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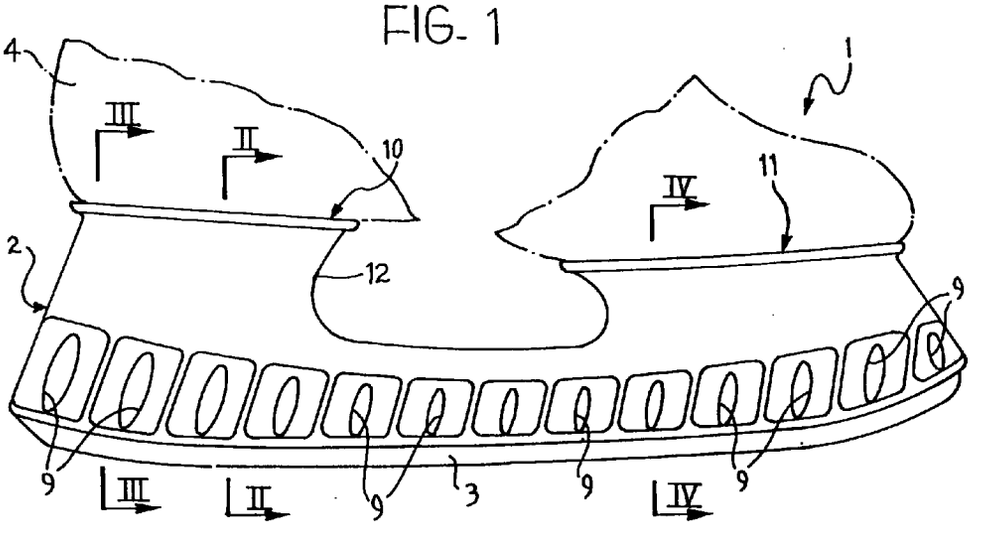
## (54) A skate structure particularly for ice skates and in-line roller skates.

(57) The skate structure described comprises running means (3; 55a-d) for the skate and a support (2; 52) for the running means, for fixing to footwear (4) The support (2; 52) comprises a first portion (5; 57) associated with the running means and a second portion (6; 58) which can be fixed to the footwear (4), the first portion (5; 57) being at least partially incorporated in the second portion (6; 58) and being made of a material having a modulus of elasticity (E1) and/or a colour different from the modulus of elasticity (E2) and/or the colour of the material of which the second portion (6; 58) is made.

FIG. 1

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## Description

The present invention relates to a skate structure according to the preamble to the main claim.

In the technical field of skates, that is, both ice skates and in-line roller-skates, it is known to make the support for carrying the blade (for an ice skate) or for supporting the wheels for rotation (for an in-line roller skate) of a plastics material which, in the former case is co-moulded with the blade of the skate in order to fix the blade to the support and, in the latter case, is formed with suitable seats for housing the axles for the rotation of the wheels. On the opposite side to the blade or wheels, the support is formed with suitable attachment surfaces for fixing it to the user's footwear.

The support must have characteristics such as to satisfy two main requirements. On the one hand, the support has to be fairly rigid to ensure the necessary stiffness, particularly torsional stiffness, especially in the region of the edge to which the blade is attached (for an ice skate) or in the region in which the wheels are mounted (for an in-line roller skate); on the other hand, however, the support must be fairly resilient for better absorption of knocks and for damping vibrations generated during skating.

The plastics materials normally used for the moulding of the support generally represent a compromise to satisfy the aforementioned conflicting requirements but cannot achieve optimal performance with currently-known 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 at the beginning which is formed in accordance with the following claims.

The characteristics and the 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 front elevational view of a first embodiment of an ice-skate structure formed in accordance with the present invention,

Figures 2, 3 and 4 are sections taken on the lines II-II, III-III and IV-IV of Figure 1, respectively,

Figure 5 is a front elevational view of a second embodiment of an ice-skate structure according to the present invention,

Figures 6, 7 and 8 are sections taken on the lines VI-VI, VII-VII and VIII-VIII of Figure 5, respectively,

Figure 9 is a side elevational view of a third embodiment of an ice-skate structure according to the invention,

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

Figure 11 is a side elevational view of a fourth embodiment of an ice-skate structure according to the invention,

Figure 12 is a side elevational view of a first embodiment of an in-line roller-skate structure according to the invention,

Figures 13 and 14 are sections taken on the lines XIII-XIII and XIV-XIV of Figure 12, respectively,

Figure 15 is a side elevational view of a further embodiment of an in-line roller-skate structure according to the invention,

Figures 16 and 17 are sections taken on the lines XVI-XVI and XVII-XVII of Figure 15, respectively.

With reference to Figure 1, 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 a blade 3 to a footwear 4, shown only partially in the drawing.

The support 2 comprises a first portion and a second portion 5, 6, fixed to the blade 3 and fixable to the footwear 4, respectively.

The first portion 5 extends longitudinally relative to the skate and is partially incorporated in the second portion 6. The portions 5, 6 are preferably formed one upon the other by co-moulding by the injection of plastics material. The first portion 5 has a "T"-shaped cross-section with a web 7 to one edge 7a of which the blade 3 is fixed and on the opposite edge of which a flange 8 is formed at right angles to the web 7. Naturally, the portion 5 may have a different cross-section, subject to its having suitable dimensions, but the "T"-shaped cross section represents a preferred choice.

The second portion 6 of the support 2 extends so as to cover the fist portion 5 and, on both sides of the support, has a plurality of windows 9 which are arranged at regular intervals, and through which the web 7 can be seen. The second portion 6 extends so as to cover the first portion 5 even on the edge on which the blade 3 is attached to the support 2 and, on the side opposite the blade, defines two spaced-apart elements 10, 11 for the attachment of footwear 4, between which elements a recess 12 is defined. The attachment elements 10, 11 have respective flanges 10a, 11a for fixing the support 2 to corresponding heel and toe portions of the footwear 4.

The first and second portions 5, 6 of the support 2 are made of materials having different moduli of elasticity, in particular, with a material of the first portion 5 having a modulus of elasticity E1 greater than the modulus of elasticity E2 of the second portion 6. The materials used have modulus of elasticity values E1 greater than about 5000 MPa, preferably greater than 15000 MPa, and modulus of elasticity values E2 below 2500 MPa, preferably below 1500 MPa.

By virtue of these properties of elasticity, a high

degree of stiffness, particularly torsional stiffness due the modulus of elasticity E1, is achieved in the first portion 5 in the region of attachment of the blade to the support 2 where the greatest resistance to stresses, particularly torsional stresses, is required in use. At the same time, by virtue of its relative resilience due to the modulus of elasticity E2, the second portion 6 which extends so as to cover the web 7, has a greater capacity to absorb knocks as well as to damp vibrations generated during skating.

High values of the modulus of elasticity E1 can be achieved preferably with the use of a reinforced plastics material, for example, polyamide filled with carbon or glass fibre. Alternatively, the first portion 5 of the support may be made of metal, for example, aluminium alloy, so as to have a high modulus of elasticity with a low specific weight. The second portion 6 of the support which has a modulus of elasticity E2 is preferably made of plastics material, for example, polyamide reinforced with a rubber filler.

The portions 5 and 6 may also be co-moulded to form the support 2 with the use of materials of different colours so as to achieve a certain aesthetic impact by virtue of the fact that the web 7 of the first portion is visible through the windows 9.

In the embodiment of Figures 1 to 4, the first portion 5 of the support extends over substantially the entire length of the blade 3. Alternatively, the portion 5 may be restricted solely to the central region of the support 2 in the region of the recess 12 in which the greatest torsional stresses are concentrated in use. It should also be noted that, by virtue of the greater torsional stiffness achieved in the first portion 5 owing to the modulus of elasticity E1, the contribution of the blade 3 to this stiffness can be limited, thus advantageously permitting the use of blades of reduced height and thickness, consequently reducing the overall weight of the skate.

Figures 5 to 8 show a second embodiment of the skate structure of the invention, generally indicated 20. Details similar to those of the previous embodiment are indicated by the same reference numerals. The skate 20 differs from that of the previous embodiment substantially in that the support 2 further comprises a third portion 21 co-moulded with the portions 5 and 6 and made of a material with a modulus of elasticity and/or a colour different from those of the first and second portions 5, 6.

In particular, the third portion 21 is made of a material having an modulus of elasticity E3 lower than the modulus of elasticity E2 of the second portion, preferably below 1000 MPa.

The third portion 21 extends so as to cover at least part of the web 7 of the first portion 5, the flange 8 of which, however, is incorporated in the second portion 6.

The web 7 remains visible through the plurality of windows 9 which are now formed in the third portion 21 on both sides of the skate 20. It can be seen, with particular reference to Figures 6 to 8, that the third portion 21 of the support extends so as to cover the web portion 7 completely in the region of the edge to which the blade 3 is attached, to protect the web against knocks to which the support is subjected during skating.

Figures 9 and 10 show a third embodiment of an ice-skate structure according to the invention, generally indicated 30. In this variant, the skate structure 30 differs from the skate structure 1 in that the first portion 5 has extensions 31, 32 in the region of the attachment elements 10, 11. The extensions 31, 32 extend away from the blade 3 on opposite sides of the flange 8 into the attachment elements 10, 11, up to the regions of the flanges 10a, 11a. The extensions 31, 32 are incorporated in the second portion 6 of the support and are restricted to the portions of the attachment elements 10, 11 facing the recess 12. In the region of these portions, the first portion 5 has a substantially "Y"-shaped cross-section, as shown in Figure 10. The provision of the extensions 31, 32 made of the stiffer material advantageously enables the forces applied to the blade 3 through the user's foot to be transferred to the sole homogeneously and continuously.

Figure 11 shows a fourth embodiment of the skate structure of the invention, generally indicated 40, which differs from the previous embodiments in that the support 2 comprises a fourth portion 41 extending from the attachment elements 10, 11 to define respective cradles 42, 43 for housing the heel and toe portions of the footwear 4. The fourth portion 41 is preferably co-moulded with the other portions of the support 2 and made of a plastics material having a modulus of elasticity and/or a colour different from those of the other portions of the support 2. In particular, the fourth portion 41 is made of a material with a modulus of elasticity E4 lower than the modulus of elasticity E2 of the second portion 6 of which the attachment elements 10, 11 are made. The structural discontinuity due to the different elastic properties of the footwear and of the support of the skate is thus attenuated by the interposition of the fourth portion 41 between the footwear 4 and the attachment elements 10, 11.

With reference to Figures 12 to 14, a further embodiment of a skate structure according to the invention, designed particularly for an in-line roller skate, is generally indicated 50. The skate structure 50 comprises a support 52 having opposed side walls between which four aligned wheels 55a-d with parallel and spaced-apart axes are supported.

The support 52 comprises a first portion and a second portion 57, 58, the former being arranged for supporting the wheels 55a-d and the second for fixing to the footwear 4, shown only partially in the drawings. The first portion 57 extends longitudinally relative to the skate structure 50 and is partially incorporated in the second portion 58. The portions 57, 58 are preferably made of plastics material by co-moulding onto one another by injection. The first portion 57 comprises a pair of symmetrical lateral cheeks both indicated 59,

connected to one another by transverse walls 60 and defining therewith respective seats for housing the wheels 55a-d.

Each cheek 59 has an L-shaped cross-section with a web 61 on one edge of which a flange 62 is formed at right angles to the web. A plurality of through-holes, all indicated 63, is formed in the web 61 on the opposite side to the flange 62 for housing respective axles for the rotation of the wheels 5a-d.

The second portion 58 comprises an elongate body with two side walls 64 each of which extends so as to cover the corresponding cheek 59 of the first portion. Through-windows 65, through which the web 61 is visible, are formed in each side wall 64 and are disposed in the vicinity of the holes 63, in positions between pairs of adjacent holes. The second portion 58 extends so as to cover the first portion up to the region of the holes 63 and, on the opposite side to the holes, defines two attachment elements 66, 67 between which a recess 68 is defined. Each attachment element 66, 67 defines a respective surface 66a, 67a for fixing the support 52 to corresponding heel and toe portions of the footwear 4.

The first and second portions 57, 58 are made of materials having different moduli of elasticity, in particular, with a material of the first portion having a modulus of elasticity greater than the modulus of elasticity of the second portion. The values of these moduli of elasticity are preferably selected in accordance with those indicated in the previous embodiments with reference to ice-skate structures, to which reference should be made for a detailed description.

By virtue of these elastic properties, a high degree of flexural stiffness and particularly torsional stiffness is achieved in the first portion 57 which is required to support the wheels, whilst relative resilience is ensured in the second portion 58 which performs the main function of protecting the web, conferring on the skate structure an improved capacity to absorb knocks as well to damp vibrations. The first portion 57 may also be made of metal, preferably light alloy, for example, aluminium alloy, so as to have a high modulus of elasticity with a low specific weight.

The co-moulding of the first portion 57 with the second portion 58 with the use of different colours also enables colour combinations with a particular aesthetic effect to be achieved by virtue of the fact that the web 61 is visible through the holes 65 (Figure 12).

Figures 15 to 17 show a second embodiment of an in-line roller-skate structure according to the invention, generally indicated 70, in which details similar to those of the previous embodiment are indicated by the same reference numerals.

The skate structure 70 differs from that of the previous embodiment substantially in that the support 52 further comprises a third portion 71 co-moulded with the portions 57 and 58 and made of a material having a different modulus of elasticity and/or colour from those of the first and second portions. This portion 71 is preferably made of a material having an modulus of elasticity lower than the modulus of elasticity of the second portion 58.

The third portion 71 extends so as to cover at least part of the web 61 of the first portion 57, the flange 62 of which, however, is incorporated in the second portion 58, as shown in Figure 16.

The second portion 58 also has, on each side wall 64, a respective appendage 72, the T-sectioned shape of which permits better anchorage, during the co-moulding stage, to the first and third portions in which the appendage 72 remains incorporated.

The web 61 is visible through the windows 65 formed in the third portion 71 in the region of the two sides of the skate.

It will be appreciated that, by virtue of the greater elastic yielding capacity of the material of which it is made, the third portion 71 extends so as to cover the cheeks 59 of the first portion with the particular function of protecting the support 52 against knocks to which it is subjected during sports activities.

Amongst the advantages achieved by the invention, it should be mentioned, in particular that, by virtue of the technique of co-moulding the blade-holder/wheel-holder support by injection of two or more materials, it is possible to form, in the skate support, regions having different physical and resilience properties, suitably selected in dependence on the specific requirements to be satisfied, which may also differ from one another such as, for example, greater stiffness in the region of the attachment of the blade or of the wheel support and relative resilience for absorbing knocks and vibrations. The use of materials having different colours achieves the further advantage of combining a certain aesthetic effect with the improved performance which can be achieved for the skate.

Naturally, in order to satisfy contingent and specific requirements, an expert in the art may apply to the above-described skate structure many modifications and variations all of which, however, are included within 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 a footwear (4), characterized in that the support (2; 52) comprises a first portion (5; 57) associated with the running means and a second portion (6; 58) which can be fixed to the footwear, the first portion (5; 57) being at least partially incorporated in the second portion (6; 58) and being made of a material having a modulus of elasticity (E1) and/or a colour different from the modulus of elasticity (E2) and/or the colour of the material of which the second portion (6; 58) is made.

2. A skate structure according to Claim 1, in which the modulus of elasticity (E1) of the first portion (5; 57) is greater than the modulus of elasticity (E2) of the material of the second portion (6; 58).

3. A skate structure according to Claim 1 or Claim 2 in which the second portion (6; 58) is made of plastics material.

4. A skate structure according to Claim 3, in which the first portion (5; 57) is also made of plastics material.

5. A skate structure according to any one of the preceding claims in which the first portion (5; 57) is co-moulded with the second portion (6; 58).

6. A skate structure according to any one of the preceding claims, in which the modulus of elasticity (E1) of the first portion (5; 57) is greater than 5000 MPa.

7. A skate structure according to Claim 6, in which the modulus of elasticity (E1) of the first portion (5; 57) is greater than 15000 MPa.

8. A skate structure according to any one of the preceding claims, in which the modulus of elasticity (E2) of the second portion (6; 58) is less than 2500 MPa.

9. A skate structure according to Claim 8, in which the modulus of elasticity (E2) of the second portion (6; 58) is less than 1500 MPa.

10. A skate structure according to any one of the preceding claims, in which the second portion (6; 58) comprises at least one window (9; 65) through which the first portion (5; 57) is visible.

11. A skate structure according to Claim 10, in which the second portion (6; 58) comprises a plurality of windows (9; 65) through which the first portion (5; 57) is visible.

12. A skate structure according to one or more of the preceding claims, in which the support (2; 52) further comprises a third portion (21; 71) which extends so as to cover at least part of the first portion (5; 57) and is fixed to the second portion (6; 58), the third portion being made of a material having an modulus of elasticity (E1) and/or a colour different from the modulus of elasticity and/or the colour of the first and second portions.

13. A skate structure according to Claim 12, in which the third portion (21; 71) is made of a material having a modulus of elasticity (E3) lower than the modulus of elasticity of the material of which the second portion (6; 58) is made.

14. A skate structure according to Claim 12 or Claim 13, in which the third portion (21; 71) is co-moulded with the first (5; 57) and second portions (6; 58) so as to form a unitary and substantially indivisible structure.

15. A skate structure according to any one of Claims 12 to 14, in which the modulus of elasticity (E3) of the third portion is below 1000 MPa.

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

17. A skate structure according to Claim 16, in which the first portion (5) comprises a web (7) to one edge (7a) of which the blade (3) is fixed and on the opposite edge of which a flange (8) is formed substantially at right angles to the web (7).

18. A skate structure according to Claim 17, in which the second portion (6) extends so as to cover the web (7) even on the edge to which the blade (3) is fixed.

19. A skate structure according to Claims 11 and 16, in which the windows (9) are arranged at regular intervals.

20. A skate structure according to Claim 19, in which the windows (9) are formed in the second portion (6) in the region of the web (7) of the first portion (5).

21. A skate structure according to one or more of Claims 16 to 20, in which the second portion (6) defines at least one element for the attachment (10, 11) of the footwear (4), the first portion (5) having, in the region of the at least one attachment (10, 11) element, extensions (31, 32) extending away from the blade (3) into the attachment element.

22. A skate structure according to Claim 21, in which the extensions (31, 32) extend through only part of the attachment element (10, 11).

23. A skate structure according to Claim 21 or Claim 22, in which the second portion (6) defines two spaced-apart attachment elements (10, 11) between which a recess (12) is defined, the extensions being restricted to the portions of the attachment elements (10, 11) facing the recess (12).

24. A skate structure according to any one of Claims 12 to 15 and 17, in which the third portion (21) extends

so as to cover the web (7), the flange (8) being incorporated in the second portion (6).

**25.** A skate structure according to one or more of the preceding claims, in which the second portion (6) defines at least one attachment element (10, 11), the support (2) comprising a fourth portion (41) extending from the at least one attachment element to define a respective cradle (42, 43) for housing the footwear (4), the fourth portion (41) being made of a material having a modulus of elasticity and/or a colour different from the modulus of elasticity and/or the colour of at least one of the first and second portions.

**26.** A skate structure according to Claim 25, in which the modulus of elasticity (E4) of the fourth portion (41) is lower than the modulus of elasticity (E2) of the second portion (6).

**27.** A skate structure according to Claim 25 or Claim 26, in which the fourth portion (41) is co-moulded with the first (5), second (6) and third portions (21).

**28.** A skate structure according to one or more of Claims 1 to 15, in which the running means comprise a plurality of aligned wheels (55a-d) supported for rotation on the support (52).

**29.** A skate structure according to Claim 28, in which the first portion (57) comprises a pair of opposed cheeks (59) connected to one another by transverse walls (60) which define with the cheeks respective seats for housing the wheels (55a-d).

**30.** A skate structure according to Claim 29, in which the second portion (58) comprises an elongate body with opposed side walls (64), each side wall extending so as to cover the respective cheek (59) up to the axles for the rotation of the wheels (55a-d).

**31.** A skate structure according to Claim 29, in which each of the cheeks (59) comprises a web (61) on one edge of which a flange (62) is formed substantially at right angles to the web (61), and in the opposite edge of which holes (63) are formed for supporting the wheels for rotation.

**32.** A skate structure according to Claims 11 and 31, in which the windows (65) are formed in the region of the holes (63).

**33.** A skate structure according to Claim 32, in which the windows (65) are also formed in the second portion (58) in positions between pairs of adjacent holes (63).

**34.** A skate structure according to Claim 29, in which the second portion (58) comprises an appendage (72) with a substantially T-shaped cross-section extending from each respective side wall (64) and incorporated in the first (57) and third portions (71).

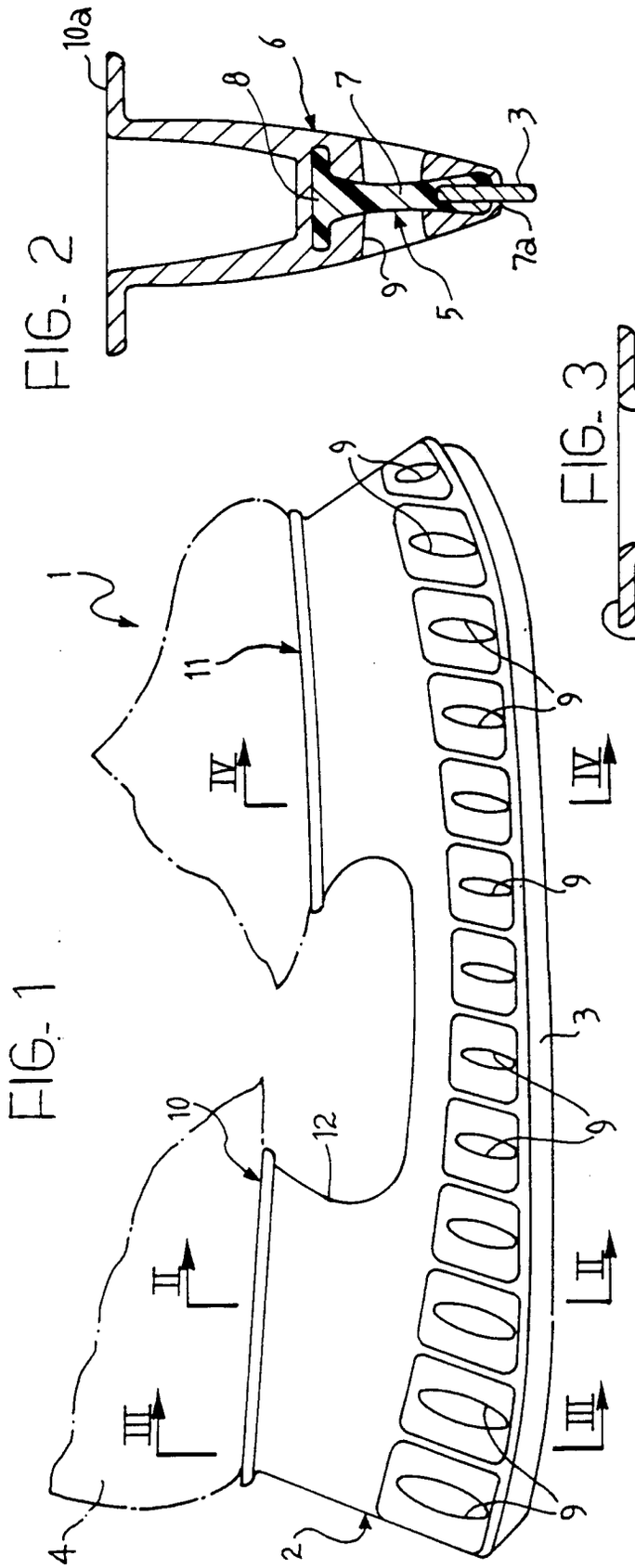


FIG. 1




FIG. 2

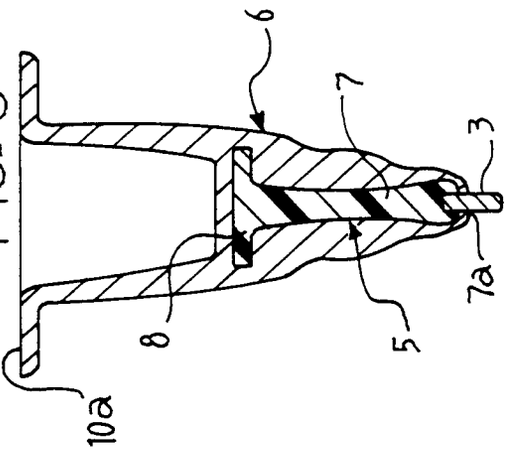


FIG. 3

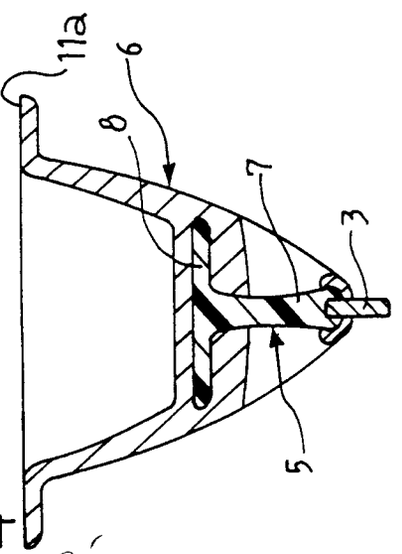


FIG. 4

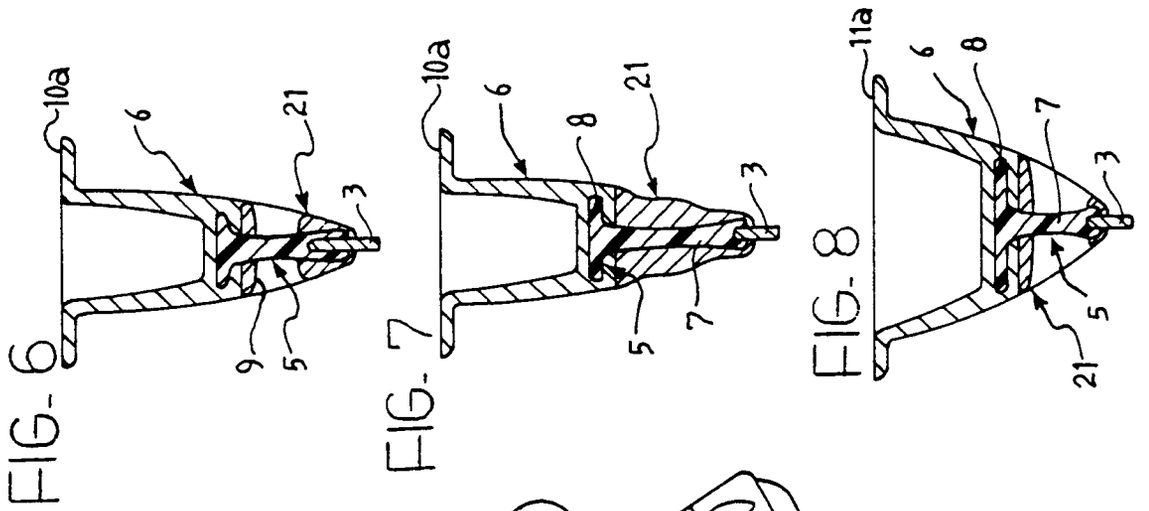


FIG. 6

FIG. 7

FIG. 8

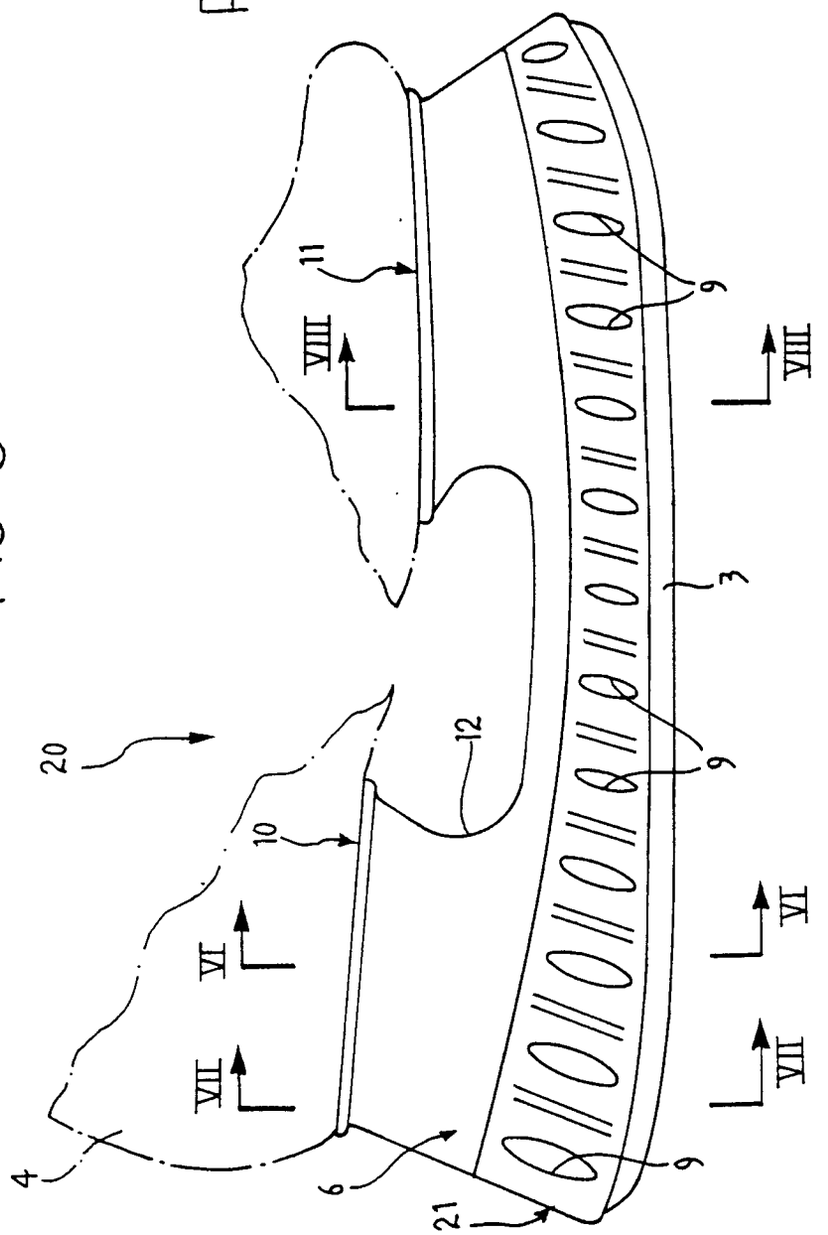


FIG. 5

FIG. 10

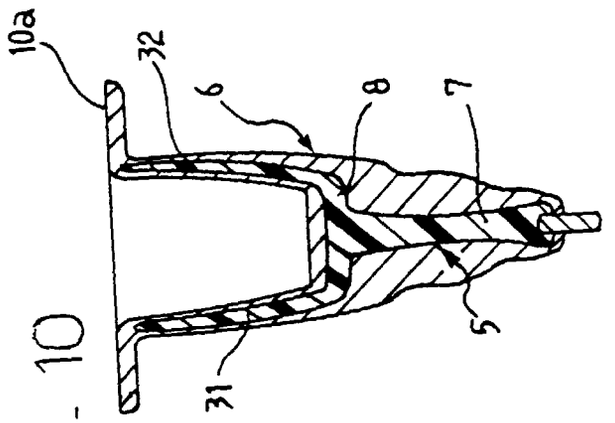


FIG. 9

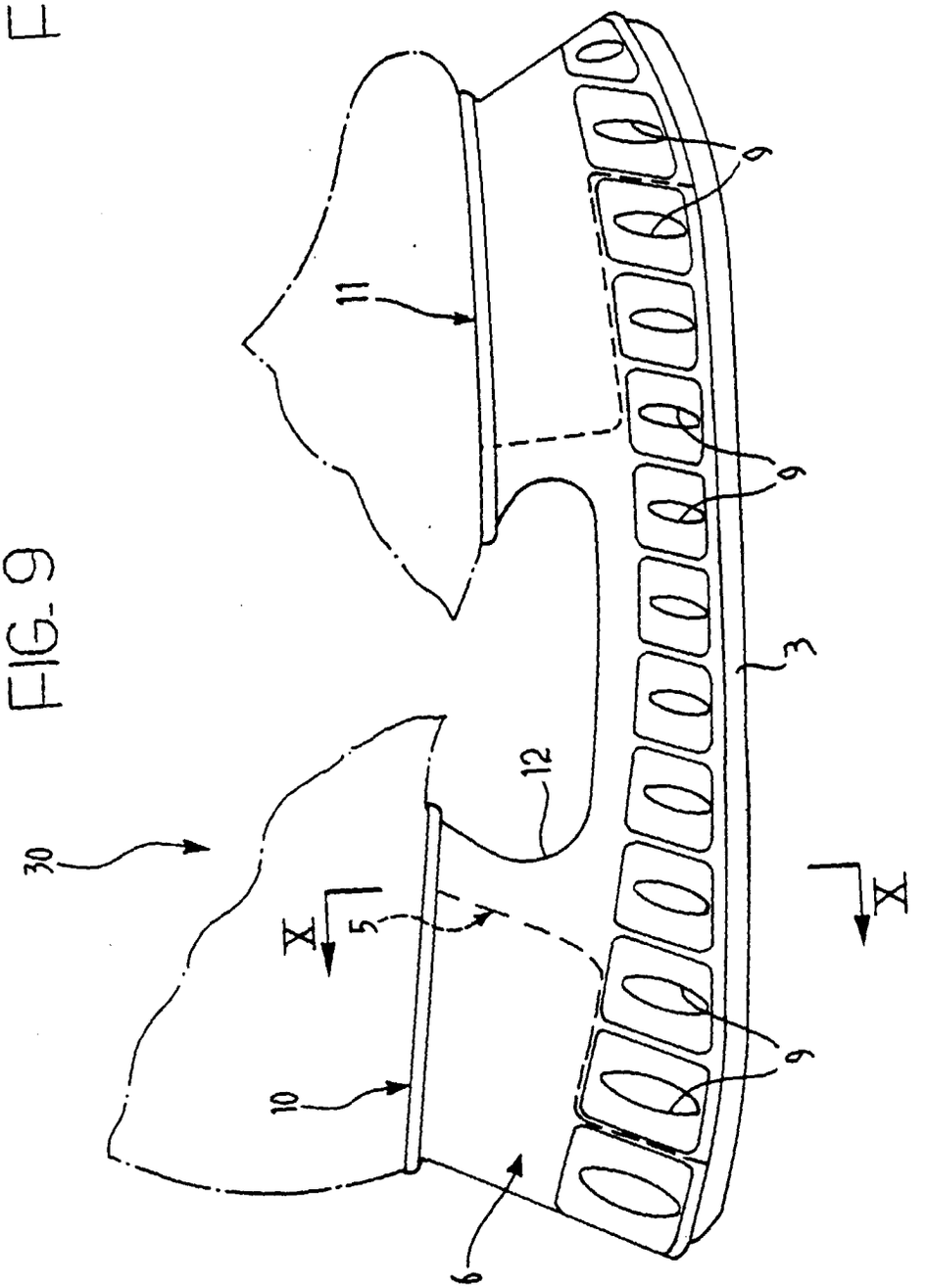

FIG. 11

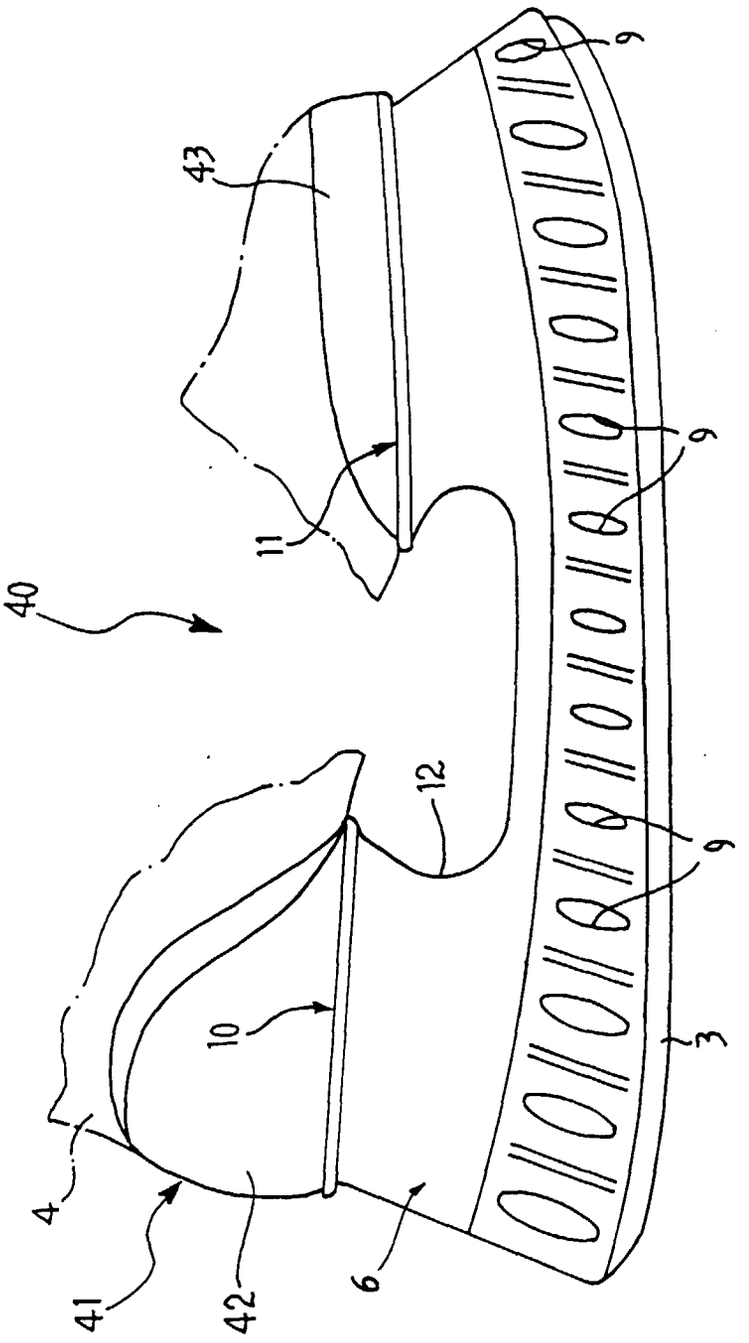

FIG. 12

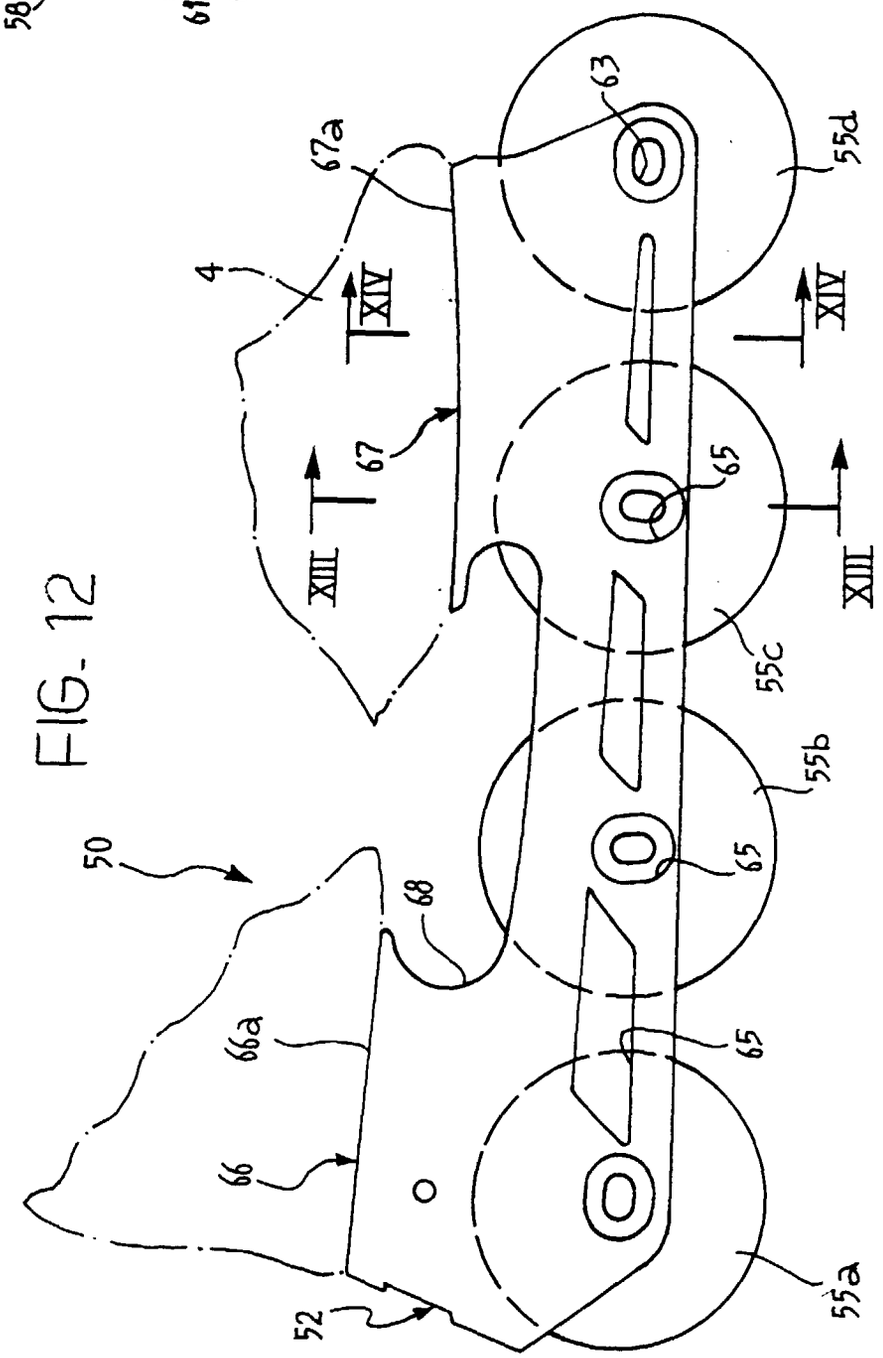


FIG. 13

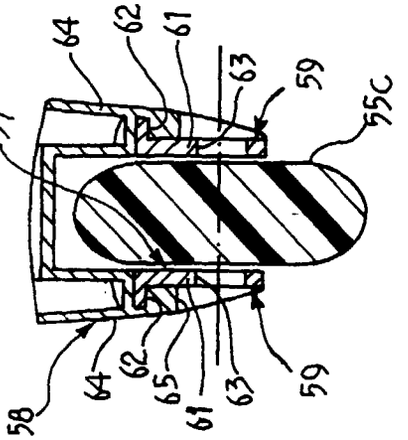


FIG. 14

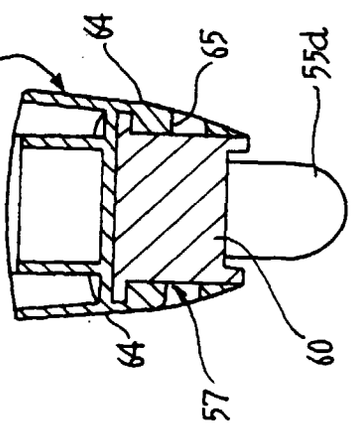

FIG. 16

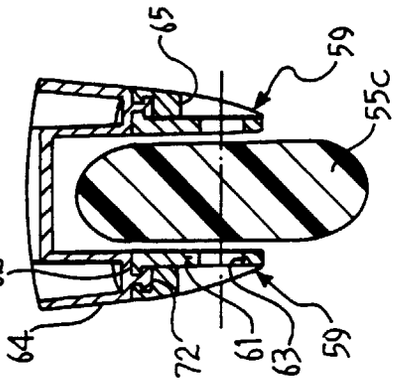


FIG. 17

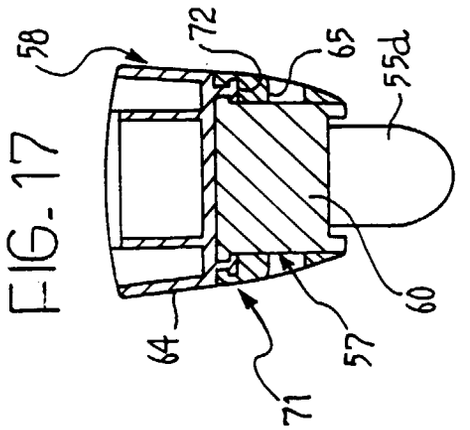


FIG. 15