April 9, 1963 LE ROY M. COLMAN 3,084,459

SHOE COVER

Filed Oct. 12, 1960

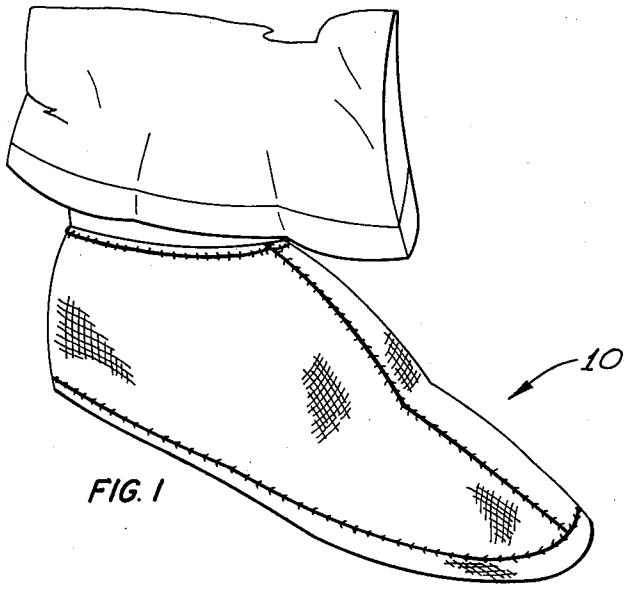


FIG. 1

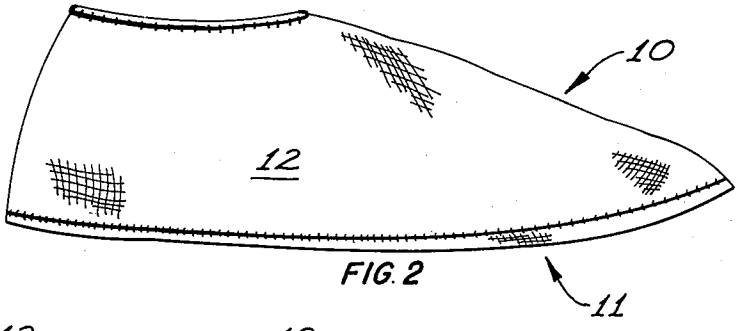


FIG. 2

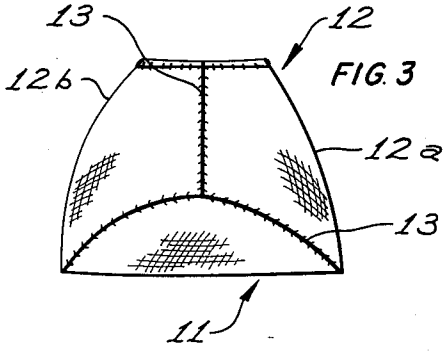


FIG. 3

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SHOE COVER

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The present invention is concerned generally with an improved shoe cover protective enclosure, and more particularly to a lint-free protective enclosure particularly adapted for covering the wearer's shoes, thereby substantially eliminating generation, distribution and transfer of lint, dust and the like from and by the wearer's shoes, stockings and the like into the area being occupied by the wearer. The apparatus of the present invention has particular application in areas where the presence of dust and lint may not be tolerated, such as for example, an area where precision control equipment or the like is being fabricated, assembled or stored. The shoe covering equipment of the present invention substantially eliminates the transfer of lint from these sources.

In the past, lint-free shoe coverings have been suggested and utilized wherein the entire fabric is prepared from a lint-free weave of threads having an inherent stretching quality. While these coverings have been basically satisfactory from the standpoint of lint protection, they have been deficient from the standpoint of durability, repairability and the like. It has been found that the materials are not sufficiently durable to provide any reasonably useful life, the stretch materials being extremely subject to separation or rupture, particularly when exposed to any abrading action while under modest or even slight degrees of stress. The use of heavier or larger diameter thread has not proved to be a satisfactory solution inasmuch as the problem of difficulty of repair continues to exist, and the degree of discomfort to the wearer increases to an impractical level. In other words, as the thread diameter increases, the permeability of the protective covering becomes sufficiently low so as to prevent or retard normal release of perspiration and the like from the wearer's feet, this occurring before a point is reached where the material is sufficiently durable for use. The fabrication of the protective coverings must, of course, be from a material which does not undergo fiber breakdown if abraded. Accordingly, nylon has been found extremely well adapted for use as a fibrous substance for yarn preparation, although it has been found that a polyester fiber such as Dacron may also be used advantageously.

In accordance with the present invention, a lint-free protective shoe covering is provided wherein the fabric for the sole portion comprises a relatively dense weave of a synthetic fibrous yarn, preferably nylon, having a thread diameter which is sufficiently large for purposes of durability, and which is not excessive so as to cause discomfort to the wearer, the thread diameter preferably being between about 200 and 300 denier. The fabric for the upper portion comprises a relatively dense weave of similar thread material having an inherent stretch or resiliency in the fabric, and having a thread diameter of between about 50 denier and 100 denier. It has been found that a thread diameter of 50 denier is required for the normal durability purposes, and a fabric prepared from a thread having a diameter in excess of about 100 denier tends to lead to discomfort on the part of the wearer.

Therefore, it is an object of the present invention to provide an improved lint-free protective enclosure which has a maximum amount of strength and durability in the fabric for the sole portion as well as a maximum degree of strength and durability in the fabric for the upper portion.

It is still a further object of the present invention to provide an improved lint-free protective enclosure which is particularly adapted for covering the wearer's shoes, the enclosure including a sole portion and an upper portion, the sole portion being prepared from a conventionally woven fabric, the upper portion being prepared from a fabric having in inherent stretch characteristic, both fabrics consisting of a synthetic fibrous yarn selected from the class consisting of nylon and Dacron.

Other and further objects of the present invention will become apparent to those skilled in the art upon a study of the following specification, appended claims, and accompanying drawing, wherein:

FIG. 1 is a sketch of the improved protective shoe covering in use on a wearer's shoe;

FIG. 2 is a side view of the improved shoe enclosure of the present invention; and,

FIG. 3 is a front view of the protective shoe enclosure.

In accordance with the preferred embodiment of the present invention, particularly as shown in the accompanying drawing, a protective shoe enclosure generally designated **10** comprising a sole portion **11** and an upper portion **12**, the sole portion and the upper portion being secured together along the seams or meeting face **13** by a particular type of thread. The upper portion comprises two panels **12***a* and **12***b*. The covering is arranged to be pulled over the wearer's shoe, the inherently resilient portion having an adequate amount of stretch to permit ingress of the shoe thereinto and to provide a reasonably taut envelope therearound while in use. Before the wearer enters the area in which a lint-free condition is required, the protective covering is placed over the shoe and dispersal of dust, lint or the like from the crevices, recesses and the like in the shoe body which may provide a harbor, trap or retention area for lint, dust, etc. Therefore, the lint and dust which is present on the surface of the wearer's shoe is retained in the enclosure, the enclosure being free from the generation of additional lint through use.

Referring now to the sole portion **11**, this body is preferably prepared from a yarn which is spun from a nylon fiber, the thread diameter preferably being about 250 denier. In addition, this thread diameter is sufficiently small to provide for reasonable non-slippage characteristics on hard surfaces. If the diameter exceeds about 300 denier, the non-slippage characteristics have been found to be lacking or at an unreasonably unsafe level. On the other hand, if the thread body is significantly less than 250 denier, for example, below 200 denier, the strength characteristics have been found to be unreasonably low. In addition, a reasonably dense weave, for example, a thread count in excess of about 2,400 threads per square inch (for example 60 courses, 40 wales) is essential for retention of lint particles and the like therewithin. Therefore, the nylon sole portion is preferably prepared from a fabric which is a relatively dense weave of threads having a diameter from between about 200 denier and 300 denier.

The upper portion is likewise preferably fabricated from a nylon fiber this fiber having an inherent stretch characteristic. The inherent stretch is obtainable from nylon which has been woven in accordance with the well known Hellenca process, in which the individual nylon threads are crimped so as to become permanently set. The thread diameter is preferably about 70 denier, however thread diameters ranging from between 50 denier and 100 denier may be utilized, the lower limit being required for providing sufficient durability in the finished product, the upper limit being established for purposes of comfort. A relatively dense weave is essential to retain the lint within the enclosure, at least about 30 threads per inch being required for this purpose, however a

density of between about 30 and about 60 threads per inch in each direction (courses and wales) may be satisfactorily utilized. In this application, the material having the inherent stretch characteristics is not subjected to conditions of local areas of high stress concentration, and hence, the fabric will be highly durable for the intended use. If a rupture or break does occur, it may be repaired without risking the probable repetition of the break due to the increase in stress which occurs in the repair. Materials fabricated in accordance with the Hellenca process are commercially available.

In order to maintain the lint-free characteristics in the product, a non-resilient thread must be employed to attach the portions, one to another. In addition, this thread must be lint-free in use. Nylon thread of the non-stretch type has been found suitable for the task. A similar non-stretch thread such as a polymer resulting from the combination of ethylene glycol and terephthalic acid commonly known as Dacron, may also be utilized satisfactorily.

The protective enclosure fabricated as indicated above may be made in a series of about 4 different sizes, these 4 sizes being sufficient for substantially all of the shoe sizes worn by the operating personnel. Accordingly, the stock requirements for the use of this protective covering are reasonably modest.

It will be appreciated that if desired, the covering may be made sufficiently large to cover and enclose the trouser end and cuff of the wearer, and thereby further reduce the lint distribution in the area which is being maintained lint-free.

It will be appreciated, of course, that the foregoing examples have been given for purposes of illustration only and there is no intention, therefore of limiting the scope of the present invention to these specific examples.

What is claimed is:

1. A lint-free protective enclosure being particularly adapted for covering the wearer's shoe and being prepared from a woven yarn consisting essentially of two different synthetic fibrous yarns one for the upper and the other for the sole of the enclosure, said protective

enclosure comprising a sole portion and an upper portion, the fabric for said sole portion being a relatively dense weave of threads having a diameter from between about 200 denier and 300 denier, the fabric for said upper portion being a relatively dense inherently resilient weave of threads having a diameter of between about 50 denier and 100 denier.

2. The shoe enclosure defined in claim 1 being further characterized in that said sole portion and said upper portion are secured together with a substantially non-resilient thread consisting essentially of a woven fiber.

3. A lint-free protective enclosure being particularly adapted for covering the wearer's shoe and being prepared from a woven yarn consisting essentially of two different synthetic fibrous yarns one for the upper and the other for the sole of the enclosure, said protective enclosure comprising a sole portion and an upper portion, the fabric for said sole portion being a relatively dense weave of threads having a diameter of substantially 250 denier, and having a thread density of between about 40 and 60 threads per inch, the fabric for said upper portion being a relatively dense resilient weave of threads having a diameter of substantially 70 denier, and having a tread density of between about 30 and 60 threads per inch.

4. The lint-free protective enclosure defined in claim 3 being particularly characterized in that said threads are fabricated from nylon.

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