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(54) **Golf practice apparatus**

(57) A golfing practice apparatus comprising a flexible surface structure (18) supported by a support frame. The support frame (12,14,16) comprises a plurality of support structures coupled together to allow relative piv-

oting and/or tilting movement between coupled support structures, and means for actuating (16) said support structures to effect said relative movement. The shape of the surface can be adjusted to exhibit a wide variety of contours.

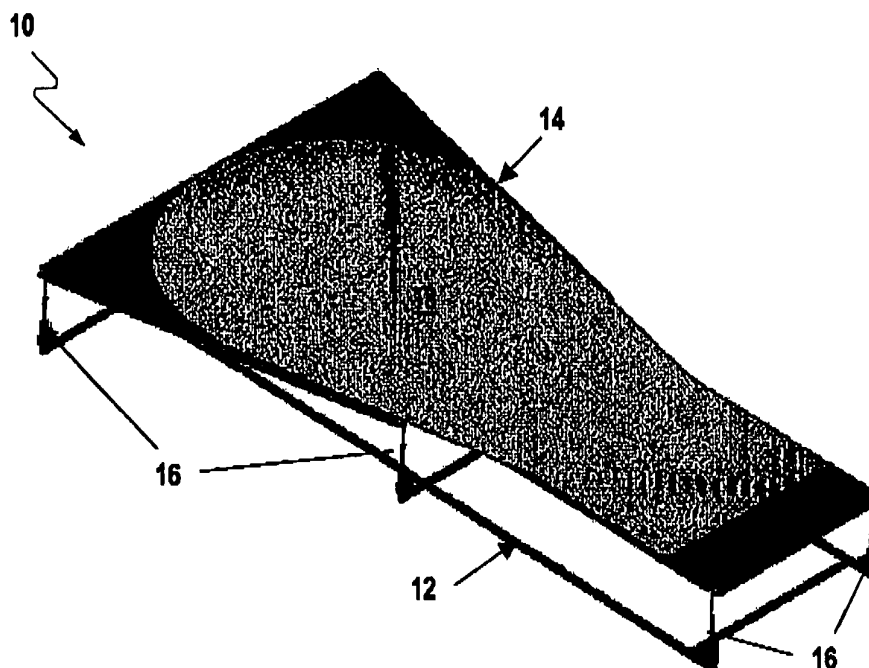


FIG. 1

Description

Field of the Invention

[0001] The present invention relates to a practice apparatus for golf and in particular to a practice apparatus with an adjustable putting surface.

Background to the Invention

[0002] Artificial golf greens, with adjustable putting surfaces are known. It would be desirable to provide an improved apparatus.

Summary of the Invention

[0003] A first aspect of the invention provides a golfing practice apparatus comprising a flexible surface structure supported by a support frame, the support frame comprising a plurality of support structures, means for coupling at least some of said support structures together to allow relative pivoting and / or tilting movement between coupled support structures, and means for actuating said support structures to effect said relative pivoting movement.

[0004] Preferably, said coupling means are adapted to allow relative pivoting and/or tilting movement about at least two, and preferably three, mutually perpendicular axes.

[0005] Preferably, the length of at least some and preferably all of said support structures is adjustable. In the preferred embodiment, each support structure comprises at least two interconnected support members that are movable with respect to one another in a longitudinal direction.

[0006] Typically, at least one end of at least some of said support structures are coupled to an end of at least one other of said support structures, or to a location intermediate the ends of at least one other of said support structures.

[0007] Preferably, said actuating means comprises a plurality of independently operable actuating devices spaced apart around said support frame.

[0008] Preferably, each actuating device is located at a respective coupling point between adjacent support members, each actuator advantageously providing means for coupling said adjacent support members together.

[0009] Preferably, said coupling means comprises, in respect of at least one support structure coupled in use thereto, one of a cooperable male and female coupling device, the other of said male and female coupling device being provided on the respective support structure. For example, said male member may comprise a lug or other projection, and said female member may comprise a co-operating socket.

[0010] Preferably, at least some of said support structures are shaped to provide a seat for receiving said sur-

face structure. For example, some or all of said support structures may include a flange for supporting said surface.

[0011] In the preferred embodiment, said surface structure comprises at least one flexible layer, formed for example from rubber, supported by at least two spaced apart batons.

[0012] Typically, the apparatus further includes a base structure, conveniently in the form of a frame or one or more blocks or panels, the actuating means being provided between the base and the support frame.

[0013] In a preferred embodiment, the frame comprises a base and a surface support, wherein the base is substantially rigid and the surface support is adjustable in shape and preferably also size. In use, the actuators adjust the shape and preferably also the size of the surface support.

[0014] Preferably the surface support comprises a framework of support members.

[0015] Preferably the surface support framework is adjustable in size and shape by sliding male and female inter-engagement of at least some of the support members.

[0016] Preferably the surface is made of flexible or semi-flexible material. The surface may comprise at least one layer of flexible or semi-flexible material. Preferably the surface comprises a plurality of layers

[0017] Further advantageous aspects of the invention will become apparent to those ordinarily skilled in the art upon review of the following description of a specific embodiment and with reference to the accompanying drawings.

Brief Description of the Drawings

[0018] An embodiment of the invention is now described by way of example and with reference to the accompanying drawings in which like numerals are used to indicate like parts and in which:

FIGURE 1 shows a perspective view of a practice putting apparatus embodying the invention;

FIGURE 2 shows a perspective view of a base included in the apparatus of Figure 1;

FIGURE 3a shows a partial perspective view of a first joining means included in the base of Figure 2;

FIGURE 3b shows a partial perspective view of a second joining means included in the base of Figure 2;

FIGURE 4 shows a perspective view of the base of Figure 2 with a plurality of actuators;

FIGURE 5 shows a perspective view of an actuator;

FIGURE 6 shows a perspective view of a surface support mounted on the base by a plurality of actuators;

FIGURE 7 shows a partial perspective view of the surface support, detailing the male and female inter-engagement of two support members;

FIGURE 8 shows a perspective view of linkage mechanisms suitable for use in the surface support;

FIGURE 9 shows a perspective view of a flange included in the surface support of Figure 6;

FIGURE 10 shows a cross sectional view of a preferred surface structure; and

FIGURE 11 shows a perspective view of a preferred embodiment of the practice putting apparatus.

Detailed Description of the Drawings

[0019] Referring now to Figure 1 of the drawings, there is shown, generally indicated as 10, a preferred embodiment of a practice putting apparatus. The apparatus 10 comprises a base 12, a surface support 14, a plurality of actuating devices 16, and a surface structure 18 carried by the surface support 14. The actuating devices 16 are arranged to act, directly or indirectly, on the surface 18 during use. In the preferred mode of use, the surface 18 is adapted for use as a practice putting surface.

[0020] The base 12 typically comprises a frame. In the embodiment shown in Figure 2, the base 12 comprises a substantially planar framework having a plurality, in this example seven, base members 20 which form a substantially rectangular frame with an intermediary base member 20a. The base members 20, 20a are, in use, interconnected in any convenient manner to form the framework. By way of example, Figures 3a and 3b illustrate suitable joints 22, including bolts 23. The base 12 may alternatively take any other suitable form, e.g. it may comprise a single plate, or plurality of plates or panels. The base 12 may be of any shape or size.

[0021] The actuators 16 are provided between the base 12 and the surface support 14. In the illustrated embodiment, six actuators 16 are mounted on the base 12: four actuators 16 are mounted on the base 12 at or adjacent a respective corner of the framework while two actuators 16 are connected to the intermediary base member 20a. It will be apparent that a variety of alternative arrangements are possible, with regard to the number of actuators 16 and their arrangement with respect to the base 12. A respective support (not shown) may be provided for each actuator 16. The supports may take the form of uprights mounted on the base 12 adjacent to, and/or located around, the respective actuator 16. At least some of the supports may be interconnected by cross bars (not shown) or other structures.

[0022] In some embodiments, the base 12 may be omitted and the actuators 16 may rest on, for example, the ground or on a respective individual base structure (not shown).

5 [0023] The actuators 16, a preferred form of which is shown in more detail in Figure 5, preferably comprise a respective hydraulic ram, although any other suitable actuating means, especially linear actuators, may be used (e.g. pneumatic or electric rams or other actuators). Typically, each actuator 16 comprises a housing 24 and an extendible/retractable rod 26 or other member. The rod 26 is operable between a retracted state and extended state, as indicated by arrow A. The actuators 16 are conveniently orientated such that the rods 26 move in a substantially vertical direction during use. In alternative embodiments, the actuators 16 do not necessarily need to be powered actuators and may for example be operable manually, e.g. take the form of a manual jack or extendible brace.

20 [0024] In use, the rods 26 are, advantageously, independently extendable and retractable. Thus each rod 26 may be independently positioned at varying heights. The free end of each rod 26 preferably carries means for coupling it to the support 14. In the illustrated example, the coupling means 28 comprises at least one, but preferably a plurality (preferably 2) of lugs 30 projecting from a plate 32 or other support. In use, the coupling means 28 couples the respective actuator 16 to the surface support 14. In the illustrated embodiment the lugs 30 take the form of substantially cylindrical projections.

25 [0025] The actuators 26 may be individually operated in any convenient manner, for example by means of individual manual control, or by means of a common control unit (not shown) comprising, for example a hydraulic control circuit or an electrical control circuit. The control unit may be programmable with one or more user selectable sets of respective settings for each actuator.

30 [0026] The surface support 14 comprises a plurality of support structures 34, preferably arranged in the form of a framework. The support structures 34, or at least some of them, are extendible and retractable in length. The support structures 34, or at least some of them, are preferably also pivotable, or tiltable, about at least one first transverse axis (which in use is typically substantially horizontally orientated). The support structures 34, or at least some of them, are preferably pivotable about at least one second transverse axis, which axis is substantially perpendicular with said first transverse axis and which, in use, is typically substantially vertically disposed. In preferred embodiments, the support structures 34 are pivotable/tiltable, as applicable, from one or both ends.

35 [0027] In preferred embodiments, each support structure 34 extends between a respective two actuators 16, or between an actuator 16 and another support structure 34, or between two other support structures 34, respective ends of the support structure 34 conveniently being supported by the respective couplings 28 and/or other support structure. In the illustrated embodiment, seven

support structures 34 are shown being supported by adjacent actuators 16.

[0028] Each support structure 34 comprises, by way of example, an assembly of a first support member 36 and a second support member 38. Each assembly 34 is extendable/retractable in a longitudinal direction. To this end, the first and second members 36, 38, or at least respective portions thereof, may be telescopically interconnected, or otherwise arranged for relative movement in said longitudinal direction. For example, as illustrated in Figure 7, at least one end of one of the first and second support members 36, 38 may comprise a sleeve which is sized and dimensioned such that, in use, at least an end of one support member 36, 38 may be fully or partially housed within the other support member 38, 36 with a male and female inter-engagement relationship. Hence the first and second support members 36, 38 are slidable with respect to each other, as shown by the arrow B, such that the support structure 34 may increase and decrease in length. The inter-engagement relationship also allows a degree of flexibility in the support structure 34.

[0029] By way of example, the respective free ends of the support structures 34 are provided with, or connectable to, a coupling device or joint for coupling the structure 34 to the respective actuator 16 or other support structure 34 as applicable. For example, in Figure 8, each end of the structure 34 is provided with an annular bearing 40 suitable for engagement with the lugs 30 provided on couplings 28. Preferably, securing means, for example a pin, bolt or other fixture (not shown), is insertable through the projecting lug 30 via an aperture 41. Where the free ends of the support members 36, 38 are coupled to other support members 36, 38, a support 32 and lug 30 are provided on the other support member 36.

[0030] Preferably, the bearings 40 and lugs 30 are shaped such that, when interengaged, the resulting coupling allows the support structures 34 relatively free pivotal and/or rotational movement with respect to the actuator 16, or other point of coupling, at least about a first transverse axis (which is typically substantially horizontal in use thereby allowing the structure to tilt or pivot up and down), preferably a second transverse axis (which is typically substantially vertical in use), and preferably also about a longitudinal axis. In the preferred embodiment, therefore, the support structures 34 can pivot or rotate, from at least one and preferably both ends, about three mutually perpendicular axes. For example, the coupling between the support structures 34 and the respective actuators 16 or other support point may comprise a ball joint, universal joint, or similar coupling mechanism. In general, any coupling means that allows a degree of rotational/pivotal movement about at least 2 and preferably 3 mutually perpendicular axes may be used to connect the surface support 14 to the actuators 16 or other point of support.

[0031] The support structures 34 also comprise means for receiving the surface 18. Figure 9 shows an example of a receiving means, wherein a flange 42 is provided on

each support member 36, 38 such that, in use, the surface 18 may be seated on top of the flange 42. It is envisaged that alternative receiving or connection means may alternatively be used.

[0032] The surface 18 comprises one or more flexible or semi-flexible sheets or panels. Preferably, the surface 18 comprises a plurality of sheets or panels, in a layered arrangement as shown in Figure 10. The surface 18 is mounted on the support members 36, 38 either directly or by way of any suitable mounting means. As a consequence of the flexible nature of the surface 18, its shape changes in use in response to movements of the surface support 14 effected by the actuators. More specifically, the flexible nature of the surface 18 allows the surface 18 to change shape in response to changes in the shape of the surface support 14.

[0033] When the apparatus 10 is in use, the actuators 16 are preferably independently operated such that the respective rods 26 are each extended or retracted to adopt respective desired positions. Varying the extensions of the actuators 16 changes the distance between the respective coupling points of the support structures 34. Thus the support structures 34 must alter in length correspondingly. In addition to altering in length, the respective support structures 34 can pivot about the respective couplings about a substantially vertical (in use) axis and, in the preferred embodiment, about two mutually perpendicular horizontal axes. To accommodate changes in length of the support structures 34, it is preferred not to fix the surface 18 to the movable parts of the structures 34, although the surface 18 may for example be fixed to one or more of the coupling points 28. Hence, the surface 18 preferably rests on the flanges 42, or other receiving surface provided on the support structures 34/support 14.

[0034] The surface 18, when mounted on the surface support 14, changes shape in accordance with the shape and size of the surface support 14. Thus by selecting the extensions of the respective actuators 16, the shape and contour of the surface 18 can be modified and a plurality of surface 18 configurations can be created.

[0035] Figure 11 shows a preferred arrangement wherein the apparatus 10 takes the form of a practice putting green. The surface 18 simulates the green and may comprise artificial grass including a portion which simulates a chipping or striking area 58, a putting green 60 and an area of rough 62. The surface 18 may also comprise simulated bunkers (not shown). An example of the preferred surface structure 18 is illustrated in Figure 10 and comprises a first layer 50 of substantially rigid or semi rigid batons, e.g. wooden, metal or plastic slats, the batons preferably being substantially parallel with and spaced apart from one another. In the preferred arrangement, the batons, in use, traverse the gap between the flanges 42, the ends of the batons resting on the flanges to support the surface 18. A second layer 52 comprises a sheet of flexible material, e.g. rubber. One or more other layers 54, 56 may be provided to simulate the desired

golfing finish, in this case a putting green layer 54 and a rough layer 56. It will be understood that the surface structure 18 may take a variety of forms and that one or more of the layers described above may be omitted, and/or further layers may be added.

[0036] A cup (not shown) for receiving a golf ball is provided in the surface 18. Optionally, a golf ball returning means (not shown) may be provided, such as a tube, which delivers the ball back to the striking area. Golfing paraphernalia such as golf clubs with stand 66, golf balls (not shown), golf tees (not shown), chipping obstacles 68 and flag 70 may be provided.

[0037] In the preferred embodiment the apparatus 10 is used to create a plurality of putting green surfaces in a single self contained unit. A control station 72 is advantageously provided to allow a user to independently alter the respective actuators 16, or to select a programmed configuration to create a desired golfing surface. Preferably, a handrail 74 and net 76 are provided for safety.

[0038] The apparatus 10 may be used in alternative applications and so the surface structure need not necessarily comprise a putting surface.

Claims

1. A golfing practice apparatus comprising a flexible surface structure supported by a support frame, the support frame comprising a plurality of support structures, means for coupling at least some of said support structures together to allow relative pivoting and/or tilting movement between coupled support structures, and means for actuating said support structures to effect said relative movement. 30
2. An apparatus as claimed in claim 1, wherein said coupling means are adapted to allow relative pivoting and/or tilting movement about at least two, and preferably three, mutually perpendicular axes. 35
3. An apparatus as claimed in claim 1 or 2, wherein the length of at least some and preferably all of said support structures is adjustable. 40
4. An apparatus as claimed in claim 3, wherein each support structure comprises at least two interconnected support members that are movable with respect to one another in a longitudinal direction. 45
5. An apparatus as claimed in any preceding claim, wherein at least one end of at least some of said support structures are coupled to an end of at least one other of said support structures, or to a location intermediate the ends of at least one other of said support structures. 50
6. An apparatus as claimed in any preceding claim, wherein said actuating means comprises a plurality 55

of independently operable actuating devices spaced apart around said support frame.

7. An apparatus as claimed in claim 6, wherein each actuating device is located at a respective coupling point between adjacent support members, each actuator advantageously providing means for coupling said adjacent support members together. 5
8. An apparatus as claimed in claim 7, wherein said coupling means comprises, in respect of at least one support structure coupled in use thereto, one of a cooperable male and female coupling device, the other of said male and female coupling device being provided on the respective support structure. 10
9. An apparatus as claimed in any preceding claim, wherein at least some of said support structures are shaped to provide a seat for receiving said surface structure. 15
10. An apparatus as claimed in any preceding claim, wherein said surface structure comprises at least one flexible layer supported by at least two spaced apart batons. 20

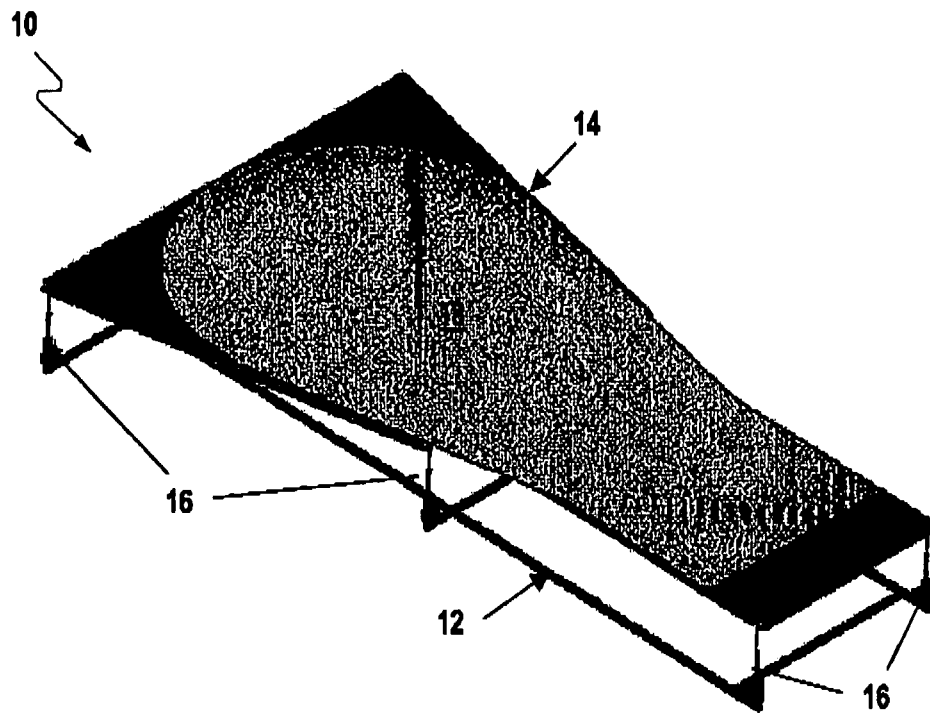


FIG. 1

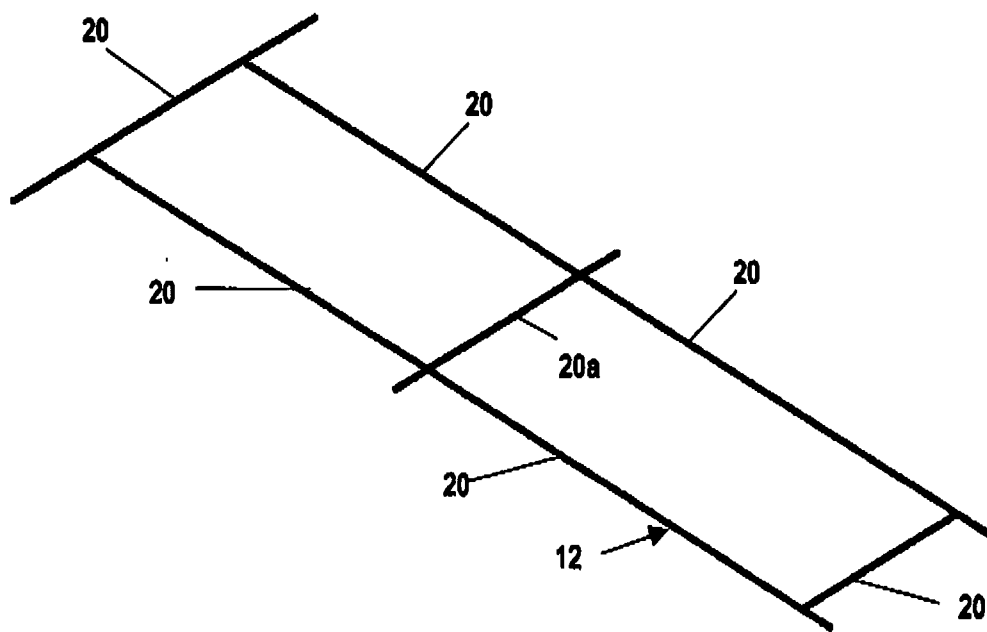


FIG. 2

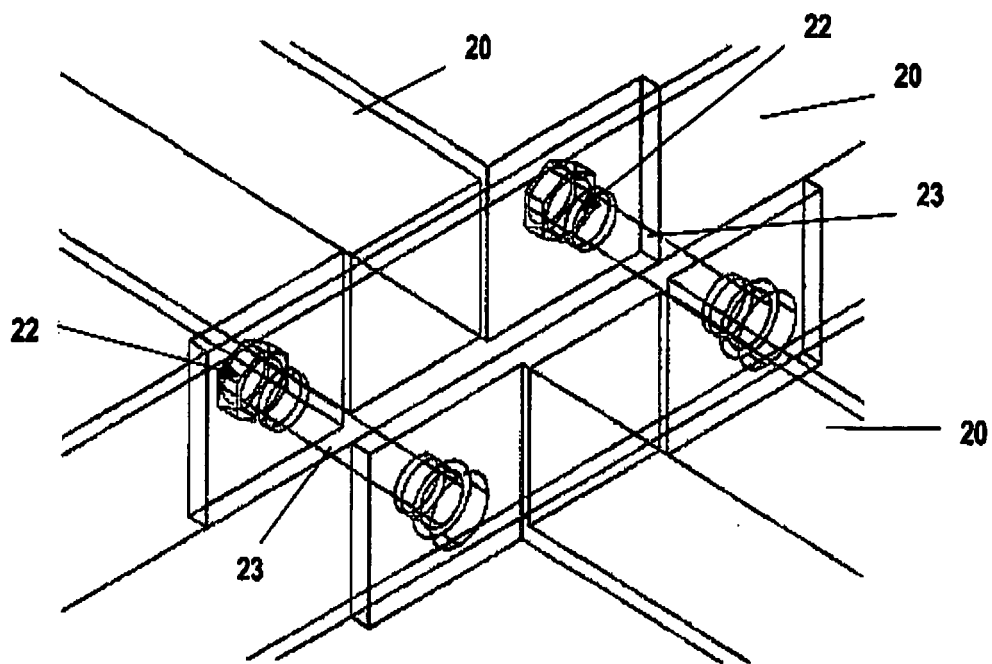


FIG. 3a

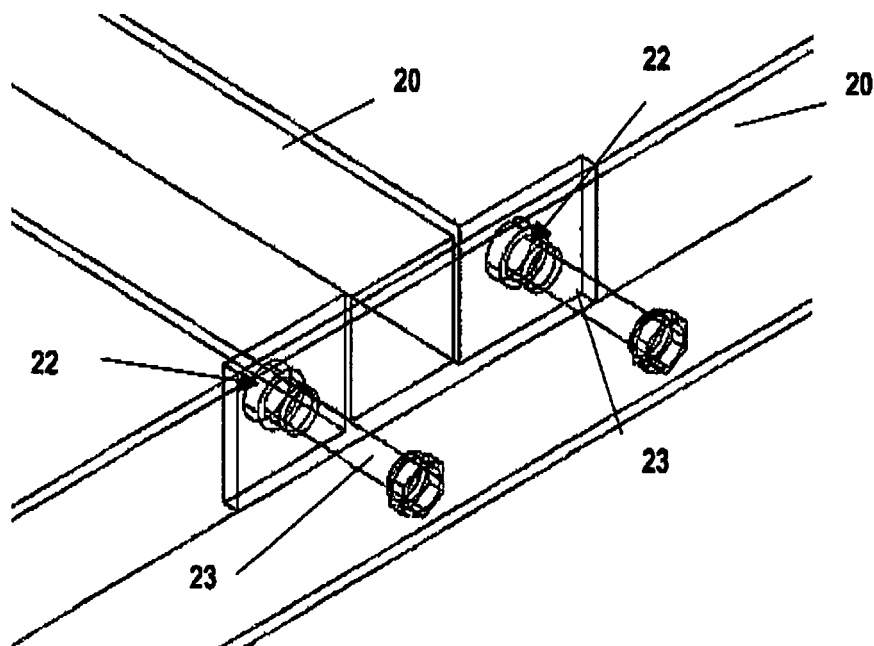


FIG. 3b

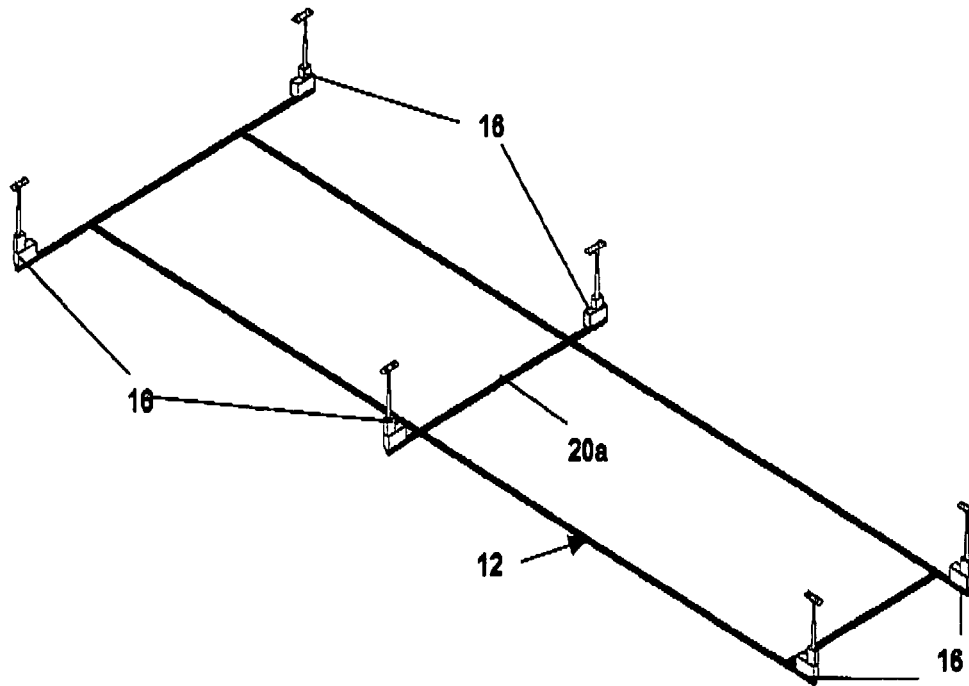


FIG. 4

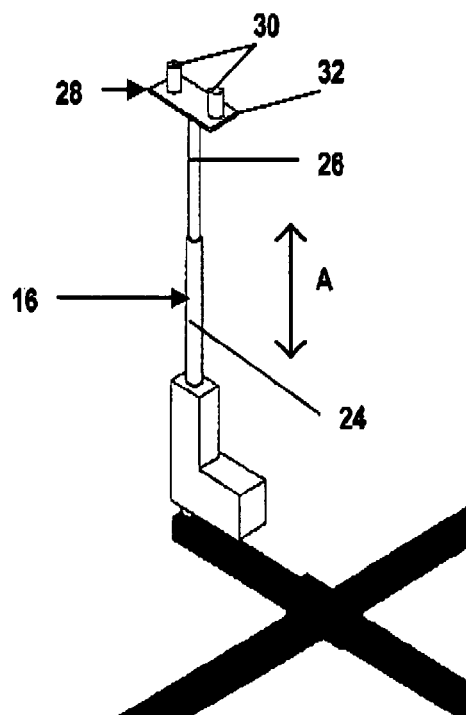
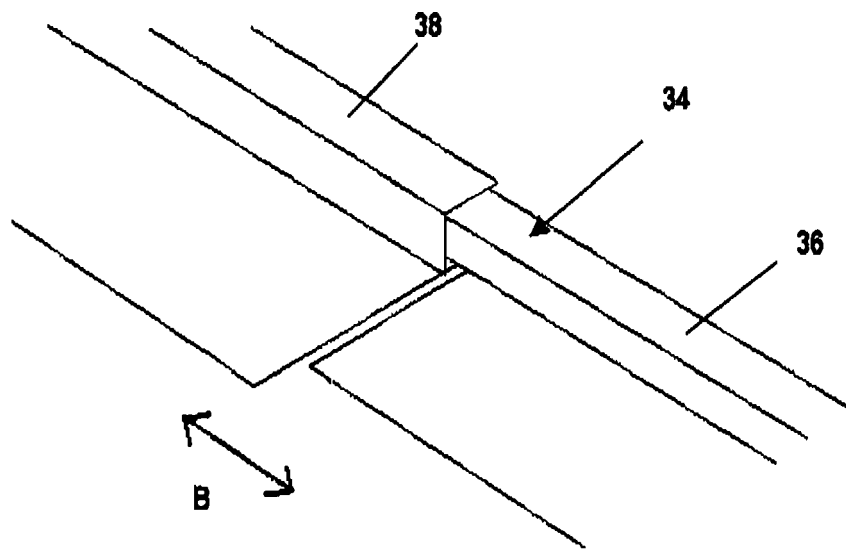
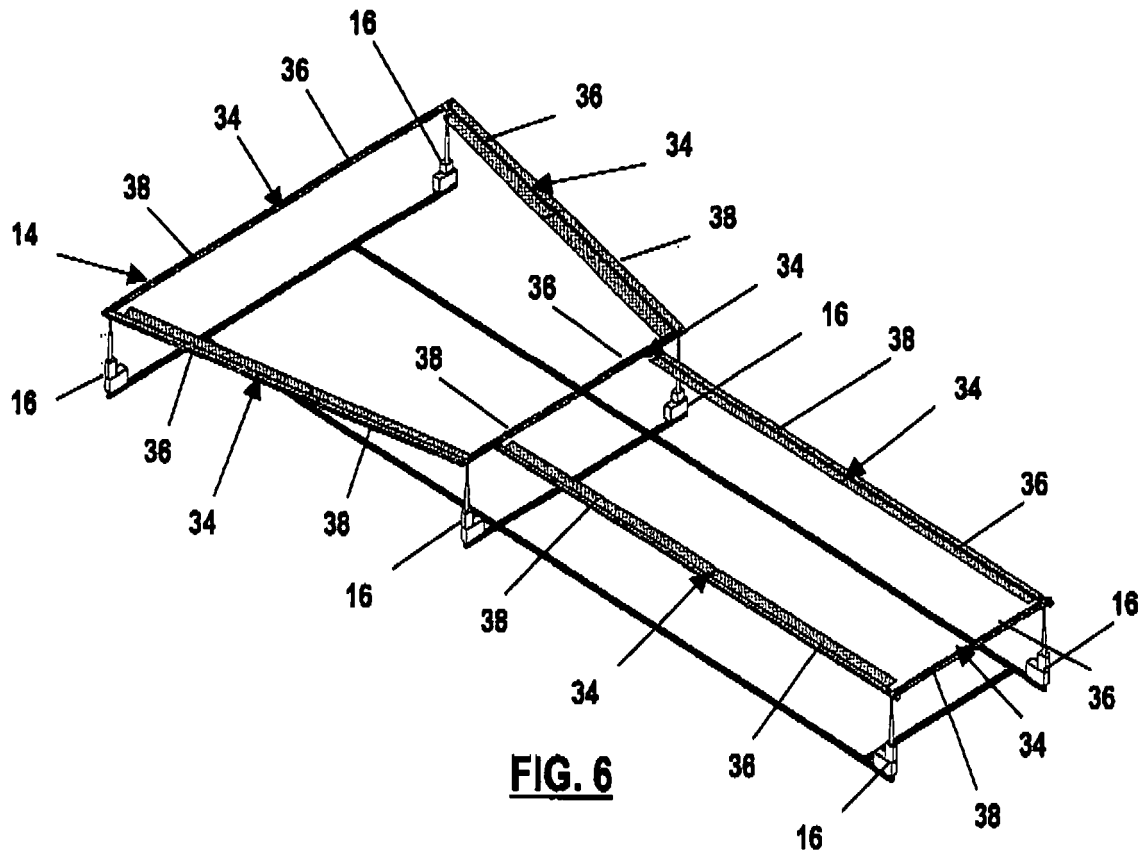


FIG. 5



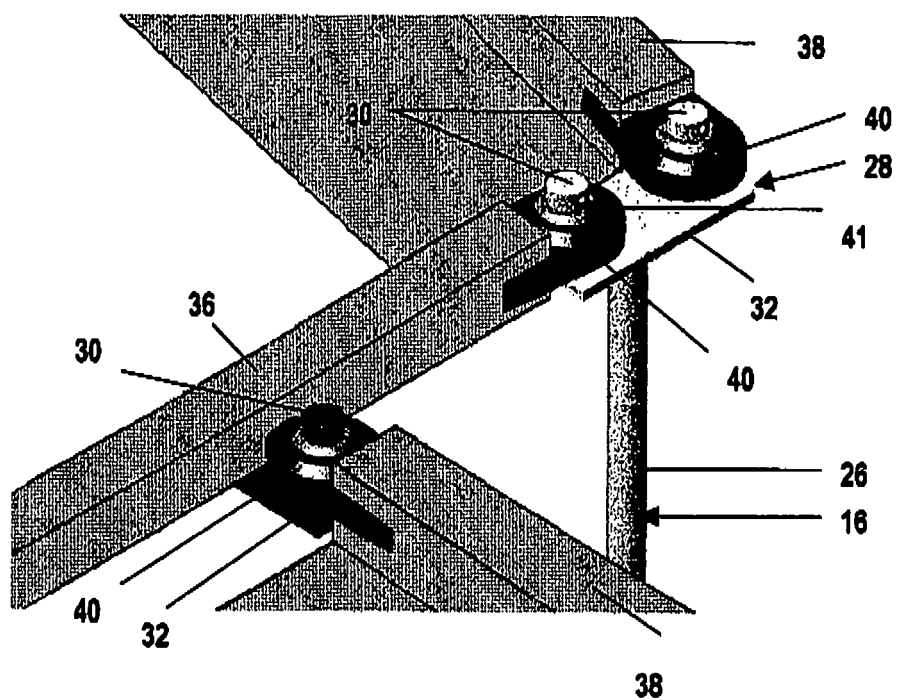


FIG. 8

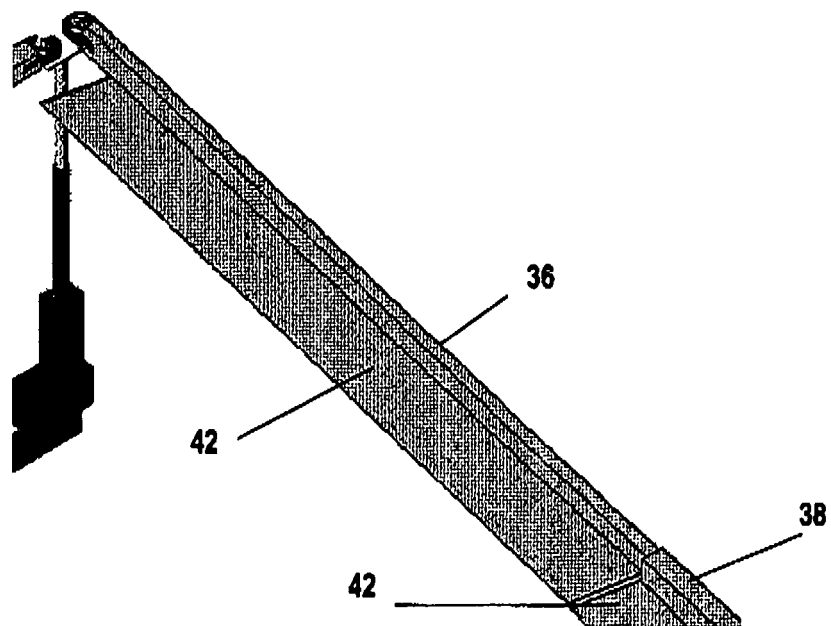


FIG. 9

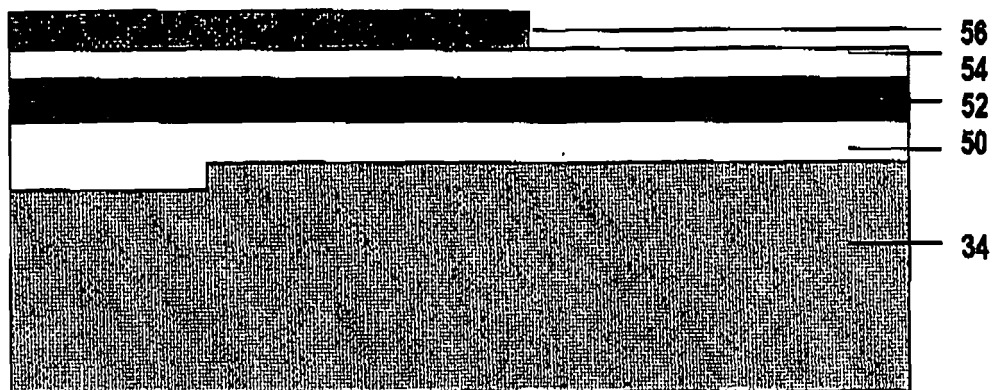


FIG. 10

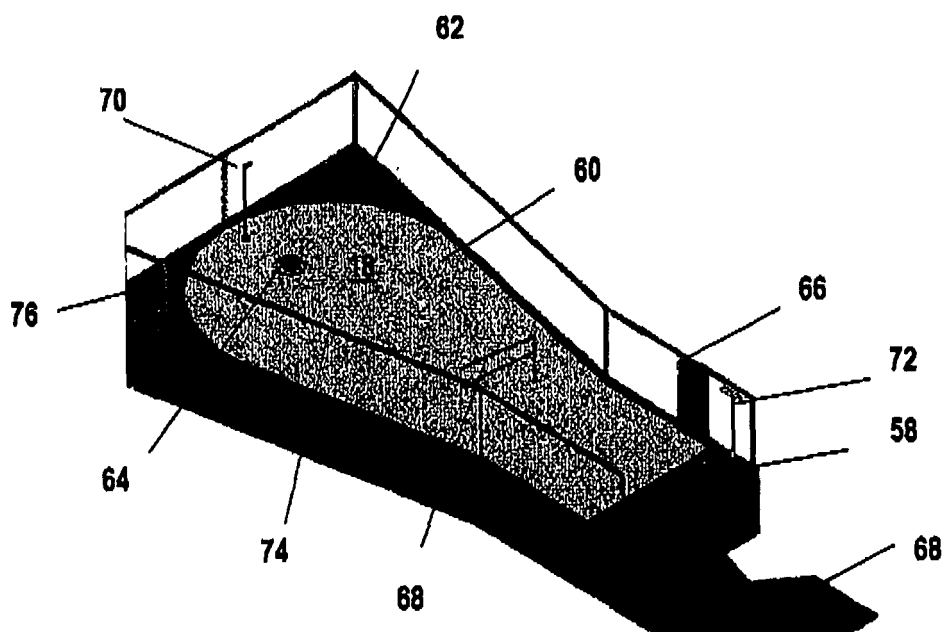


FIG. 11



European Patent
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EUROPEAN SEARCH REPORT

Application Number
EP 07 01 1808

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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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The present search report has been drawn up for all claims			
Place of search Munich		Date of completion of the search 19 November 2007	Examiner Lundblad, Hampus
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**ANNEX TO THE EUROPEAN SEARCH REPORT
ON EUROPEAN PATENT APPLICATION NO.**

EP 07 01 1808

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19-11-2007

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