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**Bernhardt**

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[54] **GARMENT AND METHOD FOR PREVENTING CONTACT SORES WITH THE HUMAN BODY**

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5,575,012 11/1996 Fox .  
5,590,420 1/1997 Gunn .  
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[57] **ABSTRACT**

[51] **Int. Cl.<sup>6</sup>** ..... **A41B 11/00**

[52] **U.S. Cl.** ..... **2/239; 2/409; 2/69**

[58] **Field of Search** ..... **2/239, 69, 243.1, 2/409, 272, 81, 85, 93, 115, 227, 228, 24; 36/42, 44**

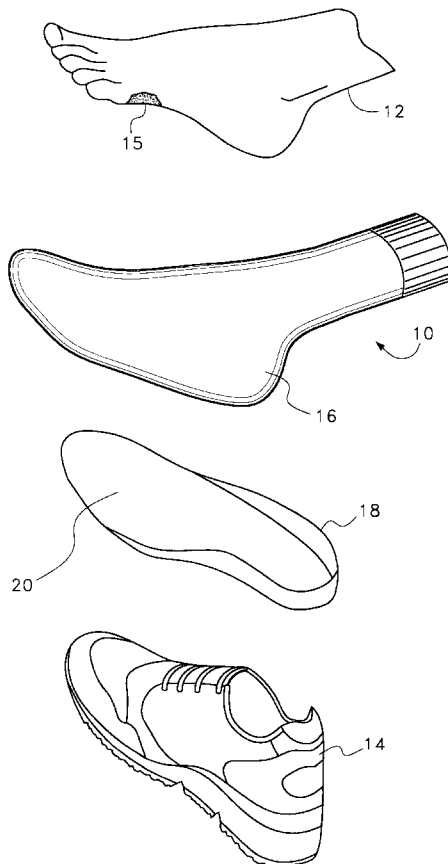
A device and method for reducing the creation of contact sores on the body caused by the body's contact with an external object. The present invention includes a garment having an internal surface and an external surface. The garment is preferably fabricated from a fabric material having at least one first thread made from a conventional garment material and a second thread made from a fluoropolymer material. The thread pattern is designed to cause the conventional garment material to be predominant on the interior surface of the garment while the fluoropolymer material is predominant on the exterior surface of the garment. The presence of the fluoropolymer material on the exterior surface of the garment causes the exterior of the garment to have a lower coefficient of friction than does the interior of the garment. As a result, the exterior of the garment moves across contacted objects with a minimum of chaffing while the skin remains padded by the static interior of the garment.

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**18 Claims, 4 Drawing Sheets**



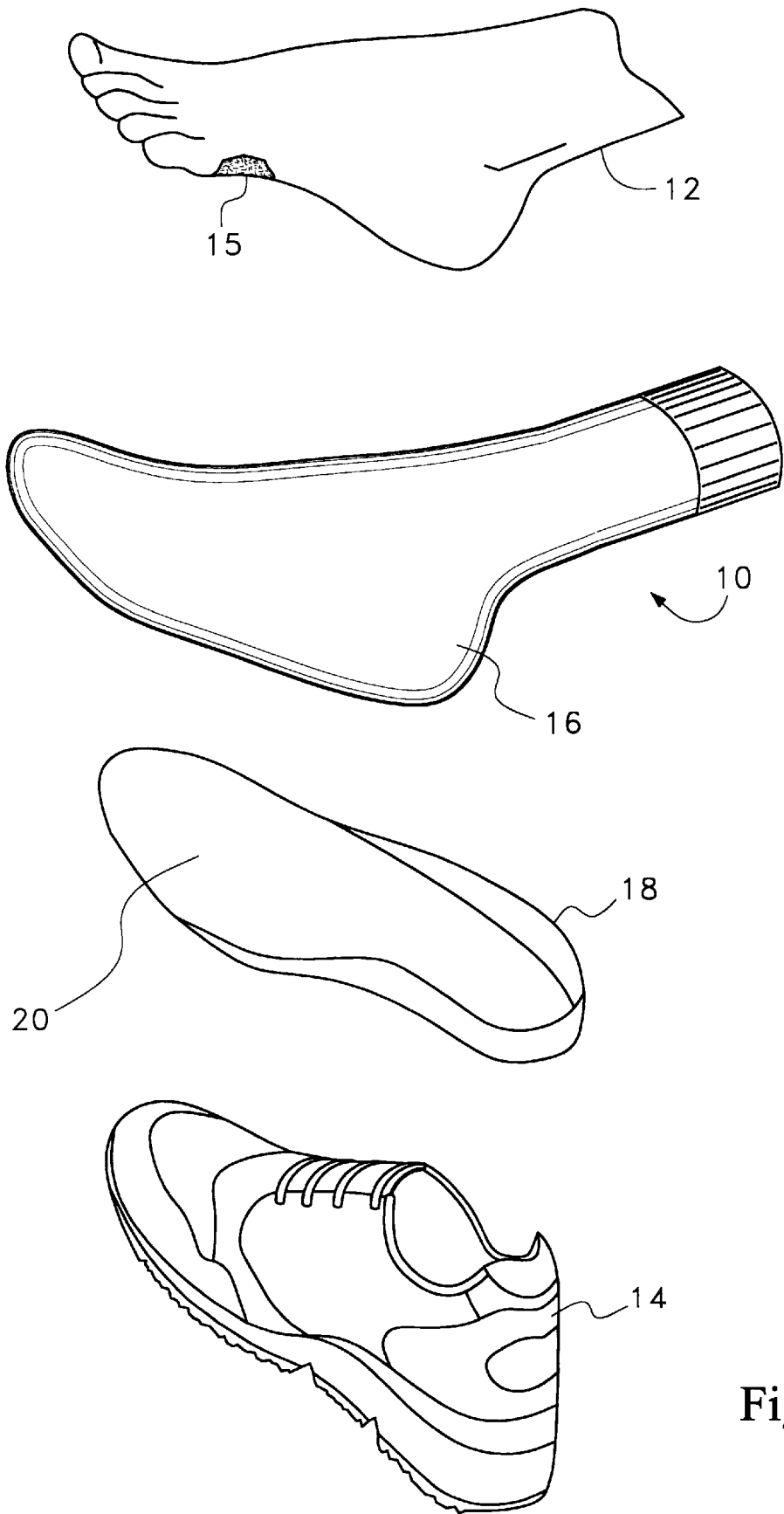


Fig. 1

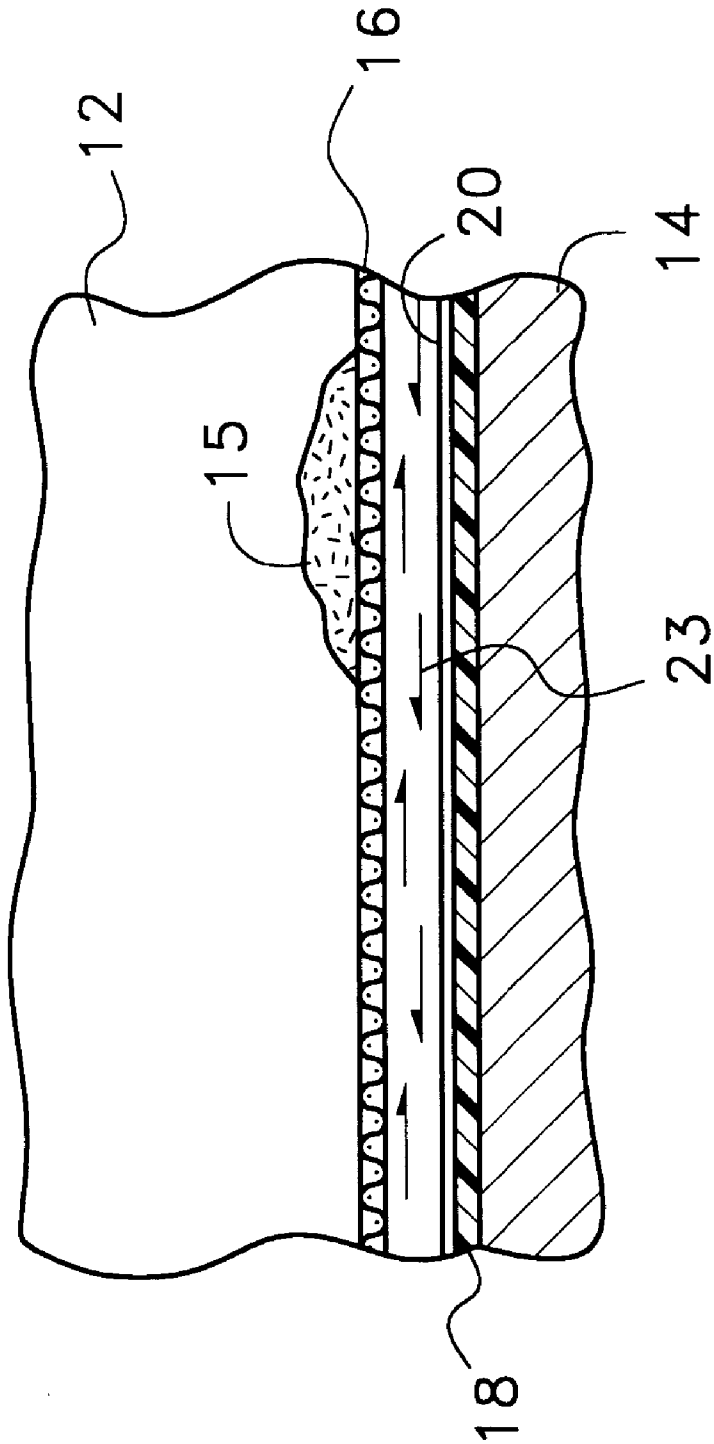


Fig. 2

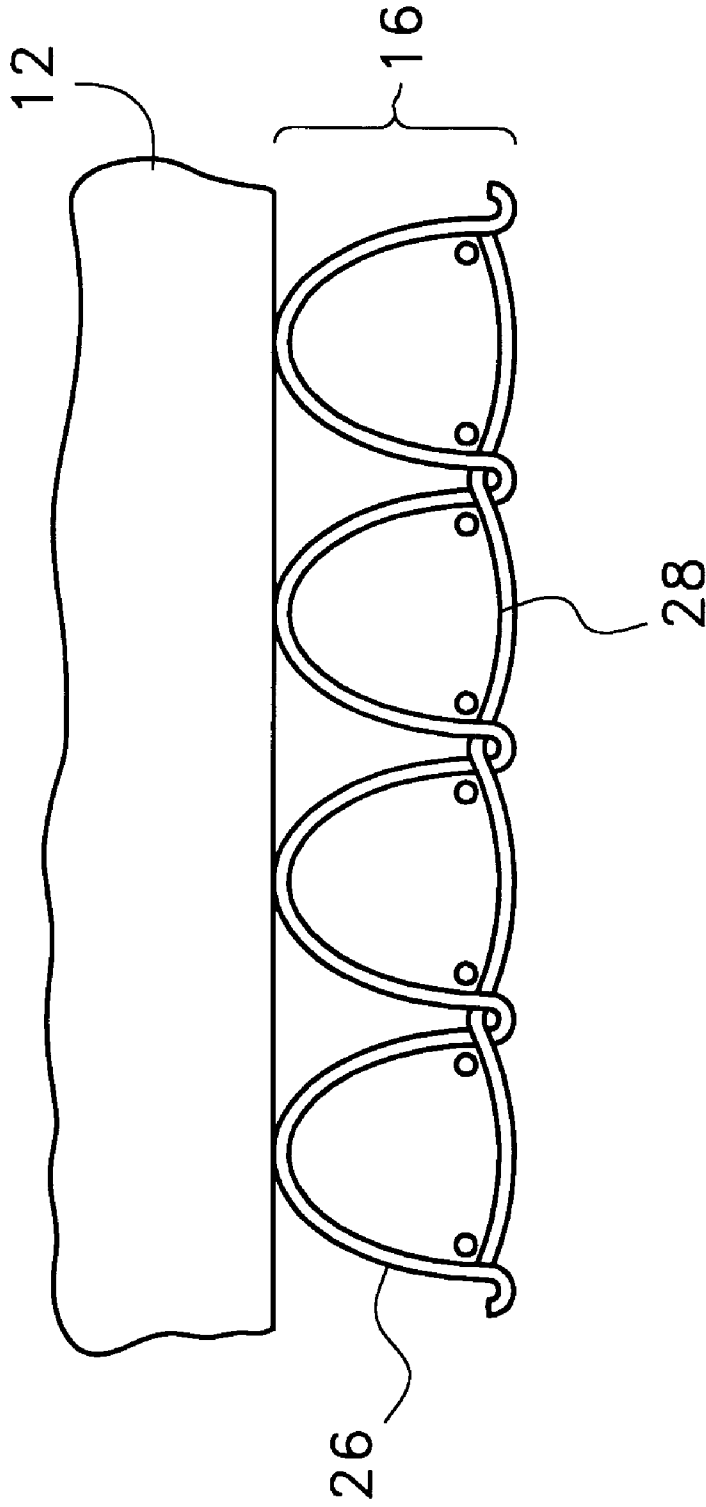


Fig. 3

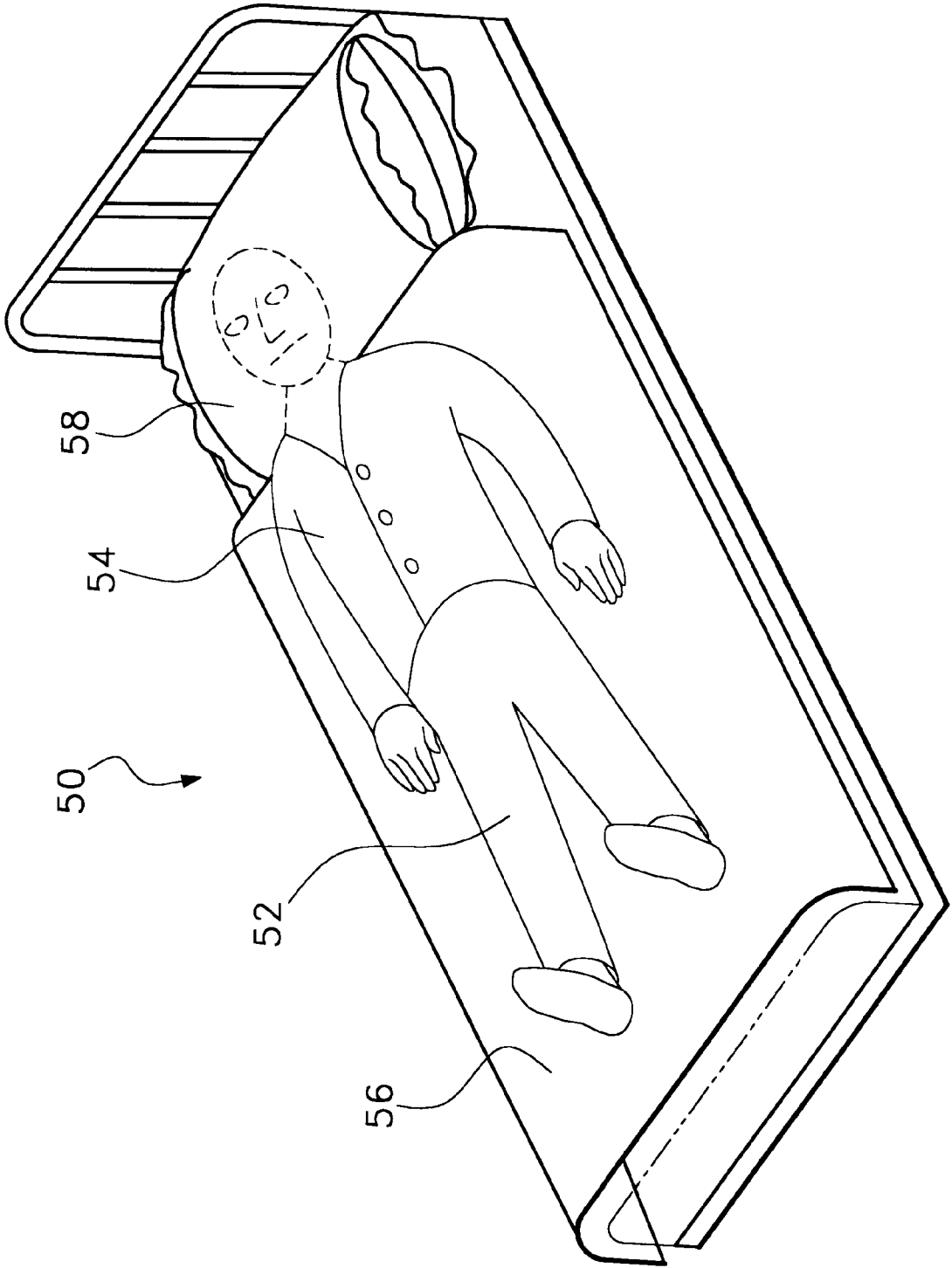


Fig. 4

## GARMENT AND METHOD FOR PREVENTING CONTACT SORES WITH THE HUMAN BODY

### BACKGROUND OF THE INVENTION

#### 1. Field of the Invention

The present invention relates to garments, materials for garments, and garment systems that are intended to reduce the occurrence of contact sores on the body, such as shoe induced foot ulcers and bed sores.

#### 2. Prior Art Statement

Many people develop contact sores on their bodies. In healthy people, these sores are often caused by poor fitting shoes or another poor fitting garment. As the body moves in relation to the poor fitting garment, friction occurs against the skin which produces chaffing of the skin. Without correction, the chaffing can lead to blistering and finally an open sore.

The problem of contact sores need not be caused by poorly fitting garments. People afflicted with diabetes or circulatory maladies often have skin that can blister and develop sores from the relatively minor chaffing of properly fitting garments. Furthermore, invalids and the infirm who are confined to a wheelchair or a bed, often develop contact sores at the points where their body weight is supported by the chair or bed.

In an attempt to reduce the occurrence of contact sores, garments have been developed in the prior art that contain static padding and position that padding against the skin. The padding in such garments helps distribute the forces acting on the skin at localized contact points, thereby reducing chaffing. However, the use of static padding does not work in many applications. For instance, if excess padding is added to a sock, a person's shoe may no longer fit properly. As a result, new chaffing points may be created and new blisters formed. Furthermore, excess padding may cause a shoe to be too tight and blood circulation can be adversely effected, thereby causing other maladies.

Another method used in the prior art to reduce contact sores is to reduce the amount of friction in between the skin and the garment surrounding the skin. Such a prior art method is exemplified in U.S. Pat. No. 5,575,012 to Fox et al., entitled METHOD FOR TREATING LEGWEAR AND PRODUCT. In the Fox patent, a sock is disclosed where the interior of the sock is coated with a fluoropolymer. The presence of the fluoropolymer reduces friction in between the skin of the foot and the sock. By reducing friction along this interface, it is believed that the amount of chaffing can be reduced and blisters can be avoided. Such a method is also disclosed in U.S. Pat. No. 5,590,420 to Gunn, entitled LOW FRICTION APPAREL, wherein only specific areas of the interior of a sock contain a low friction material.

A problem associated with coating the interior of a sock with a fluoropolymer is that movement in between the foot and the sock is promoted. The sock therefore moves relative to the foot and does not add any static padding to the foot. Without the static padding of the sock, contact forces are not dispersed against the foot. Certain areas of the foot therefore receive localized forces as the foot moves within the confines of a shoe. Such repeated contact can cause the skin to blister and a sore to develop. Furthermore, if a foot already contains a blister or an open sore, that blister or sore is caused to move past the material of the sock. The movement of the blister or sore relative to the sock can open the wound or otherwise aggravate the wound. As a result, although a

sock with a slick interior may prevent the formation of some new contact sores, such socks prevent the proper healing of any sores that may develop or that already exist.

A need therefore exists in the prior art for a garment structure that reduces the formation of contact sores, distributes contact forces acting on the foot and does not aggravate or inhibit the healing of existing contact sores. This need is met by the present invention as described and claimed below.

### SUMMARY OF THE INVENTION

The present invention is a device and method for reducing the creation of contact sores on the body caused by the body's contact with an external object. The present invention includes a garment having an internal surface and an external surface. The garment is preferably fabricated from a knitted or woven material having at least one first thread made from a conventional garment material and a second thread made from a fluoropolymer material. The knit pattern is designed to cause the conventional garment material to be predominant on the interior surface of the garment while the fluoropolymer material is predominant on the exterior surface of the garment. The presence of the fluoropolymer material on the exterior surface of the garment causes the exterior of the garment to have a lower coefficient of friction than does the interior of the garment. As a result, the exterior of the garment moves across contacted objects with a minimum of chaffing while the skin remains padded by the static interior of the garment. An optional cover can also be placed over the object being contacted. The cover has an exterior that has a low coefficient of friction. As a result, the interface between the garment and the cover has a low coefficient of friction that reduces localized contact pressures that may cause damage to the underlying skin.

### BRIEF DESCRIPTION OF THE DRAWINGS

For a better understanding of the present invention, reference is made to the following description of an exemplary embodiment thereof, considered in conjunction with the accompanying drawings, in which:

FIG. 1 is a perspective view of a sock and optional shoe insert made in accordance with the present invention. The sock and shoe insert are shown in conjunction with a foot and shoe to illustrate the intended use for the exemplary embodiment.

FIG. 2 is a cross-sectional view of a segment of the exemplary embodiment shown in FIG. 1.

FIG. 3 is a cross-sectional view of an exemplary knit pattern used in creating the sock shown in FIG. 1.

FIG. 4 is a perspective view of an alternate embodiment of the present invention.

### DETAILED DESCRIPTION OF THE INVENTION

Although the present invention system can be used in conjunction with any garment worn over the skin, the present invention system is especially suitable for use in the manufacture of socks, stockings and shoe inserts. As a result, the first exemplary embodiment of the present invention system will show the present invention system configured as a sock and shoe insert in order to set forth the best mode contemplated for the invention.

Referring to FIG. 1, an exemplary embodiment of the present invention system 10 is shown in conjunction with a foot 12 and a shoe 14. The present invention system 10 is

embodied as a sock **16** that is worn around the foot **12** and an optional shoe insert **18** that is placed within the interior of the shoe **14**. As will be explained, the structure of the sock **16** and shoe insert **18** work in unison to protect the foot **12** from contact sores and to promote healing of any contact sores that may already be present on the foot **12**.

The sock **16** is preferably of a knit manufacture and contains conventional sock thread, such as cotton, acrylic, wool, polyester or the like. The knit of the sock **16** also includes a fluoropolymer thread such as polytetrafluoroethylene, commonly known as Teflon®. The sock **16** is knitted in a manner so that the conventional sock threads are the primary material that contacts the skin of the foot **12**. As will later be described in more detail, the conventional sock threads provide cushioning the areas of the foot **12** covered by the sock **16**. The fluoropolymer thread is configured in the knit pattern so that the fluoropolymer thread is the predominant thread on the exterior of the sock's structure. As a result, the exterior of the sock **16** embodies the low coefficient of friction associated with the fluoropolymer thread.

The use of a fluoropolymer thread in a knit pattern is preferred because of the lower cost, lower degree of labor and overall quality of the material produced. However, other methods to create a sock with a fluoropolymer on its exterior exist. In alternate embodiments, it will be understood that a conventional sock can have its exterior coated with a fluoropolymer material by a spraying or dipping procedure, whereby a sock structure is created that has a conventional interior surface and a smooth exterior surface with a low coefficient of friction. Such alternate methods of production can be used in practicing the present invention.

In FIG. 1, an optional shoe insert **18** is also shown. The shoe insert **18** has a top surface **20** that is coated with a fluoropolymer material or a similar material that has a relatively low coefficient of friction. The shoe insert **18** is sized to fit within the shoe **14**. The shoe insert **18** is placed within a person's shoes, wherein the shoe insert **18** covers the interior sole of the shoe **14**. A sock **16** is then placed on each of the feet. As a person places a sock **16** onto their foot **12**, the material of the sock **16** cushions the foot **12** including any contact sore **15** that may be present on that foot **12**. Since the interior of the sock **16** is made from conventional sock material, the degree of friction in between the sock **16** and the foot **12** is approximately the same as with the use of a conventional prior art socks. As the foot **12** and sock **16** are placed within the shoe **14**, the smooth exterior of the sock **16** abuts against the smooth top surface **20** of the shoe insert **18**. The coefficient of friction in between the exterior of the sock **16** and the top surface **20** of the shoe insert **18** is therefore less than the coefficient of friction in between the foot **12** and the sock **16** or the coefficient of friction in between the shoe insert **18** and the shoe **14**. The sock **16** is therefore more likely to move relative to the shoe insert top surface **20** in response to any force applied by the foot **12**.

Referring to FIG. 2, it can be seen that the knit material of the sock **16** cushions the skin on the foot **12**. Furthermore, as the foot **12** moves within the confines of the shoe **14**, the interface in between the skin of the foot **12** and the interior of the sock **16** remains relatively static. As such, no material is moved across the area of a contact sore **15** that can aggravate that injury. Similarly, the interface in between the shoe insert **18** and the shoe **14** remains relatively static as the foot **12** moves within the confines of the shoe **14**. All movement within the shoe **14** is generated along the interface in between the exterior of the sock **16** and the top surface **20** of the shoe insert **18**, as is indicated by arrows **23**.

This is because the exterior of the sock **16** and the top surface **20** of the shoe insert **18** are both manufactured with materials that have a low coefficient of friction. The interface in between the exterior of the sock **16** and the top surface **20** of the shoe insert **18** therefore moves at a lower threshold of force than any of the other interface points.

The low coefficient of friction in between the exterior of the sock **16** and the top surface **20** of the shoe insert **18** reduces the frictional forces experienced by the foot **12**. Furthermore, the presence of the sock **16** around the foot **12** cushions the foot and distributes many of the forces that are experienced by the foot so that those forces are not experienced at a concentrated point on the foot **12**.

Referring to FIG. 3, it can be seen that the knit pattern of the sock **16** is created so that a large area of knitted loops **26** are created on the interior of the sock **16**. The large loops **26** in the knit pattern help to cushion the skin of the foot **12** and distribute forces across the skin. The individual large loops **26** conform to the contours of the foot **12** and inhibit the movement of any material across the skin or any contact sore present on the skin. As has been previously mentioned, the thread used to create the loops **26** on the interior of the sock **16** is made from conventional materials such as cotton, acrylic, wool, or polyester. Conventional materials are therefore the predominant material on the interior of the sock **16**. The knit pattern of the sock **16** also contains a cross thread **28** that is the predominant thread on the exterior of the sock **16**. It is this cross thread **28** that is made of polytetrafluoroethylene or a similar fluoropolymer. As such, a fluoropolymer is the predominant material on the exterior of the sock **16**.

It will be understood that the use of the shoe insert **18** (FIG. 1) is optional. The purpose of the shoe insert is to ensure that the interface involving the exterior of the sock **16** is the interface containing the lowest coefficient of friction. However, in many types of shoes, the interior sole of the shoe is smooth. As a result, even if the shoe insert were not used, the interface in between the exterior of the sock **16** and the interior of the shoe would still have a coefficient of friction that is significantly less than the interface between the foot **12** and the interior of the sock **16**. As a result, the use of a shoe insert helps in the functioning of the present invention system, however, the shoe insert is not necessary.

Referring to FIG. 4, an alternate embodiment of the present invention system **50** is illustrated. In this embodiment, a pair of pants **52** and a shirt **54** are fabricated from the same knit or woven material as was the sock of the previous embodiment. As a result, the interior of the shirt **54** and pants **52** are predominantly made of conventional materials such as cotton, acrylic, wool and polyester. Adversely, the exterior of the pants **52** and shirt **54** predominantly contain a fluoropolymer. The interior of the pants **52** and shirt **54** therefore have a much higher coefficient of friction than does the exterior of the same pants **52** and shirt **54**. Furthermore, the bed cover **56** and pillow case **58** on the bed are also made from a material that has a low coefficient of friction. If desirable, the bed covers can be made of the same material as are the pants **52** and the shirt **54**. The bed covers are placed on the bed so that the side of the covers with the low coefficient of friction are facing the person lying in the bed and contacting the exterior of the pants **52** and shirt **54** worn by that person. Since the low friction exterior of the pants **52** and shirt **54** are contacting the low friction material of the bed covers, most movement will occur at the interface between where the bed covers contact the shirts **54** and pants **52**. The degree of movement in between a person's skin and the shirt **54** and pants **52** is therefore lessened. A person

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would therefore be much less likely to develop bed sores or aggravate bed sores that already exist on that person's body.

From the two embodiments of the present invention illustrated, it will be understood that present invention can involve any garment that separates skin from an object. Furthermore, the present invention system may also include a cover for that object so that the interface in between the garment and the object being contacted is significantly less than the coefficient of friction in between the skin and the garment. In this manner, most movement will occur at the garment/object interface rather than at the skin/garment interface. By limiting movement along the skin/garment interface, chaffing, blistering and the development of sores are reduced.

It will be understood that the embodiments of the present invention described and illustrated herein are merely exemplary and a person skilled in the art can make many variations to the embodiment shown without departing from the scope of the present invention. For example, although a knit pattern was illustrated, the present invention can be practiced with woven patterns as well. It should also be understood that the various elements from the different embodiments shown can be mixed together to create alternate embodiments that are not specifically described. All such variations, modifications and alternate embodiments are intended to be included within the scope of the present invention as defined by the appended claims.

What is claimed is:

1. A garment to be worn on the body having an interior surface and an exterior surface, said garment being fabricated from a material containing a plurality of different threads in a predetermined knit pattern, said plurality of different threads having at least one first thread made from a conventional garment material and at least one second thread made from a fluoropolymer material, wherein said predetermined knit pattern makes said at least one first thread predominant on said interior surface of said garment and said at least one second thread predominant on said exterior surface of said garment.

2. The garment according to claim 1, wherein said fluoropolymer material includes polytetrafluoroethylene.

3. The garment according to claim 1, wherein said conventional material is selected from a group consisting of cotton, acrylic, wool and polyester.

4. The garment according to claim 1, wherein said garment is configured as a sock.

5. A system for reducing contact sores on areas of the body that contact an external object, said system comprising:

- a garment having an interior surface and an exterior surface, said garment being fabricated from a plurality of threads in a knit pattern that produces at least one predominant thread on said interior surface of said garment and at least one predominant thread on said exterior of said garment, wherein said at least one predominant thread on said exterior surface of said garment has a coefficient of friction lower than said at least one predominant thread on said interior surface; and

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a cover for covering at least one surface of said external object, wherein said cover has a coefficient of friction lower than said object.

6. The system according to claim 5, wherein at least one predominant thread on said exterior surface of said garment is at least partially comprised of a fluoropolymer.

7. The system according to claim 5, wherein said cover is at least partially comprised of a fluoropolymer.

8. The system according to claim 5, wherein said garment is a sock and said object is a shoe.

9. The system according to claim 8, wherein said cover is configured as a shoe insert.

10. The system according to claim 5, wherein said fluoropolymer material includes polytetrafluoroethylene.

11. The system according to claim 5, wherein said conventional material is selected from a group consisting of cotton, acrylic, wool and polyester.

12. The system according to claim 5, wherein said garment is selected from a group consisting of socks, pants and shirts.

13. A method of reducing the development of contact sores on the skin at points where the body contacts an external object, said method comprising the steps of:

- providing a garment having an internal surface and an external surface, said garment being fabricated from a plurality of threads in a knit pattern that produces at least one predominant thread on said interior surface of said garment and at least one predominant thread on said exterior of said garment, wherein said at least one predominant thread on said exterior surface has a lower coefficient of friction than does said at least one predominant thread on said internal surface;

providing a cover for at least one surface of said external object, wherein said cover has a coefficient of friction lower than that of said at least one surface;

placing said cover over said at least one surface of said external object;

placing said garment over the skin, wherein said external surface of said garment contacts said cover and creates a low friction interface.

14. The method according to claim 13, wherein said low friction interface has a lower coefficient of friction than exist in between the skin and said interior surface of said garment.

15. The method according to claim 13, wherein at least one predominant thread on said exterior surface of said garment is at least partially comprised of a fluoropolymer.

16. The method according to claim 13, wherein said cover is at least partially comprised of a fluoropolymer.

17. The method according to claim 13, wherein said garment is a sock, said object is a shoe and said cover is a shoe liner.

18. The method according to claim 13, wherein said fluoropolymer material includes polytetrafluoroethylene.

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