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(54) **Railing system**

(57) The invention relates to a railing system including a U-beam (2) and at least one plate-like element (1), preferably a glass plate, where the plate-like element (1) should be fitted at one edge in a groove (20) provided in the U-beam (2) and supported against it by two or more wedges (5; 14, 15). The wedge can be pressed in place by a screw (9) that is fitted to pass through part of the U-beam wall (2a). According to the invention, in the railing system the first inner surface (21) of the groove (20) of the U-beam (2) comprises, when observed on the cross-sectional plane of the U-beam, at least one straight surface (21a, 21b), that is placed at an inclined angle (α) with respect to the other inner surface (22) of the groove that is parallel with the surface of the plate-like element to be fitted in the groove, and the tip angle (β) of the wedge (5; 14, 15) corresponds to the angle (α) left between the inclined parts of the first and second inner wall. In a preferred embodiment of the invention, a screw (9) is fastened to the wedge (5; 14, 15), so that when turning the screw in one direction, the wedge is movable along the first inner wall (21) of the U-beam groove, so that the plate-like element is in the locked position pressed by the wedge against the second inner wall of the U-beam, when the plate-like element should be fastened to the U-beam, and respectively when turning the screw in the other direction, the wedge is pulled in the opposite direction, to the rest position, where the plate-like element can be released from between the wedge and the first inner wall

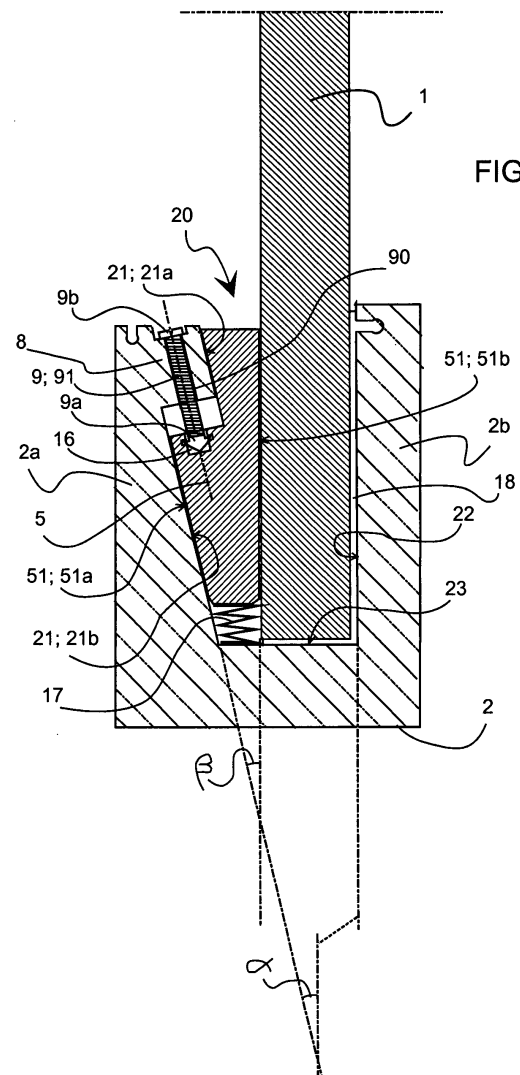


FIG. 1

Description

[0001] The invention relates to a railing system according to the preamble of claim 1.

[0002] The knowledge how to use glass as a building material has spread to more and more demanding targets, and at present this knowledge is utilized in whole buildings, except for frame structures. A narrow but all the more important target where glass has gained ground is railings. Railings are a compulsory safety system that requires strict safety criteria. A railing must be well attached to the underlying structure and supported to resist all pressures and strains directed thereto with a wide safety margin. The number of railings being used varies from welded multipart frame structure solutions to uniform entities. In most cases railings form a conspicuous part of a building, wherefore a successful technical solution also must include a successful design of the overall appearance.

[0003] Conventionally, a safe railing requires that it is supported on many sides, which requirement also results in expensive structures and costly working steps for realizing the railings on a building site. In railing design, it has proved successful to concentrate on large entities. This approach has favored two materials above all: aluminum as the railing support material, and glass as the body. Aluminum is strong, light and easily workable. As for glass, it is a beautiful material, and as an armored glass variety, also impact resistant and strong.

[0004] In the commercial market, there are found railing systems realized from aluminum and glass, where the railing is supported against other structures only from one direction and in a very narrow area. In these applications, the employed support is a U-beam made of aluminum and provided for example with 10 - 15 cm high walls. The U-beam is attached to the underlying structure by bolts. The glass plate constituting the body of the railing is embedded and fastened to the U-beam groove in various different ways. In one solution, the U-beam is composed of two elements, in between which the glass plate is compressed and attached by bolts. In another solution, the glass plate is fastened in the U-beam groove by striking wedges in between the glass plate and the U-beam walls. In shape, the wedges are long and wide in order to support the glass with an even load against the walls of the U-beam. The wedges are installed by hand implements, by knocking them in between the U-beam wall and glass.

[0005] The problem with the above described railing systems is, among others, their complicated structure and difficulty in installation. The U-beams and the glass plate must be fitted together, and openings for the fastening bolts must be suitably aligned therein. On the other hand, when using separate wedges, the knocking of wedges in between the glass and the U-beam wall takes time and requires special care in order to prevent the glass plate from being broken or otherwise damaged. The situation is especially problematic when, for one rea-

son or another, one or several glass plates in the system must be replaced, for instance owing to major repairs or damages. The disengagement of separate bolts and/or wedges is troublesome and may require expensive special tools. Consequently, maintenance is time-consuming and costly.

[0006] In the prior art there is known, from the publication EP-1277894-A2, a handrail system where the railing is formed of plate-like elements, preferably glass plate elements, and U-shaped beam, in the groove of which the plate-like element is fastened at the bottom edge by two wedges. The U-beam in part is fastened for instance at the outer edge of a balcony where the railing should be arranged. Said publication describes an arrangement where the second wedge is attached by a screw in the U-beam groove, so that the tip of the wedge points towards the groove opening. The first wedge is arranged in between the plate-like element and the second wedge, so that the tip of the wedge points towards the groove bottom and is opposite with respect to the first wedge. The plate-like element is fastened in place in the U-beam, in between the second wall of the groove and the second wedge. For this purpose, the screw is arranged to pass through the top part of the U-beam wall and to have a pushing effect in the first wedge, so that the wedge and at the same time the plate-like element are pressed in place and attached to the U-beam.

[0007] The drawback with the known railing system is that it comprises several separate elements, particularly two wedges and their fastening screws that must be fitted in place together with the plate-like element when performing the fastening operation. In addition, a particular drawback is that the railing system is difficult to maintain, particularly to dismantle for instance when a plate-like element is broken.

[0008] The object of the present invention is to eliminate the drawbacks connected to the above described railing systems. Another object of the invention is to achieve a new railing system that is suited for a variety of building targets.

[0009] The railing system according to the invention is characterized by what is set forth in the appended claim 1. The independent claims describe preferred embodiments of the invention.

[0010] The railing system according to the invention includes a U-beam and at least one plate-like element, preferably a glass plate, where the idea is to fit the plate-like element at one edge in the U-beam groove and support it there by two or more wedges that can be compressed in place with a screw that is arranged to pass through part of the wall of the U-beam. According to the invention, the first inner surface of the U-beam groove in the railing system comprises, when observed in the cross-sectional plane of the U-beam, at least one straight surface that is placed at an inclined angle with the other straight inner surface of the groove, which surface is parallel to the surface of the plate-like element to be fitted in place, and the tip angle of the wedge corresponds to

the angle left between the inclined part of the first and second inner walls.

[0011] It is an advantage of the invention that the assembling and disassembling of the railing is realized in a simple and effective way in the railing system according to the invention. The first inner wall of the U-beam groove is designed so that in the most advantageous case, the plate-like element can be reliably attached by one wedge to the supporting U-beam in order to realize the desired railing.

[0012] Another advantage of the invention is that in the most advantageous case, the dimensions of the U-beam and the wedge are equal, which means that instead of expensive molds, the extrusion technique can be applied in their production, which means remarkable savings in expenses when manufacturing the elements of the system. In addition, it is advantageous that the number of different elements of the railing system is small, which also has an effect in lowering the production expenses. Moreover, it is an advantage of the invention that the task of the railing system wedge is not so much to intrude in between two elements, but to push the plate-like element, preferably a glass plate, towards the other inner wall of the U-beam, in which case it is not necessary to strike the wedge in place by force, but it is in a way only set in place. The installation of the wedge is controlled by turning a screw, both when joining the U-beam and the plate-like element together, as when disengaging this joint.

[0013] In a preferred embodiment of the invention, by turning a screw, the wedge is made to move back and forth in the vertical direction in the space between the U-beam and the glass plate or the like, so that also the disassembling of the railing structure becomes easier. Moreover, it is advantageous that the measures of the U-beam groove are so designed that when the wedge has reached the groove bottom, the glass plate or the like is, pushed by the wedge, in a tight contact with the second inner wall of the U-beam groove, which groove is, in suitable parts, also provided with a sealing, such as rubber sealing.

[0014] The invention and its further advantages are described in more detail with reference to the appended drawing, where

Figure 1 illustrates a cross-section of a railing system according to the invention, and

Figure 2 illustrates a cross-section of another embodiment of the invention.

[0015] Like numbers for like parts are used in the drawings.

[0016] The railing system according to the invention includes a U-beam 2 and at least one plate-like element 1, preferably a glass plate. Preferably there are several plate-like elements 1, which elements are arranged in the railing to be realized in succession, in the order of their length. Respectively, the length of the U-beam 2 depends on the railing to be realized. When composing

the railing, the plate-like element 1 must be fitted at one edge in the groove 20 of the U-beam 2 and supported against it by means of at least two wedges 5; 14, 15. Said wedge 5; 14, 15 can be compressed in place by means of a screw 9; 91, 92 that is fitted to pass through part of the U-beam wall 2a.

[0017] In a railing system according to the invention, the first inner surface 21 of the groove 20 of the U-beam 2 comprises, when observed on the cross-sectional plane, at least one straight surface 21 a, 21 b that is at an inclined angle α with the second straight inner surface 22 of the groove 20, which inner surface is parallel with the edge of the plate-like element 1 to be fitted in the groove. The tip angle β ; γ , of the wedge 5; 14, 15, i.e. the angle left between the wedge sides, corresponds to the angle α left between the inclined part of the first and second inner surfaces 21, 22. When assembling the railing, the wedge 5 is set in the locked position by means of a screw 9; 91, by suitably turning it with a tool, so that the wedge is moved and pressed, in the embodiment of figure 1, towards the bottom of the groove 20, and in the vicinity of the bottom, fastens the edge area of the plate-like element 1 between the second side of the wedge 5 and the second inner surface 22 of the groove.

[0018] The U-beam 2 is preferably realized so that its wall 2a, where the first inner surface 21 is arranged, is provided with a bracket 8; 13 towards the groove 20. The screw 9; 91, 92 is arranged to pass through said bracket.

[0019] In a preferred embodiment of the invention, figure 1, the first inner surface 21 the groove 20 of the U-beam 2 comprises two successive, stepwise arranged parallel straight surfaces 21a, 21 b, against which the wedge 5 is arranged to be supported at their respectively arranged first and second sides and the support surface 51; 51 a, 51 b formed thereby.

[0020] In addition, it is advantageous that in the embodiment described above, at least one spring element 17 is arranged in between the bottom 23 of the groove 20 of the U-beam 2 and the wedge 5. The number of spring elements 17 is preferably two per each employed wedge, because the wedges are relatively wide in the lengthwise direction of the U-beam. Now the spring elements 17 are arranged, in their lengthwise direction, at the opposite ends of the wedge 5. The spring elements 17 keep the wedges 5 in the rest position against the bracket 8, and thus, by means of them, there should be maintained an installation clearance between the wedge, the plate-like element 1 to be installed, and the groove bottom. Now the plate-like element 1 is easily fitted in the U-beam groove 20, because the wedge 5 is not on the way, owing to the spring.

[0021] As was already maintained above, the width of the wedge 5; 14, 15 in the lengthwise direction of the U-beam 2 is of the order 150 - 250 mm, preferably 200 mm. In between the wedges, there are left empty spaces, preferably equally large spaces, in the lengthwise direction of the U-beam 2. The height of the U-beam is for example 100 - 150 mm, and the width is for example 70 - 100 mm.

[0022] In another preferred embodiment of the invention, at least one screw 9; 91, 92 is fastened to the wedge 5; 14, 15. In that case the screw 9 is fastened for instance at its first end 9a rotatably to a fastening element arranged in the wedge 5, such as a recession 16. The other end 9b of the screw is supported against the edges of the hole 90. Now the hole 90 passing through the U-beam 2 is provided with a threading that is compatible with the threading of the screw 9; 91. When the screw 9 is turned in one direction, the wedge 5 is movable along the first inner surface 21; 21 a, 21 b of the U-beam groove 20 towards the groove bottom, so that the plate-like element 1 is in the locked position pressed by the wedge 5 against the second inner surface 22 of the U-beam, when the plate-like element 1 should be fastened to the U-beam 2. Respectively, when turning the screw 9; 91 in the other direction, the wedge 5 is pulled in the opposite direction, i.e. outwards and away from the groove bottom, to the rest position, where the plate-like element 1 can be released from between the wedge 5 and the second inner surface of the groove 20.

[0023] In the above described embodiment of the invention, the bracket 8, provided in the wall 2a of the U-beam 2, in which the hole 90 for the screw 9 is arranged, is fitted at the opening of the groove 20, or at least in the vicinity thereof.

[0024] In a third preferred embodiment of the invention, the bracket 13 of the U-beam 2 is arranged in the middle part of the groove 20, so that it divides the groove in a first and second groove section 20a, 20b. In addition, the inner surface 201 of the first groove section 20a and the inner surface 202 of the second groove section 20b are placed at a sharp angle γ with respect to the second inner surface 22 of the groove, but with respect to the bracket 13 or a plane imagined to pass through it, in opposite directions in a mirror image, as is illustrated in figure 2. Further, two wedges 14, 15 are arranged on different sides of the bracket 13 in the first and respectively the second groove section. The first and the second wedge 14, 15 are interconnected by a screw 9b arranged in the bracket hole 13a. Both wedges have concentric holes 14a, 15a that are provided with threadings suitable for the screw 9b. As the screw 9b is turned in one direction, the wedges 14, 15 are movable away from the bracket 13, so that they follow the inclined surfaces 201, 202 and press, by their support surfaces 14a, 15a, the plate-like element 1 fitted in the groove 20 against the second inner surface 22 and fasten the U-beam in the groove 20. Respectively, as the screw 9b is turned in the opposite direction, the wedges 14, 15 are movable towards the bracket 13, in which case they also follow the inclined surfaces 201, 202, but are pulled, by their support surfaces 14a, 15a, from the plate-like element 1 fitted in the groove 20 and simultaneously from the second inner surface 22 of the groove, and thus the plate-like element 1 is released from the fastening and it can be lifted up from the U-beam groove 20.

[0025] Moreover, it is advantageous that in the various

embodiments of the invention, the groove 20 of the U-beam 2 is provided, at least as regards the bottom 23 and the second inner surface 22 of the groove, by a sealing 18, preferably rubber sealing, for ensuring a secure fastening.

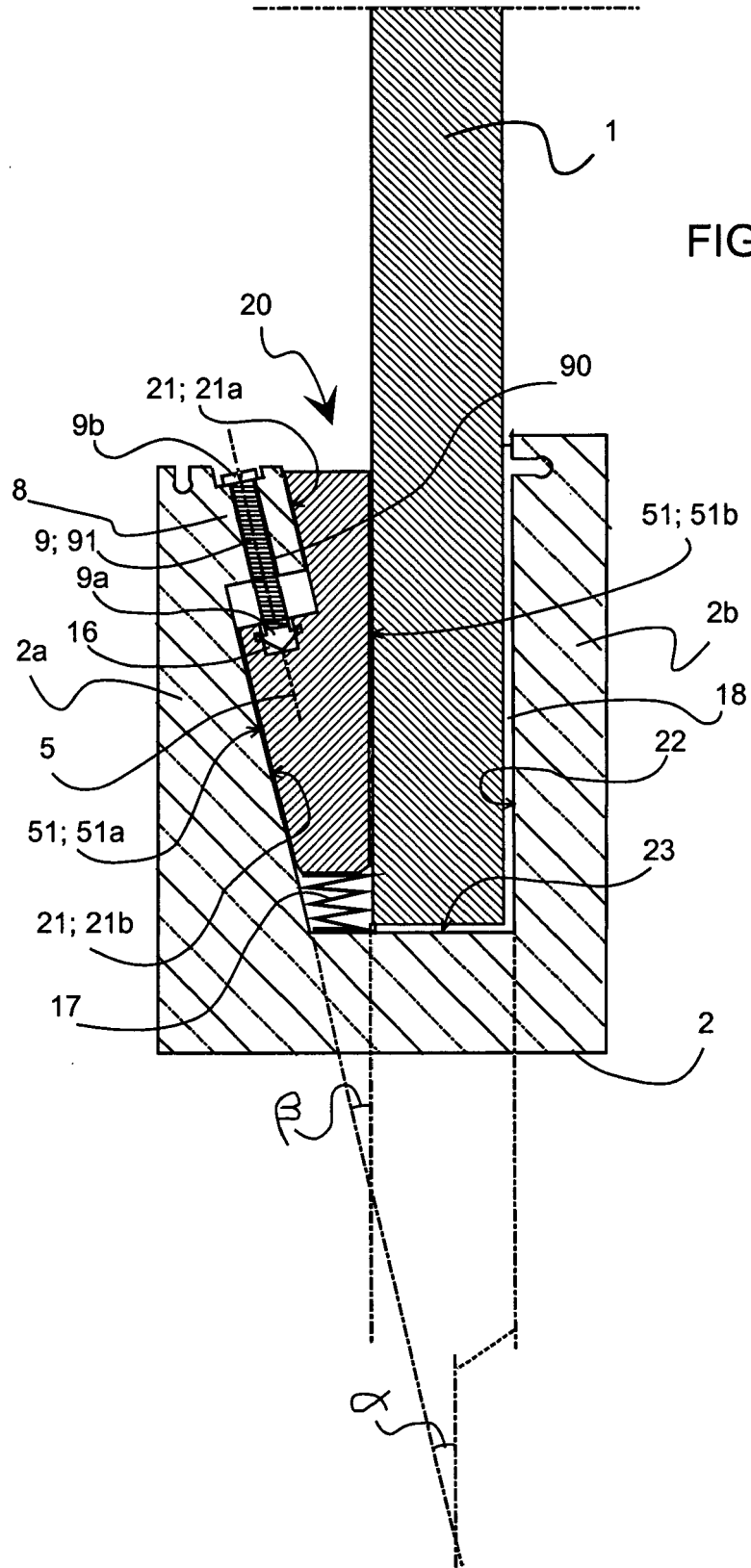
[0026] The invention is not restricted to the above described embodiment only, but many modifications are possible within the scope of the inventive idea defined in the appended claims.

Claims

1. A railing system including a U-beam (2) and at least one plate-like element (1), preferably a glass plate, where the plate-like element (1) should be fitted at one edge in a groove (20) provided in the U-beam (2) and supported against it by two or more wedges (5; 14, 15) that can be pressed in place by a screw (9) that is fitted to pass through part of the U-beam wall (2a), **characterized in that** in the railing system, the first inner surface (21) of the groove (20) of the U-beam (2) comprises, when observed on the cross-sectional plane of the U-beam, at least one straight surface (21 a, 21 b) that is placed at an inclined angle (α) with respect to the other straight inner surface (22) of the groove that is parallel with the surface of the plate-like element to be fitted in the groove, and that the tip angle (β) of the wedge (5; 14, 15) corresponds to the angle (α) left between the inclined parts of the first and second inner wall.
2. A railing system according to claim 1, **characterized in that** in the wall (2a) of the U-beam (2), provided with a first inner surface (21), there is arranged a bracket (8; 13) towards the groove (20), through which the screw (9) is arranged to pass through.
3. A railing system according to claim 1, **characterized in that** the first inner surface (21) of the groove (20) of the U-beam (2) comprises two successive, step-wise arranged parallel straight surfaces (21 a, 21 b), in which the wedge (5) is arranged to be supported against, at the respectively arranged first and second support surfaces (51; 51a, 51 b).
4. A railing system according to claim 1, 2 or 3, **characterized in that** at least one spring element (17) is arranged in between the bottom and the wedge (5) of the groove (20) of the U-beam (2), by which arrangement an installation clearance is maintained between the wedge and the groove bottom.
5. A railing system according to any of the preceding claims, **characterized in that** the wedge width in the lengthwise direction of the U-beam (2) is of the order 150 - 250 mm, preferably 200 mm.

6. A railing system according to any of the preceding claims, **characterized in that** at least one screw (9) is fastened to the wedge (5; 14, 15), so that when turning the screw in one direction, the wedge is movable along the first inner wall (21) of the U-beam groove, so that the plate-like element is in the locked position pressed by the wedge against the second inner wall of the U-beam, when the plate-like element should be fastened to the U-beam, and respectively when turning the screw in the other direction, the wedge is pulled in the opposite direction, to the rest position, where the plate-like element can be released from between the wedge and the first inner wall.
7. A railing system according to claim 6, **characterized in that** the screw (9) is at one end (9b) rotatably fastened to a fastening element, such as recession (16), arranged in the wedge (5; 14, 15),
8. A railing system according to claim 6 or 7, **characterized in that** the hole (90) passing through the U-beam (2) is provided with a threading that is compatible with the threading of the screw (9).
9. A railing system according to claim 6, 7 or 8, **characterized in that** the bracket (8) arranged in the wall (2a) of the U-beam (2), in which bracket the hole (90) for the screw (9) is arranged, is fitted in the opening of the groove (20).
10. A railing system according to claim 2, **characterized in that** the bracket (13) is arranged in the middle part of the groove (20), so that it divides the groove in a first and second groove section (20a, 20b), where the inner surface (201) of the first groove section and the inner surface (202) of the second groove section are placed at a sharp angle (γ) with respect to the inner surface (22) of the second groove, but with respect to the bracket (13) as a mirror image in opposite directions, and where two wedges (14, 15) are arranged on different sides of the bracket (13) and interconnected by a screw (9b) arranged in the bracket hole (13a), said wedges being provided with respectively threaded holes (14a, 15a) for the screw (9b), by which screw (9b) the wedges (14, 15) are movable for fastening the plate-like element (1) in the U-beam groove (20) and respectively for releasing it therefrom.
11. A railing system according to any of the preceding claims, **characterized in that** the U-beam (2) groove (20) is provided, at least on the bottom (23) and the second inner surface (22) of the groove, by sealing (18), preferably rubber sealing.

FIG. 1



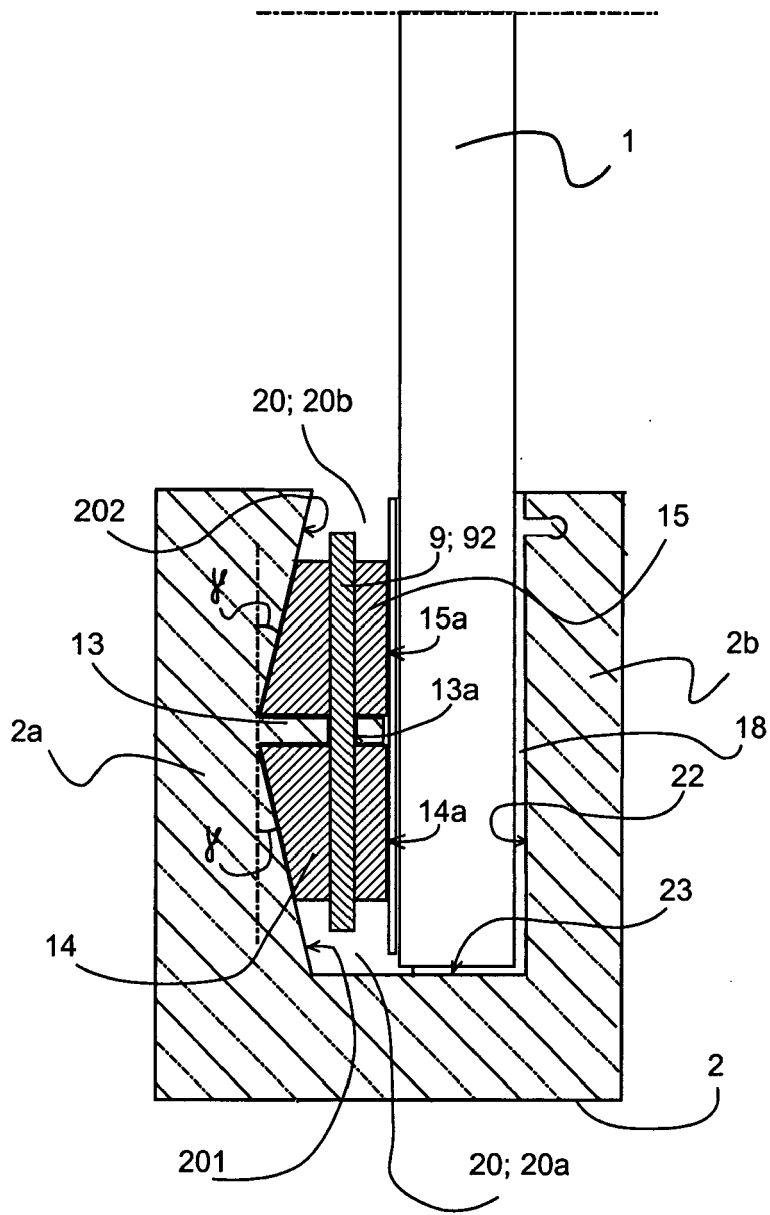


FIG. 2



DOCUMENTS CONSIDERED TO BE RELEVANT			
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Place of search		Date of completion of the search	Examiner
Munich		26 June 2007	Leher, Valentina
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**ANNEX TO THE EUROPEAN SEARCH REPORT
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