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(54) **Sole for footwear**

(57) This invention is a sole for footwear, to be specific it is a sole of the type that is obtained by injection moulding with plastic materials, such as polyurethane, to ensure that the sole is rigid at the heel end (1) yet extremely flexible in the zone underlying the sole (3) of the foot, characterised by the fact that it is one single piece that is compact and essentially solid that absorbs

the slight impacts that are transmitted when the wearer is walking, especially the impacts that are transmitted at the heel, whereas the section underlying the sole of the foot, which is much thinner than the heel section, has a series of grooves running lengthways (4) and transversally (5) on the lower surface, which not only serve to make the sole very flexible but also form studs that give the footwear a secure grip on the ground.

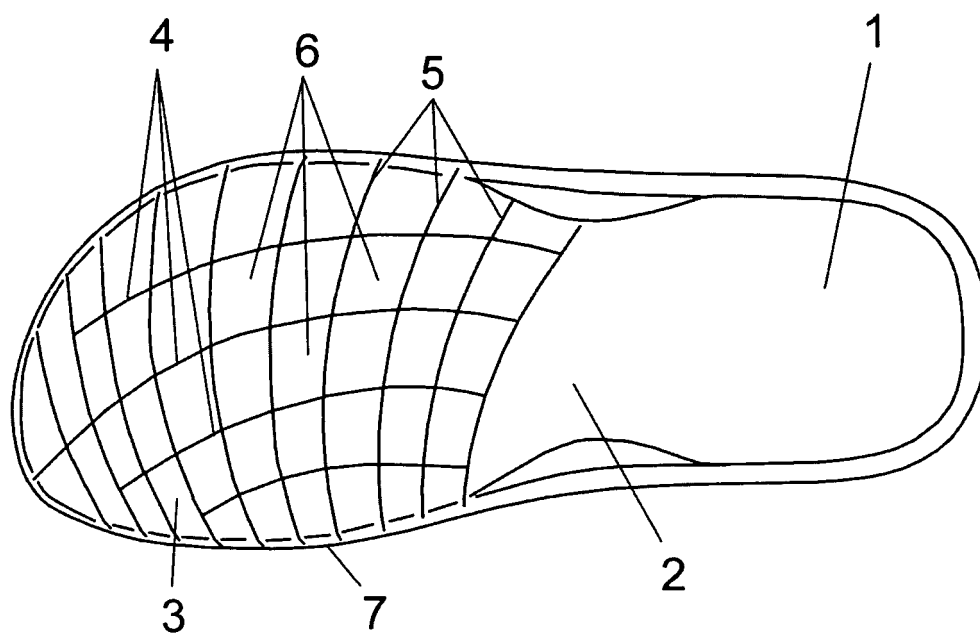


FIG. 1

Description

OBJECT OF THE INVENTION

[0001] This invention is a sole for footwear, and to be specific it is a sole of the type that is obtained by injection moulding using plastic materials such as polyurethane.

[0002] The object of the invention is to obtain a sole that is very rigid for the heel of the foot while at the same time being highly flexible for the sole of the foot, in spite of the fact that it is obtained in one single piece all from the same material, that is to say by means of a manufacturing process that is as simple as possible.

BACKGROUND TO THE INVENTION

[0003] Soles for footwear that are made of synthetic material such as the kind referred to above are well known, such soles being either more rigid or more flexible, depending on the type of material that is used, so there are "soft" soles that are both flexible and comfortable for the sole of the foot, but the drawback is that the heels are too weak, so any minor impact that is caused when one walks is transmitted to the foot, and there are "hard" soles that manage to overcome the aforementioned problem affecting the heel, but are fraught with the problem of discomfort due to the lack of flexibility afforded by the sole of the footwear.

[0004] The soles of the former type end up by causing slight injuries to the sole of the foot, whereas those of the latter type, that is to say the footwear with little flexibility in the sole, end up by weakening the foot muscles and ligaments, to such an extent that they cause atrophies or degenerations to certain muscles.

DESCRIPTION OF THE INVENTION

[0005] The sole that the invention proposes in order to overcome the problems explained above in a completely satisfactory way, in all the aforementioned aspects, offers a maximum degree of hardness at the heel while at the same time being highly flexible for the sole, a further characteristic feature being that the flexure lines on this part of the footwear are consistent with the flexure planes of the foot when one is walking.

[0006] With a view to achieving this aim, the sole that is the subject of the invention is structured at the rear, at the heel and at the shank, by means of micro-particles of high-density polyurethane, in such a way that this material easily absorbs the slight impacts that are transmitted to the foot while one is walking, especially the impacts that affect the heel.

[0007] Furthermore, the front part, for the sole of the foot, is noticeably thinner than the thick part at the rear, that is to say the heel zone, and it also has deep grooves, which go down into the surface to a depth of more than 50 % of the thickness, these grooves running both lengthwise and transversally, forming studs on the lower side

of the sole that guarantee that the footwear has a perfect grip on the ground, while at the same time ensuring that the sole has the high degree of flexibility that has been referred to above.

[0008] The grooves that are arranged lengthways are markedly curved, the concave part running towards the inner edge of the sole, the grooves being gradually staggered and running from the back towards the front, whereas the transversal grooves, which are also curved and are concave at the rear, gradually diverge from their inner edge to their outer edge, in such a way that the rear half is sloping backwards and the front half is sloping forwards, that is to say, the grooves are further apart at the outer edge of the footwear than they are at the inner edge.

[0009] The special arrangement for the grooves, together with their considerable depth, means that not only is the footwear particularly flexible in this zone, but also that the deformations affecting the foot when walking are perfectly identical to and a correct reflection of the deformations that affect the sole of the footwear, which makes the sole as comfortable as possible.

DESCRIPTION OF THE DRAWINGS

[0010] With a view to supplementing the description that is being given and in order to help to give a better understanding of the characteristics of the invention in accordance with an example of a preferred embodiment of a practical realisation thereof, the description is supplemented with a set of drawings that are enclosed and which form an essential part of that description, by way of illustrating it but not in an exhaustive way, the following figures being included:

Figure 1.- This figure shows a plan view of bottom of the sole for footwear that is the subject of this invention.

Figure 2.- This figure shows a profile of the same sole.

PREFERRED EMBODIMENT OF THE INVENTION

[0011] The figures included show how the proposed sole for footwear is formed by one single piece, which as has already been pointed out is obtained from the typical injection moulding method, but with the peculiarity that the body is made up of micro-particles of high-density polyurethane, which is comparatively thick at the heel (1) and at the shank (2), but the thickness gradually becomes thinner towards the sole (3), where it is rather thin, so, for example, it could be 1 centimetre thick or less at the sole, whereas at the heel it could be 2 centimetres thick or more.

[0012] The heel of the footwear is rather solid, although it could be lightened by open material towards its upper base, whereas in the sole zone there are deep grooves running lengthways (4) that are intersected by transver-

sal grooves (5) to form a mass of prism shaped studs(6) that increase the gripping potential of the sole when the wearer is walking.

[0013] As has already been pointed out, the grooves that run lengthways (4) are curved, being concave towards the inner edge (7) of the sole, gradually becoming more off-centre from the back to the front, as can be seen in Figure 1, and the transversal grooves (5) are also curved, but in this case the concavity is towards the back, and the grooves diverge from the inner edge (7) of the sole towards its outer edge.

[0014] As can be seen in Figure 2, the grooves (4) and (5) are really very deep, especially the grooves in the central zone of the sole, which is where the greatest deformation occurs when walking, thereby ensuring that the sole is as flexible as possible, that is to say thanks to the large number of grooves (4) and (5), the way that these grooves are arranged and their size, which also means that the sole follows all the deformations that take place in the movements of the foot, so walking is more even, and each and every muscle involved duly takes part in the process, so none of the muscles are at risk of weakening, which in the long term means that no problems will affect the lower limbs of the wearer.

and forwards.

Claims

1. st.- Sole for footwear, of the type that is made from one single piece obtained by injection moulding using synthetic materials, **characterised by** the fact that the single piece has micro-particles of high-density polyurethane at the heel zone, which form a compact and essentially solid body that absorbs the small impacts that are transmitted when one walks, especially in the heel zone, whereas the section that lies in the sole area, which is much thinner than the heel section, is provided with a series of lengthwise and longitudinal grooves on the lower part that make the sole highly flexible and form studs that enable the sole to obtain a good grip on the ground.
2. nd.- Sole for footwear, as in Claim 1, **characterised by** the fact that the grooves on the lower surface of the sole are more than half the thickness of the sole itself.
3. ^a.- Sole for footwear, as in the previous claims, **characterised by** the fact that the grooves running lengthways are curved, the concave parts of the groove running towards the inner edge of the sole and are staggered progressively inwards from the shank to the toe, whereas the transversal grooves, which are also curved, are concave towards the back, and diverge from the inner edge of the footwear to the outer edge, and in such a way that in the rear half of the sole they are sloping outwards and backwards, and in the front half they are sloping outwards

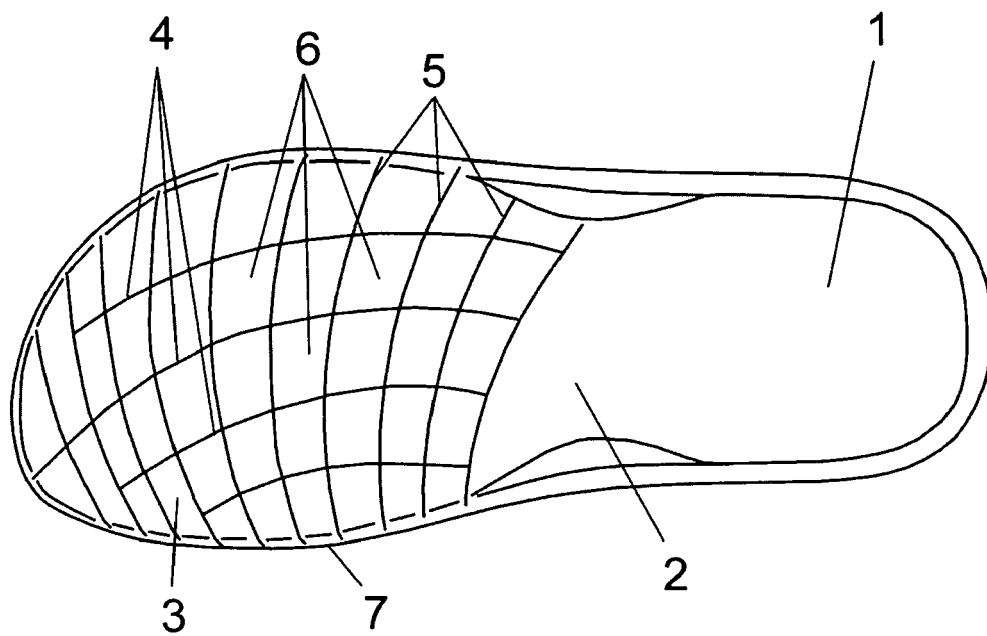


FIG. 1

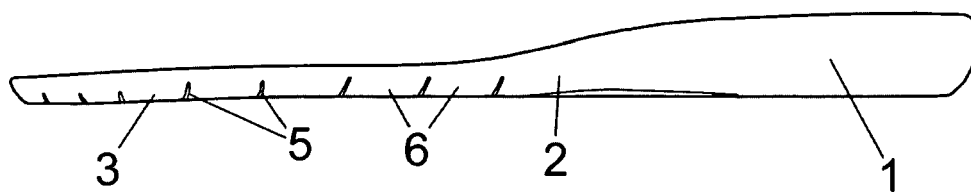


FIG. 2



European Patent
Office

EUROPEAN SEARCH REPORT

Application Number
EP 07 38 0052

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Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
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			TECHNICAL FIELDS SEARCHED (IPC)
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The present search report has been drawn up for all claims			
Place of search Munich		Date of completion of the search 13 July 2007	Examiner Herry, Manuel
CATEGORY OF CITED DOCUMENTS		T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document	
X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document			

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EPO FORM 1503 03 82 (P04C01)

**ANNEX TO THE EUROPEAN SEARCH REPORT
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EP 07 38 0052

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report. The members are as contained in the European Patent Office EDP file on
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