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(54) **A TRAINING DEVICE FOR EXERCISE UNDER ECCENTRIC LOAD**

(57) The invention relates to an apparatus for performing exercises under eccentric load, characterized in that the device comprises a base to be placed on a surface and a platform for placing a body part thereon, the platform being driven to perform a rectilinear vertical movement, and wherein the device comprises an actuator for performing the rectilinear vertical movement.

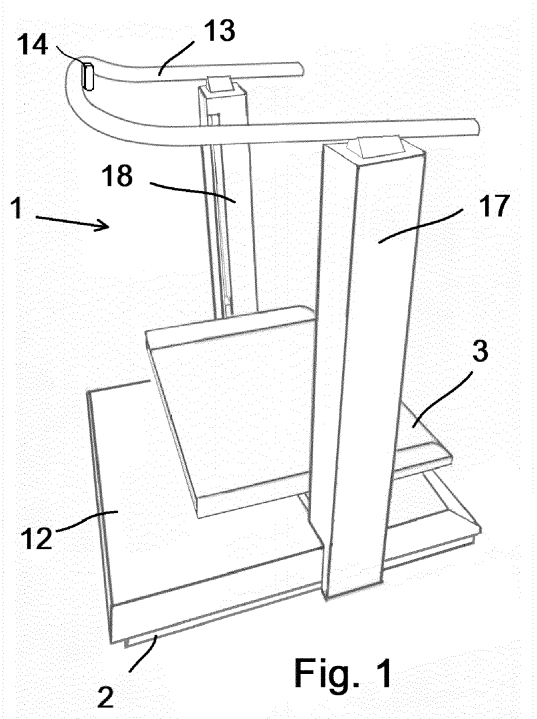

Fig. 1

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Description

[0001] The present invention relates to an apparatus for performing exercises under eccentric load according to the preamble of claim 1.

[0002] Such a device is known in the art. For example, a device is known with which a user has to follow a circular movement of the device with the legs. Due to the circular movement, the applicability of the known device is limited.

[0003] Such an apparatus needs improvement. In particular, there is a need for a multi-purpose apparatus , especially for exercising multiple muscles or muscle groups, for example to attain a greater improvement in mobility, strength, endurance, coordination, strength, and the like.

[0004] No apparatus is known in the art that offers these improvements.

[0005] The invention now has for its object to provide an improved apparatus of the type mentioned in the preamble.

[0006] In particular, the invention has for its object to provide a device or apparatus of the type mentioned in the preamble which can be used for several muscles and muscle groups. The terms apparatus and device are used both, whereas both terms have the same meaning in this description.

[0007] Another object of the invention is to provide an improved device with which an individual exercise can be performed.

[0008] In order to obtain at least one of the advantages mentioned above, according to a first embodiment the invention provides a device comprising the features of claim 1. This device has the advantage that exercises to be performed by a user can be performed in a simple manner.

[0009] It has also been found that the device according to the invention can easily be used in different ways, so that different parts of the body can be trained. Such a synergistic effect is a great advantage.

[0010] The invention therefore relates to an apparatus for performing exercises under eccentric load, in that the apparatus comprises a base to be placed on a surface and a platform for placing a body part thereon, the platform being driven to perform a rectilinear vertical movement, and wherein the apparatus comprises an actuator, also indicated as drive, for performing the rectilinear vertical movement. The device can therefore be used both by standing on the platform with one or both feet to exercise the legs during the vertical up and down movement, such as through a squat movement, but can also be used by using one or both supporting hands on the platform and supporting the legs or other part of the body elsewhere outside the device, such as by a push-up movement.

[0011] The present invention relates to a device that can be used in multiple areas, in particular for exercising multiple muscle groups of both the legs-hips and the arms-shoulder girdle. Due to the degree of adjustability of the platform movement in both frequency and amplitude and a linear vertical movement instead of a cyclical movement, as is the case in the device mentioned in the preamble, the device according to the invention can be used for any level of user training. The device is suitable, among other things, for improving mobility, strength, endurance, coordination and the like, whereby it is also suitable for rehabilitation training.

[0012] It is preferred that the apparatus comprises an electric drive for performing the vertical movement. The user can take place on the platform in the desired manner, after which the user must follow the movement of the platform with a part of the body. When the user stands on the platform with one or two legs, the user will, for example, have to keep his or her upper body at the same height during the up and down movement of the platform. Because the upper body does not undergo a change of movement, but only the legs follow the movement of the platform, a so-called eccentric exercise or load of the upper leg and buttock muscles is performed. When the user is exhausted, he can simply stand still and without further effort follow the movement with his entire body, which provides great safety.

[0013] It is further preferred that a controller is provided for regulating the frequency and amplitude of the vertical movement of the platform. As a result, an exercise can be adapted to the user. Particularly in the case of rehabilitation, the amplitude and frequency can be adapted to the capabilities of the user. For example, the amplitude can be varied from 1 to 70 cm. For example, the frequency can be varied from 1 to 60 direction changes, or even more, per minute.

[0014] Particularly when the user has reduced stability, it is preferable that the apparatus also comprises a handgrip or handrail for a user, for example during commissioning or during the performance of an exercise. Such assistance is not only a great advantage for people recovering when getting on and off, but also during unloaded mobility exercises, especially for the knee and hip, one can lean on the handrail or handrail and, depending on the situation, more or less weight can be transferred to the the body part to be trained. The user is also forced (in case of a squat movement) to keep the hips at the same height using the handle or handrail.

[0015] Particularly when the user wants to practice push-up movements, it is preferable that the platform includes a handgrip for holding by a user.

[0016] The device according to the invention is preferably constructed in that at least one upright extends upwards from the base, which at least one upright comprises a guide channel for guiding a fastener in a vertical direction, which fastener is designed for connection to the platform, and the actuator for causing the vertical movement is operatively coupled to the fastener. The base stands on a surface and therefore has a top side and a bottom side facing the surface during use. The at least one upright extends at the top, i.e. away from the

ground.

[0017] Increased stability is obtained when two uprights are provided for connecting a fastener to the platform on either side.

[0018] A simple, quiet and fast responding actuator or drive (both terms are used in this description) is obtained, especially when switching from an up to a down movement, vice versa, when the actuator comprises at least one electric motor.

[0019] The actuator or drive, especially the electric motor, preferably comprises a motor mounted in the base, which actuator is connected to each of the at least one fastener by a belt transmission or a spindle, for example a ball screw. A belt transmission has the advantage that it is relatively inexpensive and requires virtually no maintenance. The advantage of the spindle is the large forces that can be transferred with it. When driven by an electric motor, a quick response is obtained in both cases.

[0020] As an alternative embodiment, an electric motor can be provided in one of the two uprights. This electric motor can be operatively coupled to a fastener provided in said upright. The one electric motor can also be operatively coupled to a fastener provided in each upright to raise and lower the platform on both sides, via each upright. According to a further variant, an electric motor can be provided in both uprights, each motor driving a fastener provided in the respective upright to cause the platform to move up and down. In any of these variants, a ball screw, belt transmission, or any other suitable drive method may be employed in the uprights to raise and lower the fastener and platform.

[0021] In order to be able to use the device according to the invention with the highest safety and to prevent an object, a body part or something else from becoming trapped during a downward movement of the platform, it is preferable that a protective plate is located above the base, wherein an emergency switch is provided between the base and the protective plate, such that a movement of the protective plate from a rest position towards the base activates the emergency switch for switching off a vertical movement of the platform. Jamming between the moving platform and the protective plate of the base is thus adequately prevented. For example, several emergency switches can be provided for redundancy.

[0022] Increased applicability is obtained when the platform comprises a supporting plate that is rotatable relative to the platform. A user can therefore add a twist movement to the exercise while performing a squat exercise, for instance for exercising or rehabilitation of the hips, the back or the like.

[0023] For example, the support plate is rotatable about an axis perpendicular to the platform.

[0024] The invention will be explained in more detail below with reference to a drawing. The drawing shows in:

Fig. 1 shows a perspective view of a device according to the invention,

Fig. 2 shows a perspective view of a device according to the invention in which some plate materials have been removed,

Fig. 3 shows a drive for use in the device according to the invention, and

Fig. 4 shows an electrical diagram for powering the device according to the invention.

[0025] In the figures, the same parts are indicated by the same reference numerals. However, not all parts necessary for a practical implementation of the invention are shown, for simplicity of presentation.

[0026] Fig. 1 shows a perspective view of a device 1 according to the invention. The device 1 is placed with a base 2 on a surface. The device 1 comprises a platform 3 on which a user can take place. The platform 3 performs a vertical movement, for which purpose a drive 4 is provided, which is shown in Fig. 3. In the embodiment shown, the drive 4 comprises an electric motor 5, a transmission 6, two drive shafts 7, 8 and two uprights 17, 18 on which fasteners 9, 10 are provided, which are connected on the one hand to the platform 3 and on the other hand are operatively coupled to the drive 4 to raise or lower the platform 3 depending on the drive 4.

[0027] For example, the uprights may include a geared belt drive or a spindle shaft to convert the movement of the drive shafts 7, 8 into a desired vertical movement of the fasteners 9, 10. The spindle shaft and belt may be housed in the uprights 17, 18 wherein each upright comprises a guide channel for guiding a fastener in a vertical direction and wherein an opening 19 is provided in a side wall of the uprights 17, 18 to enable the fastener 9, 10 to be guided over the desired height by means of the vertical movement of the belt transmission or spindle shaft. In practice, the upright can have an inner frame to which the components for the drive are attached. A housing can then be placed around the inner frame, in which the opening 19 will have to be provided in order to be able to guide the fastener over the desired height.

[0028] Fig. 2 shows a stripped-down variant of the device 1 according to Fig. 1. Some sheet parts have been removed from the outside so that an insight into the interior is obtained. The base 2 of the device 1 is shown. Safety switches 11 are provided on the top of the base 2. The cover 12 shown in Fig. 1 rests on springs whose load-bearing upper surfaces are located at a position higher than the top of the safety switches 11 so that the cover is located in a rest position just above the safety switches 11.

[0029] When moved downwards, the cover 12 activates one or more safety switches 11, as a result of which the circuit for operating the device is interrupted and the device stops automatically. As a result, a user cannot become trapped between the platform 3 and the cover 12 or base 2.

[0030] The cover preferably rests on springs with a limit against pressing too far, but before the limit is reached by the pressed cover a safety switch placed elsewhere is pressed, which interrupts the electric circuit.

[0031] The two uprights 17, 18 are mutually coupled at their top with a support bracket 13 to which the user can hold on while performing an exercise or when getting on or off the device 1. A control 14 for the device can also be located on the support bracket.

[0032] Finally, Fig. 4 shows a simplified connection diagram for switching the device 1 on or off. The diagram provides a power supply for the motor 5 by means of a transformer 15 and an on-off control 16 which can be operated by the user. The four safety switches 11 ensure an automatic switch-off when activated as mentioned above. These four safety switches 11 can be supplemented with additional safety switches including, for example, a so-called "dead man's switch", which is attached to the user via a cord around the wrist or the like.

[0033] The invention also extends to any combination of features described above independently of each other.

[0034] The invention is not limited to the embodiments described above and shown in the figures. The invention is limited only by the appended claims.

Claims

1. An apparatus for performing exercises under eccentric load, **characterized in that** the device comprises a base to be placed on a surface and a platform for placing a body part thereon, the platform being driven to perform a rectilinear vertical movement, and wherein the device comprises an actuator for performing the rectilinear vertical movement.

2. An apparatusas claimed in claim 1, wherein the device comprises an electric drive for performing the vertical movement.

3. An apparatus according to claim 1 or 2, wherein a controller is provided for regulating the frequency and amplitude of the vertical movement of the platform.

4. An apparatus as claimed in claim 1, 2 or 3, wherein the device also comprises a handgrip for a user during the performance of an exercise.

5. An apparatus of claim 1, wherein the platform includes a handgrip
for holding by a user.

6. An apparatus as claimed in any of the foregoing claims, wherein at least one upright extends upwards from the base, which at least one upright comprises a guide channel for guiding a fastener in a vertical direction, which fastener is designed for connection to the platform, and the actuator for causing the vertical movement is operatively coupled to the fastener.

7. An apparatus as claimed in claim 6, wherein two uprights are provided for connecting a fastener to the platform on either side.

8. An apparatus as claimed in any of the foregoing claims, wherein the actuator comprises at least one electric motor.

9. An apparatus according to any one of the preceding claims, wherein the actuator comprises a motor mounted in the base, which actuator is connected to each of the at least one fastener by a belt transmission or a spindle, for example a ball screw.

10. An apparatus as claimed in claim 1, wherein a protective plate is located above the base, wherein an emergency switch is provided between the base and the protective plate, such that a movement of the protective plate from a rest position towards the base activates the emergency switch for switching off a vertical movement of the platform.

11. An apparatus as claimed in any of the foregoing claims, wherein the platform comprises a supporting plate that is rotatable relative to the platform.

12. An apparatus as claimed in any of the foregoing claims, wherein the support plate is rotatable about an axis perpendicular to the platform.

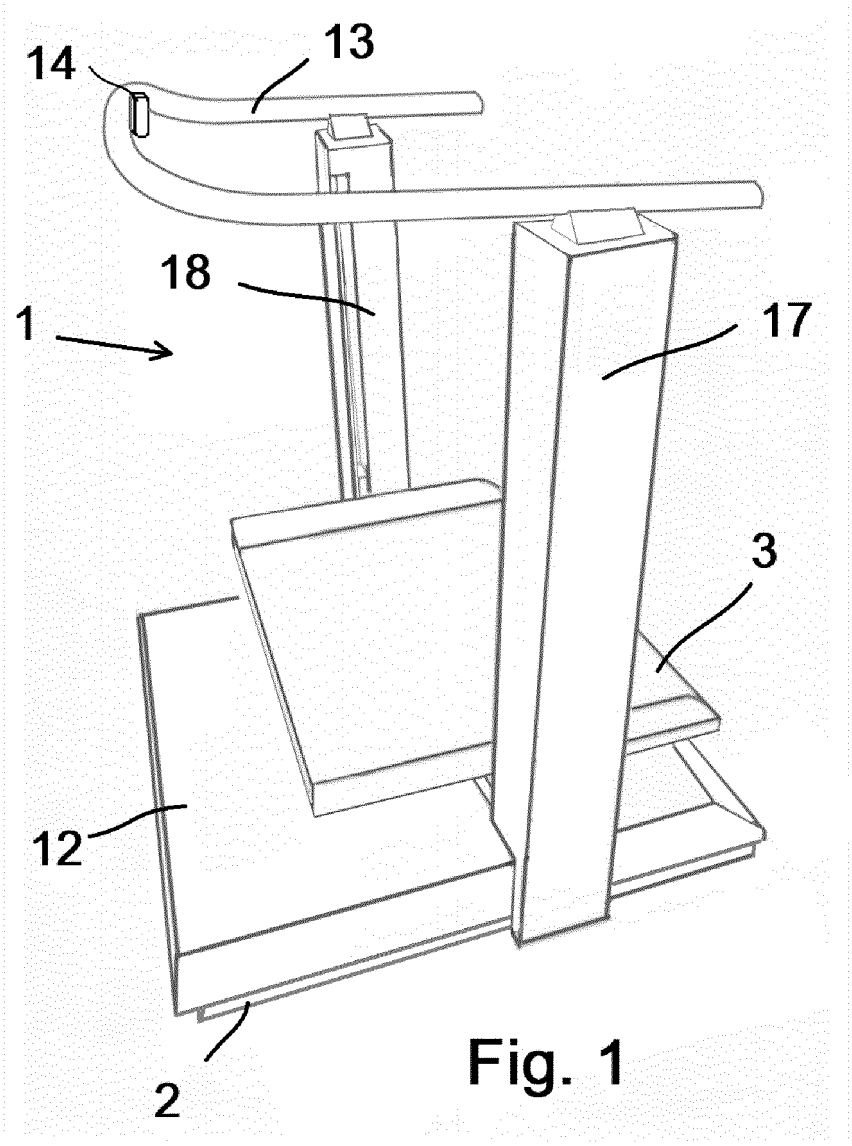

Fig. 1

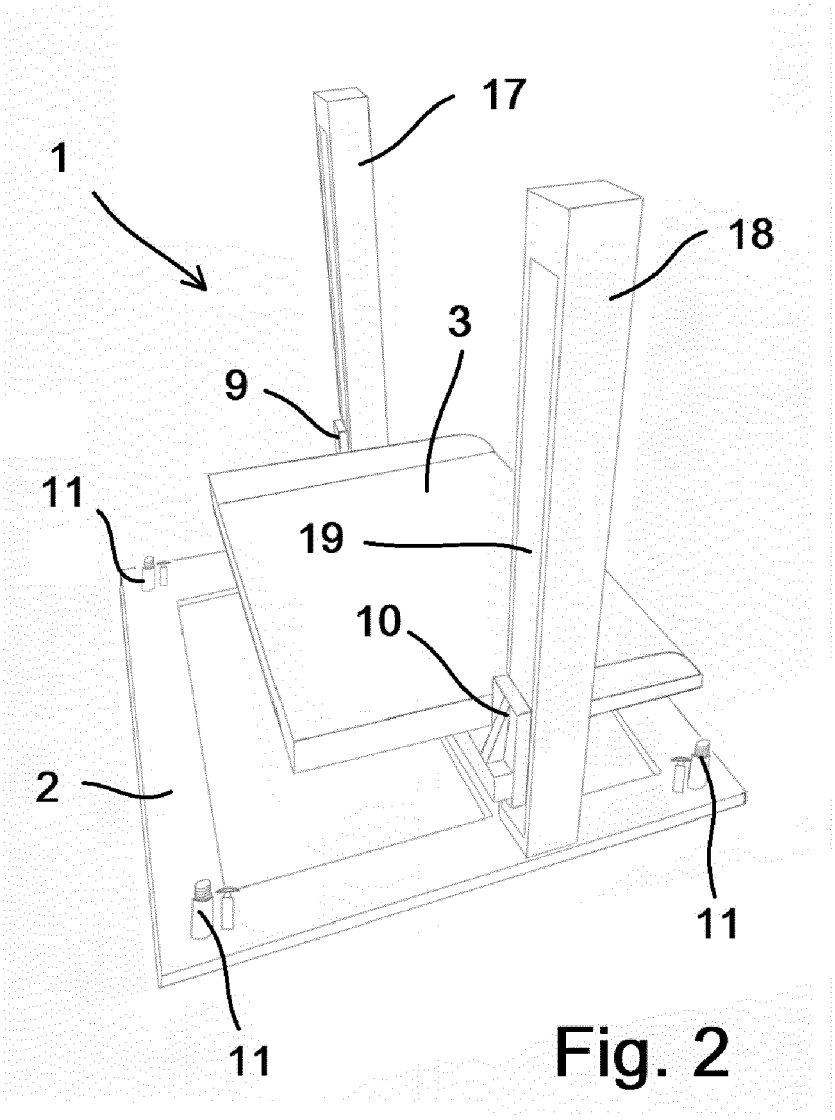

Fig. 2

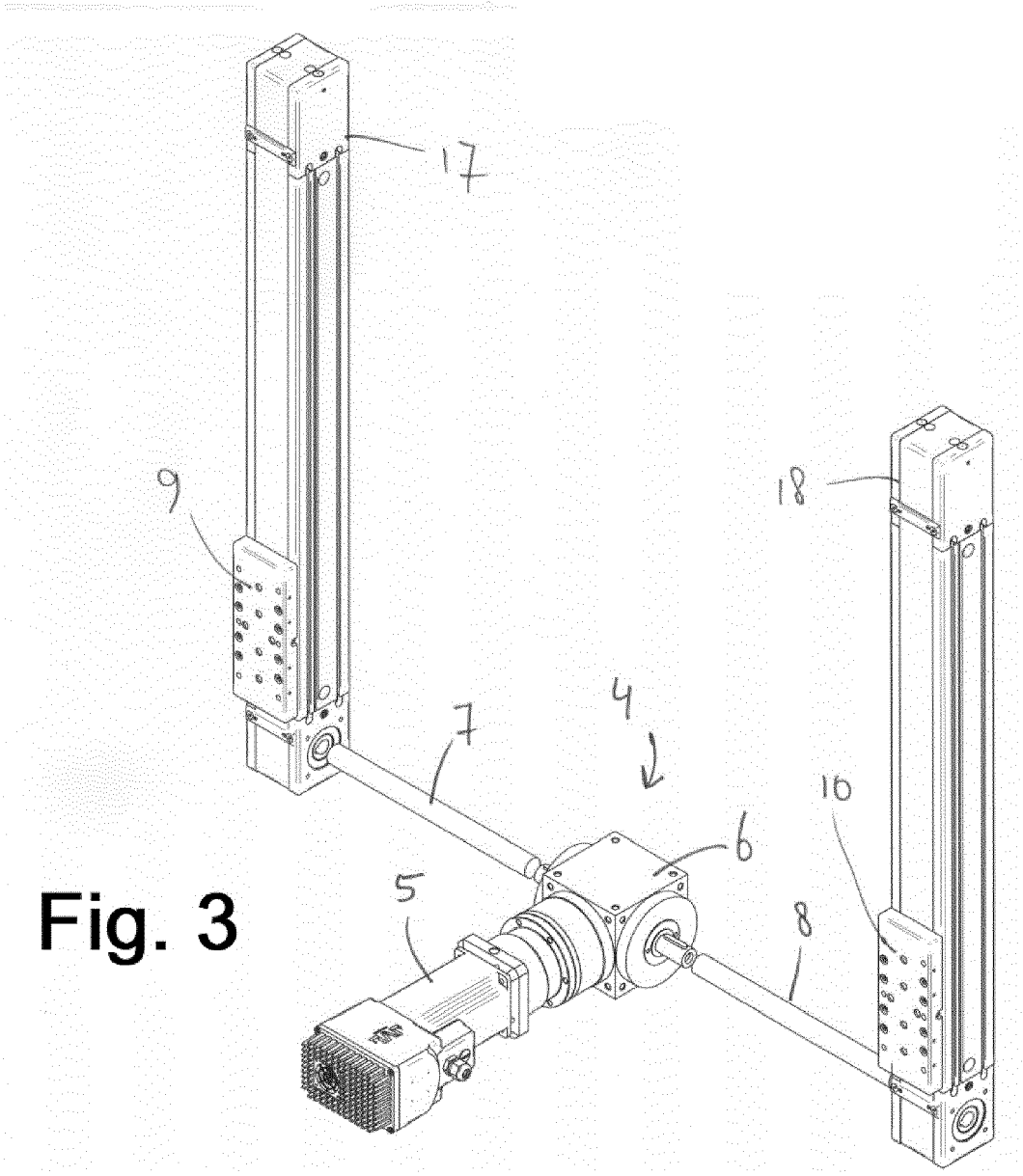

Fig. 3

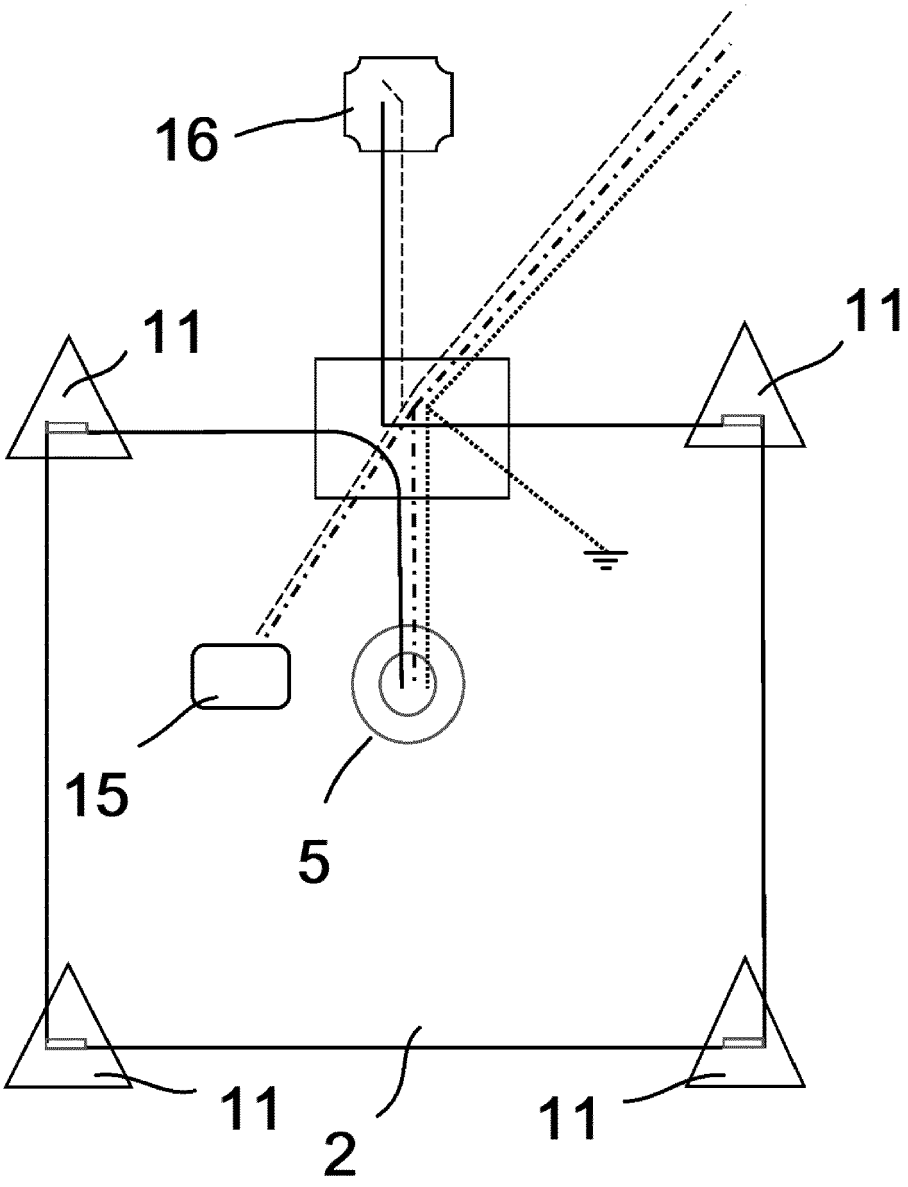

Fig. 4

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EUROPEAN SEARCH REPORT

Application Number
EP 22 19 1944

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Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
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TECHNICAL FIELDS SEARCHED (IPC)

A61H
A63B

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	17 January 2023	Teissier, Sara

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ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO. EP 22 19 1944

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