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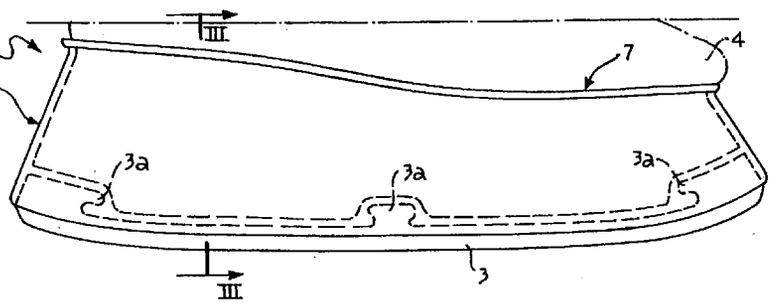
(54) A skate structure and a method for the manufacture thereof

(57) A skate structure comprising running means (3; 55a-d) for the skate and a support (2; 52) for the running means, made of plastics material, for fixing to the user's footwear (4), in which the support (2; 52) has at least one internal cavity (5; 59, 60) with a hollow cross-section having a closed outline (6; 61).

FIG. 1



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Description

The present invention relates to a skate structure according to the preamble to the main claim and also to a method for the manufacture thereof.

Within the specific technical field of skates it is known for the support of the running means, be it a blade (for an ice skate) or a plurality of in-line wheels (for an in-line roller skate), to be made of plastics material by the injection moulding technique.

These supports normally have to have a certain stiffness, particularly torsional stiffness, which is achieved by the selection of suitable dimensions of the cross-sections of the support, and at the same time, to have resilience properties such as to absorb the knocks and vibrations to which the skate is subjected during skating. Moreover, the satisfaction of both of these requirements is particularly important for some types of skates such as, for example, competition speed skates. In this field, greater torsional stiffness together with a particularly light weight of the skate are in fact generally required.

Skate structures having supports according to the prior art therefore generally have a compromise solution which thus limits the performance which can be achieved by these skate structures.

The problem upon which the present invention is based is that of providing a skate structure which is designed structurally and functionally to overcome all of the problems complained of with reference to the prior art mentioned.

This problem is solved by the invention by means of a skate structure of the type indicated above, formed in accordance with the following claims.

The characteristics and advantages of the invention will become clearer from the following detailed description of some preferred embodiments thereof described by way of non-limiting example, with reference to the appended drawings in which:

Figure 1 is a partial side elevational view of an ice-skate structure formed in accordance with the present invention,

Figure 2 is a plan view of the skate structure of Figure 1,

Figure 3 is a section taken on the line III-III of Figure 1,

Figure 4 is a side elevational view of a second embodiment of the ice-skate structure according to the invention,

Figure 5 is a plan view of the skate structure of Figure 4,

Figure 6 is a partial section taken on the line VI-VI of Figure 4,

Figure 7 is a side elevational view of a third embodiment of an ice-skate structure according to the invention,

Figure 8 is a section taken on the line VIII-VIII of Figure 7,

Figure 9 is a side elevational view of a fourth embodiment of a skate structure according to the invention,

Figure 10 is a section taken on the line X-X of Figure 9,

Figures 11 and 12 are a side elevational view and a plan view, respectively, of a first embodiment of an in-line roller-skate structure according to the present invention,

Figure 13 is a section taken on the line XIII-XIII of Figure 11,

Figure 14 is a view corresponding to that of Figure 11 of a second embodiment of an in-line roller-skate structure according to the invention,

Figure 15 is a section taken on the line XV-XV of Figure 14,

Figure 16 is a side elevational view of a third embodiment of an in-line roller-skate structure according to the invention,

Figure 17 is a section taken on the line XVII-XVII of Figure 16,

Figure 18 is a side elevational view of a fourth embodiment of an in-line roller-skate structure according to the invention,

Figure 19 is a section taken on the line IXX-IXX of Figure 18,

Figure 20 is a side elevational view of a variant of the skate structure of Figure 18,

Figure 21 is a section taken on the line XXI-XXI of Figure 20.

With reference to Figures 1 to 3, a first embodiment of an ice-skate structure formed in accordance with the present invention is generally indicated 1.

The skate structure 1 comprises a blade-holder support 2 for fixing the blade 3 to footwear 4 shown only partially in Figure 1.

A cavity 5 defined in the support 2 has a hollow cross-section with a closed outline 6, as shown in Figure 3. The cavity 5 extends through the entire length of the support 2 between the blade 3 and an opposed element 7 for the attachment of the footwear 4.

With particular reference to Figure 3, the support 2 has a V-shaped cross-section with sides 8a, b which converge at a vertex position in which the blade 3 is fixed to the support 2, and which are connected to one another at their opposite free ends by the attachment element 7 so as to define the closed outline 6 of the hollow cross-section. The attachment element 7 has flanges 9a, b projecting on opposite ends of the free ends of the sides 8a, b.

Appendages 3a formed in the blade 3 are provided for securing the blade when they are incorporated in the support 2 during the moulding thereof.

The support 2 is made of plastics material by injection moulding and the cavity 5 is formed inside the support 2 by the gas-injection moulding technique. This

technique is described, for example, in the leaflet "Arburg-515.202W00296.TI SV I". Upon completion of the injection, the cavity 5 is thus defined by fairly thin walls of the support 2, having a substantially uniform thickness, indicated S in Figure 3. By virtue of this injection technique, the moulded support 2 is hollow internally with an approximately tubular and monolithic structure. The hollow cross-section with a closed outline 6 advantageously provides the support with a certain torsional stiffness, particularly by virtue of the greater moment of inertia in comparison with that which can be achieved with solid cross-sections of the same surface area. By virtue of the increased torsional stiffness resulting from the particular geometry of the hollow cross-section, the contribution of the blade 3 to the stiffness can consequently be limited, thus advantageously permitting the use of blades of reduced height and thickness with a resulting overall reduction in the weight of the skate.

A reduction in the weight of the support 2 is also achieved by virtue of the presence of the cavity 5. The cavity 5 may also be filled with a filling material, for example, by the injection of a plastics material after the gas-injection step. The filling material is selected, in particular, so as to have a modulus of elasticity lower than that of the material of which the support 2 is made. A plastics material with a low density, particularly lower than of the material of the support, is preferably used as the filling material so as to limit the overall weight of the skate structure 1. The characteristics of the material filling the cavity are such that it can perform a shock-absorbing function inside the support 2, conferring thereon the ability to absorb knocks and vibrations.

With reference to Figures 4 to 6, a second embodiment of the ice-skate structure according to the present invention is generally indicated 20. Details similar to those of the previous embodiment are indicated by the same reference numerals.

In contrast with the previous embodiment, the skate structure 20 has two spaced-apart attachment elements 21, 22 for the footwear 4, between which elements a recess 23 is defined. Walls 24, 25 are provided inside the cavity 5 of the support and define in the cavity three adjacent chambers indicated 26, 27, 28, respectively. The chambers 26, 28 are formed on opposite sides of the chamber 27 and are defined, on the opposite side to the vertex for the attachment of the blade 3, by the respective attachment elements 21, 22. The chamber 27 extends in the centre of the support 2 adjacent the recess 23 and is defined at longitudinally opposite ends by the walls 24, 25. The walls may advantageously be formed in the cavity 5 during the gas-injection step so as to have a thickness such as advantageously to constitute stiffening elements for the tubular structure of the support 2. It can be seen that each of the chambers 26-28 has a hollow cross-section with a closed outline as shown, in a manner limited to the chamber 27, in Figure 6.

Figures 7 and 8 show a third embodiment of the invention, generally indicated 30, which differs from the skate structure 20 by the different orientation of the walls 24, 25. In the skate structure 30, the walls 24, 25 extend substantially longitudinally relative to the support 2 so as to define a first closed chamber 31 extending between the opposite longitudinal ends of the support and a second and a third chamber 32, 33, formed above the chamber 31 and extending on opposite sides of the recess 23 up to and also affecting the corresponding attachment elements 21, 22. The chambers 32, 33 are open in the region of the respective attachment elements 21, 22 (Figure 8) in the region of the flanges 9a, b. Alternatively, the chambers 32, 33 may be formed with hollow cross-sections with closed outlines as provided for in the previous embodiment.

As in the skate structure 1, the chambers defined in the cavities 5 of the skates 20 and 30 are filled in the manner described for the skate 1 with a filling material having the characteristics described for the skate 1.

With reference to Figures 9 and 10, a fourth embodiment of an ice-skate structure according to the invention is generally indicated 40, its blade-holder support 2 having a configuration approximately the same as that of the skate 1 with a cavity 5 and a single chamber extending through the entire length of the support.

With reference in particular to Figure 10, the skate 40 differs from the preceding embodiments in that the cavity 5 is defined in section by the converging sides 8a, b and by a sole 41 fitted on the flanges 9a, b to close the cavity 5. Alternatively, the support 2 may be formed with a configuration having a closed, hollow cross-section substantially the same as that of the skate 1 of Figure 3, with the sole 41 co-moulded with the support or fitted on the support subsequently.

The sole 41 comprises two respective integral cradles 42, 43 for housing corresponding toe and heel portions of the footwear 4 in order to fix the footwear to the support 2. Moreover, the sole 41 may be made of a material having a modulus of elasticity different from the modulus of elasticity of the material of which the support 2 is made. The sole 41 is preferably made of a plastics material having a modulus of elasticity lower than that of the support. Moreover, the support 2 and the sole 41 may be made of materials of different colours so as to provide the skate with a particular aesthetic impact. As in the previous embodiments, the cavity 5 may be filled with a filling material preferably of low density and having resilience properties such as to confer on the skate the ability to absorb knocks and vibrations.

With reference to Figures 11 to 13, a first embodiment of an in-line roller-skate structure according to the present invention is generally indicated 50. The structure 50 comprises a support 52 with two opposed side walls 53, 54 between which four spaced-apart, aligned wheels 55a-d with parallel axles are supported for rotation.

The support 52 comprises, on the opposite side to

the wheels 55a-d, two spaced-apart attachment elements 56, 57 between which a recess 58 is defined. The support 52 is intended to be fixed to the footwear 4, shown only partially in the drawing, by means of the attachment elements 56, 57.

Each side wall 53, 54 defines a respective cavity 59, 60 having a hollow cross-section with a closed outline 61 as shown in Figure 13. Each cavity 59, 60 extends through the entire length of the support 52 between the axles of the wheels 55a-d and the respective attachment elements 56, 57.

Each side wall 53, 54 is V-shaped with sides 62a, b converging at a vertex position approximately corresponding to the axles on which the wheels are mounted on the support, the sides 62a, b being connected to one another at their opposite free ends so as to define the closed outline 61 of the hollow cross-section. In the region of the wheel axles, each side wall has a respective recess 63 which reduces the hollow cross-section to a substantially trapezoidal configuration as shown in Figure 13.

The support 52 is made of plastics material by injection moulding and the cavities 59, 60 are formed within the respective side walls 53, 54, as in the embodiments described above, by the gas-injection moulding technique. In this embodiment also, upon completion of the injection, each cavity 59, 60 is defined by thin walls of the support 52 having a uniform thickness, indicated T in Figure 13. As a result, the moulded support 52 has a hollow interior and has a monolithic tubular structure with a hollow cross-section having a closed outline, conferring particular torsional stiffness on the support.

Each cavity 59, 60 may also be filled with a filling material, for example, a plastics material injected after the gas injection. The filling material selected preferably has a modulus of elasticity lower than the modulus of elasticity of the support 52 and a low density so as to perform the function of a shock-absorber inside the support and to limit the overall weight of the skate structure. The selection of a filling material with these physical and resilience properties also confers on the skate structure thus formed an increased ability to absorb knocks.

Figures 14 and 15 show a second embodiment of an in-line roller-skate structure according to the invention, generally indicated 65, of which the details similar to those of the previous embodiment are indicated by the same reference numerals.

The skate structure 65 differs from the previous embodiment in that walls 66a, 66b are provided inside each cavity 59, 60 and define therein three adjacent chambers indicated 67, 68, and 69, respectively. The chambers 67 and 69 are formed on opposite sides of the chamber 68 and are defined on the opposite side to the wheel axles, by the respective attachment elements 56, 57. The chamber 68 extends in the centre of the support 52 in the region of the recess 58 and is defined longitudinally by the walls 66a, b. These walls, which can be formed during the gas injection step, have a thickness such as to constitute stiffening elements for the tubular structure of each side wall.

Figures 16 and 17 show a third embodiment of an in-line roller-skate structure, generally indicated 70, which differs from the skate structure 65 by a different orientation of the walls 66a, b. In this embodiment, the walls 66a, b extend longitudinally in each side wall so as to define therein a respective closed chamber 71 extending between the opposite longitudinal ends of the support 52 and a second and a third chamber 72, 73 extending on opposite sides of the recess 58 up to and also affecting the corresponding attachment elements 56, 57 (Figure 16). Alternatively, the chambers 72, 73 may be formed with hollow cross-sections with closed outlines.

With reference to Figures 18 and 19, in a fourth embodiment of an in-line roller-skate structure according to the invention, generally indicated 80, the support 52 differs from that of the previous embodiment in that the cavities 59, 60 are closed by a sole 81 fitted on flanges 82a, b, c projecting from the free ends of the sides 62a, b.

Alternatively, the support 52 may be formed (Figure 21) with a configuration having a closed hollow cross-section substantially the same as that of the structure of Figure 11 with the sole 81 co-moulded with the support or fitted thereon subsequently.

As in the embodiments of the ice-skate structure, the sole 81 comprises cradles 82, 83 for housing corresponding toe and heel portions of the footwear. Moreover, the sole is made of a material having a modulus of elasticity different from and, in particular, lower than the modulus of elasticity of the support 52. Moreover, the support and the sole may be made of materials of different colours and the cavity may be filled with a low-density filling material as described above for the ice-skate structures.

Naturally, in order to satisfy contingent and specific requirements, an expert in the art may apply to the skate structure of the present invention, be it for an ice skate or for an in-line roller skate, many modifications and variations all of which, however, are included in the scope of protection of the invention as defined by the following claims.

Claims

1. A skate structure comprising running means (3; 55a-d) for the skate and a support (2; 52) for the running means for fixing to the user's footwear (4), characterized in that the support has at least one internal cavity (5; 59, 60) with a hollow cross-section having a closed outline (6, 61).

2. A skate structure according to Claim 1, in which the at least one cavity (5; 59, 60) extends through a predominant portion of the length of the support (2; 52) between first attachment means (3; 55a-d) for

attaching the running means to the support (2; 52) and second attachment means (7; 21, 22; 56, 57) for attaching the footwear (4) to the support.

3. A skate structure according to Claim 1 or Claim 2, in which walls (24, 25; 66a, 66b) are provided inside the at least one cavity (5; 59, 60) in the support (2; 52) and define a plurality of adjacent chambers (26, 27, 28; 31, 32, 33; 67, 68, 69; 71, 72, 73).

4. A skate structure according to Claim 3, in which the at least one cavity (5; 59, 60) or at least some of the chambers are filled with a filling material.

5. A skate structure according to Claim 4, in which the filling material is a plastics material.

6. A skate structure according to Claim 4 or Claim 5, in which the filling material has a modulus of elasticity and/or a density different from the modulus of elasticity and/or the density of the material of which the support (2; 52) is made.

7. A skate structure according to Claim 6, in which the modulus of elasticity and/or the density of the filling material are lower than the modulus of elasticity and/or the density of the material of which the support (2; 52) is made.

8. A skate structure according to Claim 7, in which the filling material constitutes a shock-absorber.

9. A skate structure according to one or more of Claims 1 to 8, in which the running means comprise an ice-skating blade (3) to be fixed to the support (2).

10. A skate structure according to Claim 9, in which the support (2) is substantially V-shaped in cross-section with sides (8a, 8b) converging at the vertex position in which the blade (3) is attached and with flanges (9a, 9b) projecting on opposite sides of the free ends of the sides (8a, 8b), the at least one cavity (5) being defined by the sides (8a, 8b) and by a sole (41) fitted on the flanges (9a, 9b) to close the cavity.

11. A skate structure according to Claim 10, in which the sole is co-moulded with the support.

12. A skate structure according to Claim 10 or Claim 11, in which the sole (41) comprises cradles for housing the footwear (4).

13. A skate structure according to Claim 12, in which the sole (41) is made of a material having a modulus of elasticity and/or a colour different from the modulus of elasticity and/or the colour of the material of which the support (2) is made.

14. A skate structure according to Claim 13, in which the modulus of elasticity of the sole (41) is lower than the modulus of elasticity of the support (2).

15. A skate structure according to one or more of Claims 1 to 8, in which the running means comprise a plurality of wheels (55a-d) arranged in line with parallel axles and supported for rotation on the support (52).

16. A skate structure according to Claim 15, in which the support (52) comprises a pair of opposed side walls (53, 54) between which the wheels are supported, the at least one cavity (59, 60) with a hollow cross-section and a closed outline (61) being formed in at least one of the side walls.

17. A skate structure according to Claim 16, in which each side wall (53, 54) of the support (52) is substantially V-shaped in cross-section with sides (62a, b) converging towards the axles of the wheels (55a-d) and with flanges (82a, b, c) projecting from opposite sides of the free ends of the sides (62a, b), the at least one cavity (59, 60) being defined by the sides and by a sole (81) fitted on the flanges to close the cavity (59, 60).

18. A skate structure according to Claim 17, in which the sole (81) is co-moulded with the support (52).

19. A skate structure according to Claim 17 or Claim 18, in which the sole (81) comprises cradles (82, 83) for housing the footwear (4).

20. A skate structure according to one or more of Claims 17 to 19, in which the sole (81) is made of a material having a modulus of elasticity and/or a colour different from the modulus of elasticity and/or the colour of the material of which the support is made.

21. A skate structure according to Claim 20, in which the modulus of elasticity of the sole (81) is lower than the modulus of elasticity of the material of which the support (52) is made.

22. A method of manufacturing a skate structure comprising the step of forming a support (2, 52) for running means (3; 55a-d) of the skate by injection moulding of plastics material, characterized in that at least part of the support (2, 52) is moulded with a configuration including at least one cavity (5; 59, 60) with a hollow cross-section and a closed outline (6, 61).

23. A method according to Claim 22, in which the cavity

(5; 59, 60) with a hollow cross-section is produced by a gas-injection moulding technique.

24. A method according to Claim 23, in which walls (24, 25; 66a, 66b) are formed in the cavity (5; 59, 60) by gas-injection and define a plurality of adjacent chambers (26, 27, 28; 31, 32, 32; 67, 68, 69; 71, 72, 73) therein.

25. A method according to Claim 24, comprising the step of the subsequent injection of a filling material into the at least one cavity or into at least one of the chambers.

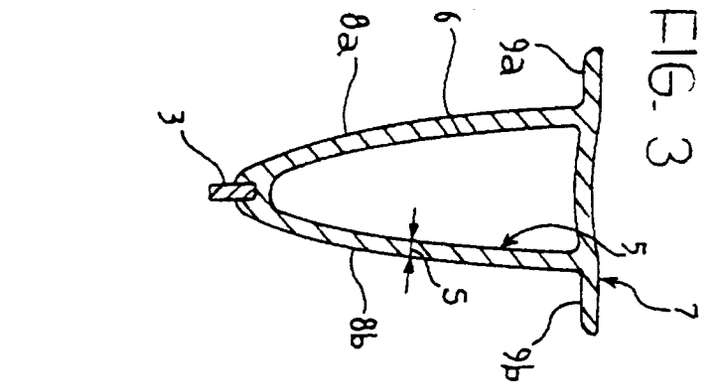


FIG. 3

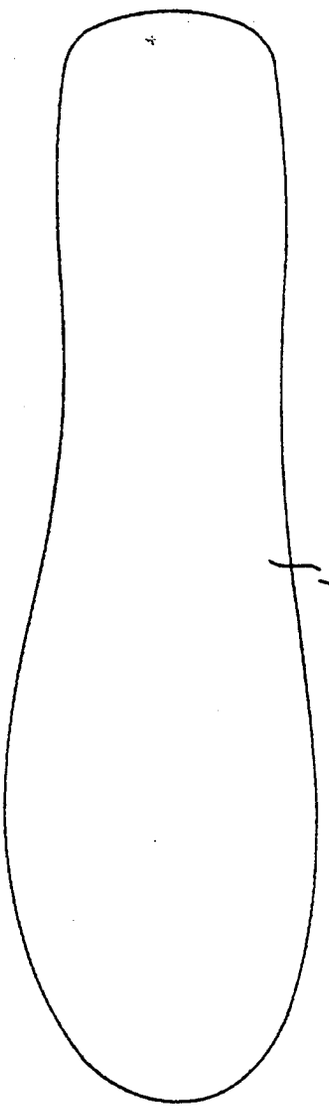


FIG. 2

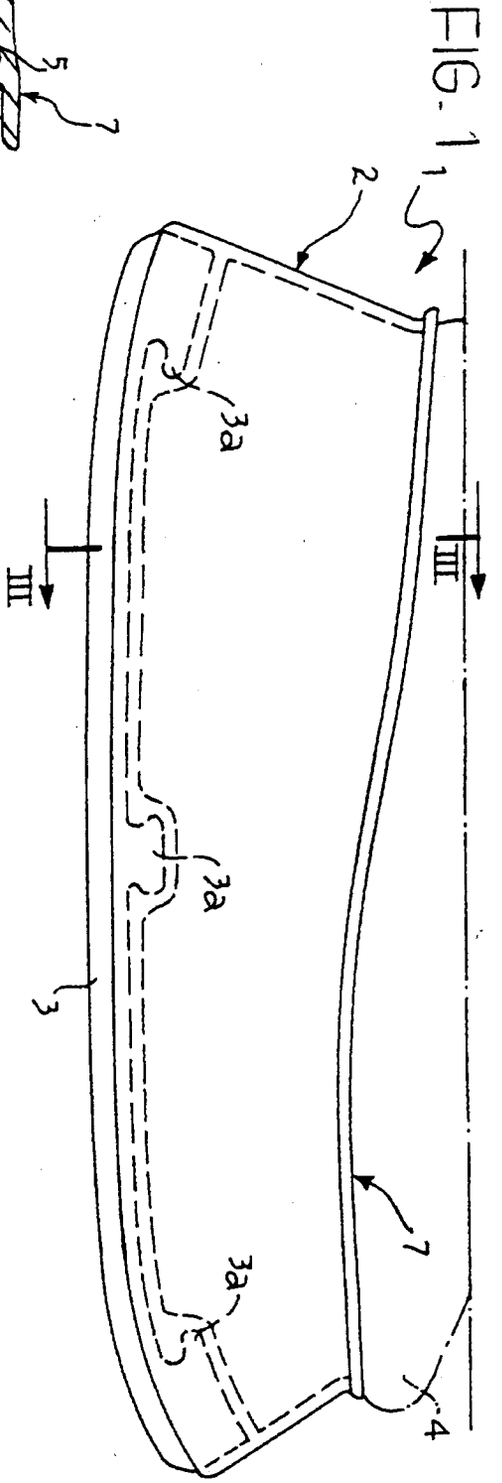


FIG. 1

FIG. 4

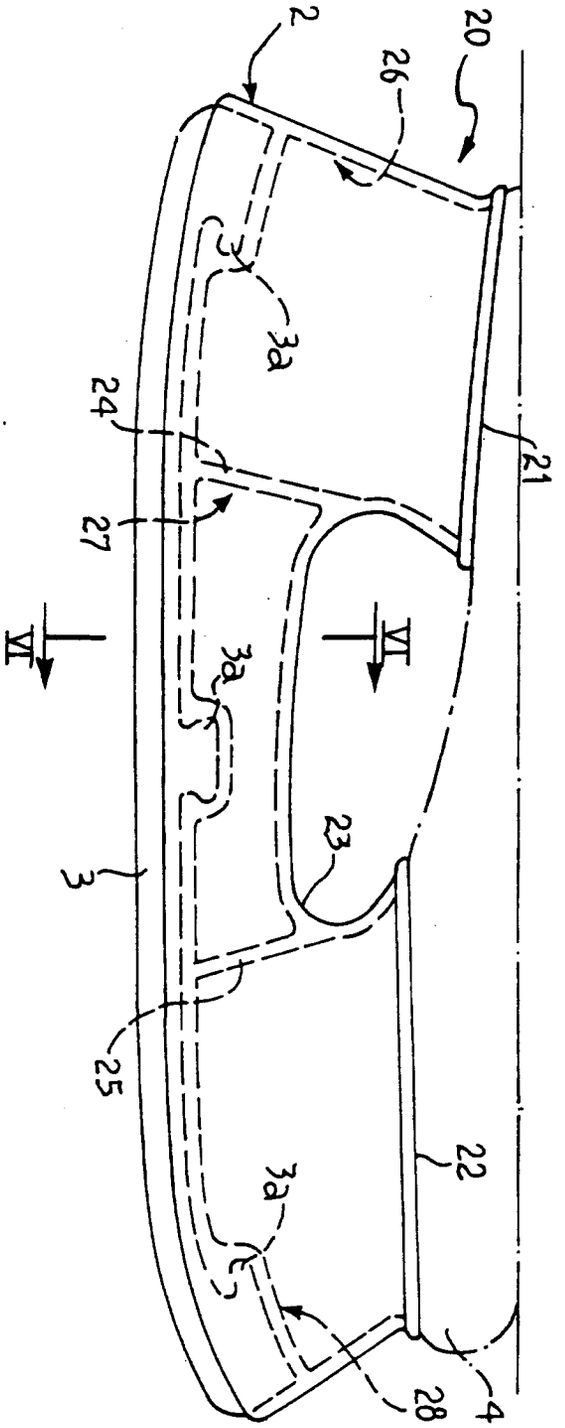


FIG. 6

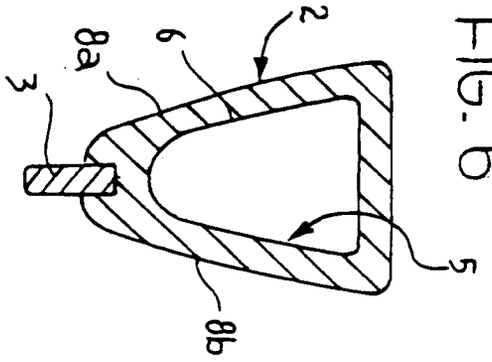
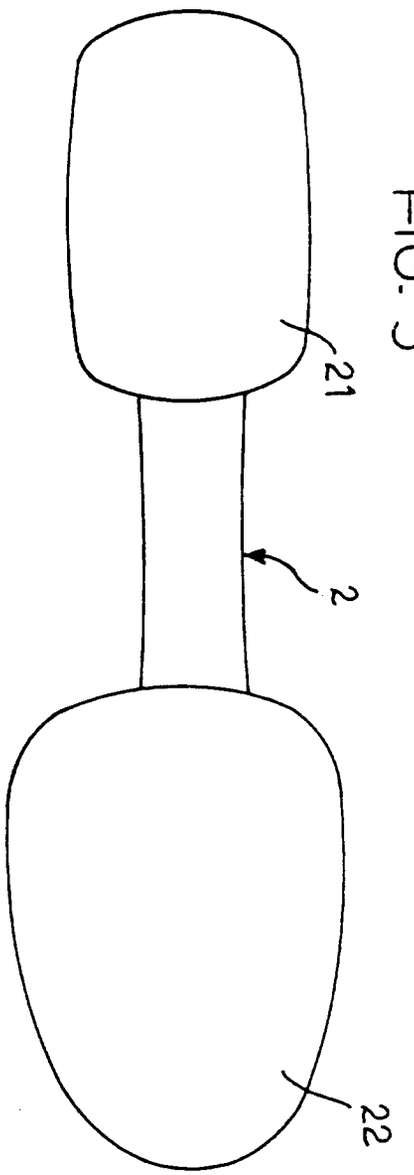


FIG. 5



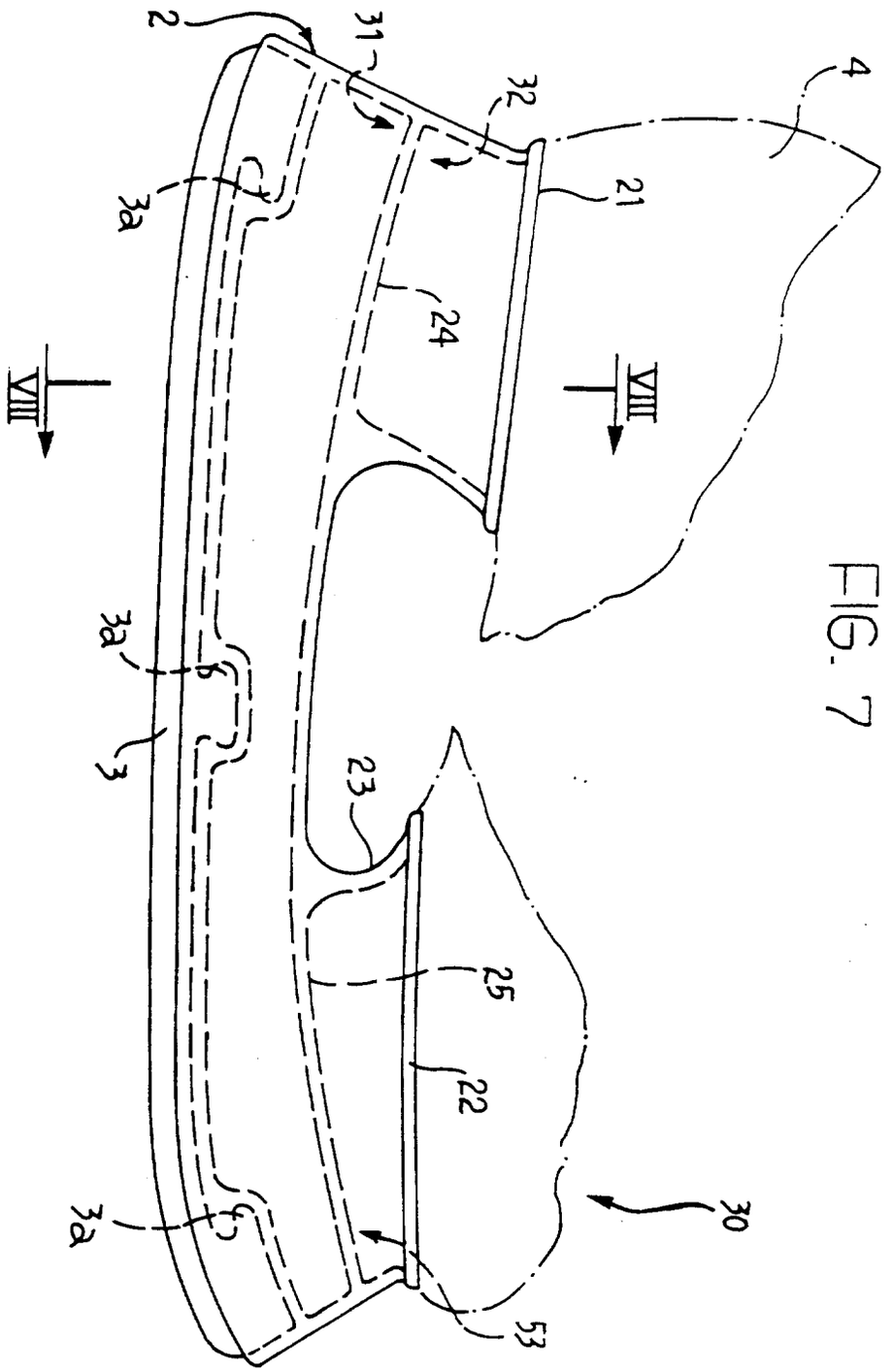

2
31
32
4
21
3a
24
VIII
VIII
3a
3
23
25
22
3a
30
53

FIG. 7

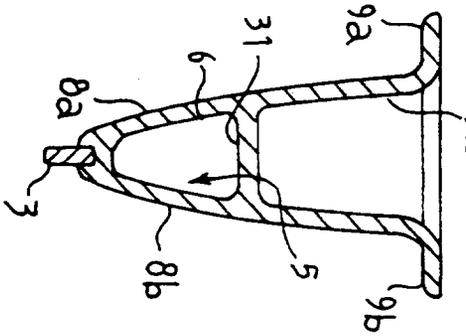

9a
31
6
32
8a
3
5
8b
9b

FIG. 8

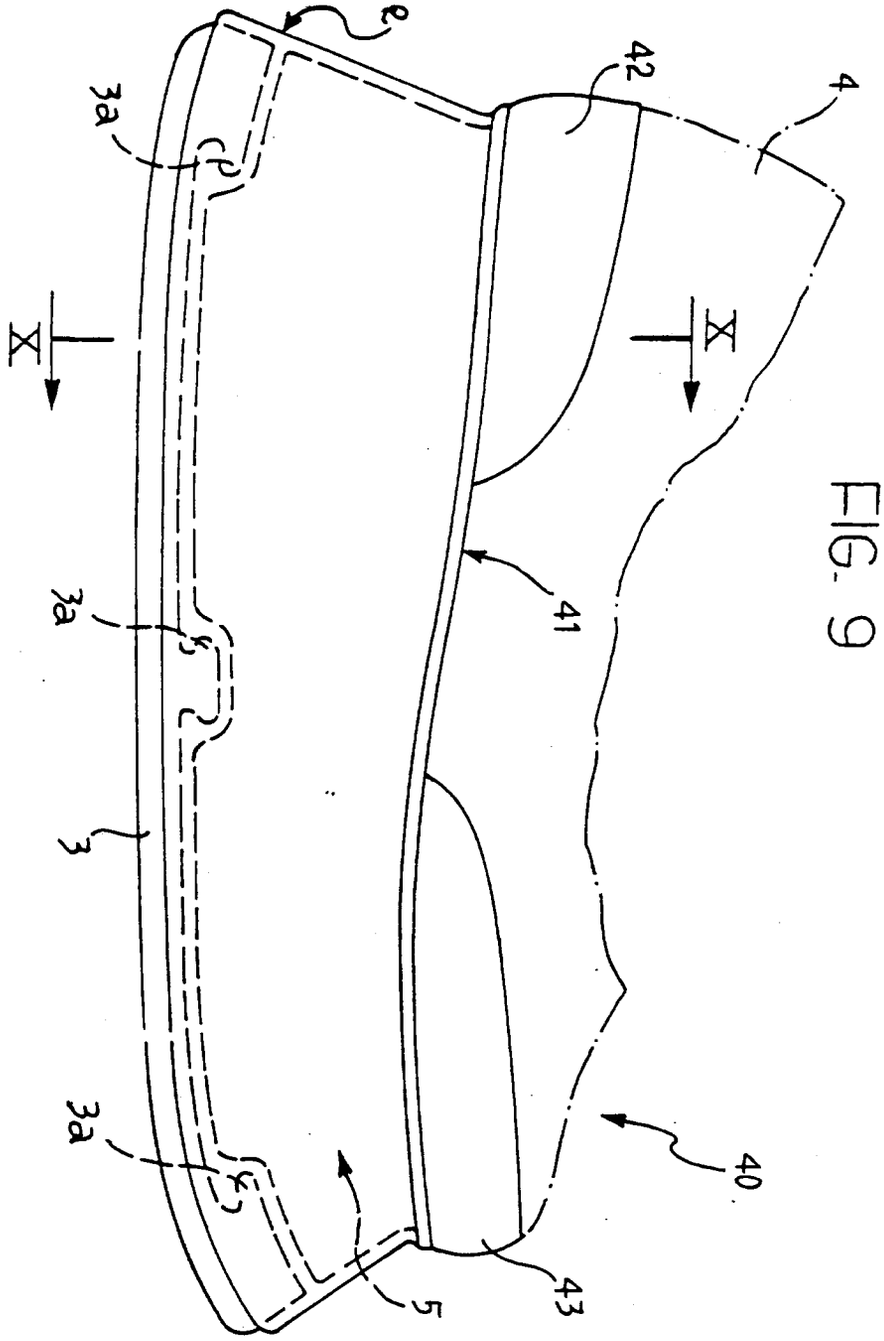


FIG. 9

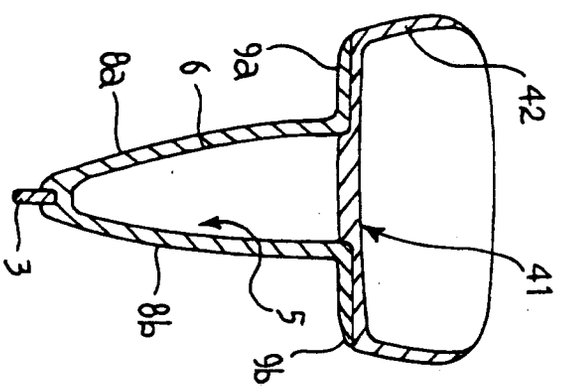


FIG. 10

FIG. 11

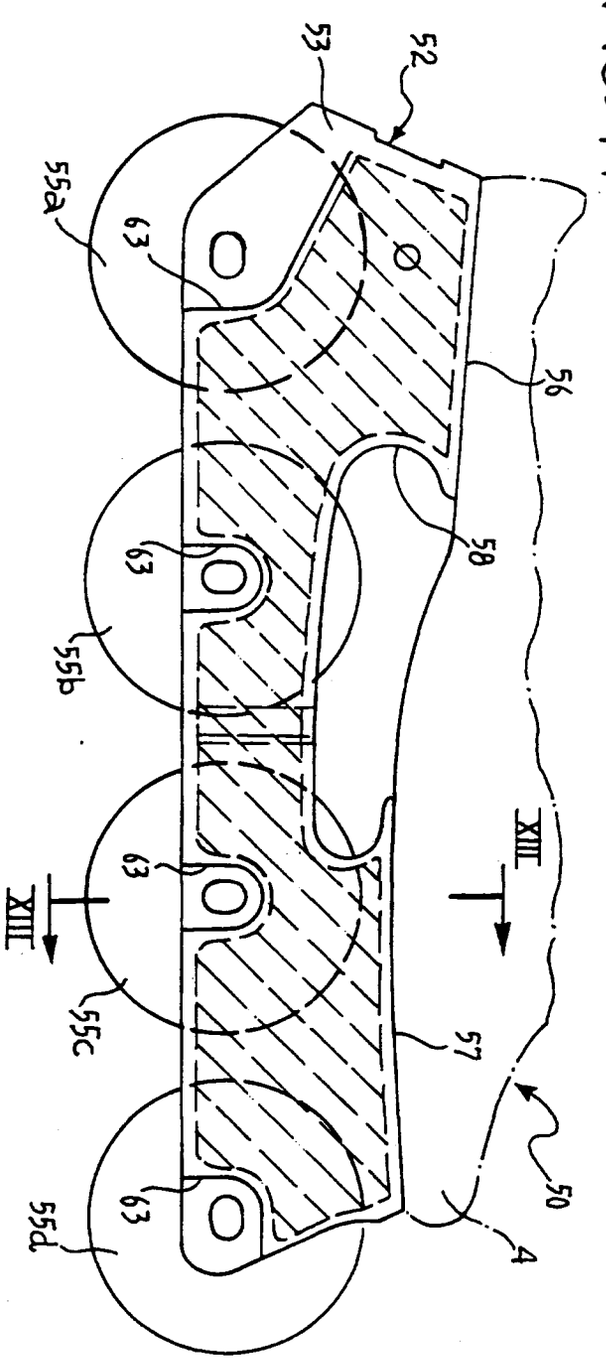


FIG. 12

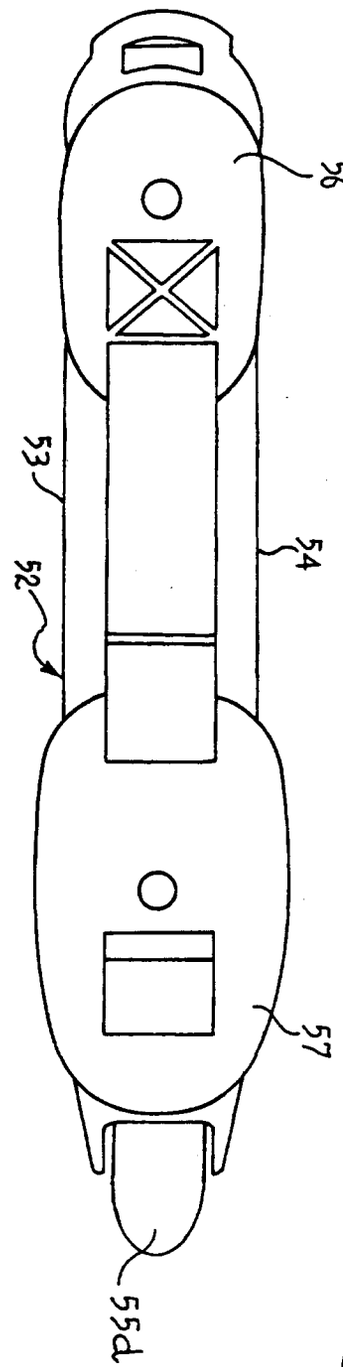
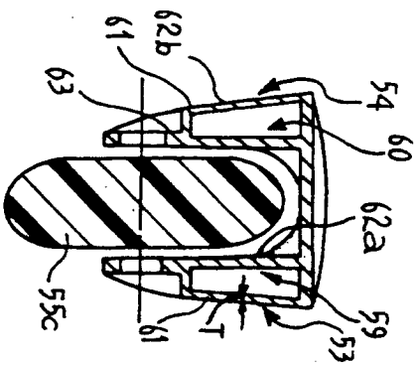


FIG. 13



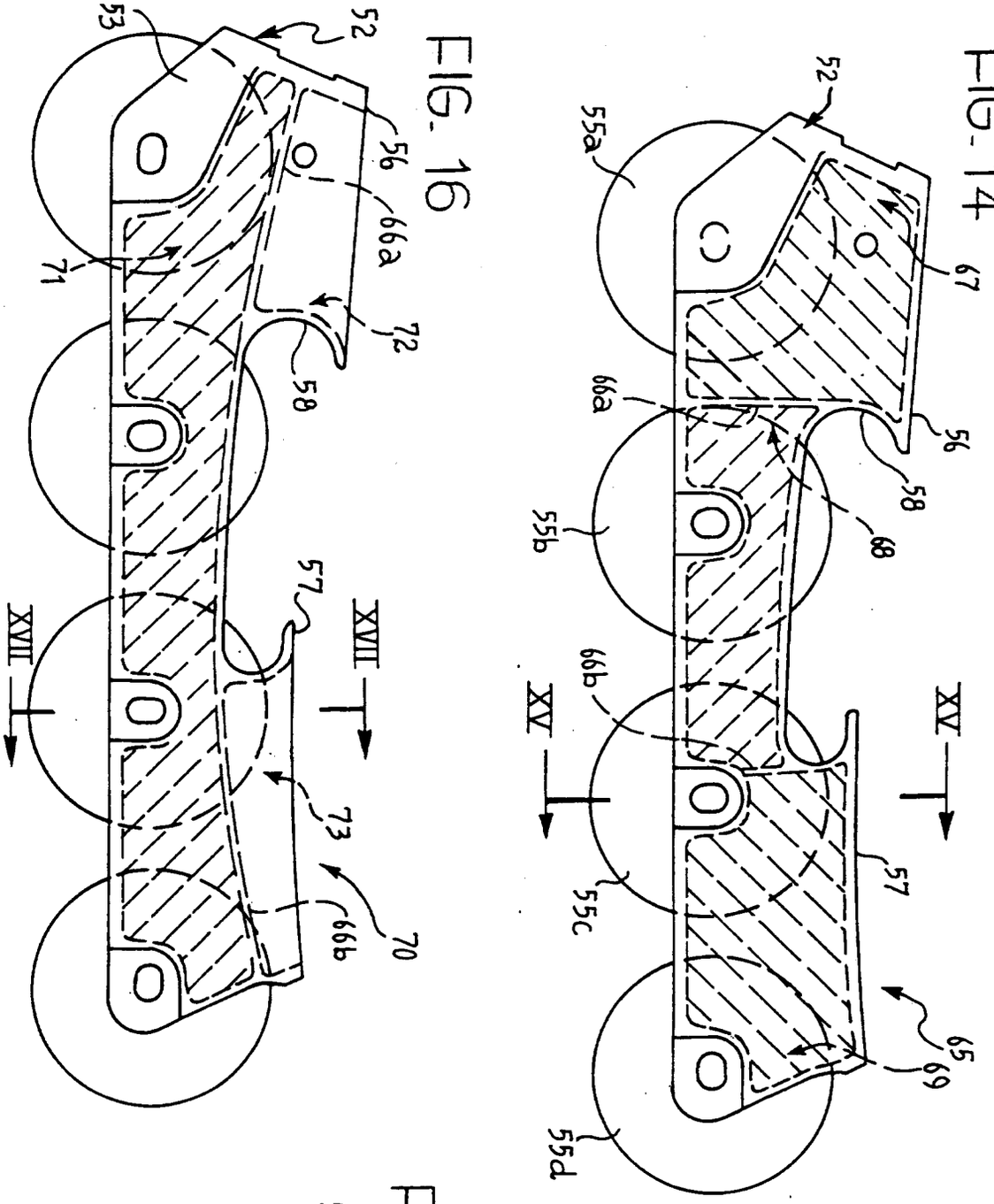


FIG. 14

FIG. 16

FIG. 15

FIG. 17

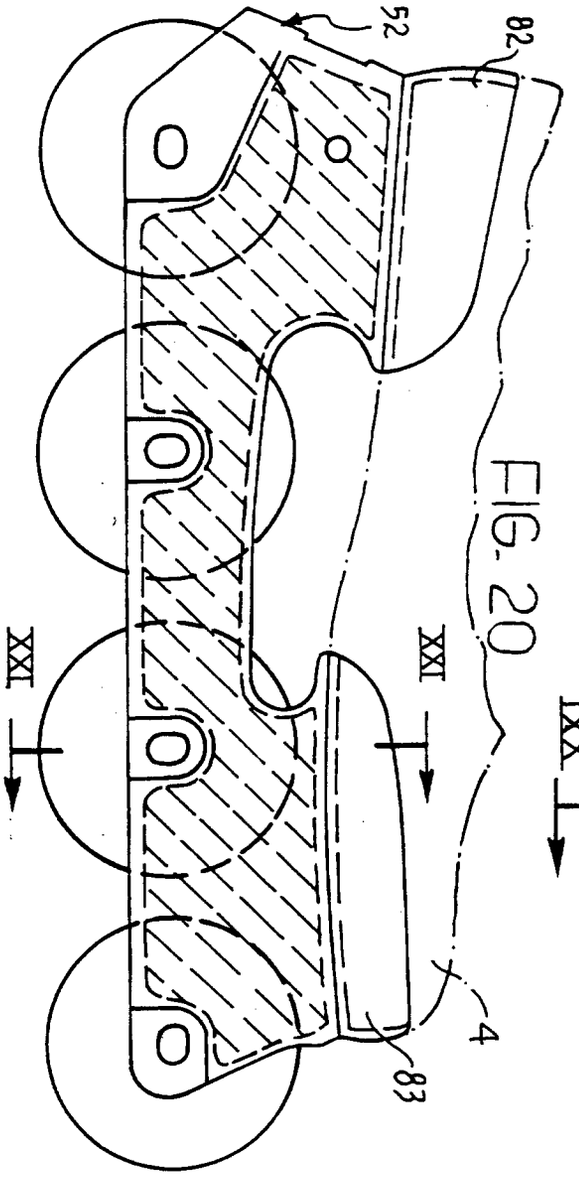


FIG. 20

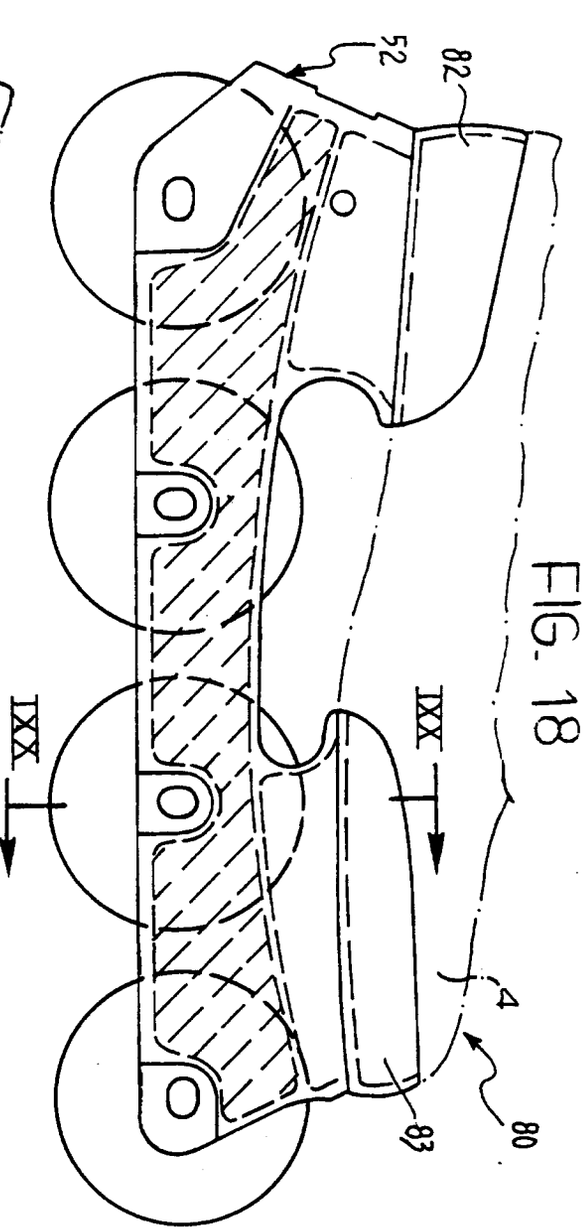


FIG. 18

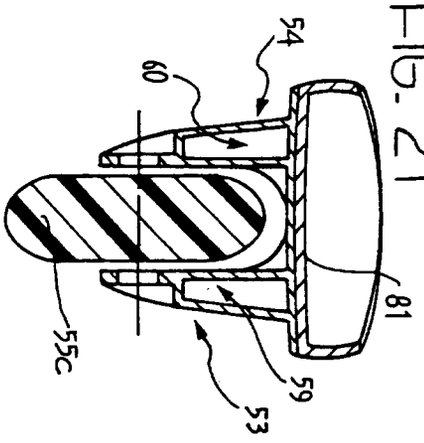


FIG. 21

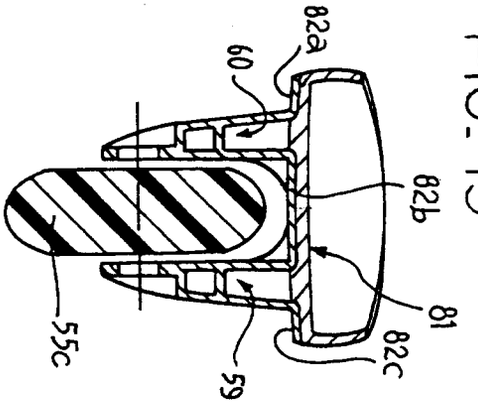


FIG. 19