FIG. 1.

The double knit structure of the web 10 is achieved by combining loops of different strands in the same wale. For example, the loops 34 of yarn strand 24 are combined in wale 20 on the side of the web 10 shown in FIG. 2 with loops 36 of yarn strand 38. In wale 20, of course, the yarn 24 and the yarn 38 have their respective loops combined or doubled on the side of web 10 shown in FIG. 1 and in wale 21, yarn 24 has its loop 26 combined with a different yarn 39.

By using the above described knit structure with a highly elastic yarn of the spandex type, a stable fabric is obtained, that is, a fabric that displays little, if any, torque characteristics usually evidenced by a tendency of a knit fabric to curl or twist on itself. In addition, the capability of the yarn ends to release or unravel from the fabric 10 in a uniform manner is enhanced since the spandex will stretch to permit loops to be pulled through a loop in an adjacent course more readily than other types of yarns.

The strip like fabric 10 can be compactly stored in

containers as shown in FIG. 4, preferably by festooning which will permit the web fabric 10 to be taken directly from the shipping container and delivered through any suitable feeding mechanism such as a pair of driven nip rolls to a textile machine. Unravelling of the yarn ends 14 from the fabric 10 would, of course, take place between the feeding mechanism and the textile machine with the delivery mechanism of the textile machine supplying the pulling force in one direction on the yarn ends 14 and the separate feeding mechanism supplying a restraining force on the knitted portion of the fabric 10. It will be appreciated by those skilled in the knitting art that the amount of force required to effect unravelling can be regulated by controlling the looseness with which the fabric 10 is itself knit. The end 12 of the fabric 10 will consist of a course of loops and the yarn ends 14 which when pulled as described above will cause the course of loops to slip through the preceding loop in the preceding course of first one wale and then its adjacent wale. For example, in FIG. 3, if the end 40 of yarn strand were pulled, the loop 42 in wale 20 would slip through the preceding loop 44 and, with continued pulling of end 40, loop 46 in wale 21 would then become free of its preceding loop 48 and so on alternately from one wale to the other until the entire fabric 10 was consumed.

Having described the invention, what is claimed is:

1. A yarn package of spandex yarns comprising a flat warp knit fabric having two faces each composed of generally parallel extending wales and courses intersecting said wales and knitted with a plurality of individual yarn strands, each yarn strand being formed into a plurality of loops, said loops of each of said strands defining alternately first one wale of said fabric on one face of said fabric and each succeeding loop of each strand defining an adjacent wale of said fabric on said other face thereof, the strands from every other wale on a face of said fabric having their loops combined in the intervening wale on the other face of said fabric so that the intersection of each course and wale of said fabric will comprise at least four loops with two of said loops lying in one face of said fabric and the other two of said loops lying in the other face of said fabric, said fabric having at one end thereof a course of loops, the strands of which have unknitted portions extending from said fabric.

2. The yarn package as claimed in claim 1 wherein said fabric is knitted in the form of an elongated web.

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