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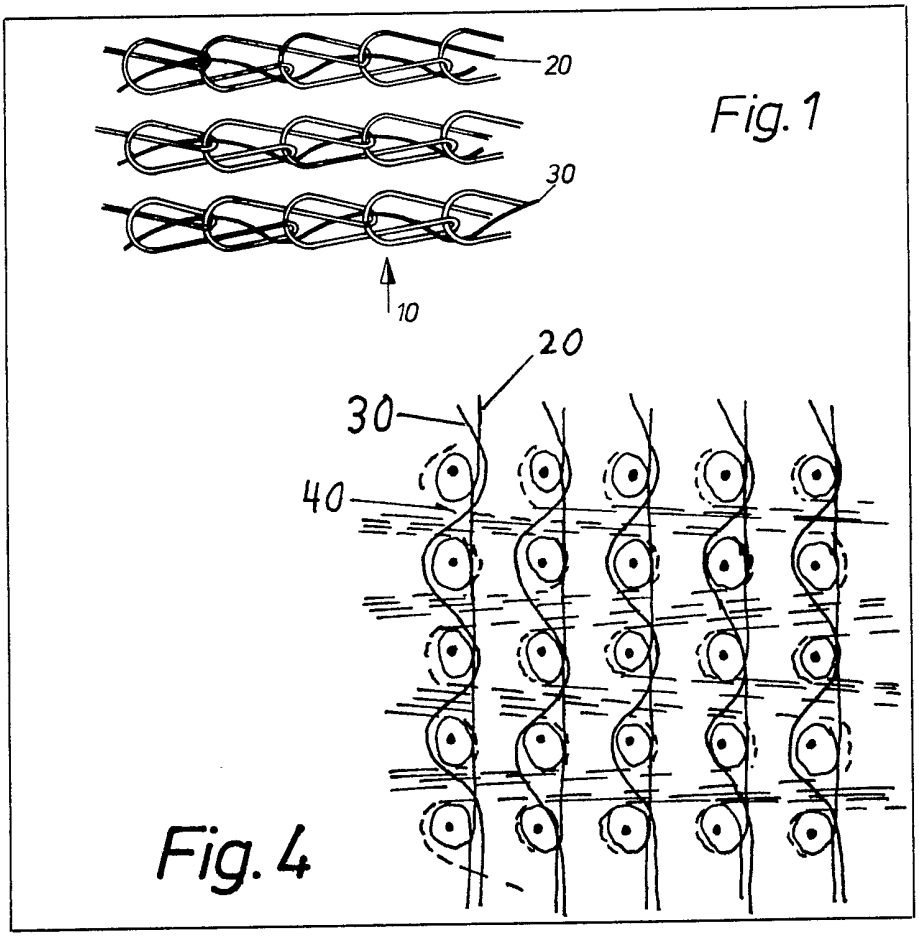
D1K
(71) Applicant
Franz Braun
Postfach 40
6759 Wolfstein
Pfalz 1
Federal Republic of Germany
(72) Inventors
Ewald Schafer
Herald Jung
(74) Agents
Fitzpatricks
Kern House
61/62 Lincoln's Inn Fields
London WC2B 6EX

(54) Processes for producing knitted, longitudinally elastic fabrics, and fabrics made thereby

(57) The invention relates to a process for producing a knitted, longitudinally elastic fabric layer for use as an elastic or permanent elastic compression or support dressing and a knitted fabric layer produced by this process, whereby untreated elastic rubber or polyurethane threads undergo deformation during the knitting process. Each elastic thread is looped by an inelastic thread, accompanied by the formation of a fringe and longitudinally directed thin mesh members, which are interconnected by inelastic wefts to give a firm knitted fabric with no irreversible displacements of the mesh members in the transverse and longitudinal directions. As a result, a dressing with flattened edges is formed, so that there can be no pressurepoints or constrictions when applying the dressings.



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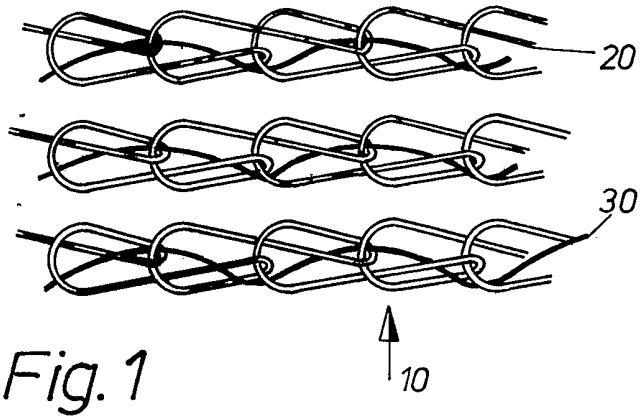


Fig. 1

Fig. 2

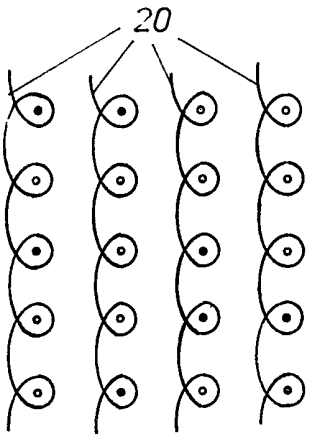


Fig. 3

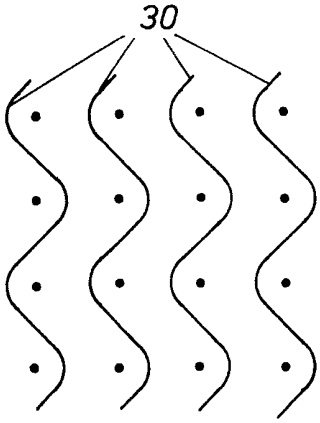


Fig. 4

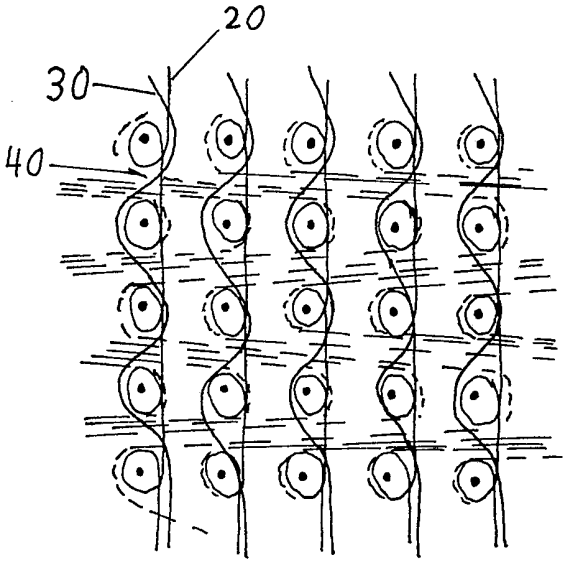
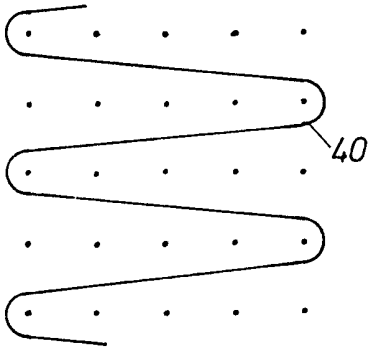


Fig. 5



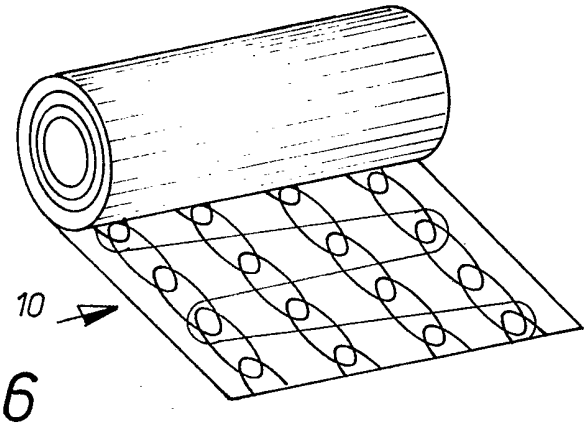


Fig. 6

SPECIFICATION

Processes for producing knitted, longitudinally elastic fabrics, and fabrics made thereby

The invention relates to a process for producing a knitted, longitudinally elastic fabric layer for use as an elastic or permanent elastic compression or support dressing and a knitted fabric layer produced by this process.

Permanent elastic dressings are known having elements which are longitudinally elastic and which by their very nature are elastic. These elastic elements are rubber or polyurethane threads covered or wound round by cotton and/or viscose staple or synthetic, textured, polyfilic threads and/or synthetic staple fibre yarns. These elastic yarn elements are longitudinally positioned in the most varied ratios with one or more single yarns formed from twisted threads of cotton or viscose or a similar blended yarn or yarns made from other raw materials. The wefts are formed from single or twisted threads of viscose, cotton or a blended yarn of cotton/viscose or synthetic yarns.

Permanent elastic dressings of this type generally have an extensibility of approximately 180%. In addition, permanent elastic dressings with short extensibility of approximately 60 to 70% and medium extensibility of approximately 100 to 120% are known. The elasticity of such dressings can be attributed to the polyurethane and/or rubber threads, covered or wound round by cotton and/or viscose staple yarns or textured polyamide or other textured plastic threads of a polyfilic nature.

In these known dressings, in the warp direction textured polyfilic, synthetic threads are used as filler threads, so that the warp component of such dressings is completely formed from non-absorptive, elastic elements. These elastic elements, particularly in the case of textured, polyfilic polyamide or other textured, polyfilic plastic threads are placed over the wefts made from natural fibres and consequently prevent bridge formation between the skin and the fabric, so that there is an extremely limited moisture transfer and as a result warm moist chambers form, which are the basis for inflammations of all types. Another disadvantageous of these known dressings, whose warps are formed solely from synthetic threads, is that allergies can occur with most patients. Such dressings are made on ribbon looms using the most varied production processes.

In addition, permanent elastic dressings are known, which are made on knitting machines and in the longitudinal direction have synthetic, crimped fibres. The "connecting elements" of the warps, having a weft-like layering procedure, are cotton or staple viscose yarns or twisted threads, which give the layer the necessary hole. In addition, these elastic yarns can be knitted in the warp direction, combined with elastic yarn elements. The elastic and inelastic threads form parallel mesh members, which can comprise both elastic and inelastic material.

The disadvantage of these known dressings, which also have polyurethane or rubber threads covered with cotton or staple viscose or synthetic, textured threads, is that on extending they become narrower and consequently constrictions can occur. In addition, with these known dressings, due to the constant return of the weft-like warp, the edge is generally somewhat thicker, so that in said edge area there are often considerable constrictions with respect to the skin. In use and particularly with synthetic fibrous material, there is a risk with these known dressings of moist, warm chambers forming, which can provide a basis for all types of inflammation.

A permanent elastic gauze dressing is known, which is produced on a bobbinet or tulle machine and which contains inelastic wefts between the rubber-elastic warps in such a way that the inelastic wefts which only loop round and do not intermesh with the warps are joined together to form a layer. In the case of longitudinal extensibility, due to this weft displacement, a considerable transverse contraction occurs i.e. the dressing becomes longitudinally narrower on extending, so that constrictions occur.

Permanent elastic knitted dressings are also known which, due to their special layering, do not give to transverse contrations during longitudinal extension and consequently retain their original width even after stretching. The disadvantage of such dressings which essentially have a gauze-like structure, is that when applied to all parts of the body due to the hard mesh members, which stand out considerably from the remainder of the dressing and due to their increased tension exert an increased pressure on the skin surface leading to groove-like impression therein, so that the venous return flow is significantly impaired and may be prevented completely. This action is particularly pronounced in the case of fringe or mesh members made from polyurethane and covered with textured polyamide formed in the longitudinal or machine running direction. In addition, such dressings have no transverse stability and cannot therefore be used as support bandages. In addition, when applying the dressing to a small-radius body part, due to the fact that the mesh members have no resilience they move or are forced apart, so that irreversible, bulge-like protuberances occur, which can even lead to the formation of holes, particularly in the heel area.

The problem of the present invention is to provide a knitted fabric layer, whose edges

are flattened and when it is used as a dressing, no pressure points or constrictions occur on firmly superimposing the turns of the dressing. Furthermore, during stretching or extension, there is no transverse contraction, i.e. constriction. In addition, the mesh members have a construction such that no significant pressure is exerted on the skin surface, i.e. no grooving occurs and as a result the venous return flow is neither impaired nor prevented.

According to the invention, this problem is solved by a process for producing a knitted, longitudinally elastic fabric layer for use as an elastic or permanent elastic compression or support dressing, characterized in that the untreated, naturally elastic rubber and/or polyurethane threads undergo a deformation of approximately 200 to 400% during the knitting process, each elastic thread is looped around by an inelastic cotton or viscose staple thread or a twisted thread, accompanied by the formation of an open or closed fringe and longitudinally directed, thin non-engaging mesh members interconnected by cotton or viscose staple threads as inelastic wefts to give a firm knitted fabric having no irreversible displacement of the mesh members in the transverse and longitudinal directions, the mesh members being interconnected by the wefts over a plurality of needles, accompanied by the formation of a weft-like insertion.

According to the invention, another solution of the problem is provided by a knitted fabric web, characterized by a flat layer formed from untreated, naturally elastic rubber and/or polyurethane threads subject to a deformation of approximately 200 to 400% each permanent elastic thread being looped round by an elastic cotton or viscose staple or twisted thread, accompanied by the formation of an open or closed fringe longitudinally directed, thin non-engaging mesh members interconnected by cotton or viscose staple threads as inelastic wefts to a firm knitted fabric having no irreversible displacement of the mesh members in the transverse and longitudinal directions, the mesh members being interconnected by the wefts over a plurality of needles, accompanied by the formation of a weft-like insertion.

The invention also provides for the use of a longitudinally elastic fabric web as an elastic or permanent elastic compression or support dressing formed from a flat layer of untreated, naturally elastic rubber and/or polyurethane threads subject to a deformation of approximately 200 to 400%, each permanent elastic thread being looped round by an inelastic cotton or viscose staple or twisted thread, accompanied by the formation of an open or closed fringe and longitudinally directed, thin non-engaging members interconnected by cotton or viscose staple threads as inelastic wefts to form a firm, non-displaceable knitted fabric, the mesh members being interconnected by the wefts over several needles, accompanied by the formation of a weft-like insertion for the purpose of forming flattened edges and to ensure the automatic return of bulged portions of the fabric to the initial state after removing the pressure and whilst avoiding transverse contraction during expansion.

Further advantageous developments of the invention can be gathered from the subclaims.

As a result of the construction according to the invention, an elastic or permanent elastic compression or support dressing is produced on knitting machines or double rib looms and formed in the following manner.

For producing the dressing, the naturally elastic rubber or polyurethane threads undergo deformation during the knitting process, said deformation amounting to 200 to 400%. An inelastic cotton or viscose staple or twisted thread made from the same raw material is looped round the permanent elastic thread, whilst an open or closed fringe is formed, so that non-engaging, thin mesh members are formed in the longitudinal direction. These mesh members are interconnected by cotton or viscose staple threads, so that a longitudinally elastic, transversely irreversible, non-displaceable firm knitted fabric is formed. In connection with the arrangement of the wefts, it is important that they interconnect the mesh or fringe members over a plurality of needles, so that a weft-like insertion takes place. This means that after three or four needles the thread returns to the starting needle and is then subject to the same displacement for the next row of meshes. Thus, during longitudinally extension, transverse contraction is initially prevented, because the tension formed during the stretching of the dressing can only act perpendicularly on the mesh members, so that irreversible transverse distortions and bulges are prevented. This completely prevents the constriction of a knitted, longitudinally elastic compression or support dressing. In the case of an extensibility of max. 200%, the dressing undergoes no width change. There is also no displacement of the mesh members, as occurs with knitted, gauze-like dressings. The permanent elastic element is located within the meshes and is completely surrounded by the mesh-forming cotton thread, so that there is no longer any need for prior covering or looping.

Another advantage is that dressings produced in this way have a flattened edge, so that then engage well, without there being any constriction of the edges and without the reduced dressing edge thickness leading to different pressure conditions from the edge towards the centre of the dressing, because there is dressing superimposition at the edge.

Thus, a knitted fabric web is formed, whose edge areas are flattened and which, when used, causes no pressure points or constric-

tions due to the superimposed turns of the dressing material.

In addition, during stretching, no transverse contraction occurs, because the mesh members are located perpendicularly on the laterally displaced wefts. The mesh members are soft, so that differing pressures are not exerted on the skin surface, so that no grooving occurs and a much more uniform pressure is exerted on the skin over the entire width of the dressing. When applying the dressing, particularly to small-radius body parts such as e.g the heel, there are no irreversible displacements of the mesh members.

Another advantage is that dressings produced in this way are made almost exclusively of pure cotton or cotton/viscose staple or viscose staple alone, so that there is an excellent moisture and heat transfer, thereby obviating the much-feared, moist, warm chambers, which are the cause of inflammation. Correspondingly finer or thicker material is used as a function of the desired compression force and fabric thickness. For producing a light compression dressing with an extensibility of approximately 18%, e.g. mesh-forming threads of 12 tex × 2 cotton are used, with 156 dtex polyurethane for the permanent elastic elements and 14 tex × 2 cotton for the weft material, the weave being e.g. as follows:

Guide rail 1 – 2.0 – 0.2
Guide rail 2 – 0.0 – 2.2
Guide rail 3 – 0.0 – 10.10

Such a weave has a stretched m^2 weight of approximately 60g. As from the fourth mesh member the edge is flattened, so that in the vicinity of the superimposed turns, the dressing does not exert an increased pressure.

A knitted fabric layer constructed according to the invention can be used as a permanent elastic knitted or double rib dressing, its advantage being that it can be used as a compression or support bandage without all the aforementioned difficulties. During longitudinal extension, no transverse contraction occurs, whereby the edge thickness of the dressing is reduced in such a way that on application, the super-imposed layers cannot insert an increased pressure. Layering is such that over the entire width of the dressing, a differing pressure is not exerted on the skin and so consequently the venous return flow cannot be prevented. In addition, the transverse stability of a dressing made from the knitted fabric layer is increased to such an extent, that irreversible changes cannot occur in the transverse direction.

The invention is described in greater detail hereinafter relative to non-limitative embodiments, and the attached drawings, wherein show:

Figure 1 the course of the mesh-forming thread of a layer in the form of a knitted fabric web.

Figure 2 the mesh-forming thread in the form of a fringe.

Figure 3 the course of the permanent elastic thread.

Figure 4 a layer according to Figs. 1 to 3 with the weft placed over four needles.

Figure 5 the displacement of a weft over five needles.

Figure 6 a diagrammatic view of a knitted fabric layer partly wound into a roll.

The layer 10 shown in Fig. 1 is formed from mesh-forming, cotton, viscose staple or twisted threads 20 and elastic or permanent elastic and rubber/or polyurethane threads 30. Each elastic thread 30 is located within the so-called fringe member, which protectively surrounds the naturally elastic rubber and/or polyurethane thread 30, (Fig. 1). The mesh forming thread 20 of layer 10 is intended for fringe formation (Fig. 2). The permanent elastic thread 30 is passed through the fringe openings formed (Fig. 3). As can be gathered from Fig. 4, layer 10 is interconnected by placing the weft over four needles. At 20, the inelastic, mesh-forming threads are shown. At 30, the permanent elastic threads and at 40 the inelastic "wefts" serving as the connecting members. Fig. 5 shows the displacement of a weft over five needles.

CLAIMS

1. A process for producing a knitted, longitudinally elastic fabric layer for use as an elastic or permanent elastic compression or support dressing, characterised in that the untreated, naturally elastic rubber and/or polyurethane threads undergo a deformation of approximatley 200 to 400% during the knitting process, each elastic thread is looped around by an inelastic cotton or viscose staple thread or a twisted thread, accompanied by the formation of an open or closed fringe and longitudinally directed, thin non-engaging mesh members interconnected by cotton or viscose staple threads as inelastic wefts to give a firm knitted fabric having no irreversible displacement of the mesh members in the transverse and longitudinal directions, the mesh members being interconnected by the wefts over a plurality of needles, accompanied by the formation of a weft-like insertion.

2. Knitted, longitudinally elastic fabric layer for use as an elastic or permanent elastic compression or support dressing, characterized by a flat layer formed from untreated, naturally elastic rubber and/or polyurethane threads subject to a deformation of approximately 200 to 400%, each permanent elastic thread being looped around by an inelastic cotton or viscose staple or twisted thread, accompanied by the formation of an open or closed fringe and longitudinally directed thin non-engaging mesh members interconnected by cotton or viscose staple threads as inelastic wefts to a firm knitted fabric having no irre-

versible displacement of the mesh members in the transverse and longitudinal directions, the mesh members being interconnected by the wefts over a plurality of needles, accompanied by the formation of a weft-like insertion.

3. Knitted, longitudinally elastic fabric layer for use as an elastic or permanent elastic compression or support dressing, characterised in that it is formed from a flat layer of untreated, naturally elastic rubber and/or polyurethane threads subject to a deformation of approximately 200 to 400%, each permanent elastic thread being looped around by an inelastic cotton or viscose staple or twisted thread, accompanied by the formation of an open or closed fringe and longitudinally directed, thin non-engaging members interconnected by cotton or viscose staple threads as inelastic wefts to form a firm, non-displaceable knitted fabric, the mesh members being interconnected by the wefts over several needles, accompanied by the formation of a weft-like insertion.

4. Knitted fabric layer according to claims 2 and 3, characterized in that for the layer the mesh-forming threads are 12 tex × 2 cotton, the permanent elastic threads 156 dtex polyurethane and the weft material 14 tex × 2 cotton.

5. Use of a longitudinally elastic fabric layer as an elastic or permanent elastic compression or support dressing formed from a layer of untreated, naturally elastic rubber and/or polyurethane thread subject to an approximately 200 to 400% deformation, each permanent elastic thread being looped by an inelastic cotton or viscose staple or twisted thread, accompanied by the formation of an open or closed fringe and accompanied by longitudinally directed, non-engaging, thin mesh members interconnected by cotton and/or viscose staple threads as inelastic wefts to give a firm, non-displaceable knitted fabric, the mesh member being interconnected by the wefts over a plurality of needles accompanied by the formation of a weft-like insertion, for the formation of flattened edges and ensuring an automatic return of bulged portions of fabric layer to the initial state after removing the pressure, whilst avoiding transverse contraction during stretching.

6. A process for producing a knitted, longitudinally elastic fabric layer for use as an elastic or permanent elastic compression or support dressing substantially as hereinbefore described.

7. A knitted longitudinally elastic layer for use as an elastic or permanent elastic compression or support dressing substantially as hereinbefore described with reference to the accompanying drawings.

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