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(71) Applicant: **Blue Dream SA**
6828 Balema (CH)

(72) Inventors:
- **Blumer, Roberto**
  6828 Balerna (CH)
- **Blumer, Michele**
  21100 Varese (IT)

(74) Representative: **Zardi, Marco**
M. Zardi & Co. S.A.
Via Pioda 6
6900 Lugano (CH)

(54) **A skate wheel assembly for use on artificial surface such as artificial ice.**

(57) A skate wheel assembly (1) for use on artificial ice or the like, comprising: a metal ring (2) secured between support flanges (3, 4) and a rotation axle (6), said metal ring having a plurality of recesses (9), and said flanges (3, 4) having protrusions (21) to engage the recesses (9) of the metal ring (2) when the wheel assembly is mounted.

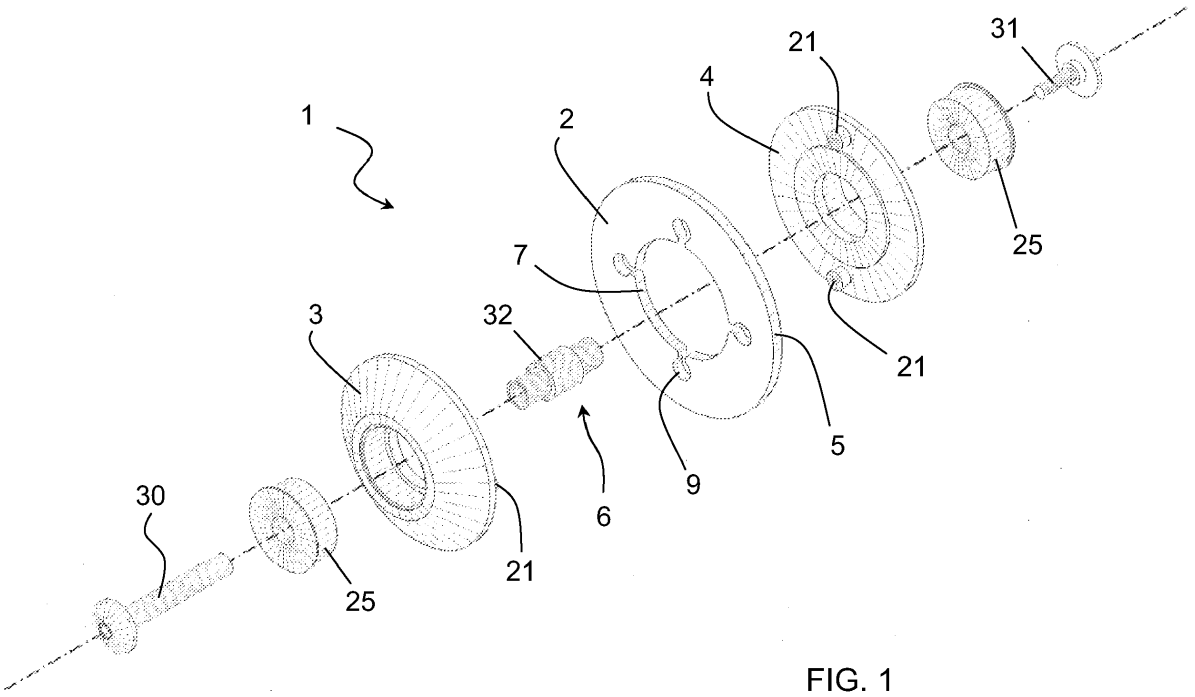

FIG. 1

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Description

Field of the invention

[0001] The invention relates to a skate wheel assembly for use on an artificial surface, for example on artificial ice.

Prior Art

[0002] Artificial ice skating rinks are known in the art. An artificial ice surface is made of a synthetic material with a low friction coefficient, intended to reproduce the experience of skating on ice. Compared to natural ice, a synthetic rink has the advantage of a lower cost and no need to install refrigeration means and connection to an energy source. An ice rink consumes a relevant amount of energy to refrigerate the surface, unless installation is outdoor with a temperature constantly below zero. An artificial ice skating rink can be installed in any location including indoor and outdoor and regardless of climate, and consumes no energy. Further advantages are that an artificial rink can be realized with a modular concept and easily assembled or disassembled, and maintenance costs are much lower compared to ice rinks.

[0003] A conventional bladed ice skate can be used also on artificial ice rinks but it has been noted that conventional ice blades are not optimal for use on artificial ice. It has been noted in particular that keeping a stable position is notably more difficult compared to natural ice, especially for non-experienced users. Moreover, the wear induced on a blade by the artificial ice is more severe than that of natural ice, i.e. frequent sharpening of the blade is required. For these reasons, skates specifically designed for use on artificial ice skating rinks have been developed.

[0004] A known kind of skate for use on artificial ice rinks has one or more of so-called rotating blades. A rotating blade is substantially a wheel assembly with a metal disc or a metal ring contacting the artificial ice surface during the use. Said metal disc is supported for example by two flanges. The thickness of the metal disc provides a skating surface with sharp edges. More in detail, a known wheel assembly for skating on artificial ice comprises a metal disc secured between a pair of support flanges; the support flanges are fitted with bearings for a support axle; the metal disc is secured between the two support flanges by friction, for example by tightly screwing an end screw into a threaded end hole of the support axle.

[0005] The above rotating blade wheel assembly operates by rotational friction instead of linear friction of a conventional blade. It has been found suitable for use on artificial ice or similar surfaces, providing the user with easier skating and reduced need of maintenance (sharpening) but has however some drawbacks. The contact between the metal disc and support flanges should ensure a rotational coupling between said elements and should keep the metal disc perpendicular to the central shaft, but experience shows the vibrations tends to loosen the wheel assembly especially under intensive use. The distance between the flanges may increase, creating some play between the flanges; as a consequence the flanges are no longer able to provide the desired support for the metal ring. As a consequence, the contact between the skating surface of the metal disc and the artificial ice surface becomes less precise and less stable and performance is affected.

Summary of the invention

[0006] The aim of the invention is to provide a novel skate wheel assembly with a metal disc, or so called rotating blade, for use on a synthetic material including artificial ice. A problem underlying the invention is to provide a better performance and a more stable support for the metal ring, avoiding vibration-induced misalignment.

[0007] This aim is reached with a skate wheel assembly comprising:

- a metal ring with a skating surface lying on the outer circumferential edge of the metal ring;
- a first support flange and a second support flange, the metal ring being secured between said support flanges;
- a rotation axle, the wheel assembly being rotatable around said axle;

characterized in that:

- said metal ring has at least a first recess or plurality of recesses, and a second recess or plurality of recesses, and
- the first support flange has one or more protrusions engaging the first recess or recesses and the second support flange has one or more protrusions engaging the second recess or recesses, when the wheel assembly is mounted and the metal ring is secured between the flanges.

[0008] In a preferred embodiment the recesses on the metal ring are passing-through holes, i.e. holes passing the whole thickness of the ring. Preferably the recesses or holes are disposed on a circumference, i.e. centre points of the recesses or holes lie on a circumference having a smaller diameter than the outer circumference of the skating surface.

[0009] Preferably the recesses and protrusions have a symmetrical arrangement and each flange has the same number of protrusions. Preferably the protrusions are formed as cylindrical pins. For example each flange has two pins and the metal ring has four recesses or holes. An advantage of a symmetrical arrangement is that the first and second flanges are identical, which

means they can be molded with a single mold or identical molds. In a preferred embodiment the metal ring has four holes evenly distributed at 90° intervals on a circumference, and each flange has two diametrically opposed pins at 180°, adapted to engage two of the four holes.

[0010] According to another preferred embodiment of the invention, each flange has an inner face with an annular base projecting from the inner face and having a diameter substantially equal to inner diameter of the metal ring. More in detail, the diameter of the annular base is slightly less than the inner diameter of the metal ring, and allows a free but precise matching with said inner diameter of the metal ring. Hence, the annular base provides a mounting seat for the metal ring and a centering means.

[0011] In a preferred embodiment the recesses on the metal ring are passing through holes obtained with a laser cutting process. Even more preferably, the cutting edge of said holes is continuously joined with the inner diameter, namely without any solution of continuity, which means that starting from a metal disc, a single laser-cutting process will be able to remove a central disc portion and at the same time to cut the aforesaid holes.

[0012] The metal ring is preferably made of steel, more preferably a stainless steel and even more preferably a duplex steel.

[0013] The flanges are made preferably of a plastic material. Suitable bearings can be made integral with the flanges, e.g. forced into the axial hole of the flanges.

[0014] During the use, the skating surface of the metal ring is in contact with the artificial ice (or other synthetic surface). The main advantage of the invention is that any torque is transmitted between the flanges and the metal ring by means of the coupling between recesses and protrusions, which is more stable and safer than a mere frictional coupling. Hence the overall stress of the wheel assembly is reduced and resistance to vibrations, stability of the metal ring and performance over time are improved.

[0015] The advantages of the invention are now elucidated with the following detailed description of indicative and not limiting examples.

Brief description of the drawings

[0016]

Fig. 1 shows the components of a skate wheel assembly according to a preferred embodiment of the invention.

Fig. 2 is a front view of the metal ring of the skate wheel assembly of Fig. 1.

Fig. 3 is a side view of the metal ring of Fig. 2.

Fig. 4 shows a support flange of the skate wheel assembly of Fig. 1, viewed form the inner side.

Fig. 5 is a cross section of one of the support flanges.

Fig. 6 is a view of a flange with the respective bearing mounted.

Fig. 7 is a cross sectional view of the flange and bearing assembly of Fig. 6.

Detailed description of a preferred embodiment

[0017] Referring to Fig. 1, a skate wheel assembly 1 comprises a metal ring 2 secured between a first support flange 3 and a second support flange 4. The metal ring 2 has a skating surface 5 with sharp edges, which is intended for contact with a surface of use, for example artificial ice. The assembly 1 is rotatable around an axle 6 by means of a couple of bearings 25.

[0018] The metal ring 2 is shown in Fig. 2 and 3 with a greater detail. Said ring 2 has an inner diameter 7 and an outer diameter 8. The surface of the metal ring 2 has a number of recesses which, in this example, have the form of passing-through holes 9. The preferred embodiment of Fig. 2 has four holes 9 evenly spaced at 90° intervals.

[0019] Each hole 9 has a cutting edge 10 which joins the edge of the inner diameter 7 with no solution of continuity, so that the holes 9 can be made with a laser cutting process while cutting the central hole of the ring 2. For example a process for making the metal ring 2 starts from a metal disc having the same outer diameter 8; a laser cut is made by following a cutting line corresponding to inner diameter 7 and edges 10 of the holes 9 distributed around said inner diameter.

[0020] Preferably the outer diameter 8 is 60 to 70 mm; the inner diameter is around 30 to 35 mm. The thickness of the ring 2, forming the skating surface 5, is preferably about 3 mm. The centres of holes 9 lie on a circumference of about 40 - 45 mm. The metal ring 2 is made preferably with a stainless steel or duplex steel.

[0021] One of the support flanges is shown in Figs. 4 and 5. In this embodiment the flanges 3, 4 are identical and each flange has an inner face 20 (facing the metal ring 2) with two pins 21 protruding from said inner face 20, for engagement with two of the holes 9 of the metal ring 2. The engagement between pins 21 and holes 9 is free, i.e. the diameter of holes 9 is slightly larger than diameter of the pins 21.

[0022] Each flange 3, 4 has a central opening with an annular surface 22 for one of the bearings 25 which support the rotation around axle 6. A suitable bearing such as ABEC-7 ball bearing or the like can be used. The bearing 25 is forced in the central opening of the flange and against the annular surface 22, so that the bearing 25 becomes practically integral with the flange 3 or 4.

[0023] Another preferred feature of flanges 3, 4 is an annular base 23 projecting from the inner face 20. The annular base 23 defines an annular surface 24 providing a seat for the metal ring 2. The diameter of said base 23

of the flanges is slightly less than the inner diameter 7 of the metal ring 2, allowing a free mounting but at the same time a support and centering of said metal ring 2. Preferably the thickness of said annular surface 24 is about half the thickness of the ring 2.

[0024] The axle 6 is preferably made with a central pin 30 a fixing screw 31 and a sleeve member 32 coaxial to the pin 30 (Fig. 1). The pin 30 has a threaded end hole for engagement with the screw 31. The sleeve member 32 has a central annular surface 33 with a larger diameter and left/right annular surfaces 34 for contact with the inner race of the ball bearings 25, when the assembly 1 is mounted.

[0025] As shown in Fig. 1, the flanges 3, 4 are rotated 90° relative to each other, so that the pins 21 of one flange 3 or 4 match two of the holes 9 of the metal ring 2, and the pins 21 of the other flange match the other two holes 9. The metal ring 2 and the flanges 3, 4 are rotationally coupled by the holes 9 - pin 21 engagement. A further advantage is stabilization of the ring 2 avoiding e.g. deviation from the vertical position (perpendicular to axle 6). Moreover, the metal ring 2 is centered and held in position with the help of the annular base 23 and related surface 24.

[0026] Another aspect of the invention is a skate for use on a synthetic surface, especially an artificial ice surface, comprising a wheel assembly or a plurality of wheel assemblies according to any embodiment of the invention. Preferably the wheel assemblies have in-line arrangement.

Claims

1. A skate wheel assembly (1) comprising:

- a metal ring (2) with a skating surface (5) lying on the outer circumferential edge of said metal ring;
- a first support flange (3) and a second support flange (4), the metal ring being secured between said support flanges;
- a rotation axle (6), the wheel assembly being rotatable around said axle;

characterized in that:

- said metal ring (2) has at least a first recess or plurality of recesses (9), and a second recess or plurality of recesses (9), and
- said first support flange (3) has one or more protrusions (21) engaging the first recess(es) and said second support flange (4) has one or more protrusions (21) engaging the second recess(es) when the wheel assembly is mounted and said metal ring is secured between said flanges.

2. Assembly according to claim 1, said recesses (9) and protrusions (21) having a symmetrical arrangement and each flange (3, 4) having the same number of protrusions, thus the first and second flanges being identical.

3. Assembly according to claim 1 or 2, said recesses of the metal ring being passing-through holes (9).

4. Assembly according to any of the previous claims, said protrusions of the flanges having the form of cylindrical pins (21).

5. Assembly according to claim 4, said metal ring having four holes (9) evenly spaced at 90° intervals on a circumference, and each of said flanges (3, 4) having two diametrically opposed pins (21) at 180°, adapted to engage two opposite holes (9) of the metal ring.

6. Assembly according to any of the previous claims, each of said flanges (3, 4) having an inner face (20) with an annular base (23) projecting from the inner face and having a diameter substantially equal to inner diameter (7) of the metal ring (2), said annular base thus providing a mounting and centering means for the metal ring.

7. Assembly according to any of the previous claims, the recesses (9) of said metal ring (2) being made with a laser cutting process.

8. A skate for use on a synthetic surface, especially an artificial ice surface, comprising a wheel assembly or a plurality of wheel assemblies according to any of claims 1 to 7.

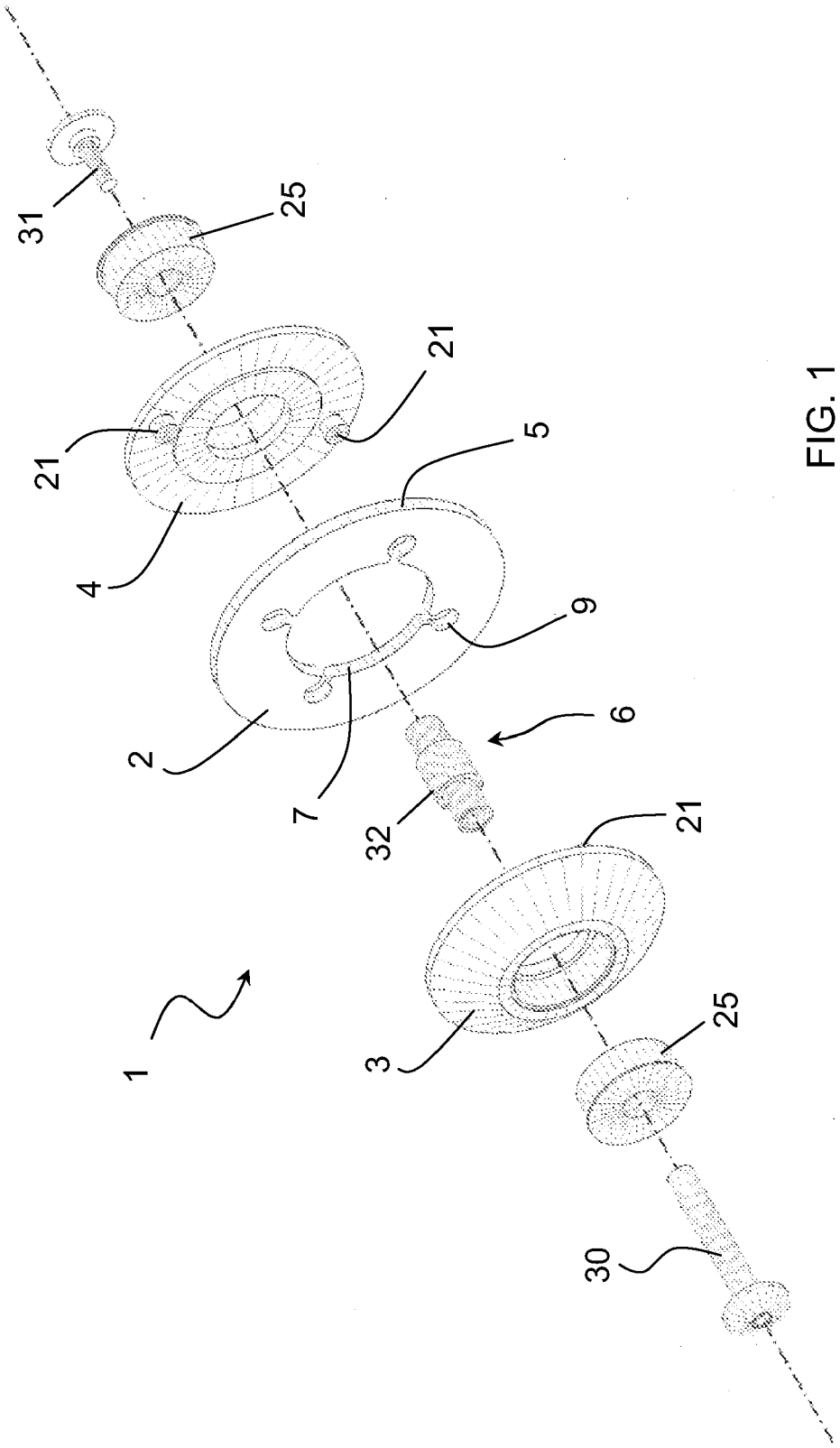


FIG. 1

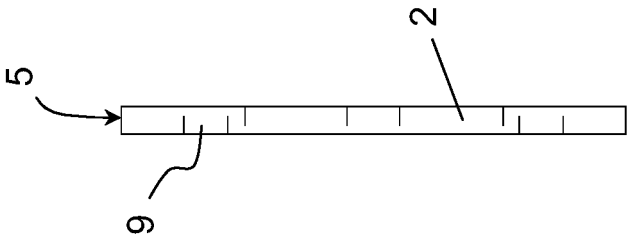


FIG. 3

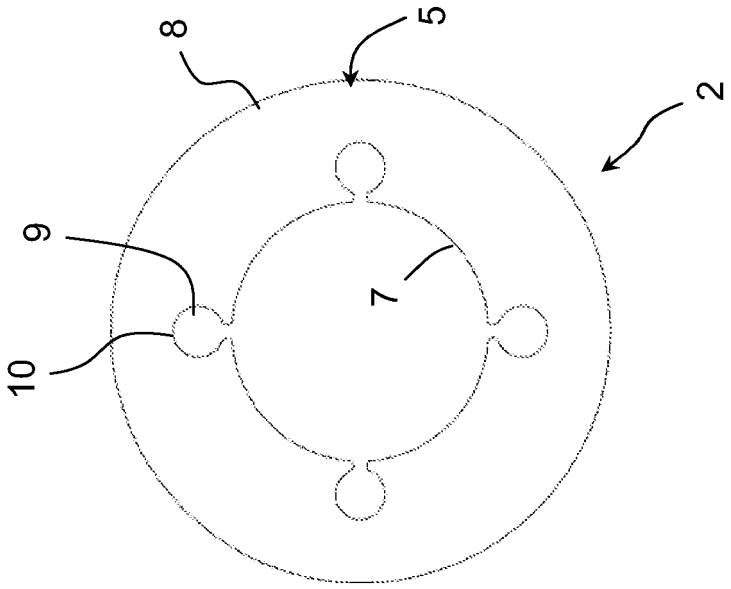


FIG. 2

FIG. 5

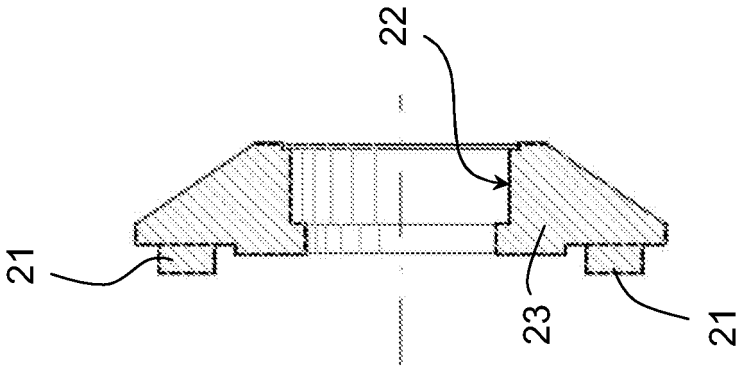
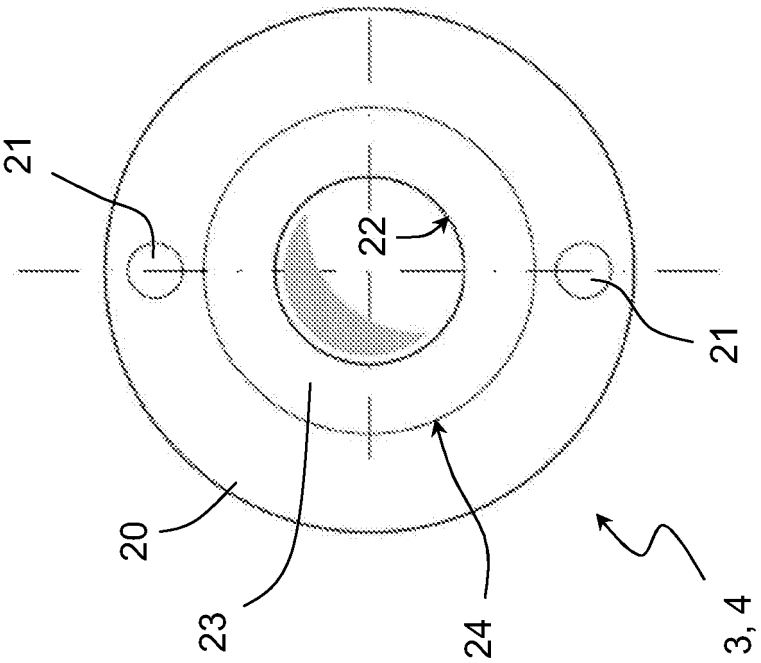


FIG. 4



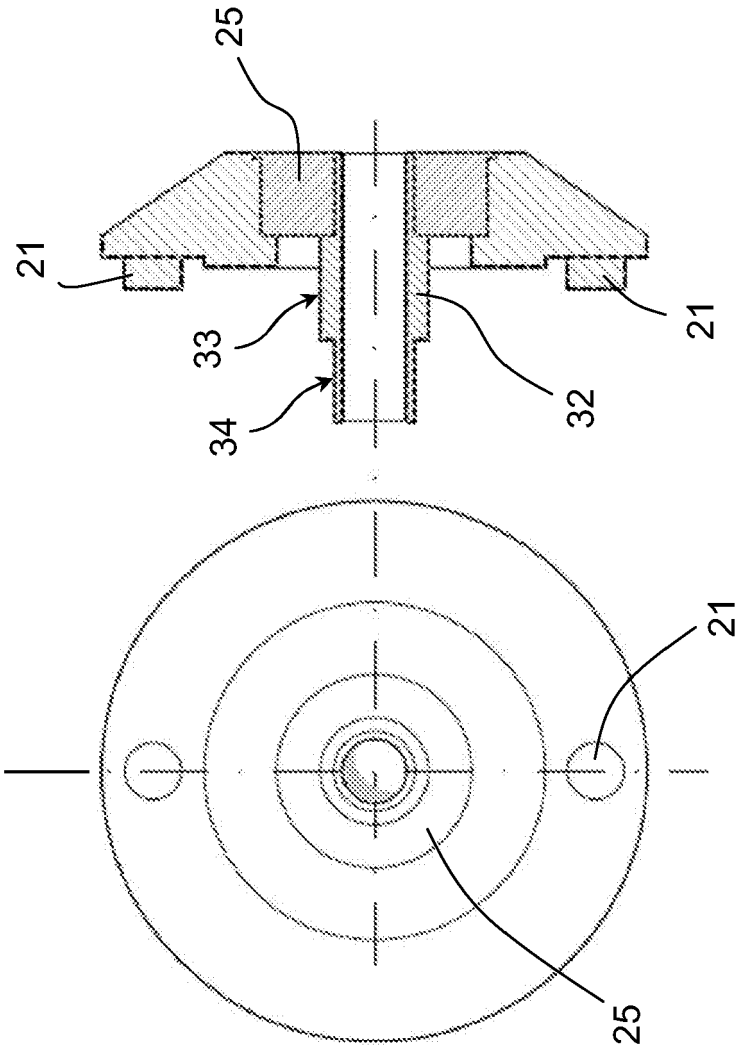


FIG. 7

FIG. 6

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EUROPEAN SEARCH REPORT

Application Number
EP 11 18 1924

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X	US 2010/225100 A1 (DEPETRI FRANK J [US] ET AL) 9 September 2010 (2010-09-09) * paragraph [0040] - paragraph [0049]; figures 1-7 * -----	1-8	INV. A63C1/30 A63C1/42

TECHNICAL FIELDS SEARCHED (IPC)

A63C

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	8 March 2012	Haller, E

CATEGORY OF CITED DOCUMENTS

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Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 2010225100 A1	09-09-2010	NONE	

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