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(54) **Resting device with variable height for supporting prefabricated modules or en bloc elements**

(57) Resting device to be placed at resting points of prefabricated modules or en bloc elements, characterized in that it substantially comprises two overlapped plates, respectively upper plate, whereon the prefabricated module or en bloc element rests, and lower plate, which rests on the ground, and means for adjusting the distance between said plates.

In this way it is possible to keep each prefabricated module in horizontal position even in presence of irregular and not horizontal grounds.

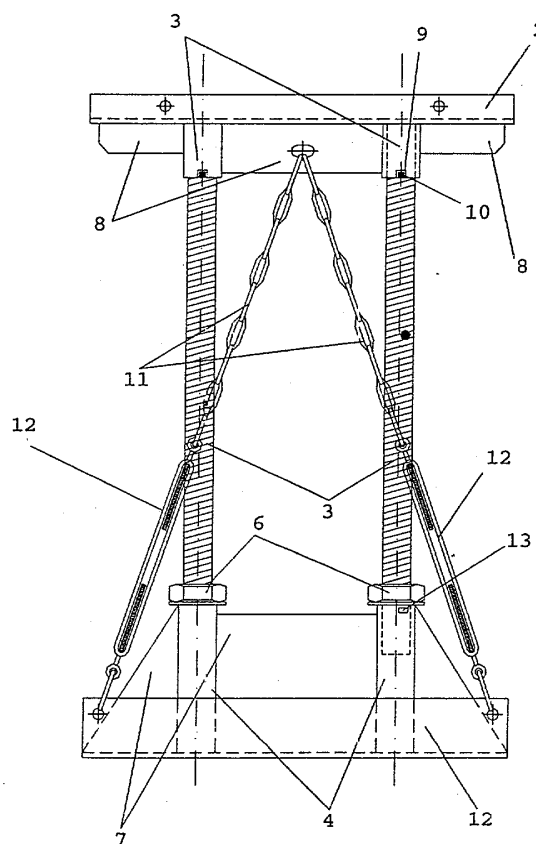


FIG. 1

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Description

[0001] The present invention mainly relates to the field of prefabricated housings and in particular the laying and installation of dwelling modules on not perfectly flat and levelled grounds and surfaces.

[0002] The possibility of implementing housings or environments for dwelling, working, recreational, etc. use is well known, by utilizing prefabricated modules which can also be placed side by side or overlapped to implement environments with different size and/or with several storeys.

[0003] Although the comfort level which can be provided by such modules and by the configurations thereof have reached very high levels, the installations in places where the ground is not flat or it is however irregular or inclined remain always a problem.

[0004] In fact, in these cases it is necessary to perform advance excavating works to arrange a horizontal, flat and regular resting surface, at least in the areas which must be occupied by the prefabricated modules mentioned above.

[0005] It is evident that these excavating or earth-bringing works are very expensive both as to the execution time and as to the costs for the taking place thereof.

[0006] Thus, the main object of the present invention is to overcome the problems mentioned above by providing a resting device to be placed at the supporting points of said prefabricated modules, which device is adjustable in height to fit the ground irregularities and to guarantee to the module itself a plurality of supports able to keep it on a horizontal plane.

[0007] This has been achieved, according to the invention, by providing the use of a plurality of resting devices which can be adjusted in height in an independent way the ones from the others, each of them comprises a lower base rigid plate resting on the ground, an upper rigid plate overlapped to the preceding one and whereon the prefabricated module rests and a pair of columns with adjustable height orthogonal to said plates, apt to sustain the weight of the loads exerting on the upper plate by discharging them on the ground by means of the lower base plate, which columns are arranged in symmetrical position between the same plates. The two plates and columns, preferably, are made of resistant and stiff metallic material.

[0008] A better understanding of the invention will take place with the following description and by referring to the enclosed figures which illustrate, by way of example and not for limitative purpose, a preferred embodiment.

[0009] In the drawings:

figure 1 is a side elevational view of the device according to the invention wholly assembled;
figures 2, 3A and 4A are the three views in orthogonal projection of the upper plate of the device of

figure 1;

figures 3B÷3D shows variants of the upper plate of figure 3A;

figure 4B shows a plate analogous to the one of figure 4A, characterized by a smaller width than the preceding one;

figures 5, 6 and 7A are the three views in orthogonal projection of the lower plate of the device of figure 1; figure 7B, analogous to figure 7A, shows a variant of the lower plate characterized by a smaller width than the one of the preceding case;

figures 7C and 7D, analogous to figures 7A and 7B, show a variant of the lower plate characterized by a smaller height of the stiffening ribs than the one of the preceding case;

figure 8 shows schematically a plan view of two prefabricated modules arranged one close to the other to form a single dwelling unit;

figures 9 and 10 show the arrangement of a device as the one of figure 1 at the intersection point between two modules designated with D in figure 8; and

figure 11 shows, in particular, the end areas of one of the threaded bars.

[0010] By referring in particular to figure 1, the resting device with adjustable height according to the present invention comprises a lower base plate 1 and an upper resting plate 2 overlapped to the preceding one, both of them stiff, equipped with respective housing means for the, respectively, lower and upper ends of a pair of columns 3 equipped with means for adjusting the height thereof. On this point, it is useful to note that the height of the columns 3 determines the distance between the lower plate 1 and the upper plate 2.

[0011] In the embodiment example which is illustrated, said housing means for the ends of columns 3 are constituted by two tubular members 4 and 5 arranged symmetrically and orthogonal thereto, opened upwards (lower plate) and downwards (upper plate), respectively.

[0012] In particular, said columns 3 are preferably constituted by two threaded bars, preferably steel bars, the upper ends thereof rest directly on the bottom of the respective housings 5 in the upper plate 2, whereas in proximity of the lower ends, which are inserted into the housings 4 on the lower plate 1, two nuts 6 are arranged, each one screwed in the thread of the respective column 3, apt to act in contrast with the seat 4 of the columns themselves by allowing the adjustment of the distance between said plates 1 and 2 by means of an appropriate variation in length of the threaded bar tract contained inside the housing 4 on the lower plate 1.

[0013] The preferred embodiment of the invention described so far provides ribs 7 and 8 arranged in a known way on the respective lower plate 1 and upper plate 2, apt to stiffen the plates themselves and to keep in position the seats 4 and 5 for the ends of the columns 3 which, as it can be easily understood, are subjected to

even very strong axial loads.

[0014] It is just the case to note that, upon screwing the nuts 6 on the threaded bars or columns 3, an approaching of the upper plate 2 and lower plate 1 is obtained, whereas upon unscrewing the same nuts 6 the opposite effect is obtained.

[0015] In order to ease the adjusting procedures just described, preventing the columns 3 from rotating around their own axis, at the opening edge of the upper housings 5 of the columns 3, recesses 9 are provided wherein corresponding pawls 10 integral with the body of the columns 3 themselves engage (figure 11). Said pawls 10, for example, can be constituted by the end of a diametral pin properly arranged in the body of each bar 3, preferably at about 50 mm from its upper end.

[0016] Apart from that, stop means preventing the accidental coming out of the columns 3 from their lower seat 4 during the procedures for adjusting the distance between the two overlapped plates 1 and 2 are also provided. In the embodiment example which is described, such means are constituted by a welding point 13 specifically implemented in proximity of the lower end of the threaded bar 3, in this way it is guaranteed that an end tract of the bar 3 remains always inside its seat 4 in the lower base plate 1.

[0017] To stiffen the lower plate 1 and the upper plate 2, the edges of greater sides thereof are folded up upwards so as to implement side edges orthogonal to the plane of the plates themselves.

[0018] Still according to the present invention, tension members are also provided, preferably constituted by four jack chains 11 with ties 12 which, after having adjusted the distance between the plates 1 and 2 of the resting devices described sofar, are stretched preferably between the ends of the folded-up longitudinal edges of the lower base plate 1 and the central rib 8 of the upper plate 2. In this way the self-levelling plates become a substantially indeformable single body.

[0019] The sizes of the plates 1 and 2 and of the columns 3 are obviously calculated based upon the loads which have to be supported. In particular, in case the dwelling modules have to be placed side by side, larger plates for "inner" rests can be provided (see figures 3A, 4A, 6, 7A, 7C) so as to be able to sustain the loads generated by two prefabricated modules and to distribute them on an appropriately broad surface. Furthermore, on the lower plates 1 also ribs 7 with different height are provided (see figures 7B, 7D) to implement resting devices able to guarantee a sufficient stiffness and resistance even in case of grounds with great differences in height.

[0020] It is obvious that the same objects of the invention are achieved also by reversing the arrangement of the columns 3, that is so that the nuts act in contrast with the upper resting plate 2, whereas obviously the already described means preventing the rotation of the columns 3 has to be arranged on the lower base plate 1. The fact of arranging the nuts 6 in the lower part makes easier

the procedures of installers, which can see the nuts which have to be rotated more readily.

[0021] From figures 8÷10 it is clearly seen that, in case of side-by-side dwelling modules M1, M2, in order to allow an easy positioning of the self-levelling resting devices according to the invention even at the intersections (one thereof is designated with the reference "D" in figure 8) between the basements' girders or beams of the prefabricated modules, it is necessary to provide openings in the stiffening side edges of the upper plates 2, in order to allow the passage of the basement's girder or beam transversal to the upper plate 2.

[0022] To this purpose, upper plates 2 with opening on the right, on the left or on both sides are provided (see figures 3B÷3D).

[0023] The present invention has been described and illustrated in a preferred embodiment thereof, but it is clear that any person skilled in the art could apply modifications and/or replacements equivalent from the technical and/or operating point of view, however comprised within the protective scope of the present industrial invention.

[0024] For example, a possible variant could concern the number of the columns 3, which could be more than two, but also only one placed at the centre between the lower plate 1 and upper plate 2.

Claims

1. Resting device to be placed at resting points of prefabricated modules or enblocs, **characterized in that** it substantially comprises two overlapped plates, respectively upper plate (2), whereon the enbloc rests, and lower plate (1), which rests on the ground, and means for adjusting the distance between said plates; thus obtaining to keep each prefabricated module (M1, M2) in horizontal position also in presence of irregular or not horizontal grounds.
2. Resting device according to claim 1, **characterized in that** said lower base plate (1) and said upper resting plate (2), both of them stiff, are provided with respective housing means for, respectively, the lower and upper ends of a pair of columns (3) equipped with means for adjusting the height thereof; the height of the columns (3) determining the distance between the lower plate (1) and upper plate (2).
3. Resting device according to the preceding claim, **characterized in that** said housing means for the ends of the columns (3) are constituted by two tubular elements (4) and (5) positioned symmetrically and orthogonal thereto, opened, respectively, upwards (lower plate) and downwards (upper plate).
4. Resting device according to the preceding claim,

characterized in that said columns (3) are constituted by two threaded bars, for example steel bars, the upper ends thereof rest directly on the bottom of the respective housings (5) in the upper plate (2), whereas in the proximity of the lower ends, which are inserted into the housings (4) on the lower plate (1), two nuts (6) are arranged each one screwed in the thread of the respective column (3), apt to act in contrast with the seat (4) of the columns themselves by allowing the adjustment of the distance between said plates (1) and (2) by means of an appropriate variation in the length of the threaded bar tract contained inside the housing (4) on the lower plate (1).

5. Resting device according to any of the claims 2 onwards, **characterized in that** it provides ribs (7 and 8) arranged in a known way on the lower plate (1) and on the upper plate (2), apt to stiffen the plates themselves and to keep in position the seats (4 and 5) for the ends of the columns (3) which, as it can be easily understood, are subjected to even very strong axial loads.

6. Resting device according to claim 4, **characterized in that** in order to ease the procedures for adjusting the distance between the upper resting plate (2) and lower base plate (1), at the opening edge of the upper housings (5) of the columns (3), recesses (9) are provided wherein corresponding pawls (10) engage, integral with the body of the columns (3) themselves, which are apt to prevent the rotation of the columns themselves around their own axis.

7. Resting device according to claim 3 or 4, **characterized in that** stop means are also provided which prevent the accidental coming out of the columns (3) from their lower seat (4) during the procedures for adjusting the distance between the two overlapped plates (1 and 2).

8. Resting device according to any of the preceding claims, **characterized in that** in order to stiffen the lower plate (1) and upper plate (2), the edges of their greater sides are folded-up upwards so as to implement side edges orthogonal to the plates themselves.

9. Resting device according to any of the preceding claims, **characterized in that** tension members are provided which, after having adjusted the distance between the plates (1 and 2), are stretched between the corner areas of the lower base plate (1) and the central area of the upper plate (2).

10. Resting device according to the preceding claim, **characterized in that** said tension members are constituted by four jack chains (11) with adjusting

ties (12); thus obtaining that the self-levelling plates become a substantially indeformable single body.

11. Resting device according to any of the preceding claims, **characterized in that**, in case the dwelling modules have to be placed side by side, larger plates are provided, so as to sustain the loads generated by two prefabricated modules and to distribute them on an adequately wide surface.

12. Resting device according to any of the preceding claims, **characterized in that**, on the lower plates (1), stiffening ribs (7) with different height are also provided to implement resting devices able to guarantee a sufficient stiffness and resistance even in case of grounds with great differences in height.

13. Resting device according to any of the preceding claims, **characterized in that** in order to allow an easy positioning even at the intersections between the basements' girders or beams in case of side-by-side dwelling modules (M1, M2), openings in the stiffening side edges of the upper plates (2) are provided apt to allow the passage of the basement's girders or beams transversal to the upper plates (2) themselves; to this purpose, upper plates with opening on the right, on the left or on both sides being provided.

14. Resting device according to claim 7, **characterized in that** said stop means are constituted by a welding point (13) specifically implemented in the proximity of the lower end of the threaded bar (3); thus obtaining that an end tract of the bar (3) always remain inside its seat (4) in the lower base plate (1).

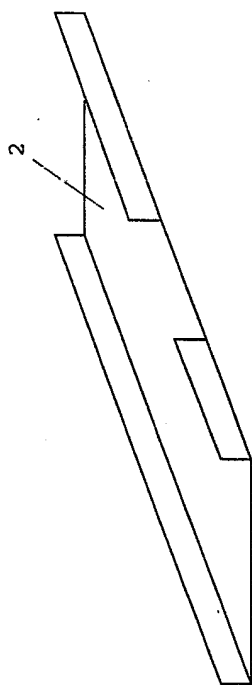


FIG. 3B

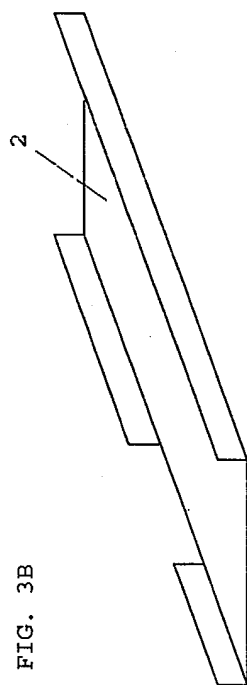


FIG. 3C

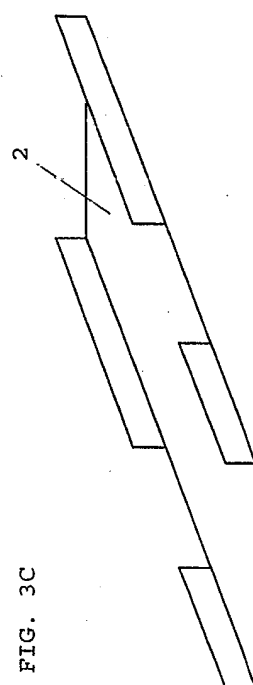


FIG. 3D

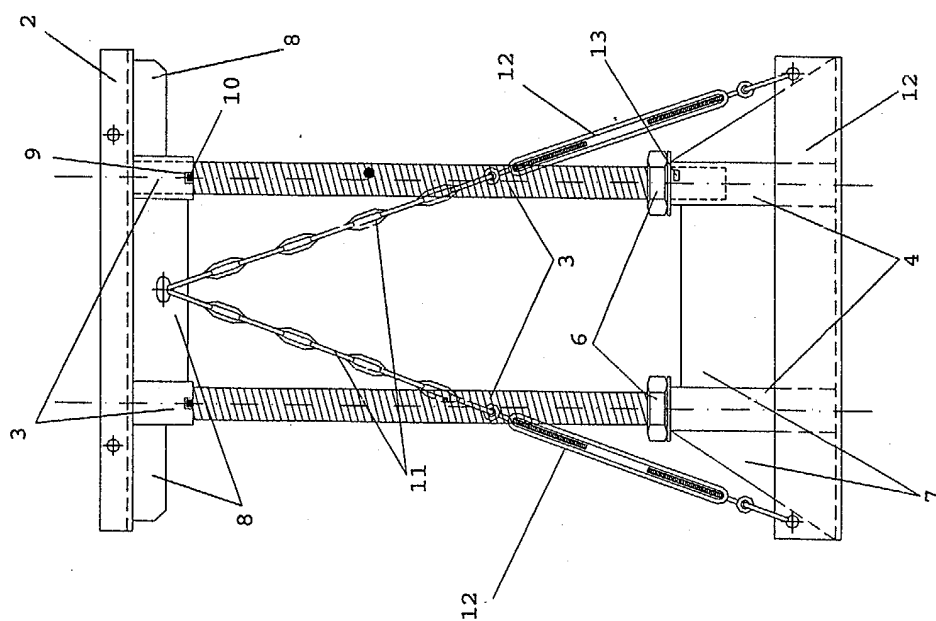
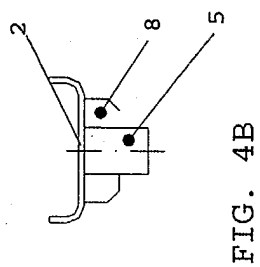
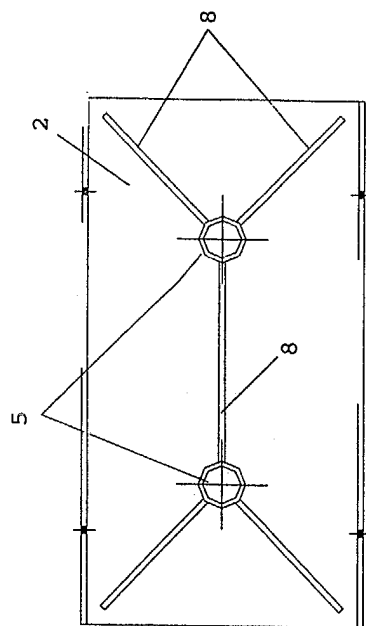
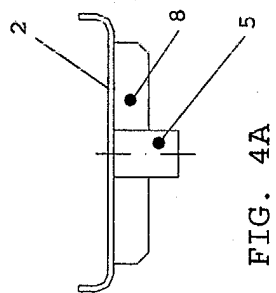
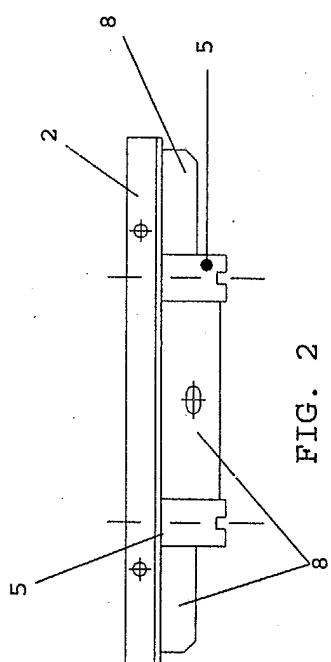


FIG. 1



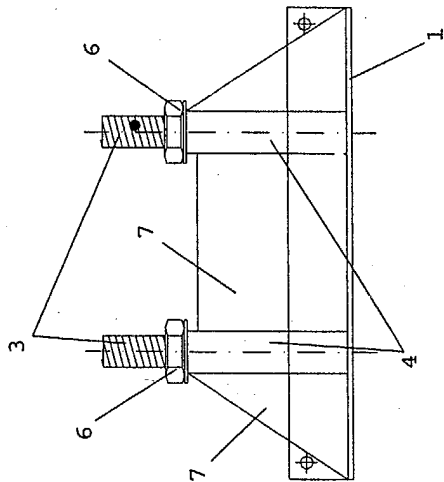


FIG. 5

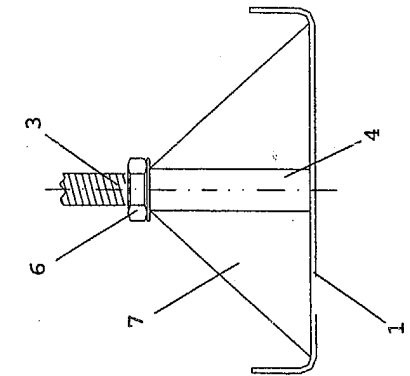


FIG. 7A

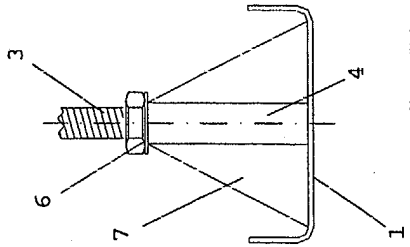


FIG. 7B

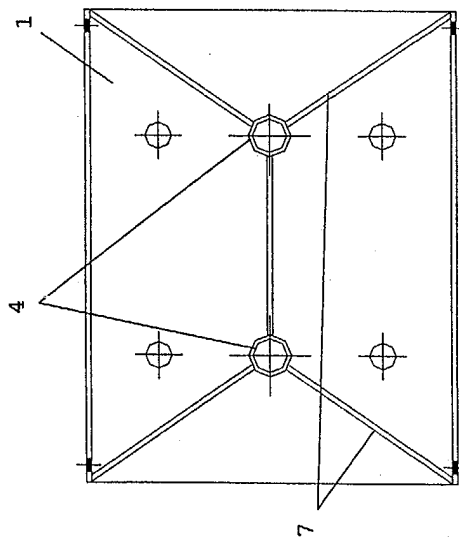


FIG. 6

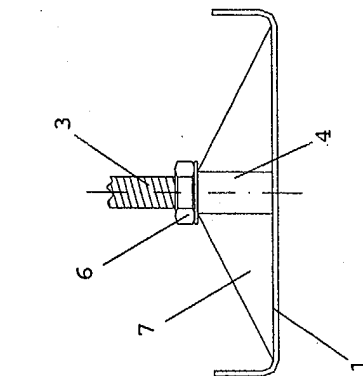


FIG. 7C

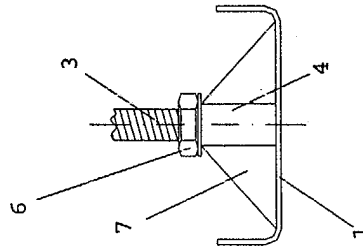


FIG. 7D

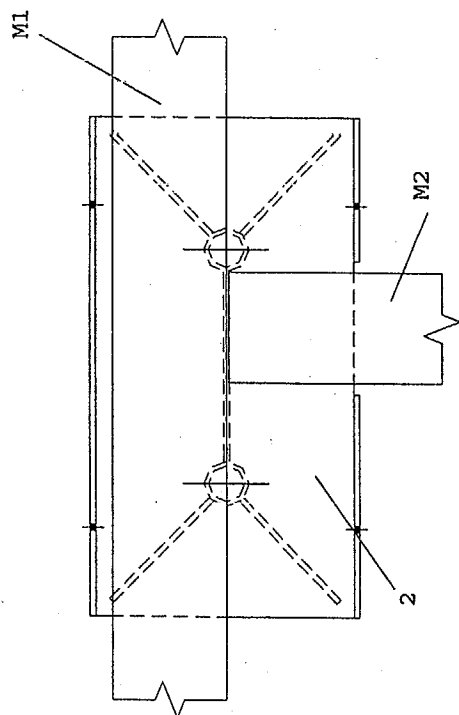


FIG. 10

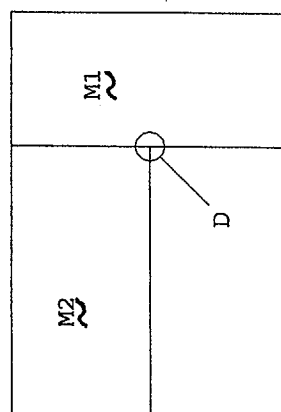


FIG. 8

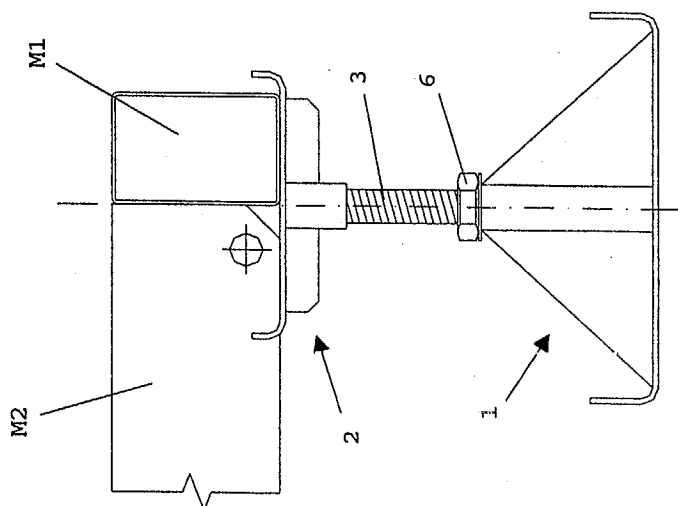


FIG. 9

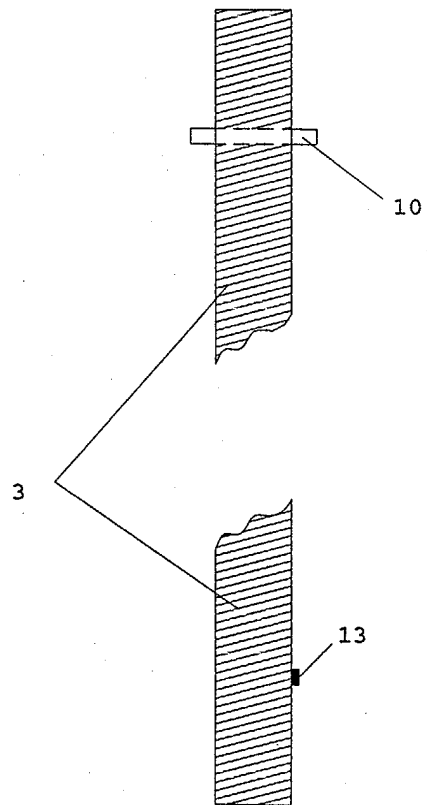


FIG. 11