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(71) Applicant: **MORRIS KURTZON, INC.** [US/US]; 1420 South Talman Avenue, Chicago, IL 60608 (US).

(72) Inventor: **WEDELL, Mark**; Envisionlight, 3316 Winchester Road, Hoover, AL 35226 (US).

(74) Agent: **FLENNER, Zareefa, B.**; FLENER IP LAW, LLC, 77 West Washington Street, Suite 800, Chicago, IL 60602 (US).

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(54) Title: MOUNTING CLAMP

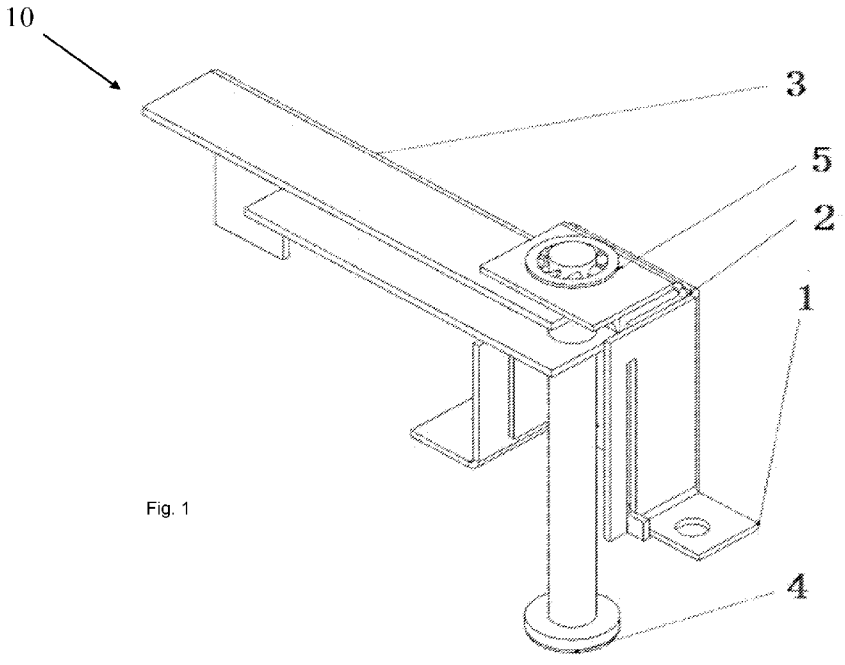


Fig. 1

(57) Abstract: Anew mounting clamp is proposed to fit more ceiling/fixture combinations without interference. According to an embodiment of the present invention, a mounting clamp for fixing a lighting fixture to a ceiling support grid comprises: a first bracket used for being fixedly attached to the lighting fixture; a second bracket telescoped inside the first bracket; a third bracket used for being clamped onto the ceiling support grid; a screw inserted through the third bracket and the second bracket and enabling the third bracket to swivel and to be telescoped when the screw is turned; and a nut set on the screw and above the second bracket.

[Continued on next page]

Declarations under Rule 4.17:

— *of inventorship (Rule 4.17(iv))*

Published:

— *with international search report (Art. 21(3))*

MOUNTING CLAMP

FIELD OF THE INVENTION

Embodiments of the present invention are related to a lighting fixture, and more particularly to a mounting clamp for installing a lighting fixture.

BACKGROUND OF THE INVENTION

A mounting clamp is installed on a lighting fixture and is used for fixing the lighting fixture on a ceiling. By putting the mounting clamp onto a ceiling support grid, the lighting fixture can be fixed on the ceiling. Conventional mounting clamps swivel from the lighting fixture body outward 90 degrees and clamp over a ceiling structure. This means that the conventional mounting clamp is disposed higher than the fixture and thus may prevent installation into certain buildings due to obstructions like sprinklers, A/C ducts, security systems, wiring systems etc.

SUMMARY OF THE INVENTION

In order to overcome the shortcomings of conventional mounting clamps, a new mounting clamp is proposed to fit more ceiling/fixture combinations without interference.

According to an embodiment of the present invention, a mounting clamp for fixing a lighting fixture to a ceiling support grid comprises: a first bracket used for being fixedly attached to the lighting fixture; a second bracket telescoped inside the first bracket; a third bracket used for being clamped onto the ceiling support grid; a screw inserted through the third bracket and the second bracket and enabling the third bracket to swivel and to be telescoped when the screw is turned; and a nut set on the screw and above the second bracket.

The second bracket may comprise a top plate, the third bracket may be set below the top plate, and the nut may be set on the screw and above the top plate.

The first bracket may comprise a first left side plate and a first right side plate, and the second bracket may comprise a second left side plate and a second right side plate. Each of the first left side plate and the second left side plate may include an opening. The third bracket may swivel through the opening of the first left side plate and the opening of the second left side plate, and up to 90 degrees by blocking of the second right side plate.

The third bracket may comprise a threaded hole. The screw may be inserted through the threaded hole and the third bracket may be telescoped when the screw is turned in the threaded hole.

The first bracket may comprise at least one groove that is parallel to a telescoping direction of the second bracket, and the second bracket may comprise at least one sliding block. The at least one sliding block may be slid in the at least one groove when the second bracket is telescoped inside the first bracket.

The nut may be further provided with star washers.

According to embodiments of the present invention, the third bracket can be pivoted 90 degrees but also be telescoped to different heights to match the heights of the ceiling type and the lighting fixture. Therefore, the mounting clamp will fit more ceiling/fixture combinations without interference.

BRIEF DESCRIPTION OF THE DRAWINGS

Fig. 1 illustrates a structure of a mounting clamp according to one embodiment of the present invention.

Fig. 2 illustrates an explosive view of a structure of a mounting clamp according to one embodiment of the present invention.

Figs. 3a~3f respectively illustrate a top view, a bottom view, a front view, a left view, a right view and a space view of a structure of a first bracket according to one embodiment of the present invention.

Figs. 4a~4f respectively illustrate a top view, a bottom view, a front view, a left view, a right view and a space view of a structure of a second bracket according to one embodiment of the present invention.

Figs. 5a~5d respectively illustrate a top view, a front view, a right view and a space view of a structure of a third bracket according to one embodiment of the present invention.

Fig. 6 illustrates a structure of a lighting fixture according to one embodiment of the present invention.

DETAILED DESCRIPTION OF THE INVENTION

Throughout the specification and claims, the following terms take the meanings explicitly associated herein, unless the context clearly dictates otherwise. The phrase “in one embodiment” as used herein does not necessarily refer to the same embodiment, though it may. Furthermore, the phrase “in another embodiment” as used herein does not necessarily refer to a different embodiment,

although it may. Thus, as described below, various embodiments of the invention may be readily combined, without departing from the scope or spirit of the invention.

In addition, as used herein, the term "or" is an inclusive "or" operator, and is equivalent to the term "and/or," unless the context clearly dictates otherwise. The term "based on" is not exclusive and allows for being based on additional factors not described, unless the context clearly dictates otherwise. In addition, throughout the specification, the meaning of "a", "an", and "the" include plural references. The meaning of "in" includes "in" and "on". The term "coupled" implies that the elements may be directly connected together or may be coupled through one or more intervening elements. Further reference may be made to an embodiment where a component is implemented and multiple like or identical components are implemented.

Hereinafter a mounting clamp for fixing a lighting fixture to a ceiling support grid will be described in detail with reference to Figs. 1-6.

Fig. 1 illustrates a structure of a mounting clamp 10 according to one embodiment of the present invention. Fig. 2 illustrates an explosive view of a structure of a mounting clamp 10 according to one embodiment of the present invention. Figs. 3a~3f respectively illustrate a top view, a bottom view, a front view, a left view, a right view and a space view of a structure of a first bracket according to one embodiment of the present invention. Figs. 4a~4f respectively illustrate a top view, a bottom view, a front view, a left view, a right view and a space view of a structure of a second bracket according to one embodiment of the present invention. Figs. 5a~5d respectively illustrate a top view, a front view, a right view and a space view of a structure of a third bracket according to one embodiment of the present invention. Fig. 6 illustrates a structure of a lighting fixture according to one embodiment of the present invention.

As shown in Figs. 1 and 2, a mounting clamp 10 includes a first bracket 1, a second bracket 2, a third bracket 3, a screw 4 and a nut 5. In an embodiment, the nut 5 may be further provided with star washers.

The first bracket 1, as shown in Figs. 3a~3f, is used for being fixedly attached to a lighting fixture. The second bracket 2, as shown in Figs. 4a~4f, is telescoped inside the first bracket 1. The third bracket 3, as shown Figs. 5a~5d, is used for being clamped onto a ceiling support grid. The screw 4 is inserted through the third bracket 3 and the second bracket 2, enabling the third bracket 3 to swivel and to be telescoped when the screw 4 is turned. The nut 5 is set on the screw 4 and above the second

bracket 2.

In an embodiment of the present invention, as shown in Fig. 4f, the second bracket 2 includes a top plate 21. In this case, the third bracket 3 is set below the top plate 21, and the nut 5 is set on the screw 4 and above the top plate 21.

Based on the structure above, when a lighting fixture is to be installed on a ceiling, the detail installation process may include the following steps.

Firstly, a plurality of mounting clamps 10 are installed on the lighting fixture in advance. For example, as shown in Fig. 6, four mounting clamps 10 are installed on four corners of the lighting fixture. The installation process of each mounting clamp may include: inserting the second bracket 2 into the first bracket 1 and inserting the third bracket 3 below the top plate 21 of the second bracket 2 to form an assembled bracket; fixing the first bracket 1 on the lighting fixture; attaching the screw 4 from a hole at a bottom of the fixture and through the second bracket 2 and the third bracket 3; and then attaching the nut 5 on the screw 4.

The mounting clamp is conducive to being used with a shorter fixture height or thickness. When the mounting clamp collapses by telescoping, the height above the fixture can be reduced. The mounting clamp by telescoping may, for instance, only project to less than one and a half (1.5) inches above the light fixture. In one embodiment the height is about between one (1) inch to about one eighth ($^1/_8$) of an inch above the fixture, and in another embodiment to ¼ inch above the fixture. The telescoping and configuration of the mounting clamp reduces the height of the fixture, reduces the height of the carton, and in turn increases the number of fixtures on a transportation truck thus additionally reducing freight costs.

Secondly, the lighting fixture is mounted into the ceiling. Thus the mounting clamps installed on the fixture are also mounted into the ceiling along with the lighting fixture.

Lastly, the lighting fixture is fixed on the ceiling by operating the mounting clamps. The detail operation process of each mounting clamp includes: making the second bracket 2 and the third bracket 3 telescope up and turning the screw 4 to make the third bracket 3 swing out 90 degrees; then turning the screw 4 reversely to make the third bracket 3 telescope downward until the third bracket 3 is clamped onto the ceiling support grid. Thus the lighting fixture is fixed on the ceiling via the four mounting clamps on the four corners.

In an embodiment of the present invention, the third bracket 3 includes a threaded hole. The screw

4 is inserted through the threaded hole and the third bracket 3 is telescoped when the screw 4 is turned in the threaded hole.

In another embodiment of the present invention, as shown in Figs. 3f and 4f, the first bracket 1 includes at least one groove 11 that is parallel to a telescoping direction of the second bracket 2; and the second bracket 2 comprises at least one sliding block 24. The at least one sliding block 24 is slid in the at least one groove 11 when the second bracket 2 is telescoped inside the first bracket 1.

In an embodiment of the present invention, as shown in Figs. 3f and 4f, the first bracket 1 further includes a first left side plate 12 and a first right side plate 13, the second bracket 2 further includes a second left side plate 22 and a second right side plate 23. Each of the first left side plate 12 and the second left side plate 22 includes an opening. The third bracket 3 swivels through the opening of the first left side plate 12 and the opening of the second left side plate 22, and swivels up to 90 degrees by blocking of the second right side plate 23.

The mounting clamp 10 can be formed from a variety of suitable materials including, but not limited to, a metal selected from the group consisting of steel and aluminum. In some embodiments, the apparatus is formed from cold-rolled steel. In other embodiments, the mounting clamp 10 can be formed from a plastic. In yet other embodiments, different components of the mounting clamp 10 – the first bracket 1, the second bracket 2, the third bracket 3, and the screw 4 – are composed of a mixture of suitable materials. It may be understood that the term “material” is used herein to indicate any material suitable for incorporation into an apparatus, a bracket assembly, or a mounting assembly, including other rigid materials.

The mounting clamp 10 can be formed using a variety of suitable manufacturing methods including, but not limited to, molding and extruding. In an exemplary embodiment, the mounting clamp 10 is made from a sheet of metal that is cut and folded into the appropriate dimensions and shape. In another exemplary embodiment, the mounting clamp 10 is made from metal that is melted and extruded until the appropriate dimensions and shape. It may be understood that the mounting clamp 10 can be manufactured using one or more of the disclosed manufacturing methods or any suitable manufacturing method for rigid materials

The above contents are the descriptions of the preferred embodiments of the present invention, which cannot be used to limit the protection scope of the present invention. Under the principle and the novel feature of the present invention, any modifying, equivalent replacement, improvement, etc.

are all considered to be within the protection scope of the present invention.

CLAIMS

I Claim:

1. A mounting clamp for fixing a lighting fixture to a ceiling support grid, comprising:

a first bracket used for being fixedly attached to the lighting fixture;

a second bracket telescoped inside the first bracket;

a third bracket used for being clamped onto the ceiling support grid;

a screw inserted through the third bracket and the second bracket and enabling the third bracket to swivel and to be telescoped when the screw is turned; and

a nut set on the screw and above the second bracket.

2. The mounting clamp of claim 1, wherein the second bracket comprises a top plate, the third bracket is set below the top plate, and the nut is set on the screw and above the top plate.

3. The mounting clamp of claim 1, wherein the first bracket comprises a first left side plate and a first right side plate, and the second bracket comprises a second left side plate and a second right side plate.

4. The mounting clamp of claim 3, wherein each of the first left side plate and the second left side plate includes an opening.

5. The mounting clamp of claim 4, wherein the third bracket swivels through the opening of the first left side plate and the opening of the second left side plate, and up to 90 degrees by blocking of the second right side plate.

6. The mounting clamp of claim 1, wherein the third bracket comprises a threaded hole.

7. The mounting clamp of claim 6, wherein the screw is inserted through the threaded hole and the third bracket is telescoped when the screw is turned in the threaded hole.

8. The mounting clamp of claim 1, wherein the first bracket comprises at least one groove that is parallel to a telescoping direction of the second bracket, and the second bracket comprises at least one sliding block.

9. The mounting clamp of claim 8, wherein the at least one sliding block is slid in the at least one groove when the second bracket is telescoped inside the first bracket.

10. The mounting clamp of claim 1, wherein the nut is further provided with star washers.

11. A plurality of mounting clamps as claimed in claim 1, mounted to a lighting fixture wherein the height protruding from the light fixture of the mounting clamps when collapsed and mounted on the lighting fixture is between about 1/8 inch to 1 inch above the surface of the lighting fixture.

12. A plurality of mounting clamps as claimed in claim 1, mounted to a lighting fixture wherein the height protruding from the light fixture of the mounting clamps when collapsed and mounted on the lighting fixture is about 1/4 inch above the surface of the lighting fixture.

13. A plurality of mounting clamps as claimed in claim 1, mounted to a lighting fixture wherein the height protruding from the light fixture of the mounting clamps when collapsed and mounted on the lighting fixture is less than about 1.5 inches above the surface of the lighting fixture.

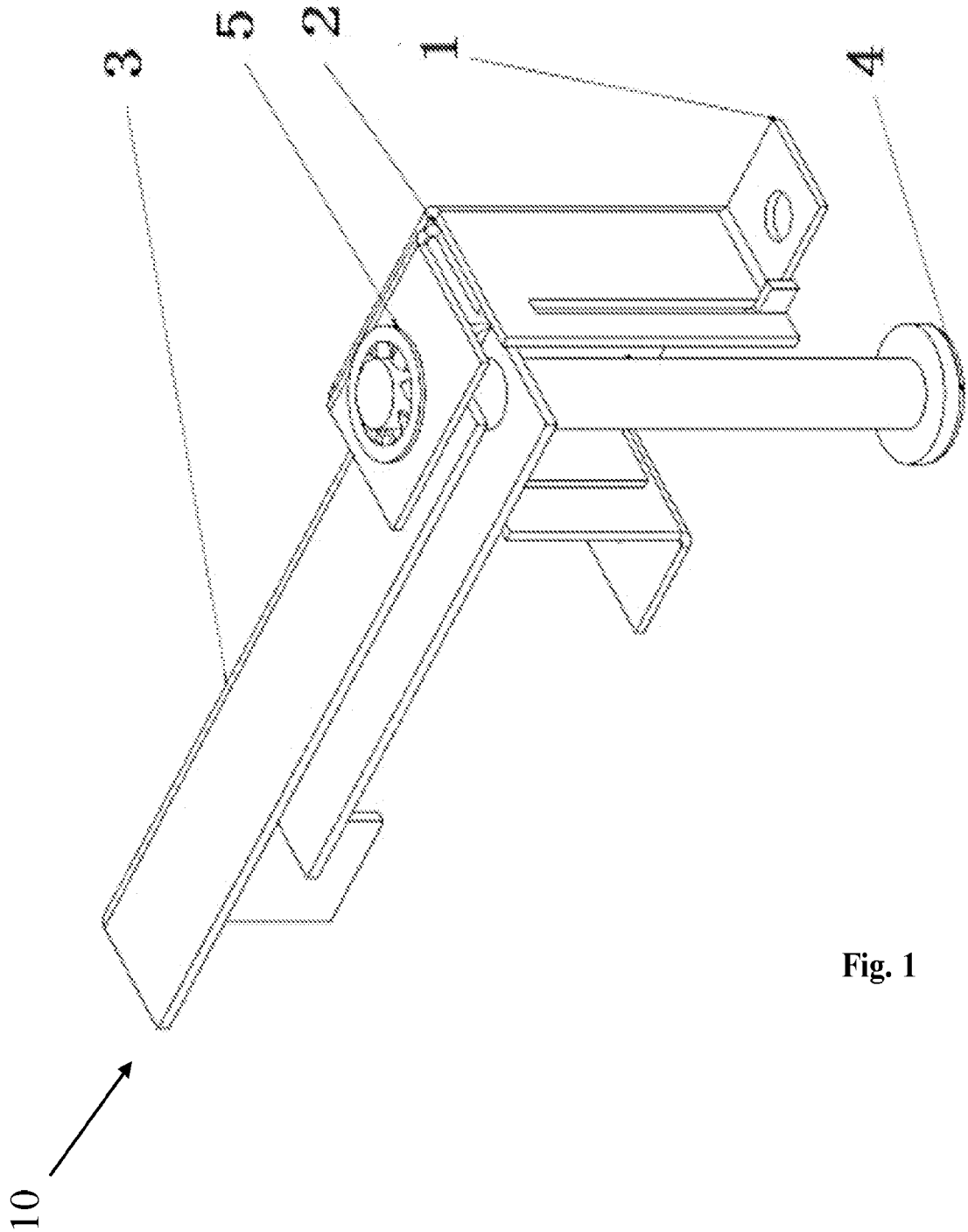


Fig. 1

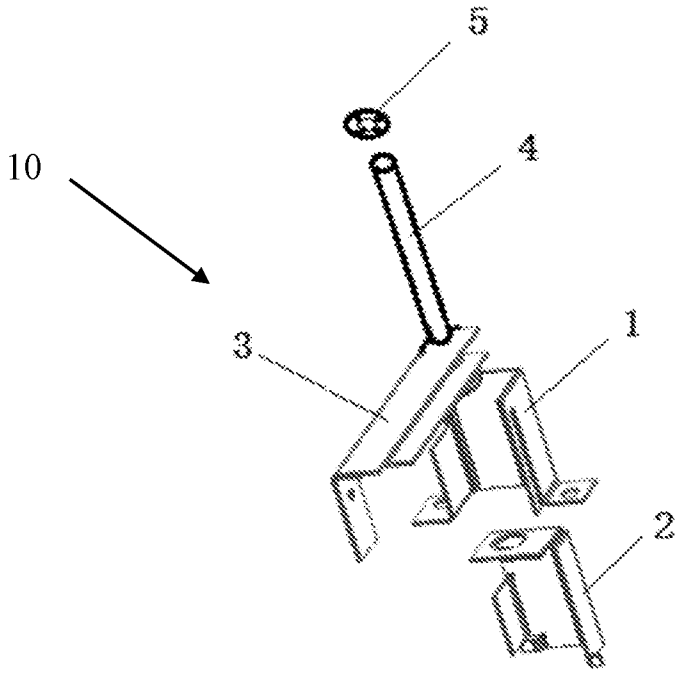


Fig. 2

1

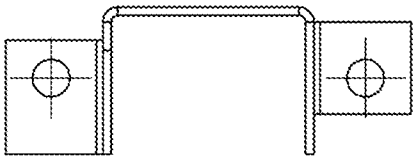


Fig. 3a

1



Fig. 3b

1

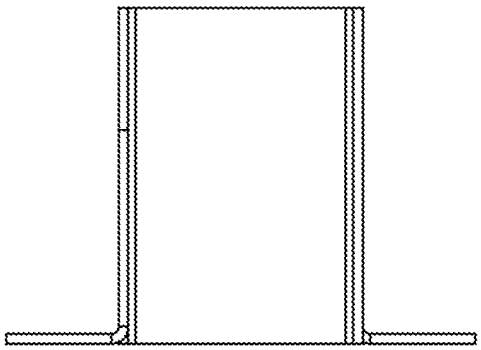


Fig. 3c

1

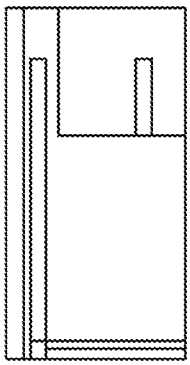


Fig. 3d

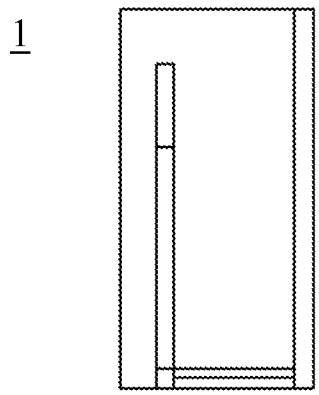


Fig. 3e

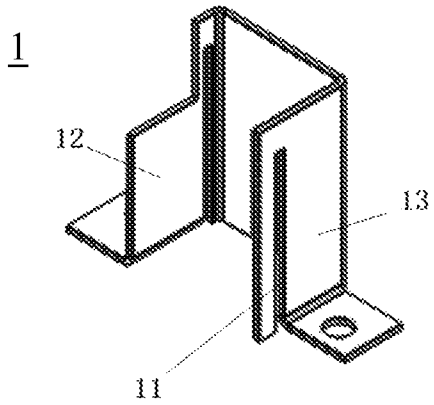


Fig. 3f

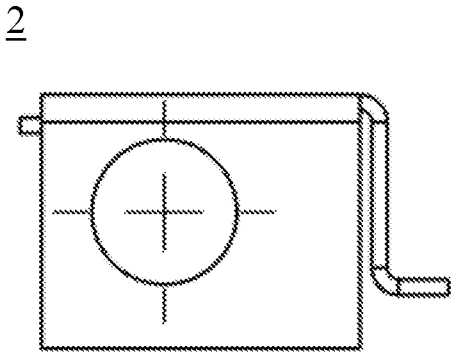


Fig. 4a

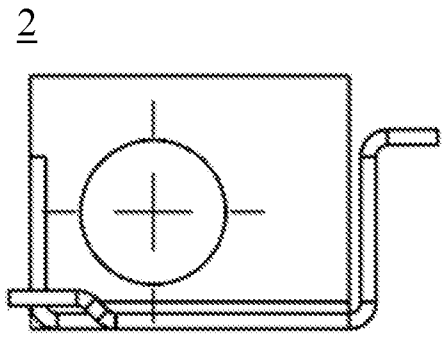


Fig. 4b

2

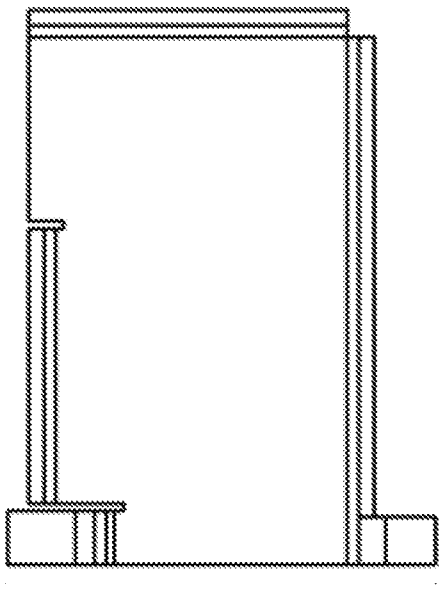


Fig. 4c

2

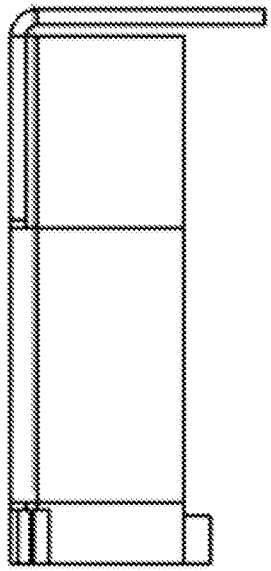


Fig. 4d

2

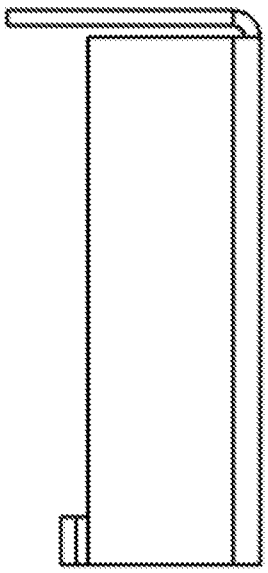


Fig. 4e

2

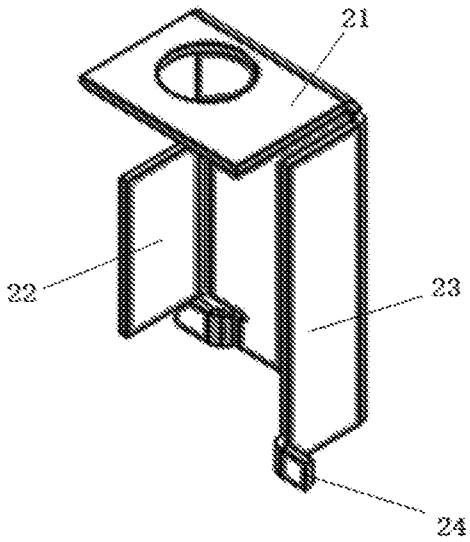


Fig. 4f

3

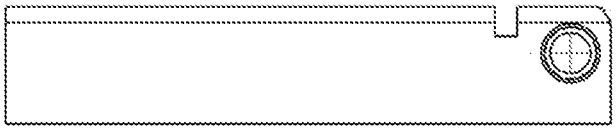


Fig. 5a

3

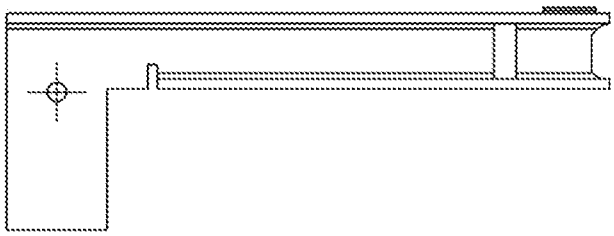


Fig. 5b

3

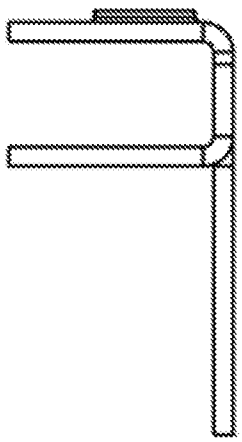


Fig. 5c

3

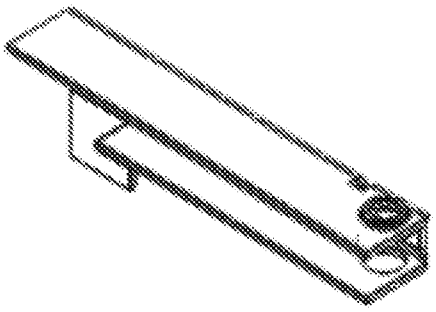


Fig. 5d

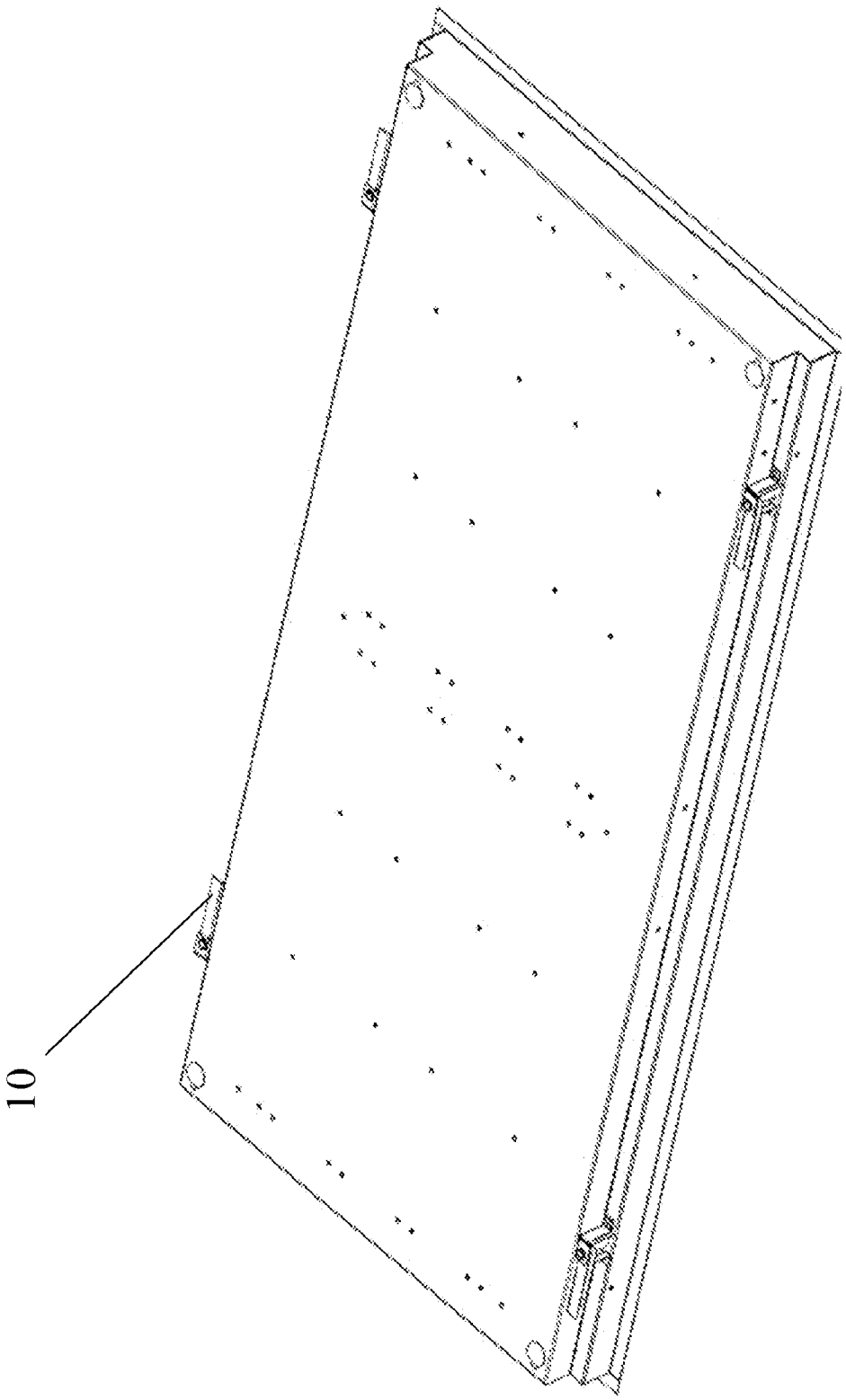


Fig. 6

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US16/30343

A. CLASSIFICATION OF SUBJECT MATTER
IPC(8) - F16B 2/02, 2/06, 2/12 (2016.01)
CPC - F16B 2/02, 2/06, 2/065; F16M 13/027; H02G 3/125
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)
IPC(8) Classifications: F16B 2/00, 2/02, 2/06, 2/10, 2/12; F16M 13/00, 13/02; H02G 3/12, 3/32 (2016.01)
CPC Classifications: F16B 2/02, 2/06, 2/065; F16M 13/02, 13/027; H02G 3/08, 3/12, 3/125

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)
PatSeer (US, EP, WO, JP, DE, GB, CN, FR, KR, ES, AU, IN, CA, INPADOC Data); clamp, mount, bracket, flange, fixture, light, ceiling, truss, joint, hanger, tighten, rotate, pivot, turn, twist, swivel, telescope, slide, self-locking, self-latching, quarter turn, 90 degrees, ninety degrees, latching, locking, bolt, fastener, star washer

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 2006/0254190 A1 (HUNT R. D.) November 16, 2006; figures 3, 10, 11; paragraph [0073]	1-3, 6-9, 11-13
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Y		10
X	US 5,118,233 A (MITCHELL E. R.) June 2, 1992; figures 8, 12	1, 3, 4
Y	US 1,497,882 A (RUMELY V. P.) June 17, 1924; figures 2, 4; page 2, column 1, lines 1-5	10
A	US 6,332,597 B1 (KORCZ K. W. et al.) December 25, 2001; entire document	1-13
A	US 5,971,334 A (CRAWSHAW A. W. et al.) October 26, 1999; entire document	1-13
A	US 4,037,098 A (KOWALSKI J. W.) July 19, 1977; entire document	1-13

☐ Further documents are listed in the continuation of Box C. ☐ 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
"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
"O" document referring to an oral disclosure, use, exhibition or other means
"P" document published prior to the international filing date but later than the priority date claimed
"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
"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
"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
06 July 2016 (06.07.2016)	05 AUG 2016
Name and mailing address of the ISA/ Mail Stop PCT, Attn: ISA/US, Commissioner for Patents P.O. Box 1450, Alexandria, Virginia 22313-1450 Facsimile No. 571-273-8300	Authorized officer Shane Thomas PCT Helpdesk: 571-272-4300 PCT OSP: 571-272-7774

Form PCT/ISA/210 (second sheet) (January 2015)