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Taddeo

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[54] **NOVEL SELF SUPPORTING ELASTIC SURGICAL STOCKING**

[76] Inventor: **Lorraine Taddeo,** Rochester, N.Y.

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[52] **U.S. Cl.** **2/240**

[51] **Int. Cl.** **A41b 11/00,** A61f 13/08

[58] **Field of Search** ..... 2/239, 240, 241, DIG. 9, 2/224, 236, 237; 128/535; 66/172, 178 R, 178 A; 139/421, 422

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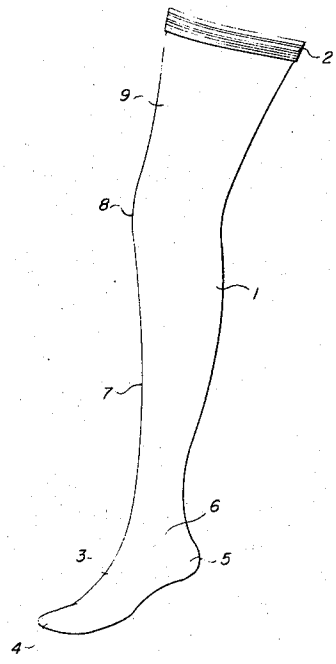
Primary Examiner—James R. Boler
Assistant Examiner—Wai M. Chan
Attorney, Agent, or Firm—Denson and Kurtzman

[57] **ABSTRACT**

A novel self supporting elastic surgical stocking is described. The stocking has a support portion attached to the top of the body portion of the stocking. The support portion is designed in a manner which permits it to keep the stocking uniformly supported over the leg yet provides no obstruction or tightening about the leg and permits free circulation of air over the skin. The support portion comprises an annular band of substantial width having two types of smaller annular areas. One type ofsmaller annular area is comprised of interwoven vertical weft and horizontal warp strips (threads). The horizontal warp threads are made from an elastic material having a relatively high coefficient of static friction with respect to the skin. The horizontal warp threads are woven in a manner such that portions are intermittently exposed on the inner surface of the annular band and the remaining portions of the threads are intermittently insulated from the inner surface by overlapping portions of the vertical weft threads. The second type of smaller annular area is comprised of substantially vertical weft threads only. The diameter of the annular band or the support portion is no less than the diameter of the adjacent portion of the stocking to which the band is attached. The pressure applied to the limb by the band is insufficient to impede circulation of the blood. Also, the pressure is no greater than the pressure applied by other portions of the stocking.

4 Claims, 4 Drawing Figures



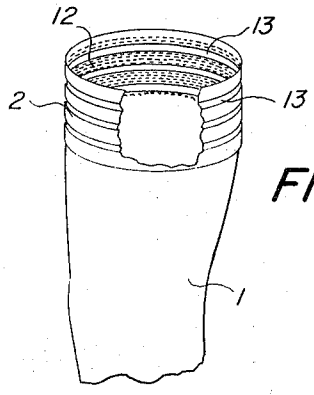


FIG. 2

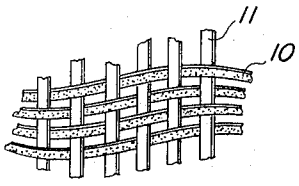


FIG. 3

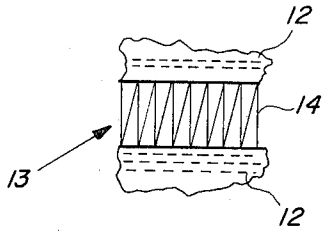


FIG. 4

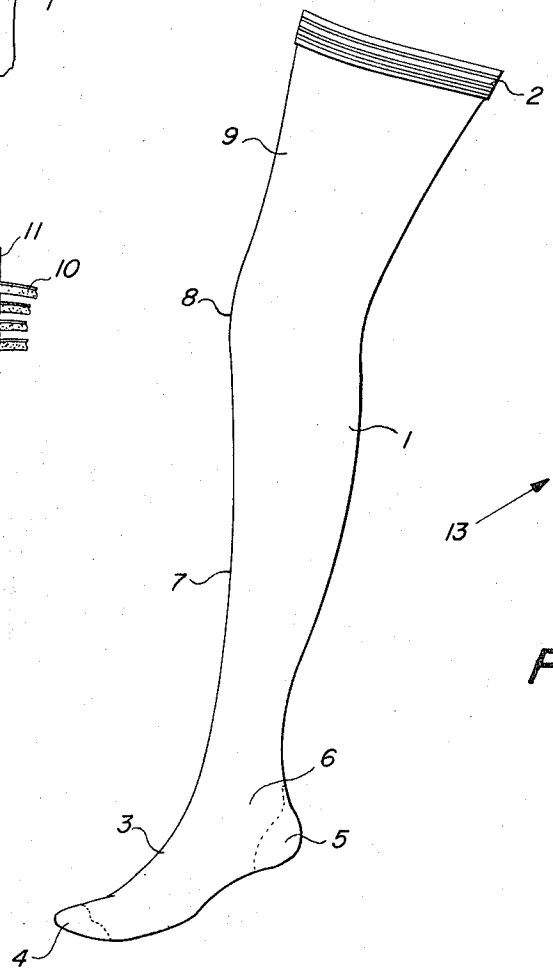


FIG. 1

NOVEL SELF SUPPORTING ELASTIC SURGICAL STOCKING

This invention relates to a novel self supporting elastic surgical stocking.

Many persons have been afflicted with various types of circulatory ailments. One of the most frequently occurring ailments, varicose veins, is a condition in which the veins are generally of increased length and capacity with valves which are atrophied and functionless. Portions of the veins have thick walls, but in areas of greatest dilation, the walls are very thin. Usually the veins are soft and elastic except in the valve areas where they are characterized by swelling, hardness and dark blue knots. In the more serious cases, the condition can be extremely painful.

Most frequently the condition occurs in those parts of the blood stream farthest removed from the heart and which are relatively unsupported by surrounding tissue. Typically, it is found in the lower limbs and particularly the legs.

Several causes give rise to the occurrence of varicose veins. Since the blood is under pressure, any condition which hinders or obstructs its return such as tight gartering can cause the veins to become enlarged in diameter and lengthened possibly resulting in their permanent dilation. Under aggravated circumstances the vein walls become extremely thin and may even break under the skin. Less frequently, varicose veins are caused by direct injury to the vein. As a result the veins may become inflamed thus weakening the walls which may then yield under the pressure of the blood stream.

Typical treatments for varicose veins include frequent elevation of the legs, bathing of the limb in cold water and surgical operation to excise the obstructed portion of the vein. The most commonly prescribed treatment is the wearing of a well-fitting elastic stocking. The stocking must produce uniform pressure over the leg when in position and therefore must be of meticulous design. The stocking should contain nothing which would obstruct or impede the flow of blood. Thus, seams should be very thin or eliminated. Also, the design should allow for the free circulation of air over the skin.

Suitable methods for supporting elastic surgical stockings have been a problem. Circular garters cannot be used since they provide an undesirable tightening about the leg which impedes the flow of blood. Such tightening is detrimental to the varicose condition and may eliminate any improvement accomplished by wearing the stocking. If a garter belt is worn, the pendant clasps which are attached to the top of the stocking can also provide unwanted obstructions. Areas between clasps tend to roll on the leg of the wearer creating a tightening effect. Also, the clasps can be irritable to the wearer by rubbing on the surface of the skin. From the standpoint of style or fashion, an unsightly bump or elevation is usually noticeable when the clasp is worn beneath thin or clinging clothing. Furthermore, such clasps bring into play torque forces which cause the stocking to twist on the leg. Also, clasps create a constant strain upon the threads of the stocking at the places of contact which can result in ruinous and costly tears and runs which continue the entire length of the stocking. On occasion, clasps will open spontaneously causing the stocking to wrinkle, sag and even drop down the leg to the detriment of the health of the

wearer. When the wearer of a garter belt bends, the stocking stretches thereby causing an undesirable tightening effect about the leg.

Thus, there is a need for new ways to support elastic surgical stockings. As described above, previously used methods of support have several disadvantages. Because of the physical condition of the wearer, support techniques utilized with conventional stockings such as gartering or elastic tightening at the top of the stocking are not suitable for supporting elastic surgical stockings.

It is therefore an object of this invention to provide a novel elastic surgical stocking.

It is another object of this invention to provide a self supporting elastic surgical stocking which does not hinder circulation of blood.

A further object of this invention is to provide an elastic surgical stocking which is comfortable to the wearer.

Another object of this invention is to provide a self supporting elastic surigcal stocking which remains securely in position on the leg of the wearer.

Still another object of the invention is to provide a self supporting elastic surgical stocking which permits free circulation of air over the portions of the skin covered by the stocking.

These and other objects are accomplished with a novel self supporting elastic surgical stocking having a support portion attached to the end of the body portion of the stocking. The support portion is designed in a manner which permits it to keep the stocking uniformly supported over the leg yet provides no obstruction or tightening about the leg and permits free circulation of air over the skin. The support portion comprises an annular band of substantial width having two types of smaller annular areas. One type of smaller annular area is comprised of interwoven vertical weft and horizontal warp strips (threads). The horizontal warp threads are made from an elastic material having a relatively high coefficient of static friction with respect to the skin. The horizontal warp threads are woven in a manner such that portions are intermittently exposed on the inner surface of the annular band and the remaining portions of the threads are intermittently insulated from the inner surface by overlapping portions of the vertical weft threads. The second type of smaller annular area is comprised of substantially vertical weft threads only. The diameter of the annular band or the support portion is no less than the diameter of the adjacent portion of the stocking to which the band is attached. Therefore, the pressure applied to the limb by the band is insufficient to impede circulation of the blood. However, the pressure is no greater than the pressure applied by other portions of the stocking.

FIG. 1 is a side view of an elastic surgical stocking with the support portion annexed at the top.

FIG. 2 is a general view of the support portion showing both inner and outer surfaces.

FIGS. 3 and 4 are detailed views of the weaving used in certain areas of the support portion.

Referring more in detail to the accompanying drawings, and particularly to FIG. 1, the invention is illustrated for a self supporting elastic surgical stocking having a body portion 1 and a support portion 2. The body portion is constructed from materials conventionally used for weaving elastic surgical stockings including natural and synthetic threads such as cotton, ny-

long, silk, synthetic substitutes for silk, elastic materials covered with cotton, nylon, silk, synthetic substitutes for silk, etc. The body portion **1** of the elastic surgical stocking contains a foot section **3**, toe section **4**, heel section **5**, ankle section **6**, calf section **7**, knee section **8** and thigh section **9**. The stocking can optionally be modified to suit the best medical interests of the wearer. In this regard toe section **4** can be removed and heel section **5** can be made from elastic or inelastic, reinforcing materials. Preferably, the heel section should be clearly marked to insure a proper fit on the wearer. While a full length stocking is illustrated, knee section **8** and thigh section **9** can be removed in the event that only a calf length stocking is prescribed. In this case, support portion **2** is annexed directly to the top of calf section **1**. Optionally, other sections can be added or removed. For example, the stocking may also contain a hip section to form pantyhose with the support portion attached to the top of the hip section.

FIG. **2** illustrates in detail the support portion **2**. Generally, the support portion comprises a relatively wide annular band constructed of a series of smaller annular areas **12** and **13**, annexed to each other in alternating fashion. FIG. **3** illustrates the construction of smaller annular area **12** which is comprised of substantially vertical weft threads **11** and horizontal warp threads **10**. The weft threads **11** are made from natural or synthetic materials the same as or different than those materials from which the body portions of the stocking is made as described previously. Also, vertical weft threads **11** can be made from elastic or inelastic materials. The horizontal warp threads **10** are made from an elastic material having a high coefficient of static friction with respect to the human skin. Typical materials include natural rubbers such as gutta percha, balata, hevea, etc., synthetic rubbers such as SBR, butyl rubbers, nitrile rubbers, butadiene-acrylic acid rubbers, chlorinated rubbers, neoprene, ethylene-propylene copolymers, polybutadiene, polyisoprene and other natural and synthetic materials which are elastic and have a relatively high coefficient of static friction. Smaller annular area **12** can optionally contain horizontal warp threads which are comprised of materials different from those described for **10**. These materials can be elastic or inelastic and can be made from natural or sythetic materials. In certain instances, the optional warp threads can be made of the same materials from which the weft threads are made. The optional warp threads are also interwoven with the weft threads. Annular area **12** is woven in a manner such that portions of elastic warp threads **10** are intermittently exposed on the inner surface of annular area **12** and the remaining portions are intermittently insulated from the inner surface by overlapping portions of the interwoven vertical weft threads **11**.

Smaller annular areas **13** of FIG. **2** are situated on both sides of smaller annular areas **12**. The structure of area **13** is shown in detail in FIG. **4** and is comprised of substantially vertical weft threads only **14**. Weft threads **14** are interlocked with warp threads **15** in a looping manner as shown at **16**. There are no horizontal warp threads in area **13**. The materials used for these weft threads can be the same as or different than those utilized as weft threads in smaller annular area **12**.

As previously explained, the diameter of the annular band comprising support portion **2** is not less than the diameter of the portion of the stocking to which it is attached. Because of this dimensional relationship, the pressure applied to the limb by the annular band is insufficient to impede circulation and is no greater than the pressure applied by other portions of the stocking.

The support portion of the elastic surgical stocking is constructed in such a manner to securely hold the body portion in position yet not hamper the flow of blood. Because of its high coefficient of static friction with respect to the skin, the contact area of elastic horizontal warp threads (i.e., clinging surface) with the limb is minimized. In order to insure no interference with the flow of blood and the free circulation of air, the exposed portion of the elastic horizontal warp threads (clinging surface) should preferably comprise less than 50 percent of the inner surface of the support portion. Depending on the shape and condition of the limb of the wearer, varying areas of clinging surface are necessary to insure that the quantity of static friction provided is sufficient to hold the body portion of the stocking securely in position. When additional clinging surface is necessary to insure the placement of the stocking body, the area of the clinging surface should be increased preferably up to 50 percent of the total inner surface of the annular band comprising the support portion of the stocking. If additional clinging surface is required to support the stocking body, the width of the support portion should be increased. However, the area of clinging surface preferably should not exceed 50 percent of the total area. The free flow of blood in the veins is enhanced in the region of the support portion of the elastic surgical stocking because of the design of smaller annular bands **12** and **13**. However, free flow of blood can be affected when the area of the clinging surface is substantially greater than 50 percent.

It will be appreciated that the self supporting elastic surgical stocking described herein is made to individual measurement and in all cases the size of the completed stocking is such that it is slightly smaller than the limb. The wearer of the stocking described herein experiences improved comfort and is not affected by the symptoms of poor circulation such as limb numbness and reduced pulse.

The invention has been described in detail with particular reference to certain preferred embodiments thereof, but it will be understood that variations and modifications can be effected within the spirit and scope of the invention.

I claim:

1. A self supporting elastic surgical stocking suitable for wear by persons having a varicose vein condition, said stocking having an elastic body portion and an elastic support portion comprising an annular band of substantial width having

a. annular areas comprising interwoven vertical weft and horizontal warp threads, said horizontal warp threads comprising an elastic material having a high coefficient of static friction with respect to human skin, portions of said horizontal warp threads being intermittently exposed on the inner surface of said annular band and the remaining portions of said horizontal warp threads being intermittently insulated from said inner surface by overlapping portions of said vertical weft threads; and

b. annular areas comprising vertical weft threads only, the diameter of said annular band being no less than the diameter of the adjacent portion of the stocking to which said band is attached whereby the pressure applied to the limb by said band is insufficient to impede circulation and said pressure is no greater than the pressure applied by the body portion of the stocking.

2. A stocking as defined in claim **1** wherein the annular areas comprising interwoven vertical weft and horizontal warp threads and the annular areas comprising vertical weft threads only are adjacent.

3. A stocking as defined in claim **1** wherein said horizontal warp threads are made from a natural rubber or a synthetic rubber.

4. A stocking as defined in claim **1** wherein said exposed portions of horizontal warp threads comprise less than **50%** of the area of the inner surface of said annular band.

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