

[54] **SOLE AND HEEL OF RUBBER OR PLASTIC**
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[51] Int. Cl.A43b 13/18
[58] Field of Search.....36/59 C, 32; D2/320

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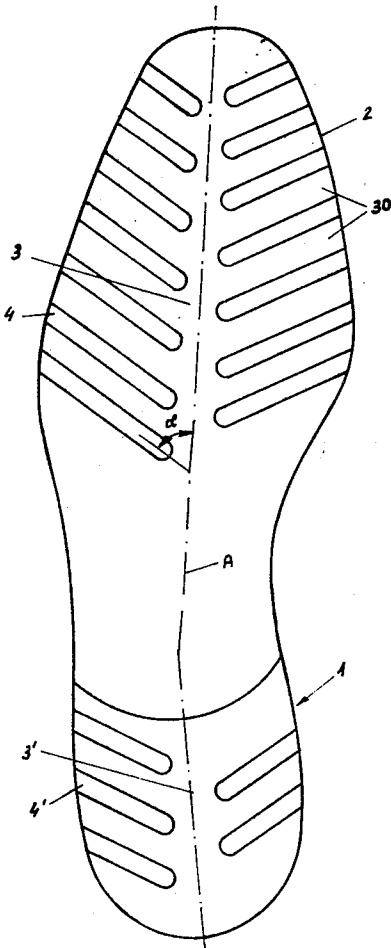
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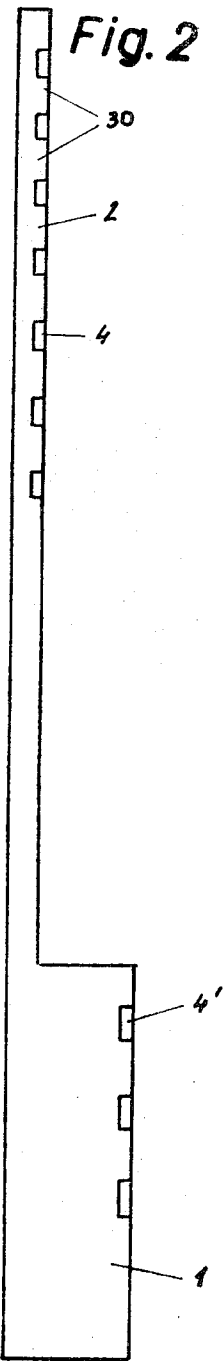
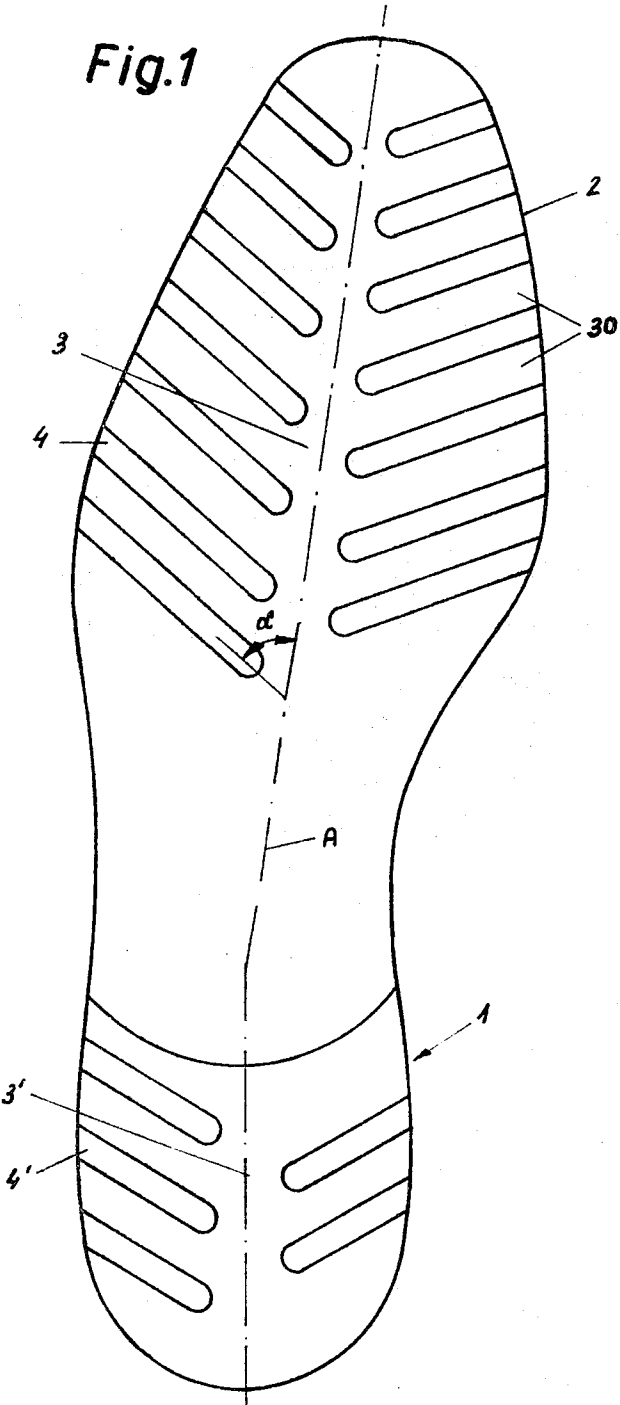
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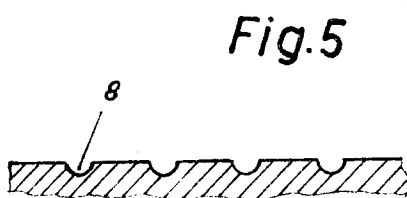
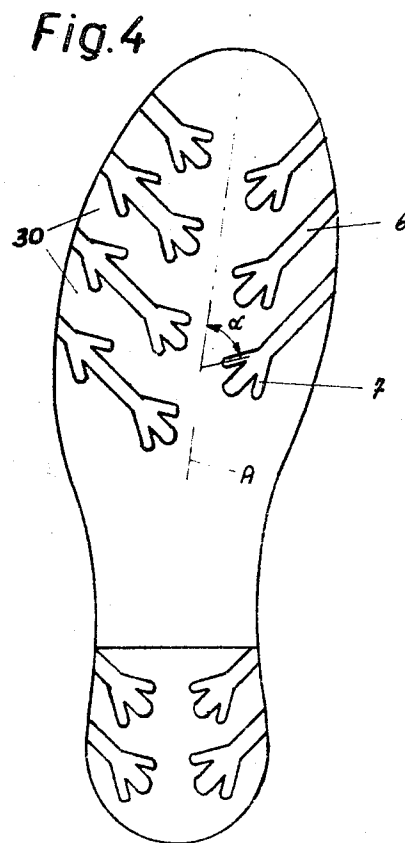
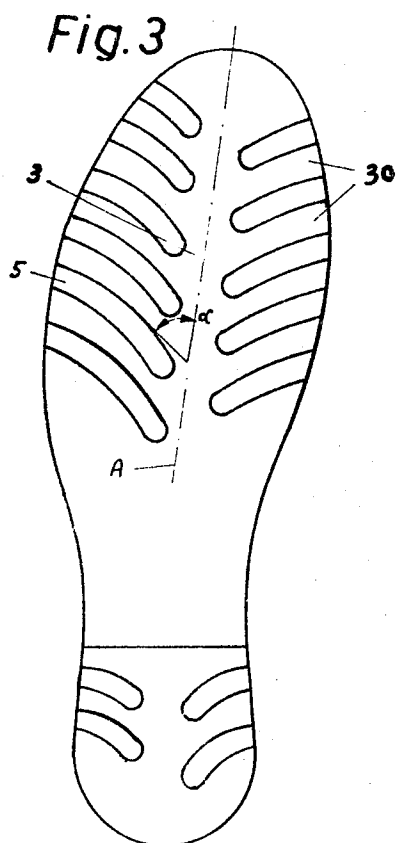
[57] **ABSTRACT**
The invention concerns a rubbery or plastic sole having a tread profile with at least one essentially longitudinal rib at a distance from the sole edge, and is characterized by transverse and/or inclined ribs that branch off said longitudinal rib and/or the central line of the sole, towards the tip of the shoe or form an angle α of not more than 90° wherein said transverse and/or inclined ribs embrace grooves not communicating with each other. These grooves may be bent, have varying depth and/or width over their length, and have arcuate or semicircular cross section; transverse and/or inclined ribs may ramify; longitudinal ribs may be provided at the edge of the sole.

8 Claims, 19 Drawing Figures





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Fig. 6

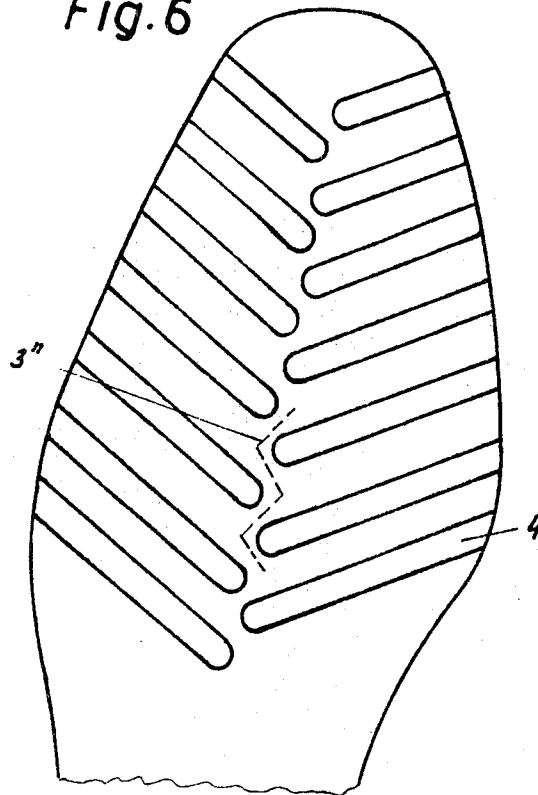


Fig. 7

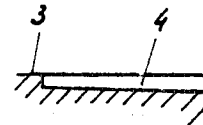


Fig. 8



Fig. 9

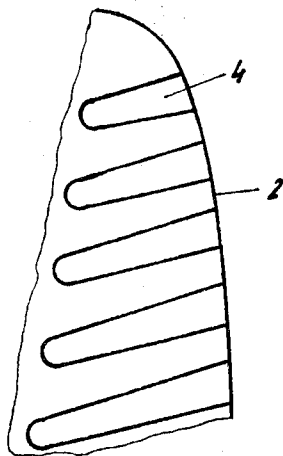
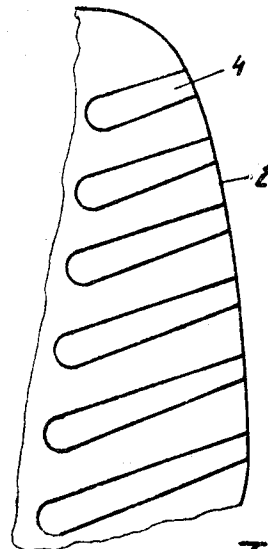
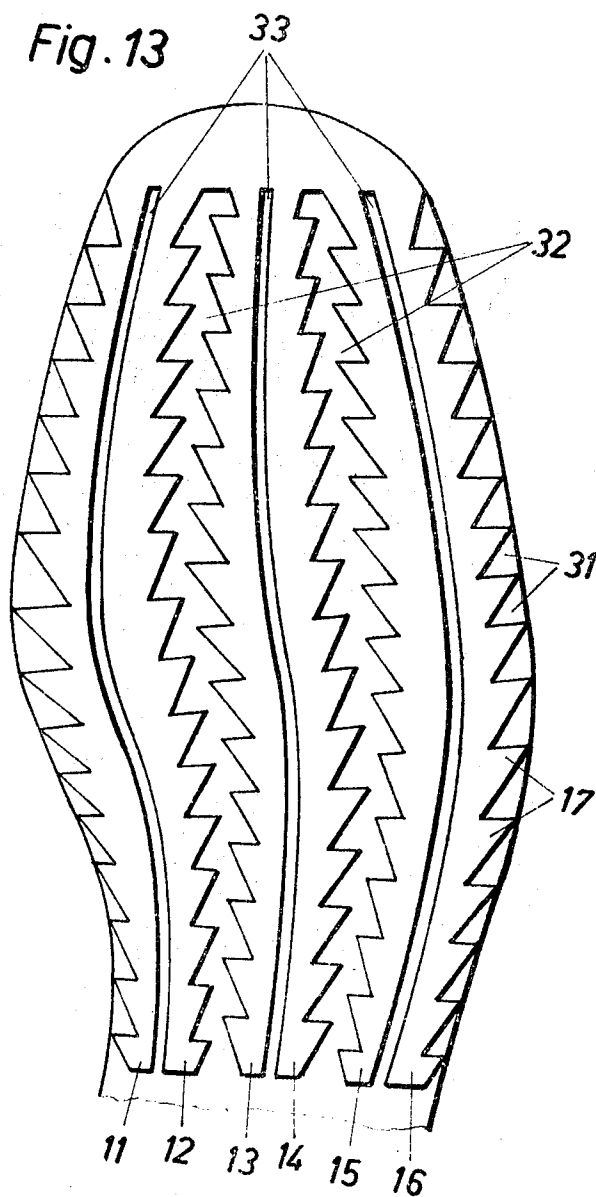


Fig. 10



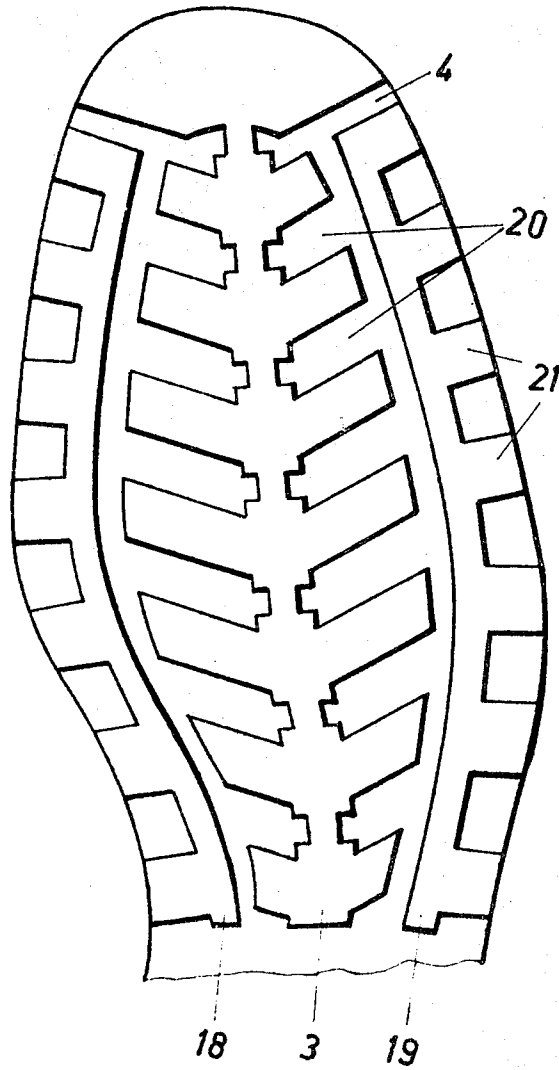
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Fig. 13



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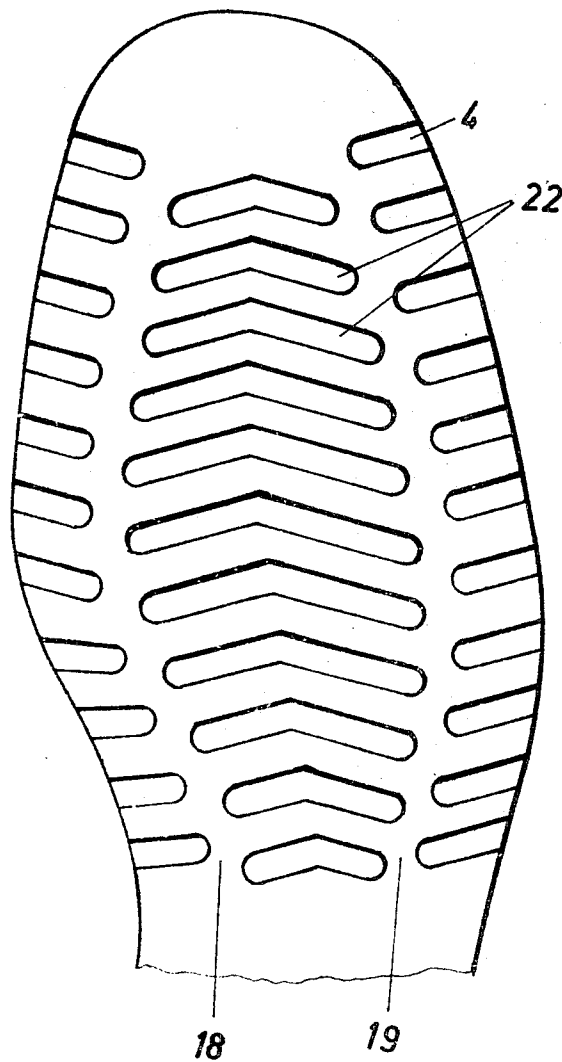
Fig. 14



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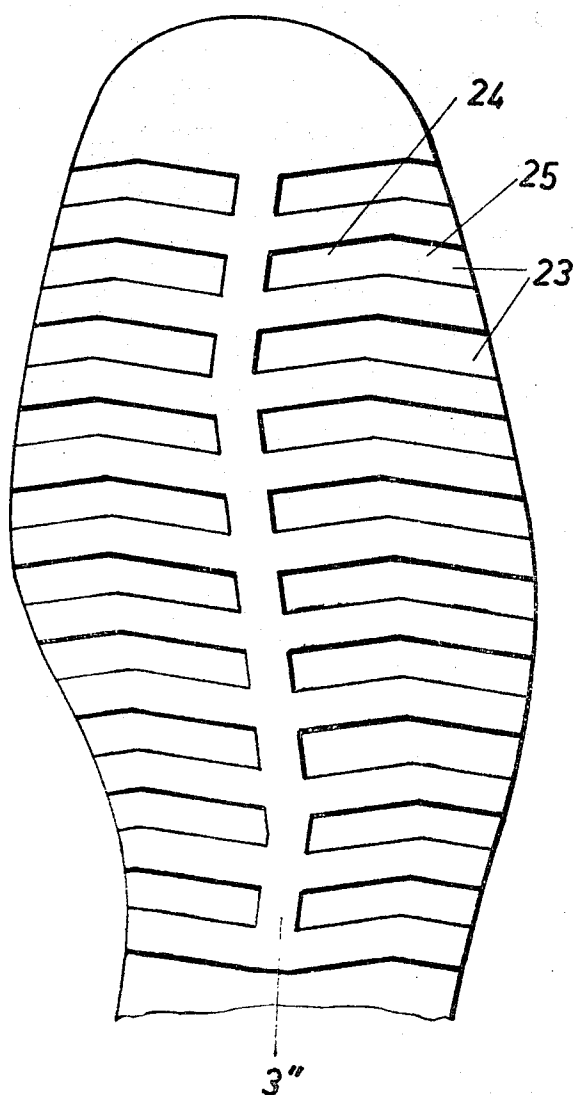
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Fig. 15



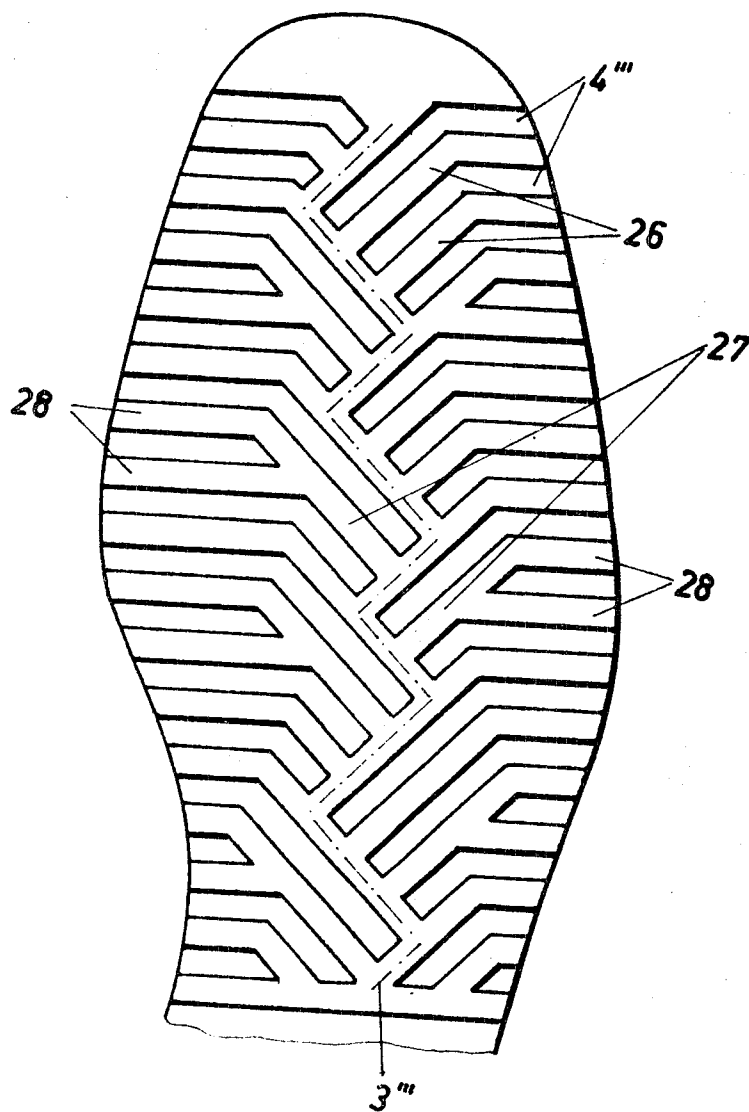
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Fig. 16



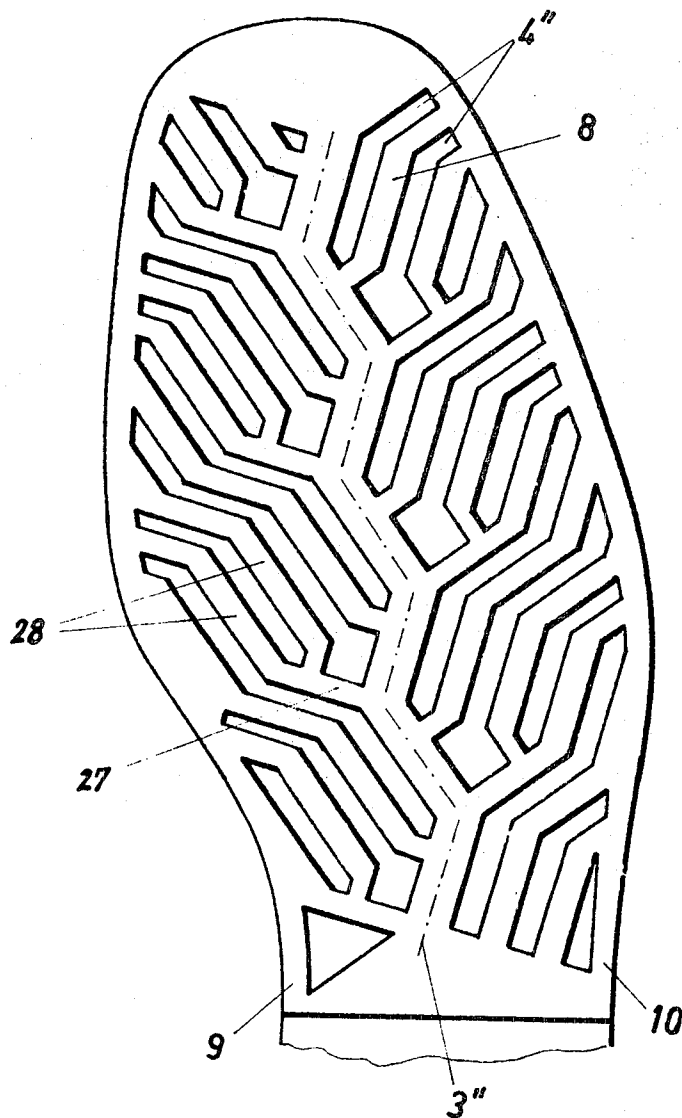
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Fig.17



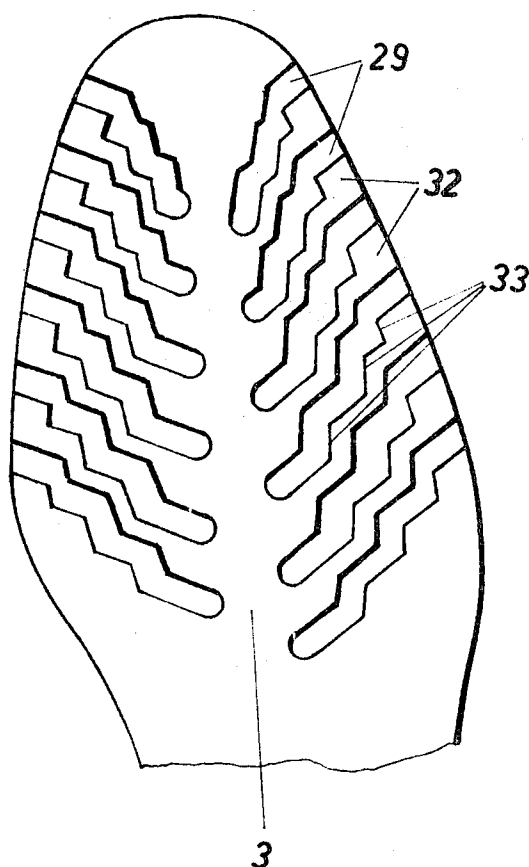
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Fig. 18



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Fig. 19



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SOLE AND HEEL OF RUBBER OR PLASTIC

BACKGROUND OF THE INVENTION

The most different profiles of shoe soles have been known. In choosing the kind of profile, up to now especially the grip of the sole has far more been taken into consideration than its firmness. A large number of sole profiles show only transverse

rills or grooves mainly running over the whole width of the sole. In this design, weakened by said rills or grooves, the sole during walking is stressed to buckling. In consequence, such places are especially exposed to get torn.

A further problem — especially in soles molded to the shoe from foaming polyurethane mixtures of relatively low viscosity — consists in the fact, that when being poured or injected into the sole mould under only low pressure, the material is not adequately distributed; various parts of the sole mould are not filled at all or only insufficiently. Thereby, air bubbles are entrapped especially at the profile edges near the tread of the sole. In this instance, the material flow by disadvantageous profile design is retarded.

SUMMARY OF THE INVENTION

The invention now refers to a sole and/or a heel of rubber or plastic, especially polyurethane with a tread preferably roughened or finely profiled and cut by grooves to improve the grip.

An object of the invention is therefore a soling having a profile which avoids the above mentioned disadvantages, the material flow not being retarded, but in contrary is uniformly distributed over the whole sole area. Thereby at least one longitudinal rib is provided in the heel as well as in the sole, over all its respective length, at some distance from the edge and running essentially in the longitudinal direction of the shoe. Transverse and/or inclined ribs now branch off this longitudinal rib running from it and/or from the central line of the sole towards the shoe-tip or forming an angle of maximum 90° and embracing grooves not communicating with each other. This disposition furthermore provides a better distribution of stress over the surface of the sole, because the buckling cannot appear in a single groove or rill. The longitudinal rib(s) may be straight or slightly bent, or they may form angles. Said grooves may be of constant depth and/or width over all their length, or the depth and the width respectively of the grooves may vary over their length.

Furthermore, the sole may be designed in such a way, that also the transverse or inclined grooves are bent, preferably arcuately or semicircularly, but any tangent to their circumference from the longitudinal rib and/or the center of sole shall run towards the tip of the shoe or form an angle with it of not more than 90°. Furthermore the grooves or rills may branch-off, but also the branches shall not form an angle or more than 90° with the center line of the sole.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

In the following, the invention is described in the drawing by way of examples. There shows

FIG. 1 sole according the invention in plan view;

FIG. 2 the sole according FIG. 1, in elevation;

FIG. 3 and 4 two further embodiments of the invention in plan view;

FIG. 5 a form of the grooves in cross section;

FIG. 6 another embodiment of the invention;

FIG. 7 and 8 longitudinal sections of grooves;

FIG. 9 and 10 a cross-sectional view of grooves with different widths;

FIG. 11 a further sole according the invention in plan view;

FIG. 12 the sole according FIG. 11 in cross section along the line XII—XII and

FIG. 13 to 19 further soles according the invention in plan view.

The profile of the sole according FIG. 1 and 2 shows two longitudinal ribs 3 and 3' running over all the length of heel 1 and sole 2 respectively. Grooves 4, 4' branch off these ribs 3, 3' towards the edges of heel 1 and of sole 2, respectively.

These grooves 4, 4' forming an angle α of not more than 90° with the longitudinal ribs 3, 3'. The smaller the angle α , the better the material can flow to the edge of the sole and fill all cavities. On the other hand, the grip of the sole in the walking direction is being reduced; in consequence an optimum solution has to be chosen between the two requirements. An angle of not less than about 30° and not more than about 60°, preferably about 45° has proven to give the best combination of properties.

On the bottom plate of the sole mould, there are ribs, corresponding to the later formed grooves 4, 4' in the sole, and channels corresponding to the later sole ribs 8, 17, 21, 26, 27, 30 (see also later figures). The main stream of the material running thru the longitudinal rib 3, 3' of the sole, is bent by the mould ribs and conducted into said channels without entrapping air bubbles.

Furthermore, by the inclined position of the grooves, the load during walking is better distributed over several ribs. In this way, no buckling lines are formed as occurs in the cross position of the grooves because of the section being reduced.

As illustrated in FIG. 3, the grooves 5 may also run arcuate or curved, e.g. as arcs or semicircles. But any tangent to the circumference of the grooves 5 shall form an angle α of not more than 90° with the central line of the sole A or with the corresponding longitudinal rib respectively.

FIG. 4 is showing a further sole, the grooves 6 of which provide branches 7, but equally form an angle α of not more than 90° with the central line A of the sole.

A semicircular cross section of the grooves may be chosen as illustrated by FIG. 5, but the cross section may have any other adequate form as well, e.g. a rectangular cross section. However, it is important to avoid sharp edges within the grooves, so that no capillary cracks are formed which could destroy the sole very soon. Furthermore, adequately rounded mould ribs in the bottom plate are facilitating a better flow of the material.

FIG. 6 illustrates a design of sole, with a zigzag central longitudinal rib 3''. It is formed by grooves 4 following a mutually alternating design.

Eventual injuries of the sole by small stitches or similar damages that usually occur under the continued stress lead to an enlargement of said stitches and further to the total deterioration of the sole. However, in the sole tread according to the invention, the bending stress during walking is transmitted to the thinner portions of the sole in the grooves, which are situated deeper than the tread of the ribs and therefore cannot or far less be damaged. Especially in the form of the sole described in FIG. 6, even the longitudinal rib 3'' of the tread remains essentially free of such bending stresses.

As shown in FIG. 7, the grooves 4 may become deeper towards the edge of the sole. In this way, the grip of the sole at the edge is improved; furthermore, upon special stress in this part (sports shoes!) a too soon wear and tear are avoided.

Where such a necessity is not given, the form of the grooves may be designed as shown in FIG. 8, the grooves becoming deeper towards the center of the sole. Upon normal walking, the bending stress for instance is transmitted to the ball in the central part of the sole. As the sole is most frequently thinner in the middle than on the edges, because of a certain curvature of the shoe last, seen transverse to the walking direction, the bending stress during walking will lead to a curvature of this central thinner inner ball part, so that it would be worn out more rapidly, compared with the edge of the sole. This can be overcome by an adequate formation of the grooves according FIG. 8.

In a similar way, the sole design may be adjusted also to other requirements, e.g. by an increase or reduction of the groove width towards the edge of the sole as shown in FIGS. 9 and 10. Especially an increasing width of the grooves 4 towards the edge of the sole is counteracting a too rapid blocking of the grooves by earth or snow and so prolongs the grip of the sole.

In the example of a sole according to FIGS. 11 and 12, cross ribs branch off the central, slightly bent longitudinal rib 3, that satisfy the requirement of the angle with the central rib and terminate at two edge ribs 9 and 10. If the grooves 4'', which now do not run to the edge of the sole, are relatively deep, it is useful to give to the sole in cross section, a curvature amounting to x' , larger than the depth x of the grooves, preferably at least 1.2 times the depth x of the grooves.

In the sole according to FIG. 13, a total of six ribs 11 to 16, of a slightly bent design, are provided in the longitudinal sense, each two ones being separated by a smooth groove and from which various short triangular transverse or inclined ribs 17 branch off, directed towards the tip of the sole and embracing grooves 31 of also triangular design at the edge of the sole. However, in the middle of the sole, these ribs embrace grooves 32 that show a serrate design.

In FIG. 14, a central rib 3 is provided, from which the grooves 4 branch off all over the width, whereas other grooves 20 terminate at longitudinal ribs 18 and 19 that are situated nearer to the edge of the sole. From the lateral longitudinal ribs 18 and 19, transverse ribs 21 branch off as well, forming an angle of 90° with the longitudinal ribs 18 and 19.

FIG. 15 represents the plan view of another sole, only providing two lateral longitudinal ribs 18 and 19. Towards the edge of the sole, open grooves 4, but towards the center of the sole grooves 22-which are closed in themselves and converge towards the tip of the shoe-branch off said ribs 18 and 19.

In the sole according to FIG. 16, grooves 23 branch off a central longitudinal rib 3'' of slightly arcuate or angular design. The first portion 24 of said grooves 23 embraces an angle of not more than 90° with said longitudinal rib, but their exterior portion 25 directed towards the edge of the sole bends slightly back, to improve the grip in walking direction.

FIG. 17 represents an especially advantageous form of the present invention. Here, the central longitudinal rib 3''', running over all the length, has a somewhat more essentially angular design. Ribs 26 and 27 branch off this rib and form an angle of 90° . Due to the angular position of the middle rib 3''', however, the first portion of said ribs 26 and 27 indeed is inclined towards the tip of the shoe, whereas their exterior portion, directing towards the edge of the sole, is situated approximately transversely to the walking direction, in order to improve the grip of the sole tread. Thereby, ribs 27 may be provided as well, that branch in such a way, that two or more outer portions 28 of said ribs 27 are situated transversely, beginning from the inner, inclined portion. Nevertheless, all these ribs are embracing grooves 4''', separated from each other.

In the representation of FIG. 18, ribs 8 and grooves 4'' branch off the slightly, angular longitudinal rib 3' but do not run to the edge of the sole; they are limited there by two lon-

gitudinal ribs 9 and 10. In the form of FIG. 19, grooves 29 branch off a straight central longitudinal rib 3 and run angularly up to the edge of the sole, forming steps, every portion forming an angle α of less than 90° with the central line of the sole.

Such a formation of the tread has the advantage, that step edges 33 are formed in the inclined, step-shaped ribs 32 which are embraced by grooves 29. Said edges 33 run more or less parallel to the edge of the sole, allowing a special grip of the sole against lateral slipping.

The invention is not limited to the given examples, but by application of the explained principle and by any other combination of the single characteristics explained in the examples, a nearly unlimited variety of sole designs may be developed.

I claim:

1. In footwear, especially a shoe, the combination of a sole and heel unit formed of a material selected from rubber or plastic, especially polyurethane, a tread face provided along the sole and heel, at least one longitudinal rib provided in the tread face, said longitudinal rib extending throughout the complete length of the unit in the lengthwise direction of the unit and spaced at a distance from the side edges of the unit, a plurality of rib members branching off said longitudinal rib, and all extending in concert towards the tip of the unit and forming an included angle of less than 90° , a plurality of grooves provided in the tread face, said plurality of grooves non-communicating with one another and bounding said rib members, said grooves being positioned in alternate lateral spaces across the longitudinal rib in the longitudinal direction.

2. The footwear as defined in claim 1, wherein the depth of said grooves varies from the center to the side edges of the unit.

3. The footwear as defined in claim 1, wherein the width of said grooves varies from the center to the side edges of the unit.

4. The footwear as defined in claim 1, wherein said grooves are arcuate.

5. The footwear as defined in claim 4, wherein a tangent to the outside surface of any groove extends in the direction of the tip of the unit and forms an angle with said longitudinal rib which is less than 90° .

6. The footwear as defined in claim 1, wherein said grooves being provided with branches forming an angle with respect to said rib members.

7. The footwear as defined in claim 1, wherein said rib members branching off said longitudinal rib form an angle of between approximately 30° and 60° with respect to said longitudinal rib.

8. The footwear as defined in claim 7, wherein said angle is approximately 45° .

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