

Title: Attachment arrangement for plates

DESCRIPTION

The invention relates to a positional fixing device for plates, in particular glass plates and solar modules.

5 Positional mountings for drilled glass plates are known, in which the movability of the glass plate relative to a carrier construction is made possible by way of links, of which the centre point lies within the through-hole of the glass plate. Such a positional mounting is evident from the EP 0 201 212 B1: The link thereby allows a pivotation, but
10 practically no displacement perpendicularly to the plate plane.

The EP 0 655 543 B1 describes a limited pivotability of a holed plate, which is achieved thereby that in a recessed screw within the through-hole of the plate a double conical head of a bolt connected to the carrier construction is moveably located. This double conical head is
15 located on the face side between elastomeric discs. This construction is composed of numerous parts. Its manufacturing expense is very high. The assembly is time-consuming and can only be performed on the one side of the panel.

In the DE 198 59 888 A1 an arrangement for attachment of plate
20 shaped building elements is described, which requires no recesses in the plate shaped building element for attachment of the mounting elements. For this, in addition to the plate-shaped building elements, on one side a further plate-shaped building element is added in that a recess is present, through which a holding element passes. Thereby

the holding element is located in a partially conical partially cylindrical bore within the plate and through which a threaded bolt passes.

An attachment arrangement for a glass plate with voltaic elements is shown in the WO 99/63193. Thereby the attachment arrangement is held by a building side mounting on the one hand and on the other hand the glass plate is tensioned between two clamping elements. This invention is directed thereto that, at the inner side clamping element with adjustable pre-tension, a bell shaped cap is supported, whereby between the bell shaped cap and the inner side clamping element a permanent elastic spring element is arranged, which allows a relative movement of the bell shaped cap relative to the clamping element. Furthermore the invention is directed to the formation of several space links between the glass plate and the building side mounting as well as to the conductance of the current through the attachment arrangement as such.

The object of the present invention is to create an attachment arrangement in the form of positional mountings for plates, in particular glass plates, which allows a pivotation and a translatic displacement of the glass plate within particular limits. In addition this attachment arrangement must be produced at low cost and be universally applicable, whereby also a use with solar modules with aesthetic claim must exist. Furthermore the attachment arrangement must be simply and rapidly mountable so that the overall cost for facades, roofs, ceilings and the like composed of these panels is decreased considerably. The attachment arrangements must be

designed such that connection to a carrier construction on both sides of the plates is possible. Both sides of the plates mean both the inner side as well as an exterior side attachment. Finally the attachment arrangement must include both the positional mounting for simple
5 glass plates as well as for laminated glass plates.

The object of the invention is solved by the patent claim 1. The subsidiary claims thereby provide a further embodiment of the concept of the invention. The object is solved in the attachment arrangement mentioned initially as positional mounting in accordance with the
10 invention thereby that in each through-hole of a plate, here in particular a glass plate, an annular body with an interior thread and therewith tightly connected by a force locking and form locking connection to the exterior jacket of an elastic material is applied and a threaded bolt for connection to a carrier construction is screwable into
15 the annular body.

An elastic collar or an elastic ring, which under deformation can take up all possible movements of the plate relative to the carrier construction, is arranged between the annular body arranged in the through-hole of the plate, which can consist of metal, in particular
20 stainless steel, and the plate. This elastic jacket body has a radial dimension, which is dimensioned such that considerable movements between the annular body and the plate can be taken up without that these transfer the movements onto the plate. Such an attachment arrangement is suitable to maintain the elasticity of the glass plate,
25 because it does not restrict the freedom of movement thereof and thus

will lead to a force neutralisation. The glass plate is not restricted in its degrees of freedom relative to the base construction. Fixed tensioning means rigidity and therewith destruction of the glass plate.

The annular body has an axial threaded through-bore so that the threaded bolt can be screwed in from both sides of the ring body. The elastic jacket embraces the annular body on the inside and on the outside it abuts against the wall of the through-hole of the plate. Thus the overall intermediate space between the annular body and the plate is filled by the elastic jacket. By way of this measure different movements between annular body and plate, as already described, can be taken up, this includes in particular e.g. displacements of the plate plane to the annular body axis, a displacement of the plate plane parallel or inclined to the annular body axis or a displacement of the plate perpendicularly to the annular body axis (heat expansion of the plate, wind and snow loads on the plate). The positional mounting in accordance with the invention is therewith suitable for hanging and supporting application of plates, in particular glass plates, as is applied e.g. for ceilings or roofs, as well as for application of vertical carrier constructions, e.g. in glass facades but also for solar modules.

According to a preferred embodiment of the positional mounting of an attachment arrangement a nut is screwed onto the threaded bolt by way of the through-hole. Thus between the nut and the edge of the plate hole a ring of elastic material is arranged. By way of this ring, which is separate from the actual jacket in the through-hole, an

increased reliability in the moveable holding of the plate at the carrier construction results.

According to a preferred embodiment of the positional mounting in accordance with the invention on the annular body on the outside
5 there is formed at least one projection embedded in the jacket. This projection increases the contact surface between the annular body and its elastic jacket body and improves the force transfer from the plate onto the annular body in the different relative movements between the plate and the annular body or the carrier construction, which are
10 possible in practice. The projection can extend axially symmetrically across the overall circumference of the annular body. It can, however, also include several partial projections, such, as for example, prongs projecting star-shaped distributed outwardly and being embedded in the jacket body or the like. In the preferred embodiment a lens ring
15 shaped projection is formed on the annular body. Thereby this projection can be surrounded advantageously on all sides by an elastic jacket material. The lens shaped projection can be formed asymmetrically relative to a radial plane passing through its ridge line. Furthermore this projection can be arranged off centre on the annular
20 body and this being in such a manner that it has a larger distance from the mentioned face side of the annular body neighboured by the mentioned nut than from the face side spaced away from the nut.

Preferably the outer side of the annular body has an exterior and an interior cylindrical region, between which at least one projection is
25 arranged.

According to the preferred embodiment of the positional mounting further the through-hole of the plate is shaped at least convergingly. Thereby the contact surface between the inner side of the hole and the elastomeric jacket body is increased and the connection between the panel and metallic ring body is strengthened. Preferably the largest outer diameter of the annular body (e.g. at the ridge line of its projection) is larger than the smallest diameter of the plate through hole. Thereby the emergence of the annular body itself on loosening the elastomeric jacket body from this on the narrow side of the through-hole is excluded. Then the annular body can be held axially in the through-hole only by way of the above-mentioned nut screwed onto the threaded bolt adjacent the annular body. In suitable manner the through-hole of the plate and the exterior side of the jacket have a cylindrical conical cylindrical profile. Thereby the abovementioned nut is supported on the narrowed side of the through-bore at the plate and/or annular body.

According to a preferred embodiment of the positional mounting in accordance with the invention the elastic jacket is vulcanised onto the annular body. The rubber metal ring is a pre-manufactured part. In general its outer profile corresponds to the profile of the through-bore of the plate. The plates to be mounted are already provided in the factory with such a profiled through-bore and are brought with the fitted rubber metal ring into the trade. The rubber jacket in suitable manner has a Shore Hardness, which is adapted to the case of use. It is also possible that the rubber metal ring is glued within the hole in

the plate in order to avoid an unintended loosening during transportation.

The annular body preferably is surrounded only at its outer circumference by the exterior side jacket so that the annular body, seen
5 in axial direction, closes snugly on the outside with the jacket and therewith is free of the jacket. The present invention also extends on a positional mounting for laminated glass plates, consisting of an interior and an exterior glass plate, between which a plastics foil or a synthetic resin layer is arranged, characterized thereby that the positional
10 mounting extends only through the interior glass plate or through the interior and exterior glass plate. The positional mounting in accordance with the invention can be provided in laminated glass plates essentially with the same annular body with elastic jacket as in the case of simple glass plates, which are also provided with single
15 sheet safety glass, whereas in the case of known constructions the laminated glass plate requires a more complicated (multi-part) construction than the simple glass plate.

In suitable manner in the positional mounting for laminated glass plates the elastic jacket has a recess on the outside into which a cover
20 plate can be placed. This metal plate covers the annular body with the elastomeric jacket and the threaded bolt and improves the optical effect from the viewed side (e.g. in the case of a glass facade).

In addition to the recess for cover plate the annular body extends relative to the jacket in axial direction in the interior of the interior
25 plate. Therewith it is ensured that with a movement of the plate or the

attachment arrangement, the annular body does not come into contact with the exterior plate. In the case of very thick glass plates also several annular bodies, which are jacketed by an outside jacket, form an attachment arrangement within the glass.

- 5 Hereafter several embodiments are explained in more detail by way of schematically represented drawings.

It is shown in:

Figure 1: The axial section of a positional mounting for a simple glass plate with attachment tie located on the outside.

- 10 Figure 1a: As Figure 1 with modified lock nut.

Figure 2: A plan view of the positional mounting illustrated in Figure 1.

Figure 3: A view from below of the positional mounting shown in Figure 1.

- 15 Figure 4: The axial section of the positional mounting shown in Figure 1, however with attachment tie located on the inside.

Figure 4a: As Figure 4 with modified lock nut.

- Figure 5: The plan view of a positional mounting according to
20 Figure 4.

Figure 6: The view from below of the positional mounting shown in Figure 4.

Figure 7: The axial section of a positional mounting in a laminated glass plate.

Figure 8: The axial section of a positional mounting in a laminated glass plate with design modified in comparison to Figure 7.

5 Figure 9: The plan view of a positional mounting according to Figure 7.

Figure 10: The view from below of a positional mounting according to Figure 7.

10 Figure 11: Axial section through a positional mounting with photovoltaic elements and conductor guides through the positional mounting.

According to Figure 1 a glass plate 1 is provided with a cylindrical-conical-cylindrical through-bore 2, into which an annular body 3 is inserted, on which a rubber jacket 4 is vulcanised on the outside. Thus
 15 the annular body 3 and the jacket 4 form an integral unit, which is joined force lockingly and form lockingly. As can be seen, the metallic annular body 3 has on the outside, a lens annular shaped projection 3^a, shown in section, which has the cross-section shown in Figure 1 over its overall circumference. The projection 3^a is formed asymmetrically
 20 in relation to a radial plane 5. The annular body 3 has an interior threaded bore 3^b into which a threaded bolt 6 is screwed. The threaded bolt 6 extends through the annular body 3 and abuts with its head 6^a, carrying its exterior thread, against the outer side of the annular body 3. A nut 7 is screwed onto the head 6^a, of which the

outer diameter is larger than the inner diameter of the through bore 2 on the outer side of the glass plate 1. Between an exterior side 7^a of the nut 7 and the glass plate 1 there lies a ring 8 of an elastic material similar to the jacket 4. This elastic ring 8 can, analogously to the vulcanised rubber jacket 4, be vulcanised onto the face side of the nut 7.

As can be seen from Figure 3 the nut 7 has recesses 11 at the circumference for engagement of an assembly spanner. The face surfaces of the annular body 3 and the rubber jacket 4 close flush with the outer or inner side of the glass plate 1 (Figure 1). The rubber metal body 3, 4 therewith can be inserted into the bore 2, without that it hinders on stacking or during transportation of the glass plates 1. In the plan view of the positional mounting according Figure 2 it becomes clear that in the centre region the annular body 3 is not covered by the jacket 4. The embodiment shown in Figures 1 to 3 is suitable for the hanging application, e.g. from ceilings or facades.

The Figures 4 to 6 show the same positional mounting as in Figures 1 to 3. The glass plate 1 selectively can be assembled on the one or the other side whilst using the positional mounting in accordance with the invention. Therewith the number of the parts held in stock for the positional mounting system in accordance with the invention can be kept low. In this embodiment the head 6^a is designed as separate nut, which, on the one hand, is screwed into the nut 7 and on the other hand, through it a screwed-in threaded bolt 6 passes. However, it is also possible here to use a modified threaded bolt 6, in which the head

6^a is not located at the end but is arranged off-set for a reduced measure of the thickness of the ring body. A thread, which engages into the threaded bore 3^b, is present at this attachment.

In the Figure 1^a a modified nut 15 is shown. The exterior geometric formation of the nut 16 is analogous to the nut 7. The threaded bolt 6 thereby engages with its thread into a thread of the nut 15, whereby in the region of the interior thread of the nut 15 this region is designed such that it has a greater thickness than the nut 15 itself. By way of this section it is ensured that the ring 8 of the elastic material can spread onto the surface of the nut 15. The diameter of the interior region of the nut 15 with its thread is brought into line with the same diameter of the annular body 3, which is not covered by the jacket 4. On drawing the nut 15 onto the threaded bolt 6 therewith here the metallic material comes into contact with the annular body 3. Simultaneously it is ensured that in case of movement, both in the case of the glass plate 1 as well as the attachment arrangement a knocking of the outer edges of the nut 15 onto the surface of the glass plate 1 is avoided.

In similar manner only by way of a mounting on the other side, in Figure 4a the nut described in Figure 1a is used.

The Figure 7 shows a glass plate 1, which is represented as a laminated glass pane, consisting of an interior glass plate 1^a and an exterior glass plate 1^b, which are joined by way of an intermediately placed plastics foil 12. The annular body 3 with the elastomeric jacket 4 is inserted into a through-bore 2 of the plate 1^a. The construction shown in

Figure 7 differs from the preceding but for the additional glass plate 1^b and the foil 12 by way of the outer side formation of the annular body 3. Whereas the annular body 3 in the embodiment according to Figure 3 extends on the outside in the form of an annular cylindrical part up to the outer side of the plate and the jacket 4, and therewith closes off flush therewith, similarly in Figure 1a and 4a this annular cylindrical part is absent on the outer side of the annular body 3. The jacket, however, has a circularly shaped step 4^a in the form of a recess, into which a circularly shaped cover plate 13, preferably of stainless steel, is inserted. From the outer side through the plate 1^b the viewer sees, corresponding to Figure 9, merely a narrow ring of the rubber jacket 4 and the cover plate 13 arranged in the centre but not the annular body 3 and the threaded bolt 6 screwed therein. Furthermore the annular body 3 projects backwardly relative to the circularly shaped step 4^a, to prevent damage to the plastics foil 12 or the exterior glass plate 1^b on movement of the positional mounting.

In the embodiment of the positional mounting shown in Figure 8 the elastic jacket on the outside to the glass plate 1^b has a somewhat larger axial dimension than the embodiment according to Figure 7. The jacket 4 extends up to the exterior plate 1^b. The plates 1^a and 1^b are joined by way of a cast resin layer, which however is absent in the region of the elastomeric jacket 4. The Figures 9 and 10 show plan view or views of below of the positional mounting shown in Figures 7 and 8.

In a further embodiment of the concept in accordance with the invention a positional mounting of the type described in Figure 11 is shown in modified manner in an application in a solar module.

Between the glass plates 1^a and 1^b solar cells 9 are embedded in the synthetic plastics foil 12. The solar cells 9 have connecting conductors 10. In order to lead the connecting conductors 10 from the solar cells to a rectifier the threaded bolt 6 is provided with a bore 16, through which the connector conductors 10 are led away from the solar module. Also in this embodiment the annular body 3 with its elastomeric jacket ring 4 is embedded within the glass plate 1^a . Therewith the solar module is covered hermetically on the outside by the glass plate 1^b . The annular body 3 is attached by way of the threaded bolt 6 and this is fixed by way of the already described lock nut 15 against an outer shoulder of the annular body 3. Also in this case an elastomeric ring 8 is placed between the outer side of the glass plate 1^a and the abutment surface of the lock nut 15. In this manner of use of a positionally formed attachment 11 already in the creation process care can be taken that the connecting conductors 10 are led through the annular body 3 with its jacket 4, which are embedded within the bore 2 of the glass plate 1^a .

The above described positional mounting is characterized by simple construction, low manufacturing costs and a simple assembly. All possible relative movements between the plate 1 and the bolt 6 or the support structure connected therewith can be taken up to a particular degree. In the represented embodiment forms this is achieved by way

of an elastomeric annular profile, which abuts on the inside against the metallic annular body 3, in particular is vulcanised thereon and on the outside abuts against the holed wall of the plate.

Reference numerals

	1	glass plate
	1 ^a	interior glass plate
	1 ^b	exterior glass plate
5	2	through-bore
	3	annular body
	3 ^a	lens shaped projection
	3 ^b	threaded bore
	4	jacket
10	4 ^a	recess
	5	radial plane (ridge plane)
	6	threaded bolt
	6 ^a	head
	7	nut
15	7 ^a	outside
	8	ring
	9	solar cell
	10	connecting conductor
	11	recess
20	12	plastics foil
	13	cover plate

14 cast resin layer

15 lock nut

16 bore



PATENT CLAIMS

1. Attachment arrangement for plates, in particular glass plates (1) to a support on the side of a building, whereby the glass plates (1) have through-holes (2), characterized thereby that in each through-hole (2) at least one metallic annular body (3) with an interior thread (3^b) and with a jacket (4) of an elastic material connected tightly to the annular body (3) is inserted, and a threaded bolt (6) for connection to the building side support is screwed into the annular body (3).
5
- 10 2. Attachment arrangement according to claim 1, characterized thereby that a nut (7, 15) projecting beyond the through-hole (2) is screwed onto the threaded bolt (6).
3. Attachment arrangement according to claim 1, characterized thereby that at least one projection (3^a), embedded in the jacket (4), is formed on the outside on the annular body (3).
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4. Attachment arrangement according to the claims 1 and 3, characterized thereby that a lens annular shaped projection (3^a) is formed on the annular body (3).
5. Attachment arrangement according to claim 4, characterized thereby that the projection (3^a) is formed asymmetrically relative to a radial plane (5).
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6. Attachment arrangement according to claim 1, characterized thereby that the outer side of the annular body (3) has an exterior



and an interior cylindrical region, between which at least one projection (3^a) is arranged.

7. Attachment arrangement according to claim 1, characterized thereby that the through-hole (2) is shaped to be at least partially converging.
8. Attachment arrangement according to claim 7, characterized thereby that the largest outer diameter of the annular body (3) is larger than the smallest diameter of the through-hole (2).
9. Attachment arrangement according to one or more of the preceding claims, characterized thereby that the jacket (4) is vulcanized onto the annular body (3).
10. Attachment arrangement according one of the claims 1 to 9, characterized thereby that the through-hole (2) and the outer side of the jacket (4) have a cylindrical-conical-cylindrical profile.
11. Attachment arrangement according to one or more of the preceding claims, for laminated glass plates (1) consisting of an interior glass plate (1^a) and a exterior glass plate (1^b), which are joined by way of a synthetic plastics foil (12) or a synthetic resin layer (4) located between these, characterized thereby that the positional mounting extends only through the interior glass plate (1^a) or the interior and the exterior glass plate (1^a and 1^b).
12. Attachment arrangement according to one or more of the preceding claims, characterized thereby that between the nut (7)



on the one hand and the jacket (4) and the plate (1, 1^a) on the other hand a ring (8) of elastic material is arranged.

13. Attachment arrangement according to claim 11, characterized thereby that the elastic jacket (4) has a recess (4^a) for a on the
5 outside, into which a cover plate (13) is inserted.
14. Attachment arrangement according to one or more of the preceding claims, characterized thereby that the annular body (3) jumps back relative to the circularly shaped recess (4^a).
15. Attachment arrangement according to claim 11, characterized
10 thereby that between the interior glass plate (1^a) and the exterior glass plate (1^b) in the region of the synthetic plastics foil (12) solar cells (9) are embedded, of which the connecting conductors (10) are led through the annular body (3) provided with the jacket (4) or/and through a bore (16) of the threaded bolt (6).