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JOINT ASSEMBLY WITH MULTIPLE DEGREES OF ROTATIONAL FREEDOM

FIELD OF THE INVENTION

5 The present invention relates to joint assemblies. In particular, the present invention relates to joints which give multiple degrees of freedom.

BACKGROUND OF THE INVENTION

Assemblies for mounting objects such as video projectors and
10 televisions should preferably contain a joint which provide multiple degrees of rotational freedom for proper alignment to be maintained. Prior art assemblies of this type usually give only one or two degrees of rotational freedom, which are adequate for mounting equipment such as loud speakers and television. But for other types of equipment, such as
15 projectors, which require finer spatial alignment, mounting assemblies which give only two degrees of freedom become very tricky to use. Furthermore, prior art assemblies are often complicated, with numerous components involved, making the assembling process tedious and difficult, particularly for a lay-person who wants to Do-it-yourself.

OBJECT OF THE INVENTION

It is therefore an object of the present invention to provide a joint assembly which overcome the shortcomings as stated above.

It is another object to provide one embodiment of a joint assembly with two
5 degrees of rotational freedom.

It is another object to provide another embodiment of a joint assembly with three degrees of rotational freedom.

SUMMARY OF THE INVENTION

10 According to the objects of the present invention, there is provided a simple yet versatile joint assembly that offers multiple degrees of rotational freedom to objects attached to opposing sides of the joint. This joint is provided with a cross-shaped attachment member with the first and second arm both having cylindrical ends. A first and a second bracket each with two
15 holes, are rotatably attached to the ends of the first and second arms respectively by fastening members. When the fastening members are not tightly fastened, rotational movements via the longitudinal axes of the respective arms are allowed for the respective brackets. As the two arms are perpendicularly disposed, there are provided two degrees of rotational
20 freedom for an object attached to the first bracket in relation to a second object attached to the second bracket. For a third degree of freedom, one embodiment provides an additional rotating means which can be attached to one of the brackets.

BRIEF DESCRIPTION OF THE DRAWINGS

Figure 1 is an exploded view of the preferred embodiment of the present invention.

Figure 2 is a perspective view of the preferred embodiment of the present
5 invention.

Figure 3 is a perspective view of the cross member of the preferred embodiment.

DESCRIPTION OF THE INVENTION

10 Figure 1 shows the specific preferred embodiment of the present invention wherein a first bracket **20** and a second bracket **22** are attached to a cross member **24**. In this embodiment, the two brackets are identical and are generally saddle-shaped, with a flat base **26** and two lugs **28** extending perpendicularly outwards from the two opposing edges of the flat
15 base. A circular hole **30** is provided on the end of each lug and is adapted for engaging the ends of the arms of the cross member. In this embodiment, the arms are hollow and contain internal threads, such that screws **32** may be used to secure the bracket onto the ends of the arms. For rotational movement of a bracket along the longitudinal axis of the corresponding
20 arm, the screw may be loosened. For fixed positioning, the screws may be re-tightened after the proper position has been obtained.

For a third degree of rotation, a number of different rotating joints may be attached to one of the brackets. In the example shown in Figure 1, an L-bar

34 with an arcuate end 36 is used to engage the neck 38 of a column 40. Column 40 has one end attached to the first bracket, with the remaining portion of the column adapted for insertion into a cylindrical member or tube 42. The column is secured within the cylindrical tube by the L-bar, which is
5 attached by a screw 44 to the external surface of the cylindrical tube. The arcuate end 36 of the L-bar may be fitted as a brace around neck 38 through slot 46 of the cylindrical tube. This allows the column to rotate along the longitudinal axis of the cylindrical tube, providing a third degree of rotational freedom.

10 For mounting equipment which require alignment adjustment along all three axis of rotation, the embodiment as shown in Figure 1 and 2 is ideal. Attachment means such as holes 48 may be provided on the cylindrical element for attachment onto a ceiling or wall. Fastening means such as holes 50 and screws may also be provided on the second bracket for
15 mounting the equipment. A base plate 52 may also be provided for fastening larger equipment.

Figure 2 shows the specific preferred embodiment and the three axes of rotation. It is clear that using the present embodiment, a piece of equipment may be adjusted by rotation in all directions.

20 Figure 3 shows a cross member which may be used to practice the present invention. The arms are cylindrical to allow rotational movement of the brackets. The end of each arm has a flange for the engagement of the bracket. If screws are used for tightening the bracket onto the end of the arm, then the cross member should have hollow arms with internal thread.

Alternatively, the threads may be provided externally onto a longer flange, in which case the arms may be solid rods and nuts can be used to secure the brackets.

While the present invention has been described particularly with
5 references to Figs 1 to 3 with emphasis on a joint assembly for hanging
equipment from a wall or ceiling, it should be understood that the figures
are for illustration only and should not be taken as limitation on the
invention. In addition it is clear that the method and apparatus of the
present invention has utility in many applications where rotatable joints are
10 required. It is contemplated that many changes and modifications may be
made by one of ordinary skill in the art without departing from the spirit and
the scope of the invention described.

CLAIMS

- 1 1. A joint assembly comprising :
- 2 a) a cross member with a first and second arm having cylindrical
- 3 ends;
- 4 b) a first bracket having two holes for rotatably engaging the two
- 5 ends of said first arm;
- 6 c) a second bracket having two holes for rotatably engaging the
- 7 two ends of said second arm; and
- 8 d) four fastening members for securing said first and second
- 9 brackets onto said first and second arms.
- 1 2. A joint assembly according to claim 1 wherein said first bracket is
- 2 attached to rotating means for rotating said first bracket to give the
- 3 joint assembly a third degree of rotational freedom.
- 1 3. A joint assembly according to claim 2 wherein said rotating means
- 2 comprises a
- 3 a) a cylindrical tube;
- 4 b) a column with a neck having one end fixedly attached to said
- 5 first bracket and a second end inserted into the cylindrical
- 6 tube;
- 7 c) an L-shaped bracket having one end fixedly attached to the
- 8 exterior surface of said cylindrical tube and a second arcuate

9 end extending into the interior of the cylindrical tube to
10 rotatably engage the neck of said column.

1 4. A joint assembly according to claim 1 wherein said first bracket has a
2 flat base with one lug provided on each of two opposing edges of
3 said base and one hole disposed within each lug.

1 5. A joint assembly according to claim 4 wherein said second bracket is
2 substantially identical to said first bracket.

1 6. A joint assembly according to claim 1 wherein said first bracket
2 further comprises attachment means for mounting to an object.

1 7. A joint assembly according to any one of claims 1-6 wherein said
2 second bracket further comprises fastening means for mounting to
3 an object.

1 8. A joint assembly according to claim 6 wherein said fastening means
2 comprises holes in the second bracket and screws for fastening an
3 object to be mounted.

1 9. A joint assembly according to claim 7 wherein said fastening means
2 comprises holes in the second bracket and screws for fastening an
3 object to be mounted.

1 10. A joint assembly according to any one of claim 1-6 wherein a base
2 plate is attached to said second bracket.

1 11. A joint assembly according to any one of claims 1-5 wherein said
2 fastening members are screws and said first and second arms are
3 internally threaded.

1 12. A joint assembly according to any one of claims 1-5 wherein the
2 ends of said first and second arms have flanges for engaging the
3 holes of said first and second brackets.

1 13. A joint assembly according to claim 11 wherein said fastening
2 members are nuts and said first and second arms have externally
3 threaded flanges.