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(54) **Method of area-stretching of leather and apparatus for carrying out the method.**

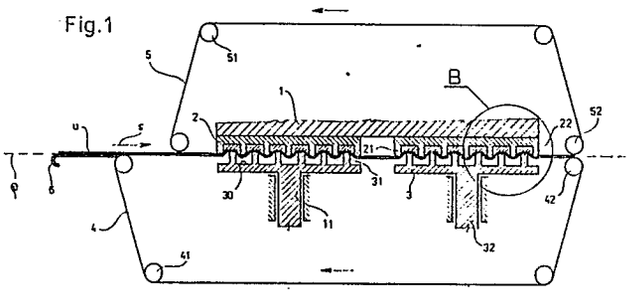
(57) The invention solves an improvement of method and apparatus for area-stretching of leathers which re inserted between two resilient belts with which they are alternatively and cyclically either moved (fed between a set of deepenings and a set of pulling studs, wither stretched by causing of reversible shifting (pushing-in) of said pulling studs into said opposite depenings.

The improvement is reached as follows:

Before beginning of each stretching cycle both the resilient belts, commonly with treated leather, are mutually clamped, one opposite to the other, at peripheral places of the deepenings and before the resilient belts subsequently shift, their clamping is released. Between pulling studs (21) there are mounted resilient plates (22) and oppositely to them, on peripheries of the deepenings (30), there are provided contact planes (31r) which are parallel to the shifting plane (o) of the resilient belts (4, 5). Except these distinguishing signs of the present invention there exist also further possible variances.

The present invention can be used for area-stretching of leathers.

Fig.1



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Description

METHOD OF AREA-STRETCHING OF LEATHER AND APPARATUS FOR CARRYING OUT THE METHOD

This invention relates to a method of area-stretching of leather inserted between two resilient belts with which they are alternatively and cyclically either moved (fed) between a set of recesses and a set of studs, either stretched by revesible shifting (pushing-in) of said studs into said opposite recesses. This invention also relates to an apparatus for carrying out the method which comprises two resilient belts which are movable in a plane extending between a set of pulling studs, which are modified for reversible shifting motion into these opposite recesses.

When leather is treated in the phase between its wet and dry stages, that means between working operations of the so-called wet pre-treating after tanning and finishing working operations, it is needed to cut down the moisture content to a sufficient degree and at the same time to prevent reduction of the leather area as much as possible, and preferably even to enlarge this area, if possible. Final cutting down of the moisture content in leather is done by drying. Therefore it is obvious that these two requirements are contrary because the collagenous fibres of the leather structure shrink due to drying and consequently the leather area is reduced.

A method of area-stretching (staking) is known, in which the leather is clamped between two resilient membranes and then is stretched, together with the membranes, in the directions from its centre radially to its periphery. A disadvantage of this method is that is requires too much handling work in connection with inserting pieces of leather between the membranes and their removing. Therefore this method is too laborious.

Known apparatus for carrying out this method of area stretching of leather comprises two separated layers of resilient material which form two said membranes. At least one of these layers of resilient material is guyed (fastened) on its circumference to piston rods of pressure cylinders. The treated leather is inserted between these two layers of resilient material, by and between which it is then clamped by a pressure device. Then the pressure cylinders are caused to act and their piston rods begin to area-stretch the layer of resilient material which is guyed to them, this area-stretching being thus caused from the centre radially to the circumference of the whole layer of resilient material. Because of friction, the other layer of resilient material and also the treated leather are area-stretched. After rated time the leather is released from clamping between both layers of resilient material which was caused by the pressure device. Then the piston rods of the pressure cylinders move back and the layer of resilient material, which is guyed to them, is thus area-shrunk into original stage.

Also known is a similar apparatus in which both the layers of resilient material are separately fastened to frames. The treated leather is also clamped between these layers of resilient material which then begin area-stretch by pressured air of liquid, or by vacuum, or by a shifting punch. When the layers of resilient material area area-stretched, the leather which is clamped between them, is area-stretched too. The disadvantage of both these apparatuses is that they cannot be incorporated into continuous working lines. As a matter of fact, the treated leather must be manually layed between the layers of resilient material and at the end of the working operation it must be manually removed.

Also known is a method of softening leather and an apparatus for carrying out this method in which the treated leather is fed between two resilient belts with which it is cyclically stretched and released by the set of pulling studs which are arranged on one side of the resilient belts and with which these studs are reversibly shifted (pulled-in) between the fixed studs of the second set, which is arranged on the other side of the resilient belts. The pulling studs of the first set are arranged opposite the centres of the spaces which are left between fixed studs of the second set. The spaces, as a matter of fact, thus create demarcations of the recesses into which are pushed the resilient belts, even with the leather inserted between them. The leather is thus softened and area-stretched in consequence of friction of the studs of both sets. But the effect of softening and stretching is very non-uniform in individual places of the leather, as is also the friction between the resilient belts with the treated leather and the studs of both sets. The nearer is the place, which is being treated by the particular pulling stud, to the centre of the leather and to the centre of surface arrangement of the studs of both sets, to the more intensive softening and area-stretching is this place subjected. This is caused because in the vicinity of this place the leather is treated, at the same time, by the highest possible number of the other pulling studs and thus the leather is here subjected to the highest possible friction of the studs of both sets. On the contrary, if this place, just treated by the particular pulling stud, is on the periphery of the leather or on the periphery of surface arrangement of the studs of both sets, then further in a direction to this periphery, the leather is subjected to no more friction because there are no further studs. Therefore these peripheral places of the leather are almost freely slipping (in predominant measure) between the just treating pulling studs and the respective fixed studs and thus the effect of area-stretching and softening is minimal.

Also known is a method of area-stretching (staking) of leather during its continuous feeding between mutually adjacent branches of the rope conveyor endless loops. The endless rope loops are symmetrically deviated from the longitudinal axis of the feeding movement to both sides. As a consequence of friction and slipping between the rope loops the highest effect of waving (corrigating) and staking, and thus also of area-stretching, is at the place of longitudinal axis of the leather and in

directions to their side edges this effect is gradually smaller. The disadvantage of this method lies also in that the leather is stretched only in a direction which is perpendicular to the direction of movement of the rope loops.

The aforementioned disadvantages are removed by the method of area stretching leathers according to the present invention which is characterised in that before the beginning of each stretching cycle both the resilient belts, together with treated leather, are mutually clamped, one opposite to the other, at peripheral places of said recesses and before the resilient belts subsequently move, their clamping is always released.

An apparatus for carrying out the method according to the present invention is characterised in that between pulling studs there are mounted resilient plates and opposite to them on the peripheries of the recesses, there are provided contact planes which are parallel to the plane of movement of the resilient belts. The resilient plates are made of layers of elastic material or of springs fastened to the upper stretcher with pulling studs and to pressure pad. The contact planes of the last row of recesses, in the direction of movement of the resilient belts are lower than those of the other. Higher technical effect of treating method according to the invention lies in that in consequence of cyclical clamping of resilient belts with inserted leather the uniformity of area stretching of all places of the whole leather is substantially increased. This increased uniformity of area stretching is thus demonstrated namely at marginal places of the treated leather.

Higher technical effect of the apparatus for carrying out the method according to the present invention lies in that by bearing of the contact planes of the recesses against the resilient plates, the resilient belts with treated leather are clamped in peripheral places of the said recesses. Uniformity of area stretching of the whole leather is thus substantially increased. The construction of the resilient plates from layers of elastic material or of springs and pressure pads is very simple and ensures reliable clamping of the resilient belts in places of lowered contact planes of the last row of the recess. The treated leather is under substantially lower stress, whereby possible battle marks of the pulling studs are advantageously erased.

The example of performing the method according to the present invention:

Leathers are inserted between two resilient belts with which they alternatively and cyclically reciprocally move between a set of recesses and a set of studs either they are stretched by reversible slanting of said studs into said opposite recesses. When the studs are in their basic position both the resilient belts always shift by certain distance even with the inserted leather. At the beginning of each this shift into motion of the studs from their basic position in the direction into opposite recesses both the resilient belts, together with the treated leather are mutually clamped, one opposite the other, at peripheral places of said recesses. Thus the studs begin to push these peripherally clamped places of the resilient belts into opposite recesses and the leathers, thus, at these places are stretched in directions from centres of said recesses radially to their peripheries. After reaching extreme ideal centre the studs move back to their basic position, the clamping of the resilient belts releases and the resilient belts move again by certain distance with the treated leather. Thus the working cycle of leather area stretching is closed.

The resilient belts are made of plastics material with sufficient modulus of elasticity and thus they are area stretched by studs only in the range of elastic deformation. Because of it when the tension is released they wholly return to their original flat position. But the material for natural leathers has a much poorer elasticity modulus and thus during common area stretching with the resilient belts the treated leather elastic deformation is partially exceeded into the sphere of its plastic deformation. Therefore after tension is released the area stretched leather shrinks back only within the range of caused elastic deformation and the consequence of caused plastic deformation is demonstrated as a permanent fixed area accession. At the same time the consequence of mechanical softening by the studs is demonstrated by increased softening of the material structure of the treated leather.

An apparatus according to the present invention will now be described by way of example with reference to the accompanying diagrammatic drawings in which:

Fig. 1 is a side elevation of the machine partly in section;

Figs. 2 to 4 are partial sections on a larger scale through sets of recesses and pulling studs in various stages of the stretching cycle;

Fig. 5 is the same section as in Fig. 2 but with an alternative construction of the resilient plates;

Fig. 6 is a section along the line A-A in Fig. 3; and

Fig. 7 is a detail B from Fig. 1 on a larger scale.

The apparatus comprises a frame 1 (Fig. 1) to which are fixed substantially horizontally extending stationary upper stretchers 2. On the bottom side of each upper stretcher 2 are provided sets of spaced-apart pulling studs 21 which are uniformly distributed in rhombical arrangement (Fig. 6), and the bottom ends of which are part spherically rounded. In the spaces between the individual pulling studs 21 are mounted layers 22a, 22b of elastic material both in the form of resilient plates 22. The layer 22a (Fig. 2) is made of a foamed plastics material which is sufficiently compressible and the layer 22b of a compact elastic material which is sufficiently wear resistant.

In an alternative embodiment the resilient plates 22 are formed by springs 22c (Fig. 5) which are fixed at one end to the upper stretcher 2 and at the other to a pressure pad 22d. Under the upper stretchers 2 are mounted reciprocable bottom stretchers 3 which extend parallel to the upper stretchers 2 and on the upper side of which are provided spaced-apart clamping studs 31 which are also uniformly distributed in a rhombic arrangement and the sets of

recesses 30. The pulling studs 21 are so located that their rounded ends are directed into the centres of the opposite recesses 30.

Between the sets of pulling studs 21 and the recesses 30 extends the upper branch of a bottom endless resilient belt 4 and the bottom branch of an upper endless resilient belt 5. The resilient belts 4, 5 run on respective guide rollers 41, 51 and driving rollers 42, 52 which are connected with driving units (not shown). The upper branch of the bottom resilient belt 4, together with the bottom branch of the upper resilient belt 5 thus form a belt conveyor extending in the plane ρ and movable in the direction s. The plane ρ is parallel to the planes containing the bottom ends of the pulling studs 21 and the upper ends of the clamping studs 31.

The beginning of the upper branch of the bottom resilient belt 4 is extended upstream of the beginning of the bottom branch of the upper resilient belt 5 and a table 6 for depositing leather u is annexed thereto. The bottom stretchers 3 are provided with extensions 32 by which they are mounted in guides 11 which are arranged on the frame 1 of the apparatus. The extensions 32 are connected to a driving unit (not shown) for vertical reciprocation in the guides 11. On the upper ends of the clamping studs 31 are provided substantially flat contact surfaces 31r. The clamping studs 31 which demarcate the last row of the recesses 30, viewed in the direction s, are shorter than the other clamping studs 31, so that their contact surfaces 31r are lower by a value h (Fig 7).

The driving rollers 42, 42 continuously rotate and thus continuously move the resilient belts 4, 5 in the direction s. The leather u, to be treated, is manually deposited onto the table 6 or is automatically supplied from a preceding working operation of the technological process of leather production. Thus each leather u successively enters between the resilient belts 4, 5 and together with them passes between the sets of recesses 30 and pulling studs 21. The bottom stretchers 3 are reciprocated by their extensions 32 movable in vertical direction in the guides 11. When in their basic position, the bottom ends of the pulling studs 21 (Fig. 2) and the resilient plates 22 are safely above the upper resilient belt 5. The bottom stretchers 3 are in their basic position at their bottom dead centre so that the contact surfaces 31r of the clamping studs 31 are safely under the bottom resilient belt 4. In this phase of the reciprocating motion of the bottom stretchers 3 both the resilient belts 4, 5 together with the leather u, move by a certain distance in the direction s. At the beginning of the upward motion of the bottom stretcher 3 in the direction to its upper dead centre the clamping studs 31 bear against the resilient belts 4, 5, and the leather u, between them and press all these layers, against the resilient plates 22. At the same time, these resilient plates 22 are compressed to a desired degree due to deformability of the layer 22a of elastic material or of the springs 22c. Thus the resilient belts 4,5 mutually clamp themselves , one opposite to the other, at peripheral places of the recesses 30, which are demarcated by the contact surfaces 31r of the clamping studs 31. This phase of the shifting motion of the bottom stretchers 3 is illustrated in Fig. 3.

As the upward movement of the bottom stretchers 3 continues, the pulling studs 21 progressively enter into the opposite recesses 30, and at the same time the clamping studs 31, which demarcate these recesses 30, compress more and more intensively the resilient belts 4, 5 and the treated leather u, by their contact surfaces 31r onto the resilient plates 22, which are more and more compressed, as necessary. The entering of the pulling studs 21 into the recesses 30 pushes the adjacent portions of the resilient belts 4, 5, together with the adjacent portions of the treated leather u, into the recesses 30. The intensity of this pushing is progressively raised, up to the point when the bottom stretchers 3 reach their upper dead centre and the clamping studs 31 force both the resilient belts 4, 5 by maximum intensity to the resilient plates 22 which are now also compressed to the maximum degree. This phase of the upward motion of the bottom stretchers 3 is illustrated in Fig. 4. The treated portions of the leather u are thus advantageously clamped in the peripheries of the recesses 30 by a force which is directly proportinal to the tensile stress in the leather u caused by the pulling studs 21. The leather u is thus area-stretched in these individual portions from the centres of the recesses 30 in radial directions to their peripheries.

When the bottom stretchers 3 reach their upper dead centre, they begin to move downwards to their basic position in the bottom dead centre. When the bottom stretchers 3 reach this position, the pulling studs 21 are fully withdrawn from the recesses 30 and the resilient belts 4, 5, together with the treated leather u, are released. At the same time, due to the elasticity of the layer 22a, or of the springs 22c, the resilient plates 22 also return to their basic position. During the stretching cycle the resilient belts 4, 5 were continuously moved by the driving rollers 42, 52, and were consequently elongated in section behind the output of the last pair of the bottom stetcher 3 and the upper stretcher 2. The value of this elongation is proportional to the length of the possible (but not performed) movement of the resilient belts 4, 5 during the time, which is equal to the delay of the whole stretching cycle, during which this movement was made impossible. At the moment of releasing, the resilient belts 4, 5 move in the direction s, either due to compensation of this arisen length extension, either due to next rotating movement of the driving roller 42, 52. In the meantime the bottom stretchers 3 begin to move again to their upper dead centre and the next stretching cycle begins.

When the resilient belts 4, 5 pass between the last rows of the recesses 30 and the pulling studs 21, viewed in the direction s, the treated leather u is stretched under substantially lower stress, this being caused by the contact surfaces 31r which are lower by the value h compared with the contact surfaces 31r of all the preceding rows of clamping studs 31. The leather u is here, in fact, only very midly squeezed and thus any baffle marks which might have been caused by the pulling studs 21 in the

preceding stages are advantageously removed.

Claims

1. A method of area-stretching of leather inserted between two resilient belts with which they area alternatively and cyclically moved between a set of recesses and a set of studs and stretched by repeated entering of said studs into said opposite recesses, characterised in that before the beginning of each stretching cycle both the resilient belts, together with the treated leather, are mutually clamped, one opposite to the other at peripheral places of said recesses and before the resilient belts subsequently move, their clamping is always released.

2. An apparatus for carrying out the method according to Claim 1, comprising two resilient belts which are movable in a plane extending between a set of pulling studs which are arranged for reversible shifting motion into the opposite recesses, characterised in that between the pulling studs (21) there are mounted resilient plates (22) and opposite to them, on peripheries of the recesses (30), there are provided contact surfaces (31r) which are parallel to the plane (ρ) of movement of the resilient belts (4,5).

3. An apparatus according to Claim 2, characterised in that the resilient plates (22) are made of layers (22a, 22b) of elastic material.

4. An apparatus according to Claim 2, characterised in that the resilient plates (22) are made of springs (22c) each of which is fastened to an upper stretcher (2) with pulling studs (21) and to a pressure pad (22d).

5. An apparatus according to Claim 2, 3 or 4 characterised in that the contact surfaces (31r) of the last row of the recesses (30), in the direction (s) of movement of the resilient belts (4,5), are lower than the contact surfaces of the other.

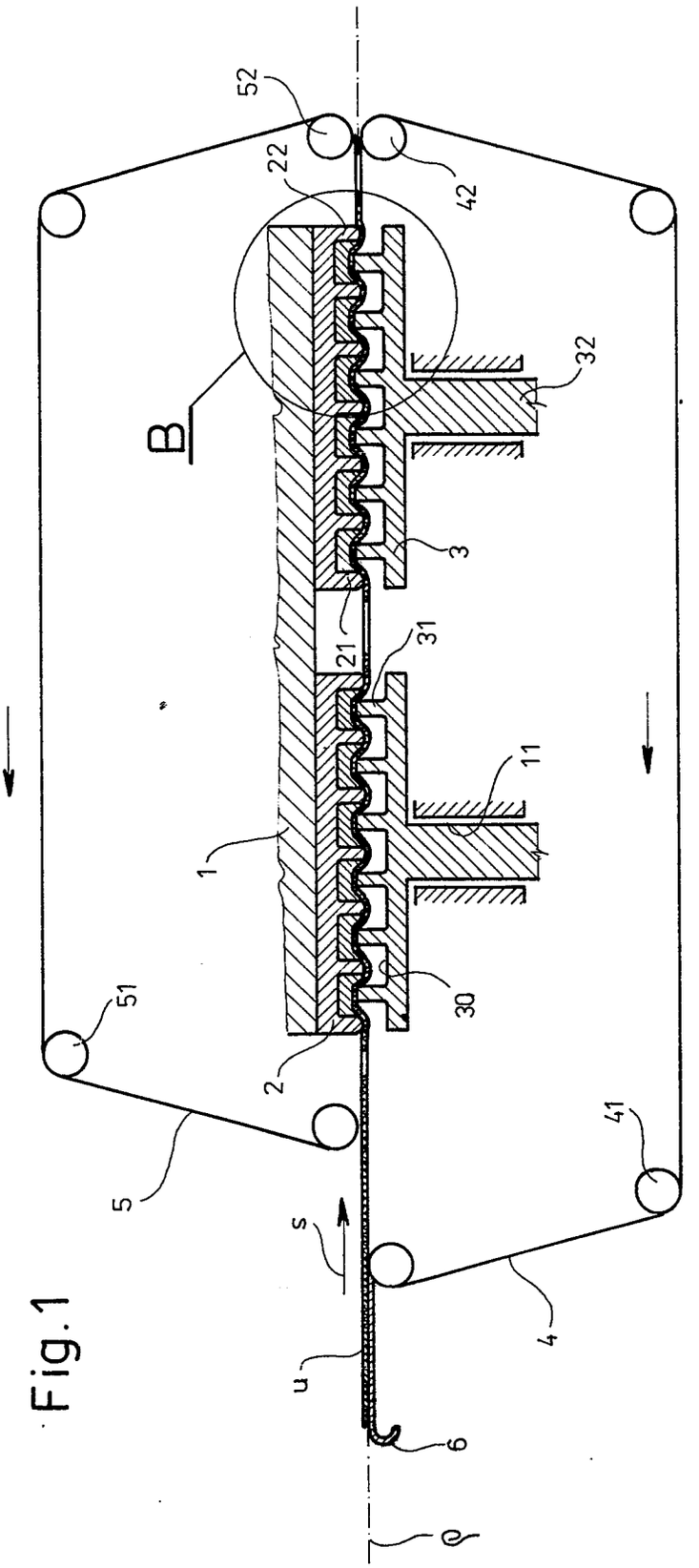

Fig.1

Fig. 2

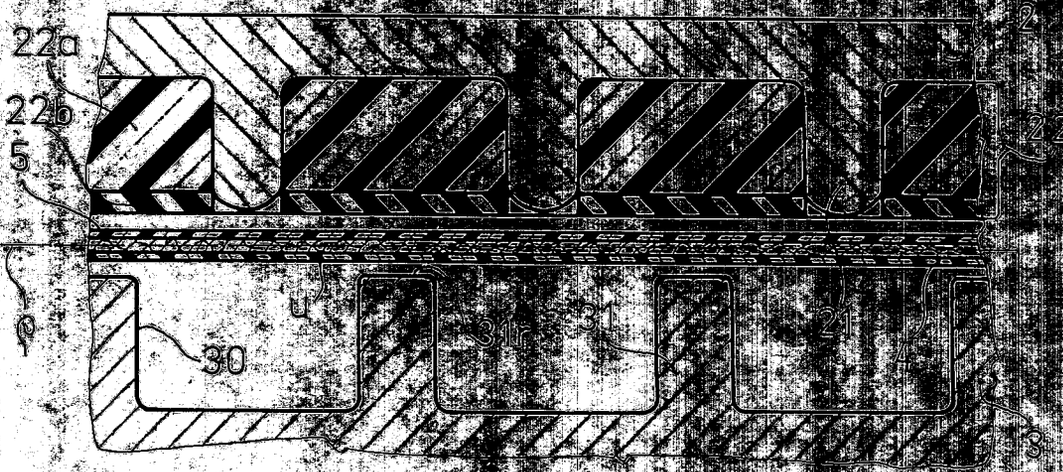

Fig. 3

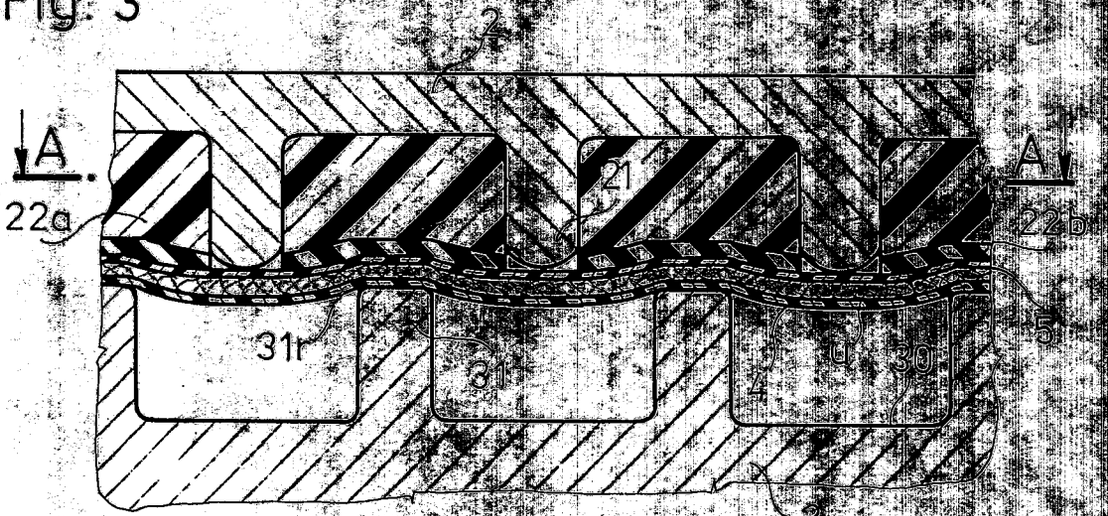

Fig. 4

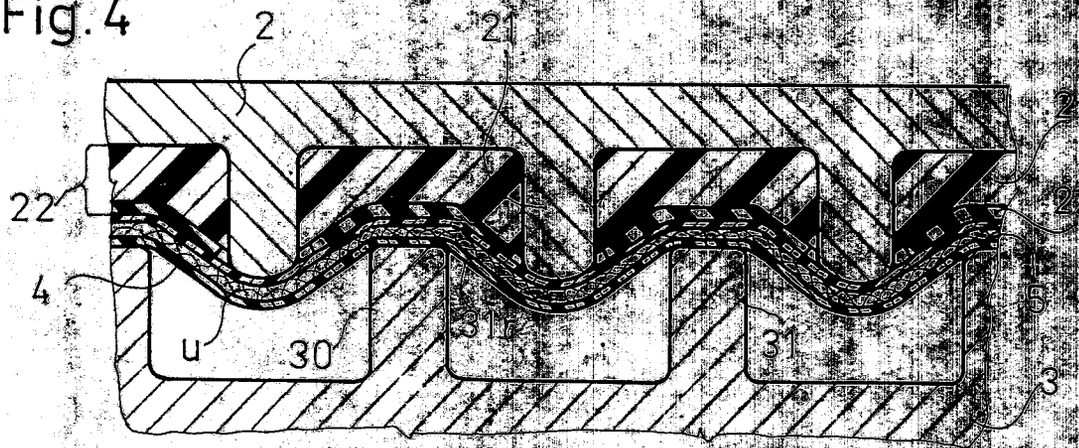

Fig. 5

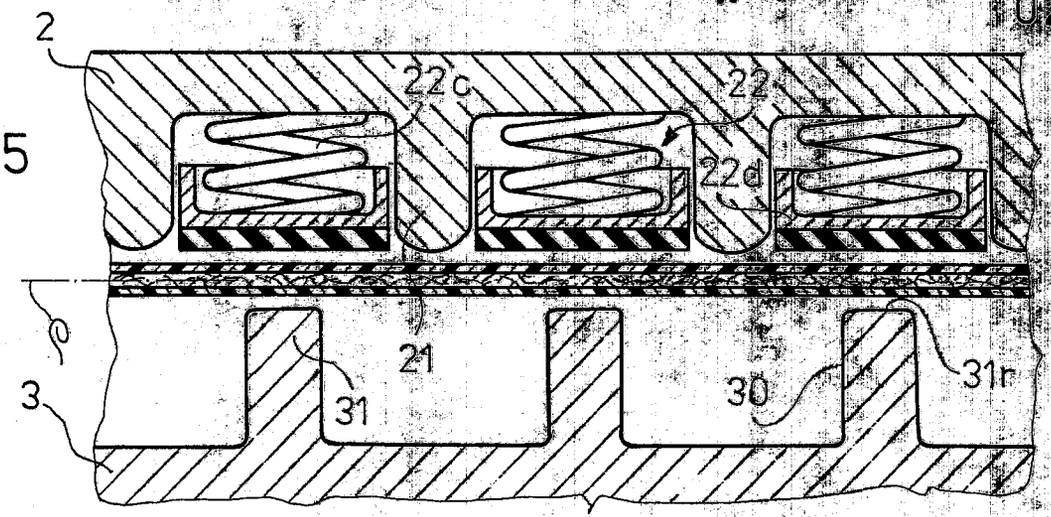

Fig. 6

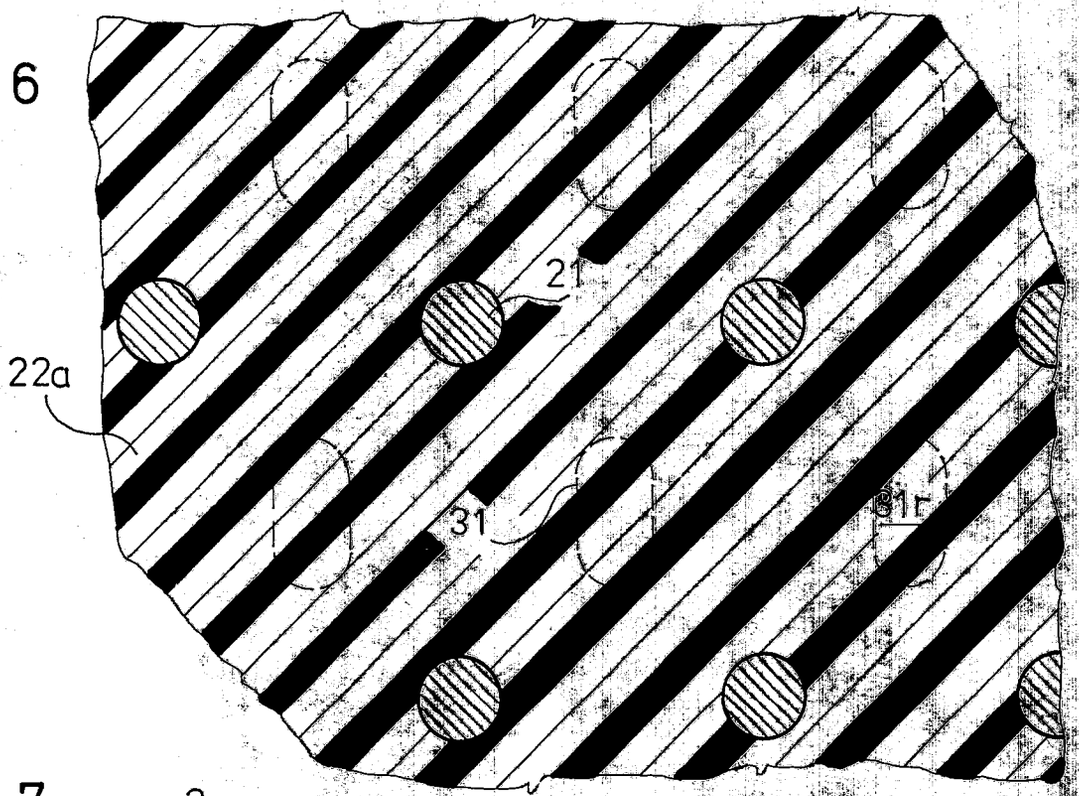

Fig. 7