

[54] **TUBULAR GRAFTS HAVING INDICIA THEREON**

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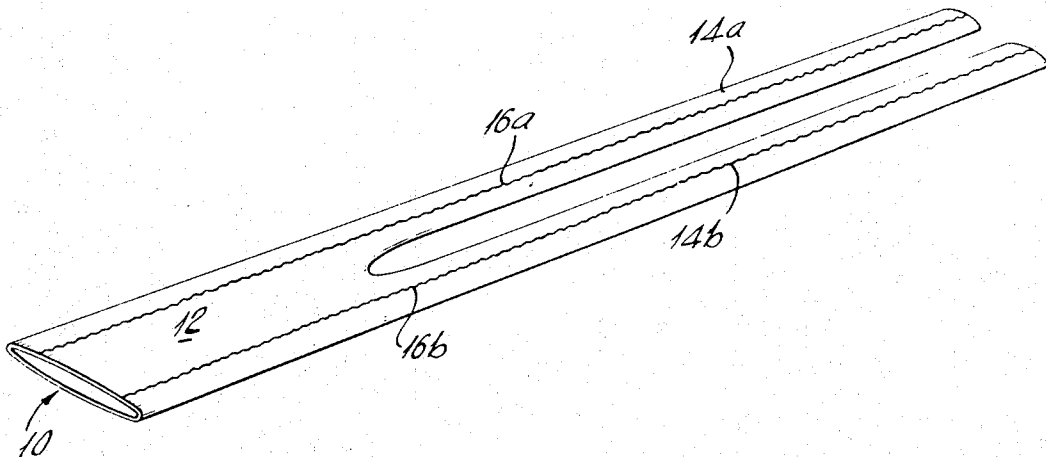
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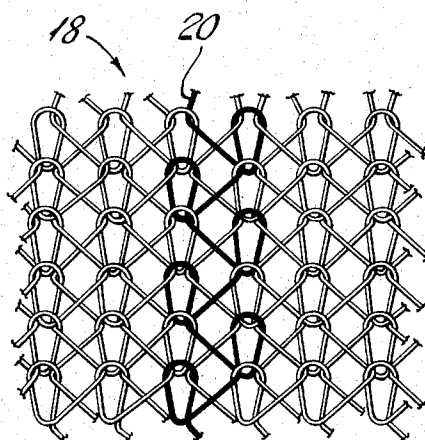
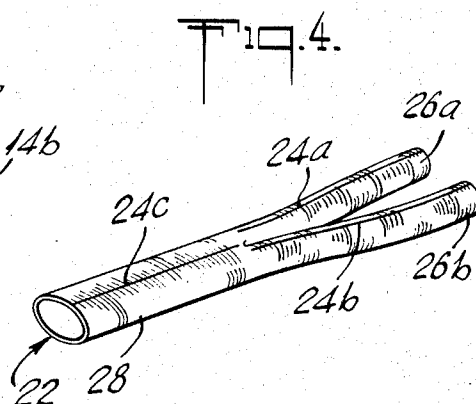
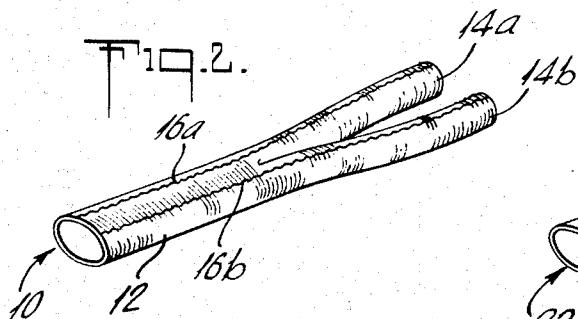
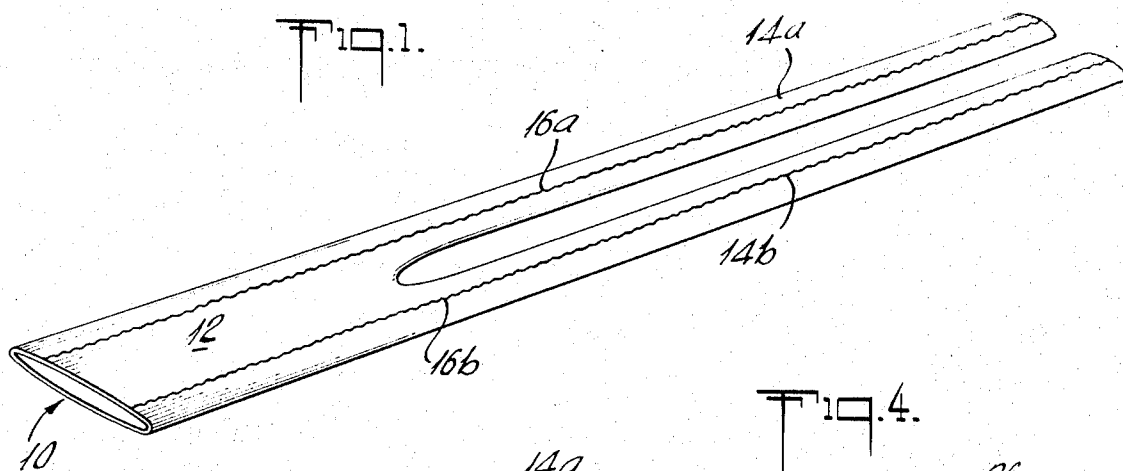
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ABSTRACT

Tubular grafts such as vascular grafts which are used in the human body. The graft includes an elongated flexible tubular body having thereon, at its exterior, an elongated line which is visibly distinct from the remainder of the tubular body as by being of a color different from the remainder of the tubular body. This line is situated in such a way that when the graft is used it can readily be angularly oriented about its longitudinal axis so that the graft will not be implanted in a twisted condition, for example, and at the same time the line may also serve for identification purposes as by forming part of a code system which enables the particular graft be identified by the particular nature of the line, such as the color thereof.

4 Claims, 4 Drawing Figures





TUBULAR GRAFTS HAVING INDICIA THEREON

BACKGROUND OF THE INVENTION

The present invention relates to grafts.

In particular, the present invention relates to tubular grafts of the type which are used in the human body, for example, for repairing tubular parts such as arteries and the like. These vascular grafts are generally made of a fabric such as polyester fabrics, e.g., Dacron and must be very carefully implanted so as to repair a damaged tubular part of the body. However, one of the problems encountered with vascular grafts of this type is that due to the flexible nature of the tubular graft as well as due to the fact that it is composed of yarns which are knitted or woven, the graft cannot always be introduced precisely with the proper angular orientation and creates problems when it is introduced in an angularly twisted condition or in a condition where it is not angularly oriented properly with respect to its longitudinal axis.

A further problem encountered with grafts of this type is that there are several different types of grafts which are available to be used for different purposes, and is not always possible to identify readily the particular graft which is required for a particular purpose.

SUMMARY OF THE INVENTION

It is accordingly a primary object of the present invention to provide a tubular graft which will avoid the above drawbacks.

In particular, it is an object of the invention to provide a tubular graft with a structure which will enable it to be angularly oriented with respect to its longitudinal axis in a highly precise manner when the graft is implanted.

Also, it is an object of the invention to provide a tubular graft of this type which can be readily identified.

Furthermore, it is an object of the invention to provide a warp knit vascular graft product which has the above features and in which these features are incorporated without changing the structure of the tubular graft.

According to the invention the graft includes an elongated flexible tubular body which has at its exterior a longitudinally extending line which is visibly distinct from the remainder of the tubular body so that by the use of this line it is possible when the graft is implanted to angularly orient the tubular graft with respect to its longitudinal axis in a highly precise manner.

BRIEF DESCRIPTION OF DRAWINGS

The invention is illustrated by way of example in the accompanying drawings which form part of this application and in which:

FIG. 1 is a perspective illustration of one embodiment of a vascular graft according to the invention shown in its flattened condition;

FIG. 2 shows the structure of FIG. 1 on a smaller scale but in the condition it assumes when it is used;

FIG. 3 is a fragmentary illustration of the yarns which are warp knit to form the article of FIGS. 1 and 2 with FIG. 3 showing one of the yarns which has a color different from the remainder of the yarns; and

FIG. 4 shows a tubular graft provided with another embodiment of a marking line.

DESCRIPTION OF PREFERRED EMBODIMENTS

Referring to FIG. 1, there is shown therein a tubular graft 10 which has the features of the present invention.

The particular vascular graft 10 shown in FIG. 1 is a warp knit vascular graft product and is shown because the present invention is particularly suited for this type of product. The tubular graft 10 has a main tubular portion 12 and a pair of subsidiary tubular portions 14a and 14b respectively branching from the main tubular portion 12 so that the tubular graft 10 has a substantially Y-shaped configuration, particularly when it is used as shown in FIG. 2. In other words before the tubular graft is used it has the flattened condition shown in FIG. 1, whereas when it is implanted it has the tubular condition shown in FIG. 2. Such grafts may be made of a yarn such as Dacron which is warp knitted in the particular example illustrated. In any warp knit tubular graft it is possible to utilize warp ends for the purposes of the present invention.

Thus, as is shown in FIG. 1, a pair of elongated lines 16a and 16b extend longitudinally of the tubular graft 10, parallel to the longitudinal axis thereof. When the graft is used and assumes the condition shown in FIG. 2, these lines 16a and 16b, which are visibly distinct from the remainder of the tubular graft 10, enable the tubular graft to be angularly oriented in a highly precise manner with respect to its longitudinal axis. As a result the graft is not implanted in a twisted condition. For example with the particular product shown in FIGS. 1 and 2 the graft when implanted will have the pair of branches 14a and 14b properly aligned angularly with respect to the main branch 12. Thus, it is possible to avoid with the use of the lines 16a and 16b twisting of one or the other or both of the branches 14a and 14b with respect to the main tubular portion 12. Thus the subsidiary tubular portions 14a and 14b will be properly aligned angularly with respect to the main tubular portion 12, and the entire graft will be properly oriented angularly with respect to the tubular part of the body to which it is attached.

The manner in which the fabric of the tubular graft 10 is knitted is illustrated in detail in FIG. 3. Thus, FIG. 3 shows a section 18 of the fabric used in the product 10. This fabric is a conventionally warp knit tube. The present invention lends itself in particular to this type of fabric because it is a simple matter to introduce into the fabric a warp end, such as the warp end 20 shown in FIG. 3, which is visibly distinct from the remainder of the yarns, as by having a color different from the remainder of the yarns, so that in this simple way the tubular product 10 has part of its basic structure a longitudinally extending line which can be used both for angular orientation as well as for identification. In other words there are different types of grafts which are commonly used such as the Cooley graft, or other types of known grafts, and by utilizing a suitable coded color system, it is possible to choose for the lines 16a and 16b formed by the yarns 20 a color which will identify the type of tubular graft and which will serve the additional function of providing for the proper angular orientation.

However, it is to be understood that the invention is not limited to identifying and orienting lines which are woven or knit directly into the fabric which forms the tubular graft. For example FIG. 4 shows a tubular graft 22 which may be circularly knit, for example. With

3

such a product it is not possible to have longitudinally extending yarns such as the warp ends of the product of FIGS. 1-3. Thus with the embodiment of FIG. 4 the elongated lines 24a, 24b, and 24c may be marked directly on the exterior surface of the tubular graft 22 with a suitable instrument such as a suitable pen. In this case also it will be noted that the lines 24a and 24b extend along the pair of subsidiary branches 26a and 26b. However only a single line 24c is required to extend along the main tubular portion 28. In this case since the lines 24a-24c are directly marked on the tubular graft, only a single line 24c is required at the main tubular portion 28, with this line extending longitudinally along the main tubular portion 28, parallel to the axis thereof, from the intersection between the pair of subsidiary branches 26a and 26b.

It is thus apparent that with the above structure of the invention a tubular graft is provided which can readily be oriented angularly when it is used and which also can be easily identified, and these results are achieved without changing the basic nature of the tubular graft itself so that the invention lends itself readily to use with conventional tubular grafts.

What is claimed is:

1. A graft comprising an elongated tubular body made of flexible material, said tubular body being a

4

warp knit body having warp ends which extend longitudinally of the tubular body, and one of the warp ends having a color different from the remainder of the warp ends to form at least one longitudinally extending line visibly distinct from the remainder of the tubular body for accurately orienting the tubular body angularly with respect to its longitudinal axis.

2. The combination of claim 1 and wherein said body has a main elongated tubular portion and a pair of subsidiary elongated tubular portions branching from said main tubular portion and providing the body with a substantially Y-shaped configuration, said line extending longitudinally along each of said subsidiary tubular portions and along said main tubular portion.

3. The combination of claim 2 and wherein there are two lines formed by a pair of warp ends both of which have a color different from the remainder of the warp ends, the latter warp ends extending without interruption along the subsidiary tubular portions and parallel to each other along the main tubular portion.

4. The combination of claim 2 and wherein the line includes a pair of portions extending along the subsidiary tubular portion and a third portion extending along the main portion longitudinally thereof from the intersection between the pair of subsidiary tubular portions.

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