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(54) **Racket**

Schläger

Raquette

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Description

BACKGROUND

Technical Field

[0001] The invention relates to a racket used in badminton and the like.

Related Art

[0002] Badminton is a game in which a player is required to hit down a shuttlecock quickly. So, badminton rackets having high repulsion power have been developed.

[0003] Patent Literature 1 discloses a badminton racket that has a molded carbon fiber prepreg including carbon nanotube.

[0004] [Patent Literature 1] Japanese Patent Application Laid-open Publication No. 2012-147846 Document WO-A-2009/063332 describes a racket frame having a flex point. When swinging a racket, hitting a shuttlecock as far from your arm as possible can increase the velocity at which the string of the racket is contacting the shuttlecock. So, when skilled players hit a smash and the like, they often hit an object such as a shuttlecock at an area of the tip side from the center of the racket frame. Thus, players wish to further increase the velocity at which an object such as a shuttlecock is being hit when hitting the object at an area of the upper side from the center of the frame.

[0005] The invention has been made in view of the above issue, and an advantage thereof is to increase the velocity at which an object is being hit at an area of the tip side from the center of the frame.

SUMMARY

[0006] The invention relates to a racket as claimed in claim 1.

[0007] Other features of this invention will become apparent from the description in this specification and the attached drawings.

Effects of the Invention

[0008] With a racket of the invention, the thin central region of its frame in the direction perpendicular to the plane defined by the frame allows the frame to deform with its central region serving as the kick point when swinging the racket. This can increase the repulsion power of an area of the upper side from the center of the frame. This makes it possible to increase the velocity at which an object is being hit at an area of the tip side from the center of the frame.

BRIEF DESCRIPTION OF THE DRAWINGS

[0009]

FIG. 1A is a front view of a badminton racket 1 according to the present embodiment, and FIG. 1B is a side view of the badminton racket 1 according to the present embodiment.
FIG. 2 is a side view of the frame 10 of the racket 1.
FIG. 3 is an explanatory diagram of the frame 10 when an external force is applied to the tip region 11.

DESCRIPTION OF EXEMPLARY EMBODIMENTS

=== Overview ===

[0010] From the description in the detailed description of the invention and the accompanied drawings, at least the following matters will be apparent.

[0011] A racket, including:

a handle;
a shaft; and
an annular frame,

the frame being connected to the handle through the shaft,
the frame including:

a central region in a shaft-axial direction along which the shaft extends;
a root region located in a shaft side area relative to the central region in the shaft-axial direction;

a tip region located in a racket-tip side area relative to the central region in the shaft-axial direction,

the central region is smaller in thickness in a direction perpendicular to a plane defined by the frame than the root region and the tip region.

[0012] With such a racket, the thin central region of its frame in the direction perpendicular to the plane allows the frame to deform and its central region to serve as the kick point when swinging the racket. This can increase the repulsion power of an area of the upper side from the center of the frame. This makes it possible to increase the velocity at which an object is being hit at an area of the tip side from the center of the frame.

[0013] In such a racket, an elastic modulus of the frame in the central region is higher than an elastic modulus of the frame in the tip region and is higher than an elastic modulus of the frame in the root region.

[0014] With such a racket, the central region has high elastic modulus. This can further increase a restoring force under a deformation which is caused when the central region serves as the kick point. The increased restor-

ing force can further increase the velocity at which an object is being hit. In such a racket, a material of the frame in the central region is different from at least either one of a material of the frame in the tip region and a material of the frame in the root region.

[0015] With such a racket, by using a different material for the central region of the frame from the other regions of the frame, the elastic modulus of the frame in the central region can be made higher than the elastic modulus of the frame in other regions.

[0016] In such a racket, the central region is a region extending in both ways an equal distance in the shaft-axial direction from a center of the frame.

[0017] With such a racket, the real center of the frame in the shaft-axial direction can serve as the central region.

[0018] Therefore, it is possible to provide a racket with excellent balance that allows a player to swing it easily.

[0019] In such a racket, a height of the central region in the shaft-axial direction is smaller than a height of the tip region in the shaft-axial direction and is smaller than a height of the root region in the shaft-axial direction.

[0020] With such a racket, the frame deforms locally on the narrow central region. This makes it possible to hit an object on the tip region with higher repulsion power.

=== Racket 1 ===

[0021] A badminton racket will be described below as an example of a racket according to the present embodiment.

[0022] FIG. 1A is a front view of a badminton racket 1 according to the present embodiment, and, FIG. 1B is a side view of the badminton racket 1 according to the present embodiment. The badminton racket 1 (hereinafter referred to merely as a "racket 1") includes an annular frame 10, a shaft 20 and a handle 30. The frame 10 is strung with a string 40. In FIG. 1A, the central position of the frame 10 in the vertical direction of the racket 1 (the shaft-axial direction) is indicated by the symbol Ct.

[0023] FIG. 2 is a side view of the frame 10 of the racket 1. In FIG. 2, the frame 10 is divided into the following three regions in the shaft-axial direction along which the shaft 20 extends: a tip region 11; a central region 12; and a root region 13. As shown in FIG. 2, the central region 12 is a region extending in both ways an equal distance D in the shaft-axial direction from the center Ct of the frame 10.

[0024] In the frame 10 of the racket 1 of the present embodiment, the central region 12 is thinner than the tip region 11 and the root region 13, as shown in the side view of FIG. 2. Specifically, as shown in FIG. 2, the thickness TH2 of the central region 12 is smaller than the thickness TH1 of the tip region 11 and the thickness TH3 of the root region 13.

[0025] In the present embodiment, the central region 12 in the shaft-axial direction is smaller in width than the tip region 11 and the root region 13 in the shaft-axial direction. Specifically, as shown in FIG. 2, the width L2 of the central region is smaller than the width L1 of the tip region 11 and the width L3 of the root region 13.

[0026] In the frame 10, for the central region 12, selected is a material which is different from the material of the tip region 11 and the material of the root region 13. In this case, the material for the central region 12 is selected so that the tensile modulus of the frame 10 in the central region 12 is higher than in the tip region 11 and in the root region 13. For this purpose, the material of the frame 10 in the central region 12 can differ from at least either one of the material in the root region 13 and the material in the tip region 11.

[0027] For example, as the material of the frame 10 in the central region 12, it is possible to select a material having a tensile modulus of 350 GPa or more, whereas for the material of the tip region 11 and the material of the root region 13, selecting a material having a tensile modulus ranging from 200 to 260 GPa for each region. For example, carbon can be employed for the materials in the tip region 11 and the root region 13.

[0028] Further, in the central region 12, it is possible to select a material so that the tensile modulus of the frame 10 is 450 GPa, for example.

[0029] Increasing the tensile modulus described above can be realized by a heat treatment at a higher temperature or for longer duration when carbon fibers are produced from polyacrylonitrile which is a raw material.

[0030] In such a racket 1, only the central region 12 of the frame is thin as seen from side (that is, only the central region 12 is thin in the direction perpendicular to the plane defined by the frame 10). This allows the frame 10 to deform with the central region 12 serving as the kick point when swinging the racket 1. Here, the kick point of the frame 10 refers to the position where the most of the bending takes place in the frame 10 when swinging the racket 1. That is, it is possible to hit a shuttlecock by bending the frame 10 locally on the central region 12 when swinging the racket 1.

[0031] FIG. 3 is an explanatory diagram of the frame 10 when an external force is applied to the tip region 11. FIG. 3 is a side view of the frame 10, which shows how the frame 10 deforms with the central region 12 serving as the kick point when a force indicated by the arrow is applied to the tip region 11.

[0032] If the central region 12 is the position where the most of the bending takes place as mentioned above, it is possible to increase the repulsion power of an area of the tip side from the center. So, when a player hit a shuttlecock on the area of the tip side from the center, this can further increase the velocity at which the shuttlecock is being hit. Particularly, since a badminton player tends to hit a shuttlecock at an area of the tip side of his/her racket, it is possible to more effectively increase the velocity of the shuttlecock which has been hit.

[0033] Further, by using a different material for the central region 12 of the frame 10 from other regions of the frame, the elastic modulus of the frame 10 in the central region 12 is set higher than the elastic moduli in the root

region 13 and in the tip region 11. Therefore, the frame 10 has a property that, even when the frame 10 deforms with the central region 12 serving as the kick point, the deformed frame 10 is likely to be restored to its original shave by the high restoring force. Because of the repulsion power produced by the restoring force, it is possible to increase the velocity at which an object such as a shuttlecock is being hit.

[0034] That is, in the present embodiment, the thin central region 12 realizes the property of the frame 10 a part of which is easy to bend. Also, employing any high elastic material as the material of the central region 12 increases restoring force, which realizes high repulsion power for the shuttlecock.

[0035] As mentioned above, the central region 12 is a region extending in both ways the equal distance D in the shaft-axial direction from the center Ct of the frame. So, the real center of the frame 10 can serve as the central region 12. Therefore, it is possible to provide the racket 1 with excellent balance that allows a player to swing it easily.

[0036] Further, the width L2 of the central region 12 in the shaft-axial direction is smaller than the width L1 of the tip region 11 in the shaft-axial direction and the width L3 of the root region 13 in the shaft-axial direction. As a result, when swinging the racket 1, the frame deforms locally on the narrow central region 12. This makes it possible to hit a shuttlecock on the tip region of the frame 10 with higher repulsion power.

[0037] Especially when skilled badminton players hit a smash, they tend to hit a shuttlecock at a tip area of the frame 10. That is, the abovementioned configuration enables to further increase the velocity of the shuttlecock which has been hit.

=== Other Embodiments ===

[0038] It should be noted that the aforementioned embodiment is for facilitating understanding of the invention, and are not limiting of the invention, and are not to be interpreted as limiting the invention. The invention can of course be altered and improved without departing from the gist thereof.

< Racket >

[0039] In the above embodiment, a badminton racket is taken as an example of a racket associated with the invention. However, the invention is not limited thereto. For example, the invention may be applied to a tennis racket, a squash racket, and the like.

[0040] In the above embodiment, the badminton racket 1 strung with the string 40 is taken as an example of a racket associated with the invention. However, a racket which is not strung may also be included in the technical idea of the invention as the main body of a badminton racket 1.

[0041] In the above embodiment, for the material for the central region 12, a material with a tensile modulus of 350 GPa or more is employed, whereas for the material of the tip region 11 and the material of the root region 13, a material with a tensile modulus ranging from 200 to 260 GPa is employed for each region. However, the materials are not limited thereto as long as the elastic modulus of the frame 10 in the central region 12 is higher than the elastic modulus of the frame 10 in the root region 13 and the elastic modulus of the frame 10 in the tip region 11.

[0042] In the above embodiment, the central region 12 is a region extending in both ways the equal distance D in the shaft-axial direction from the center of the frame. However, the central region 12 may not be a region extending in both ways an equal distance from the center.

[0043] In the above embodiment, the width of the central region 12 in the shaft-axial direction is smaller than both of the width of the tip region 11 and the width of the root region 13 in the shaft-axial direction. However, the width of the central region 12 may be larger than those of other regions. Reference Signs List

1 badminton racket,
10 frame, 11 tip region, 12 central region, 13 root region,
20 shaft, 30 handle , 40 string

Claims

1. A racket, comprising:

a handle;
a shaft; and
an annular frame, the frame being connected to the handle through the shaft,
the frame including:

a central region;
a root region located in a shaft side area relative to the central region; and
a tip region located in a racket-tip side area relative to the central region,
the central region is smaller in thickness in a direction perpendicular to a plane defined by the frame than the root region and the tip region,
characterised in that an elastic modulus of a material of the frame in the central region is higher than an elastic modulus of a material of the frame in the tip region and is higher than an elastic modulus of a material of the frame in the root region.

2. A racket according to claim 1, wherein the material of the frame in the central region is different from at least either one of the material of the frame in the tip region and the material of the frame in the root region.

3. A racket according to any one of claims 1 to 2, wherein the central region is a region extending in both ways an equal distance in the shaft-axial direction from a center of the frame.

4. A racket according to any one of claims 1 to 3, wherein a height of the central region in the shaft-axial direction is smaller than a height of the tip region in the shaft-axial direction and is smaller than a height of the root region in the shaft-axial direction.

Patentansprüche

1. Schläger, umfassend:

einen Griff;
einen Schaft; und
einen ringförmigen Rahmen, wobei der Rahmen durch den Schaft mit dem Griff verbunden ist, wobei der Rahmen Folgendes umfasst:

einen zentralen Bereich;
einen Wurzelbereich, der sich in einem Schaftseitenbereich relativ zum zentralen Bereich befindet;
und
einen Spitzenbereich, der sich in einem Schlägerspitzenseitenbereich relativ zum zentralen Bereich befindet,
wobei die Dicke des zentralen Bereichs in einer Richtung senkrecht zu einer durch den Rahmen definierten Ebene kleiner als der Wurzelbereich und der Spitzenbereich ist,
dadurch gekennzeichnet, dass ein Elastizitätsmodul eines Materials des Rahmens im zentralen Bereich höher ist als ein Elastizitätsmodul eines Materials des Rahmens im Spitzenbereich und höher ist als ein Elastizitätsmodul eines Materials des Rahmens im Wurzelbereich.

2. Schläger nach Anspruch 1, wobei sich das Material des Rahmens im zentralen Bereich von mindestens einem von dem Material des Rahmens im Spitzenbereich und dem Material des Rahmens im Wurzelbereich unterscheidet.

3. Schläger nach einem der Ansprüche 1 bis 2, wobei der zentrale Bereich ein Bereich ist, der sich in beide Richtungen in gleichem Abstand von einer Mitte des Rahmens in die schaftaxiale Richtung erstreckt.

4. Schläger nach einem der Ansprüche 1 bis 3, wobei eine Höhe des zentralen Bereichs in der schaftaxialen Richtung kleiner ist als eine Höhe des Spitzenbereichs in der schaftaxialen Richtung und kleiner ist als eine Höhe des Wurzelbereichs in der schaftaxialen Richtung.

Revendications

1. Raquette, comprenant :

une poignée ;
une tige ; et
un cadre annulaire, le cadre étant relié à la poignée par la tige,
le cadre comprenant :

une région centrale ;
une région inférieure située dans une zone côté tige par rapport à la région centrale ; et
une région de tête située dans une zone côté tête de raquette par rapport à la région centrale,
la région centrale a une épaisseur inférieure dans une direction perpendiculaire à un plan défini par le cadre à celle de la région inférieure et de la région de tête,
caractérisée en ce qu'un module d'élasticité d'un matériau du cadre dans la région centrale est supérieur au module d'élasticité d'un matériau du cadre dans la région de tête et supérieur au module d'élasticité d'un matériau du cadre dans la région inférieure.

2. Raquette selon la revendication 1, dans laquelle le matériau du cadre dans la région centrale est différent d'au moins un matériau parmi le matériau du cadre dans la région de tête et du matériau du cadre dans la région inférieure.

3. Raquette selon l'une quelconque des revendications 1 et 2, dans laquelle la région centrale est une région qui s'étend dans les deux sens à égale distance du centre du cadre dans la direction axiale de la tige.

4. Raquette selon l'une quelconque des revendications 1 à 3, dans laquelle une hauteur de la région centrale dans la direction axiale de la tigeest inférieure à une hauteur de la région de tête dans la direction axiale de la tige et est inférieure à une hauteur de la région inférieure dans la direction axiale de la tige.

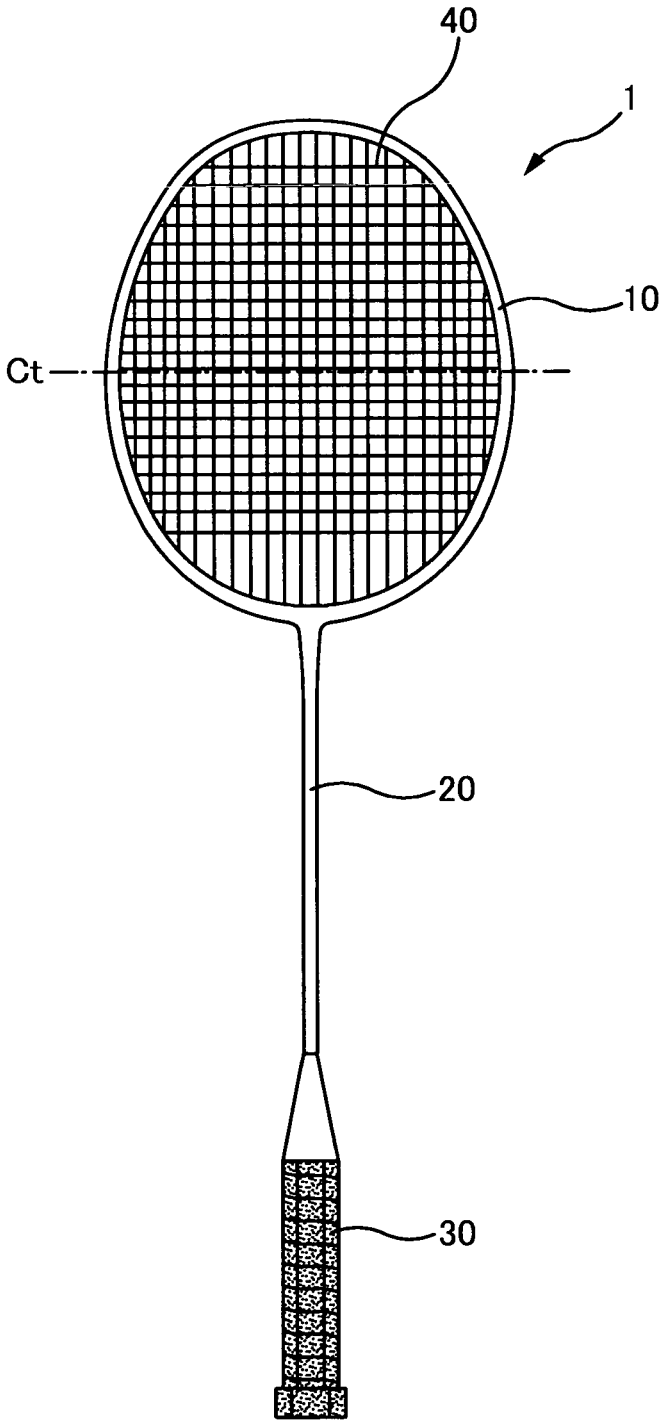

FIG. 1A

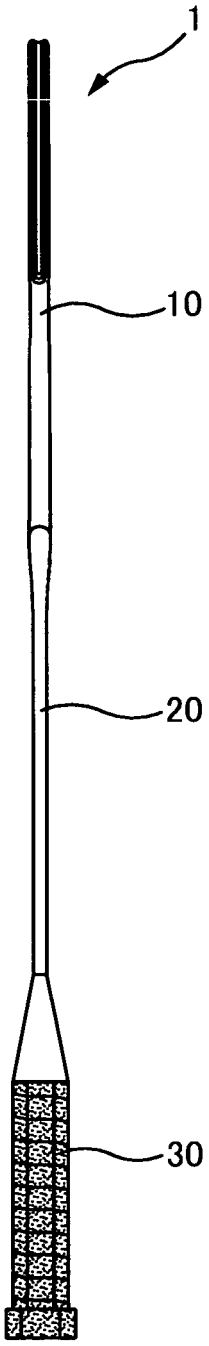

FIG. 1B

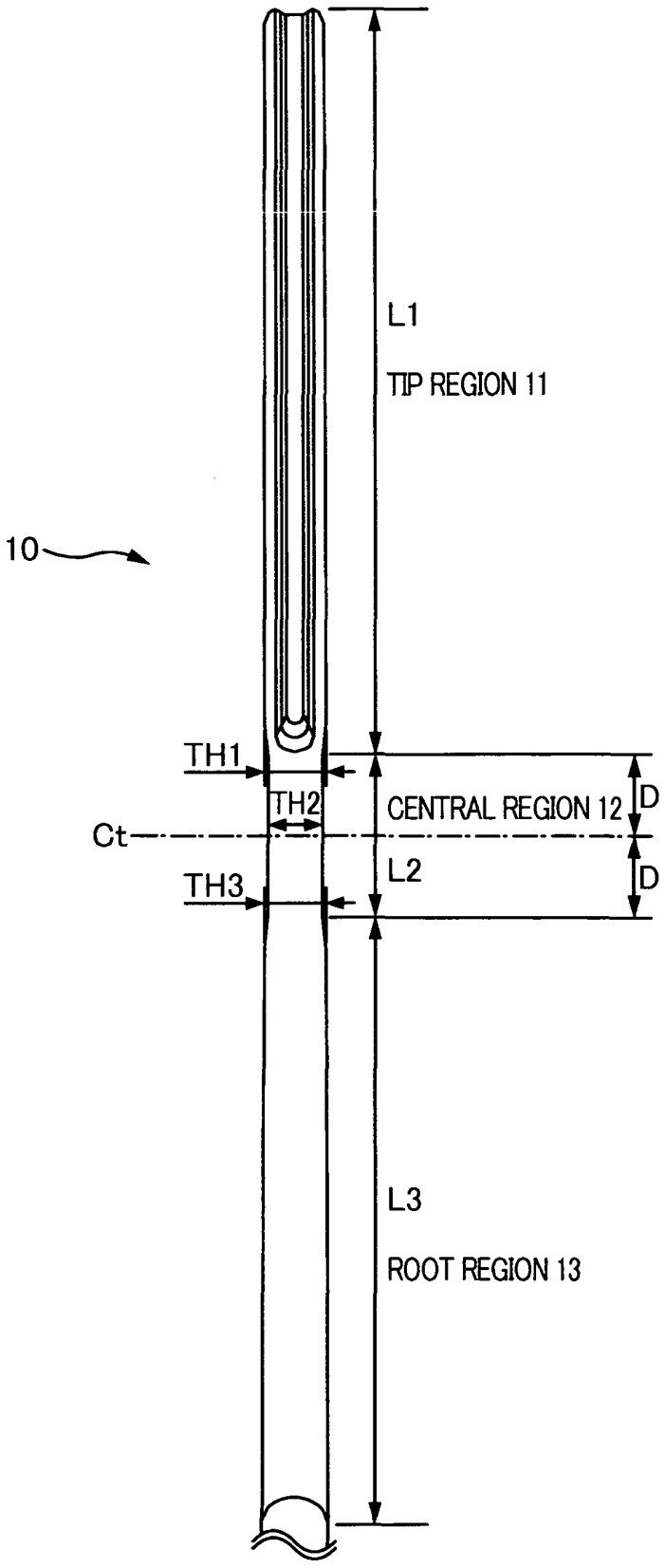
L1
TIP REGION 11
10
TH1
TH2
CENTRAL REGION 12
D
Ct
L2
D
TH3
L3
ROOT REGION 13

FIG. 2

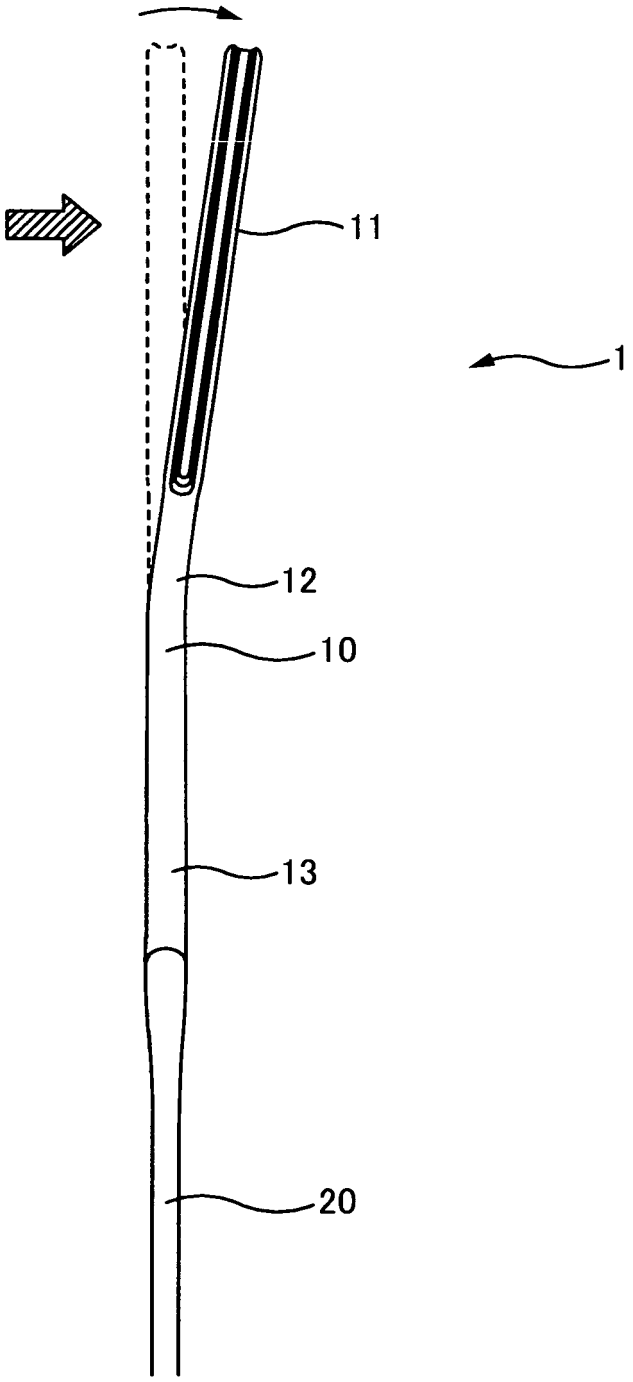

FIG. 3

REFERENCES CITED IN THE DESCRIPTION

This list of references cited by the applicant is for the reader's convenience only. It does not form part of the European patent document. Even though great care has been taken in compiling the references, errors or omissions cannot be excluded and the EPO disclaims all liability in this regard.

Patent documents cited in the description

- JP 2012147846 A **[0004]**
- WO 2009063332 A **[0004]**