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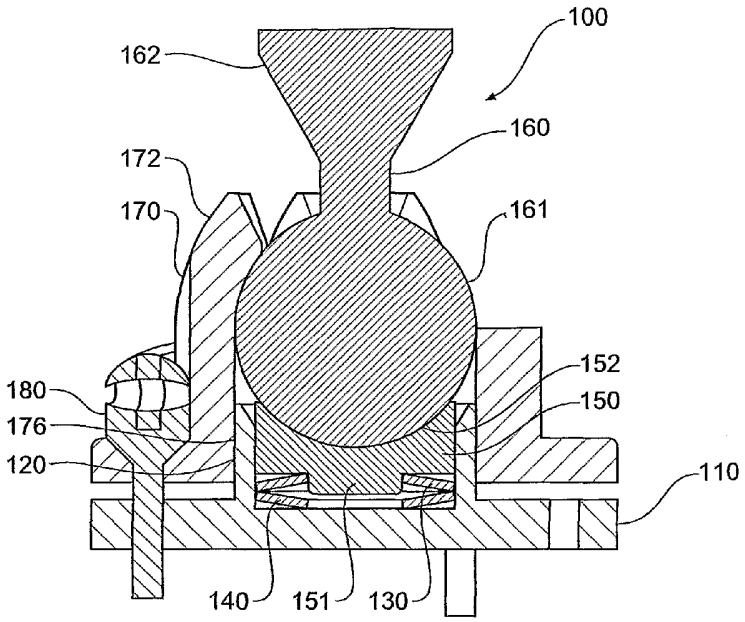
(54) Title: UNIVERSAL BALL JOINT TENSIONING MECHANISM



(57) Abstract: Mounting assembly (100) includes a ball member (160) and a base member (100). Ball member (160) has a mounting portion (162) and spherical section (161) engaged by spring biased supporting means (150). Housing member (170) forms a socket for retaining the spherical section (161) spaced from base member (110) so that the spherical section (161) is in compression with biased supporting means (150). Housing member (170) includes an aperture through which the mounting portion (162) protrudes. Adjustment means (180) is provided for adjusting the biasing force exerted by springs (130, 140) on biased supporting means (150) to allow manual repositioning of mounting portion (162) from a first fixed orientation to a second fixed orientation without further adjustment of the biasing force.

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For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

UNIVERSAL BALL JOINT TENSIONING MECHANISM

FIELD OF THE INVENTION

The present invention relates to an adjustable mounting assembly capable of supporting an article in various orientations. In a particular form the present invention relates to a mounting assembly that may be manually reorientated.

BACKGROUND OF THE INVENTION

There are many examples of articles requiring mounting in a number of fixed orientations. Some examples include camera mounts, mounting arrangements for lighting, computer monitors and even mounts suitable for a telescope. In many of these applications the article mounted must be capable of a multitude of orientations which are not necessarily limited to a particular plane. One means to accomplish the setting of an article into a desired orientation is to provide one or more separate adjustable mounting mechanisms.

Clearly the type of article needing adjustment will determine the number of degrees of freedom of orientation required. For example, a 'still' camera mounted to a tripod will need to be adjustable so that it can be both panned and tilted. The tripod itself will provide the ability for it to be set at an appropriate height above the ground thereby providing a third degree of adjustment.

Typically a mounting mechanism for a 'still' camera consists of two adjustable pivots. For a camera located on a tripod placed on the ground, a first adjustable pivot allows rotation of the camera about a substantially local vertical axis thus providing adjustment of where the camera faces about the horizon (panning). A second adjustable pivot allows rotation of the camera about a substantially local horizontal axis thus providing adjustment of where the camera faces vertically so that it can be pointed level with the horizon, or up or down with respect to the ground (tilting). Achieving a desired orientation is at least a two step process requiring separate adjustment and temporary fixing of the pan and tilt orientation individually.

One approach to improve the ease of use of mounts required for multi-directional applications is to replace the two separate mounts with a single universal joint. This type of joint typically consists of a ball and socket arrangement so that the article to be positioned can be directly manoeuvred to the required orientation. Typically, to lock the mount in a given direction, a screw is threaded through an aperture in the socket section of the mount that directly engages with the ball, thus providing frictional resistance to the movement of the ball so as to maintain the desired orientation. Until friction is applied, the ball joint moves freely so the desired orientation of the article needs to be held by the user until the screw is tightened. To change orientation of the mount this screw must be un-tightened, the orientation changed and held, and then the screw re-tightened.

A serious disadvantage of standard ball and socket type mounts is that they have essentially two states. That is they are either released for manoeuvring the mounted article or locked once the correct orientation has been found. Thus, even if only a small amount of readjustment is required, the mount must be released and then re-locked. Of course when the mount is in the released state the article must be supported or otherwise it will fall under the effect of gravity often resulting in damage to the article that is being supported by the mount.

It is an object of the present invention to provide an adjustable mounting assembly capable of being manually reorientated between any number of fixed orientations without locking and releasing operations.

SUMMARY OF THE INVENTION

In a first aspect the present invention accordingly provides an adjustable mounting assembly including:

a ball member, said ball member including a spherical section and a mounting portion,

a base member, said base member including a biased supporting means to engage said spherical section of said ball member,

a housing member forming a socket for retaining said spherical section spaced from said base member such that said spherical section is in compression with said biased supporting means, said housing member further including an aperture through which said mounting portion protrudes,

and adjustment means for adjusting a biasing force of said biased supporting means to allow manual repositioning of said mounting portion relative to said base member from a first substantially fixed orientation to a second substantially fixed orientation without further adjustment of said biasing force by said adjustment means.

As any article attached to the mounting portion can be repositioned or reorientated by simply moving it to the new orientation without having to release and then retighten the mount in any manner, this mounting assembly provides a decided advantage over standard mounting arrangements. In medical applications it may be of critical importance that an article such as a medical display monitor be able to be quickly and accurately reorientated whilst a physician completes an emergency procedure.

Preferably, said biased supporting means includes a support element slidably mounted to said base member, said support element having an engagement surface to engage said spherical section of said ball member. This provides a convenient way of providing a biasing force to the ball member.

Preferably, said base member includes a sleeve portion to slidably mount said support element, said sleeve portion including biasing means to bias said support element from said sleeve.

In this manner the biasing means and support element are encapsulated in the sleeve thereby simplifying the manufacture of the mounting assembly.

Preferably, said engagement surface is substantially hemispherical. This improves the smoothness of movement when adjusting the mounting assembly between different orientations.

Preferably, said biasing means includes at least one Belleville spring. Belleville springs are a convenient way of providing high biasing forces with small displacement.

Preferably, said adjustment means adjusts the positioning of said housing member relative to said biased supporting means thereby adjusting the compressive force applied by said biased supporting means to said ball member.

This provides a simple way to adjust the overall tension of the mounting assembly as only the relative positioning of certain components of the mounting assembly require adjustment.

Preferably, said adjustment means is manually operable. Preferably, said adjustment means is adjustable at a single location.

Preferably, said aperture includes slots, said slots arranged to allow said mounting portion to be positioned in a predetermined range of orientations. Often it is important to limit the potential range of movement that a mounted article may undergo. Additionally this can prevent damage to an article if the mounting assembly is initially incorrectly adjusted as the article will be prevented from moving freely in an unconstrained manner.

In a second aspect the present invention accordingly provides an adjustable mounting assembly including:

a ball member having a spherical body and a mounting portion,

a base member including biasing means and an abutment member, said abutment member moveable with respect to said base member and in contact with said bias means and with said spherical body,

a housing member in contact with said spherical body so as to allow movement of said ball member with respect to said housing member, and

at least one adjustable spacing member adapted for adjusting the spacing between said housing member and said base member to adjust the tension of said abutment member against said ball member.

BRIEF DESCRIPTION OF THE DRAWINGS

A preferred embodiment of the present invention will be discussed with reference to the accompanying drawings wherein:

FIGURE 1 is a cross-sectional view of a preferred embodiment of the invention;

FIGURE 2 is a cut-away perspective view of the invention illustrated in Figure 1;

FIGURE 3 is a perspective view of the invention as illustrated in Figure 1; and

FIGURE 4 is a perspective view of the invention as illustrated in Figure 1, being used as a mount for a clamp.

In the following description, like reference characters designate like or corresponding parts throughout the several views of the drawings.

DESCRIPTION OF PREFERRED EMBODIMENT

Referring to the drawings, illustrated in Figure 1 is a cross-sectional view of an adjustable mounting assembly 100 according to a preferred embodiment of the present invention. Mounting assembly 100 includes a base member 110 incorporating a central sleeve 120. Support element or abutment member 150 has an overall cylindrical shape that slides freely up and down within sleeve 120. At the bottom of sleeve 120 there is located a pair of opposed Belleville springs 130, 140 acting to bias support element 150 from sleeve 120.

Support element 150 also includes projection 151 which slots into the central aperture of top Belleville spring 130. Support element 150 furthermore includes a concave,

hemispherical upper engagement surface 152 which has a radius of curvature that substantially matches with the lower portion of the spherical section 161 of ball member 160. In this preferred embodiment, support element 150 is constructed from hard chromed steel, but equally it may be constructed from any other suitably rigid material.

Opposed Belleville springs 130 and 140 function to provide resistive force to any downward movement of support element 150 within sleeve 120. This force will increase as the amount of downward deflection of support element 150 within sleeve 120 increases. Ball member 160 is constructed from stainless steel in this embodiment. However, any other suitably rigid material may be used. Ball member 160 includes a spherical section 161 which matches the shape of, and engages with the hemispherical upper engagement surface 152 of support element 150. As would be apparent to those skilled in the art, general biased supporting means which engage and apply a compressive force to the ball member are also contemplated to be within the scope of the invention.

Housing 170 for the ball member 160 also includes a lower cylindrical section 176 allowing it to slide over the exterior surface of sleeve 120 thereby allowing housing 170 to move slidably with respect to base member 110.

As illustrated in Figure 2, housing 170 also includes an upper hemispherical section 172 which envelops the upper portion of the spherical section 161 of ball member 160, forming a socket for the ball member 160. Continuous biasing force resulting from the expansion forces generated by Belleville springs 130 and 140, upon the support element 150, force the upper portion of the ball member 160 into and against the upper hemispherical section 172 of the housing 170, while the housing 170 and base member 110 are maintained in proximity to each other so as to compress the Belleville springs 130 and 140.

Housing 170 also includes aperture 173 through which the post section or mounting portion 162 of ball member 160 protrudes. Housing 170 is attached to base member 110 by a number of screws (one of which is depicted in cross-section in Figures 1 and 2) which are screwed into the base plate. A single screw 180 is configured to be easily turned manually. A single screw or adjustable spacing member 180 is used to adjust the spacing between the base member 110 and the housing 170. The screw rotates freely in an aperture in the housing 170 but is threadingly engaged with the base member 110, which in turn adjusts the position of the housing with respect to the position of the support element 150.

Additional screws or adjustable spacing members (not shown but typically at least two others) are set and typically remain unchanged in relation to the amount that they are screwed into the base member. It has been found that it is only necessary to provide one adjustable screw that can be used to vary the tension between the ball member 160 and the housing 170 or alternatively tighten the tension if there has been wear between the elements.

Referring now to Figure 3, housing 170 includes a first slot 174 and second slot 175. The width of slot 174 allows the neck 163 of post section 162 to positively locate within the sides of slot 174, thus ensuring limited movement in an azimuthal direction for ball member 160. Slot 175 is configured so that only a predetermined range of azimuthal movement of ball member 160 can occur when the neck 163 of post section 162 is within slot 175. Clearly, as would be appreciated by those skilled in the art, the positioning, size and number of slots can be varied according to the requirements for the mounting assembly.

By appropriately adjusting screw 180 mounting assembly 100 may be positioned in a fixed orientation, but due to the inventive arrangement disclosed herein, manual changing of the orientation of the mounting assembly 100 may be performed without further adjustment of screw 180. As ball member 160 is mounted on spring-loaded

upper element 150, ball member 160 may be disengaged from housing 170 by applying appropriate force to post section 162. By applying such force the spherical section 161 of ball member 160 is released from the upper hemispherical section 172 of housing 170, thus allowing free movement of ball member 160 within the confines of housing 170. When the force is released, ball member 160 is once again engaged with housing 170 and thereby again fixing the orientation of mount 100 in a new direction. As would be readily appreciated by those skilled in the art, the degree and type of spring loading can be varied according to the article being mounted.

An example of how mounting assembly 100 may be used in practice includes base member 110 being attached to a rigid structure such as a wall, and an article such as a camera being attached to the post section 162 of ball member 160. Alternatively, post section 162 may be attached to a tripod or a clamp, and the article to be mounted attached to the base member 110. A particular example is illustrated in Figure 4 where mounting assembly 100 is attached to a clamp 200 which is suitable for mounting equipment in a hospital environment.

In this illustrative example, base member 110 of mounting assembly 100 is attached to the rear surface of a flat panel touch screen monitor often used to display patient diagnostic information. Clamp 200 can then be attached to a variety of objects such as a bed railing or similar. By adjusting the tension of mount 100 appropriately, the orientation of the display monitor can be changed easily by the physician from a position parallel to the ground to another position where information can be displayed easily to the patient or other medical personnel. Movement of the monitor is limited within the ranges provided by slots 174 and 175. Thus, the invention disclosed can be used in many different arrangements.

Although a preferred embodiment of the present invention has been described in the foregoing detailed description, it will be understood that the invention is not limited to the embodiment disclosed, but is capable of numerous rearrangements,

modifications and substitutions without departing from the scope of the invention as set forth and defined by the following claims.

THE CLAIMS DEFINING THE INVENTION ARE AS FOLLOWS

1. An adjustable mounting assembly including:

a ball member, said ball member including a spherical section and a mounting portion,

a base member, said base member including a biased supporting means to engage said spherical section of said ball member,

a housing member forming a socket for retaining said spherical section spaced from said base member such that said spherical section is in compression with said biased supporting means, said housing member further including an aperture through which said mounting portion protrudes,

and adjustment means for adjusting a biasing force of said biased supporting means to allow manual repositioning of said mounting portion relative to said base member from a first substantially fixed orientation to a second substantially fixed orientation without further adjustment of said biasing force by said adjustment means.

2. An adjustable mounting assembly as claimed in claim 1, wherein said biased supporting means includes a support element slidably mounted to said base member, said support element having an engagement surface to engage said spherical section of said ball member.

3. An adjustable mounting assembly as claimed in claim 2, wherein said base member includes a sleeve portion to slidably mount said support element, said sleeve portion including biasing means to bias said support element from said sleeve.

4. An adjustable mounting assembly as claimed in claim 2 or 3, wherein said engagement surface is substantially hemispherical.

5. An adjustable mounting assembly as claimed in claim 3 or 4, wherein said biasing means includes at least one Belleville spring.

6. An adjustable mounting assembly as claimed in any one of the preceding claims, wherein said adjustment means adjusts the positioning of said housing member relative to said biased supporting means thereby adjusting the compressive force applied by said biased supporting means to said ball member.

7. An adjustable mounting assembly as claimed in claim 6, wherein said adjustment means is manually operable.

8. An adjustable mounting assembly as claimed in claim 7, wherein said adjustment means is adjustable at a single location.

9. An adjustable mounting assembly as claimed in any one of the preceding claims, wherein said aperture includes slots, said slots arranged to allow said mounting portion to be positioned in a predetermined range of orientations.

10. An adjustable mounting assembly including:

a ball member having a spherical body and a mounting portion,

a base member including biasing means and an abutment member, said abutment member moveable with respect to said base member and in contact with said bias means and with said spherical body,

a housing member in contact with said spherical body so as to allow movement of said ball member with respect to said housing member, and

at least one adjustable spacing member adapted for adjusting the spacing between said housing member and said base member to adjust the tension of said abutment member against said ball member.

11. An adjustable mounting assembly as claimed in claim 1, wherein said abutment member includes a support element slidably mounted to said base member, said support element having an engagement surface to engage a spherical section of said ball member.

12. An adjustable mounting assembly as claimed in claim 11, wherein said base member includes a sleeve portion to slidably mount said support element, said sleeve portion including said biasing means to bias said support element from said sleeve.

13. An adjustable mounting assembly as claimed in claim 11 or 12, wherein said engagement surface is substantially hemispherical.

14. An adjustable mounting assembly as claimed in claim 12 or 13, wherein said biasing means includes at least one Belleville spring.

15. An adjustable mounting assembly as claimed in any one of claims 10 to 14, wherein said at least one adjustable spacing member is manually adjustable.

16. An adjustable mounting assembly as claimed in claim 15, wherein said at least one adjustable spacing member is adjustable at single location.

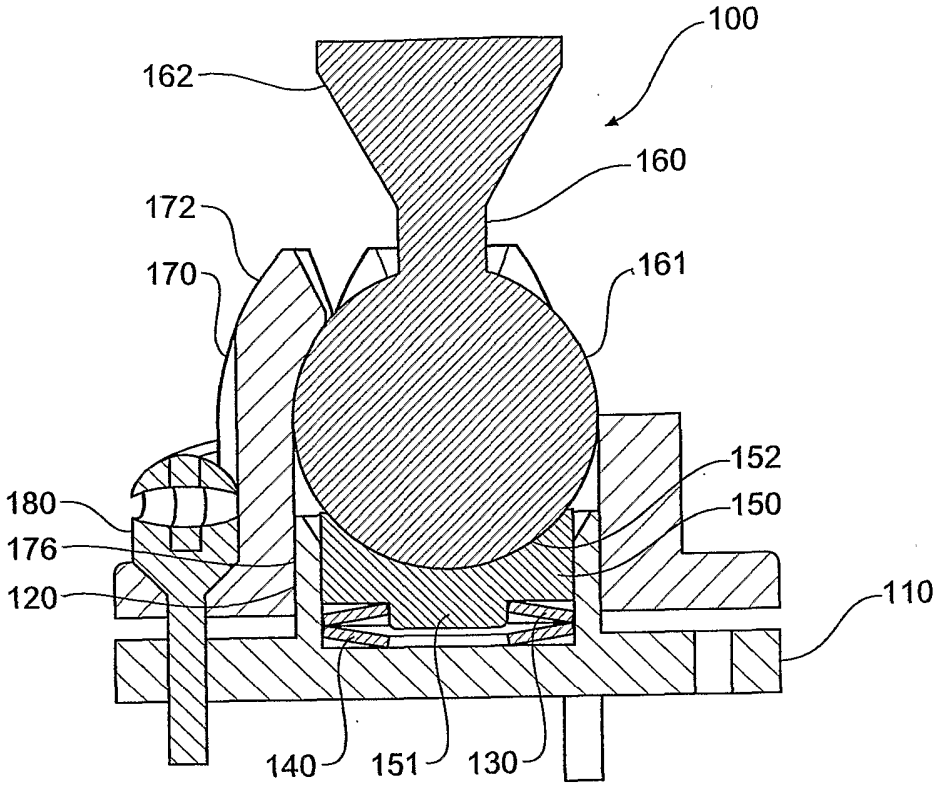
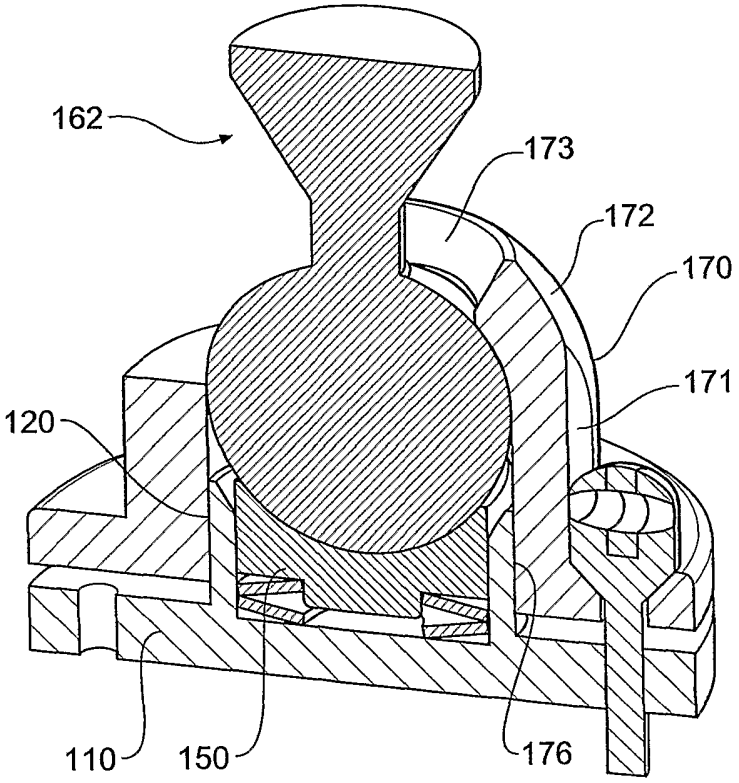

100
162
160
172
170
161
152
150
180
176
120
110
140
151
130

Fig 1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170
171
120
110
150
176

Fig 2

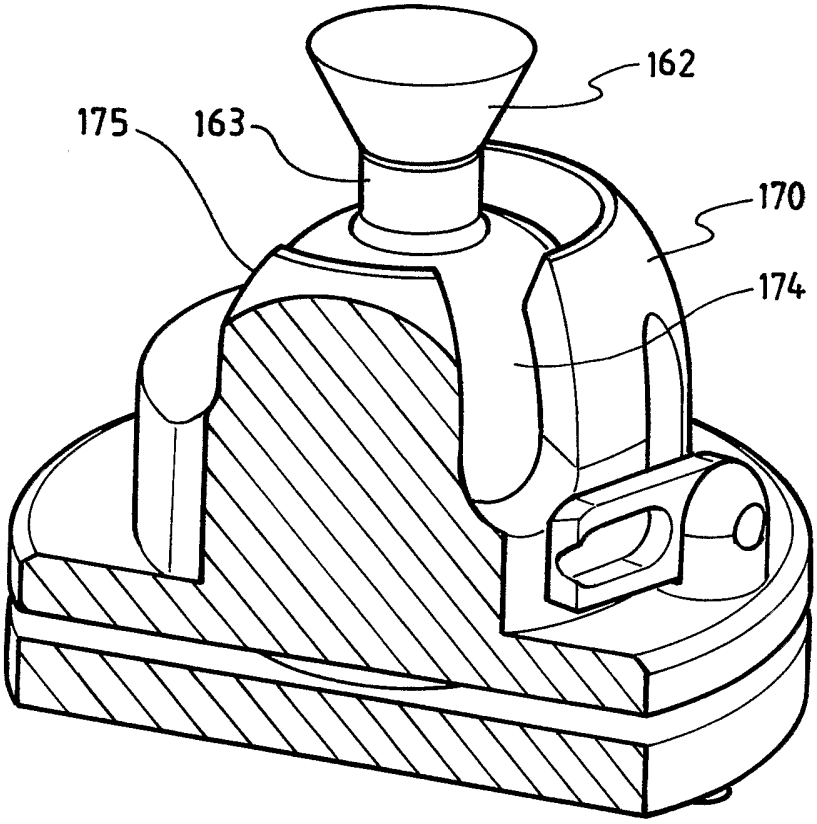

Fig 3

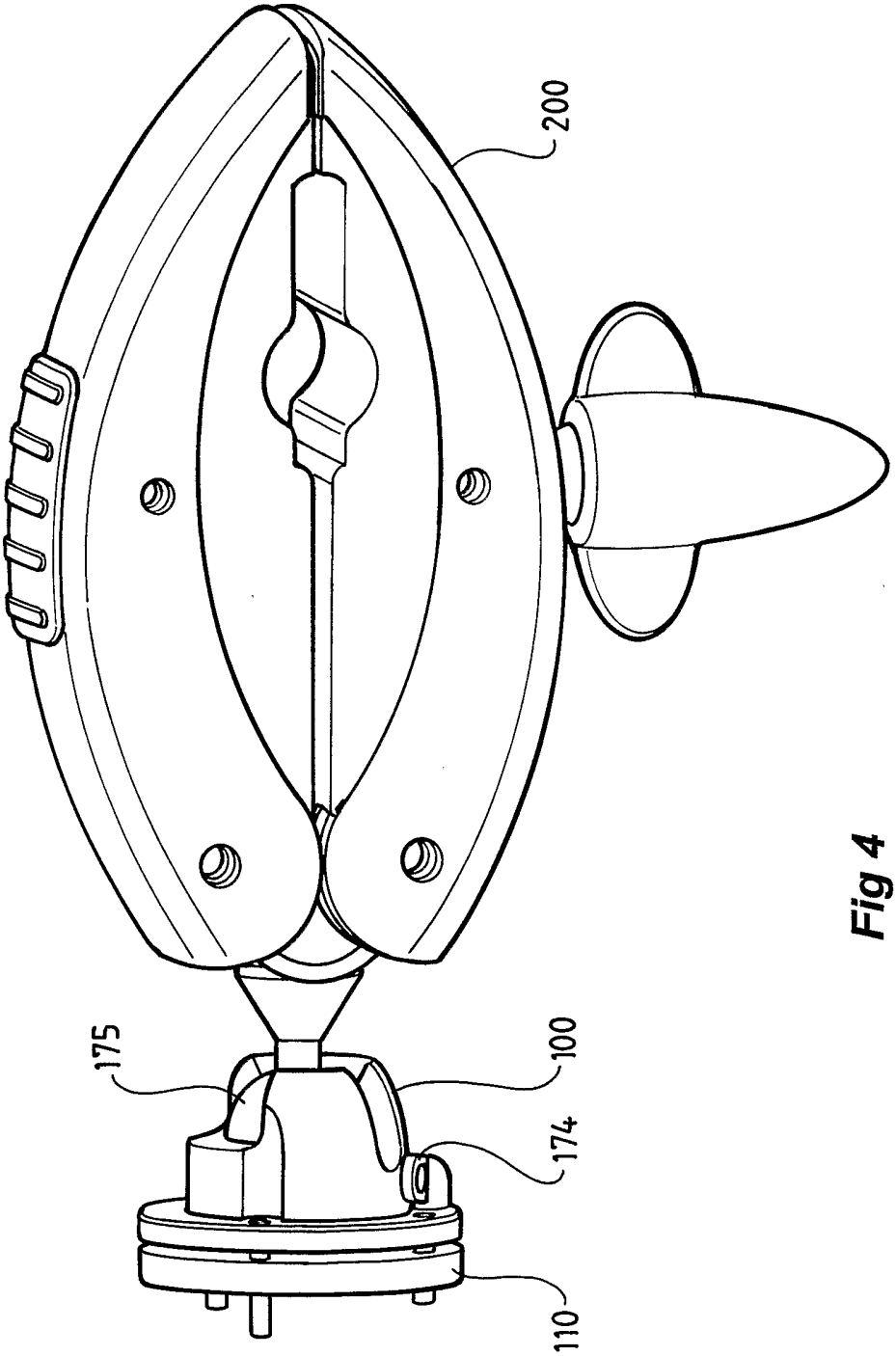

Fig 4

INTERNATIONAL SEARCH REPORT

International application No.
PCT/AU2004/001346

A. CLASSIFICATION OF SUBJECT MATTER

Int. Cl. [7]: F16M 11/14, 13/02; F16C 11/10; B25B 5/16

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched
AU: IPC F16C 11/06, 11/10; F16M 11/14, 13/02; B25B 5/16

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)
DWPI with keywords such as mount, pivot, ball, adjust, spring and similar terms.

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 3622112 A (STROH) 23 November 1971 Figure 4	1-16
X	FR 2658585 A (PFLIEGER) 23 August 1991 Whole document	1-16
X	US 4974802 A (HENDREN) 4 December 1990 Whole document	1-16
X	FR 1018869 A (GITZHOVEN) 14 January 1953 Figure 1	1-16

[X] Further documents are listed in the continuation of Box C [X] See patent family annex

* Special categories of cited documents:
"A" document defining the general state of the art which is not considered to be of particular relevance
"E" earlier application or patent but published on or after the international filing date
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"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
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"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
29 October 2004	4 NOV 2004
Name and mailing address of the ISA/AU	Authorized officer
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INTERNATIONAL SEARCH REPORT

International application No.
PCT/AU2004/001346

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 4447139 A (BIBER) 8 May 1984 Whole document	1-16
X	GB 723695 A (WALL'S LTD) 9 February 1955 Whole document	1-16

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No.
PCT/AU2004/001346

This Annex lists the known "A" publication level patent family members relating to the patent documents cited in the above-mentioned international search report. The Australian Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

Patent Document Cited in Search Report		Patent Family Member	
US	3622112	NONE	
FR	2658585	NONE	
US	4974802	NONE	
US	4447319	GB	2090324

Due to data integration issues this family listing may not include 10 digit Australian applications filed since May 2001.

END OF ANNEX