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(54) Glass structure

(57) The invention relates to a glass structure comprising a first and a second glass construction part, particularly bearing glass panels, each provided with at least one main surface, wherein both construction parts are interconnected by means of at least one connection assembly so as to transfer forces, the connection assembly comprising:

a first connection member comprising a first connection surface which by means of an adhesive is attached to said main surface of the first glass construction part,

a second connection member comprising a first connection surface which by means of an adhesive is attached to said main surface of the second glass construction part, and

a third connection member connecting the first and second connection member for transferring constructive forces,

wherein the first connection surface of the first and second connection member are each spaced apart from an edge of the first and second glass construction part, respectively.

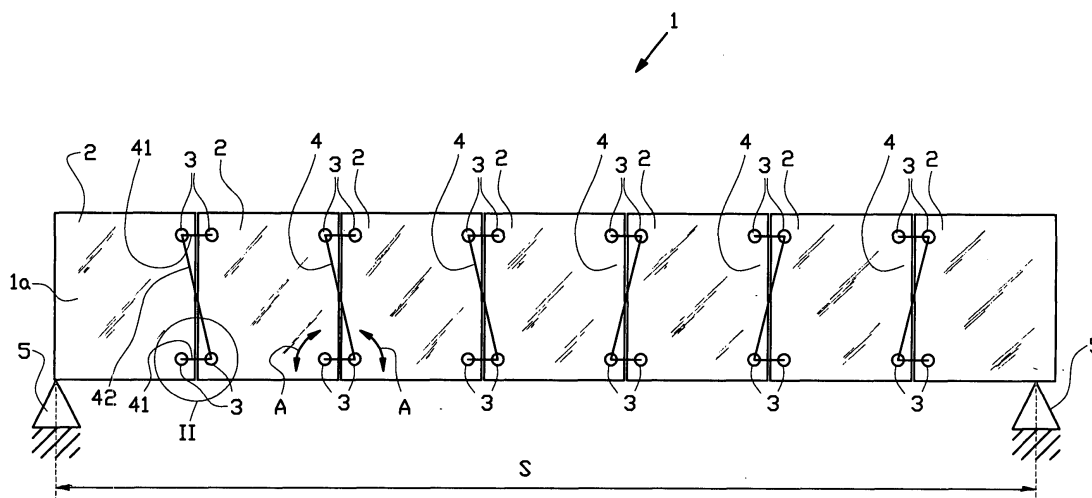


FIG. 1

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Description

[0001] The invention relates to a glass structure, particularly a bearing structure having bearing glass construction parts.

[0002] The invention furthermore relates to an assembly for mutually connecting construction parts in such structures, as well as to connection members for them.

[0003] Due to its properties glass is very alluring to architects and constructors. Up until now use has predominantly been made of the transparency and/or translucency of glass and glass mainly has a partitioning function, particularly a climate partitioning function. Glass panels are thus used in casings, doors and/or as facade cladding or in glass facades. In said uses the glass panels are connected to a bearing structure of for instance wood, metal, stone or concrete.

[0004] Using the strength of glass, wherein glass itself is used as construction part, up until now has been highly problematic. For realising large spans, such as glass footbridges, it is also desirable to use interconnected glass construction parts. For such an interconnection of glass construction parts and particularly for interconnecting bearing glass construction parts in a bearing manner a connection between the glass panels is necessary that is not only strong, but predominantly reliable and predictable in order to thus build safely.

[0005] It is therefore an object of the invention to provide a reliable and sufficiently strong bearing glass structure, which is provided bearing glass construction parts.

[0006] It is a further object of the invention to provide a reliable connection for bearing glass structures, wherein relatively large forces can be transferred, despite it being glass.

[0007] From one aspect the invention provides a glass structure according to claim 1. Advantageous embodiments have been described in the depending claims.

[0008] The glass structure according to the invention comprises a first and a second glass construction part, each provided with at least one main surface, particularly bearing glass panels, wherein both construction parts are interconnected by means of at least one connection assembly so as to transfer forces, the connection assembly comprising:

a first and second connection member that are each provided with a first connection surface that is attached by means of an adhesive to said main surface of the said glass construction part for transferring constructive forces, preferably substantially parallel to the said main surface, and
a third connection member connecting the first and second connection member for transferring constructive forces, particularly normal forces,

wherein the first connection surface of the first and

second connection member are each spaced apart from an edge of the first and second glass construction part, respectively. The connection members thus do not engage onto the relatively weak edges of the glass construction parts, thus sparing the edges.

[0009] In the structure according to the invention the bearing glass construction parts can be used for transferring constructive forces, despite it being glass (panels). The structure according to the invention may thus have the function of a girder, particularly in a (foot) bridge. Separate girder parts, such as steel tube structures, for the bearing function may at least be partially dispensed with.

[0010] Preferably the glass construction parts are panel-shaped and they are situated in a plane that is approximately or entirely vertically oriented.

[0011] It is furthermore advantageous when the first connection surface is provided with a recessed edge area, such as a slot running along its circumference. During installing the connection member on the glass construction part the superfluous glue may flow in said slot.

[0012] The bounding edge of the slot facing away from the first connection surface preferably is recessed, so that it is spaced apart from said main surface of the glass construction part. This ensures that only the connection surface contacts the glass construction part, and thus prevents that other parts of the connection member than the connection surface support on the glass construction part.

[0013] In one embodiment each connection member comprises a bonding disk provided with the connection surface. Advantageously the bonding disk is provided with coupling members for coupling the third connection member thereto. Preferably the third connection member is adapted for transferring normal forces, tensile forces and/or pressure forces.

[0014] Preferably the third connection member is connected with the bonding disk so as to hinge about a centre line that is substantially perpendicular to the main surface.

[0015] In one embodiment the third connection member is moment-fixedly connected to the bonding disk, considered in a plane perpendicular to the main surface.

[0016] Particularly in case the glass construction parts have two opposite main surfaces, it is preferred that at least one and preferably each of the first and second connection members comprises a second connection surface, wherein the first and second connection surface are placed opposite each other and on the said main surface of the said glass construction part. The two connection surfaces that are attached to either side of the glass construction part by means of an adhesive, may be loaded mirror-symmetrically with respect to the centre plane of the glass construction part, which results in an advantageous transfer of forces.

[0017] As regards the transfer of forces it is furthermore advantageous when the first and second connection surface preferably are substantially congruent,

which enhances a proper transfer of forces and also enhances the look. In addition identical first and second connection surfaces are preferred for production-technical reasons; for a device according to the invention namely only one type of connection surface needs to be designed and produced.

[0018] In one embodiment wherein the first and second glass construction part comprises a through-opening extending substantially perpendicular to the opposite main surfaces, each of the connection member comprises a first bonding disk provided with the first connection surface, and a second bonding disk provided with the second connection surface and a coupling member extending through the through-opening for mutually coupling the first and second bonding disk. Preferably the first and second bonding disk are substantially congruent.

[0019] It is furthermore advantageous when the coupling member comprises biasing means for exerting a clamping force oriented towards each other on the first and second bonding disks. In this way the adhesive transfers forces in substantially pure shearing onto the glass construction part. The biasing means ensure a little pre-biasing on the connection in order to increase operative portion of the connection surfaces. In this way the effects of peeling-tensions, generated by for instance internal moments, wherein there is question of forces that are transverse to the main surface and moments that tend to move the connection surface and the construction part away from each other, are counteracted.

[0020] In a simple embodiment the first and second bonding disk comprise a through-opening through which the biasing means have been passed, wherein the biasing means preferably abut a side of the first and second bonding disk that faces away from the glass plate, and wherein the biasing means preferably comprise a nut and an axle, wherein the axle is provided with an external thread near at least one of its ends, wherein the nut can be screwed onto the end of the axle provided with the external thread for adjusting the clamping force on the first and second bonding disk.

[0021] In one embodiment the first and/or second connection surface is placed near the through-opening in the main surface of the glass construction part and spaced apart from an edge of said through-opening. The weakened edge area of the through-opening is thus kept free from contact, spanned by the said bonding disk, and is not loaded.

[0022] The bonding disks can be made from one piece of metal or a metal alloy or a synthetic material. In connection with the durable character of the glass construction parts preferably a durable and low-maintenance material, such as for instance stainless steel, is also selected for the connection members. The relatively little difference between the coefficient of thermal expansion of stainless steel and that of glass prevents problems due to temperature differences. The machinability is good which is important as the bonding disks are made on a lathe. In addition the visual combination of glass and stainless steel can be considered attractive.

bility is good which is important as the bonding disks are made on a lathe. In addition the visual combination of glass and stainless steel can be considered attractive.

[0023] Preferably the third connection members comprise bars transferring normal forces, coupling strips or coupling rods that directly or indirectly engage onto the coupling member, particularly the axle, and which preferably are also made of a metal or a metal alloy or a synthetic material. Preferably one or more third connection members are placed at a side of each bonding disk that faces away from the glass construction part. In this way a moment-fixed connection can be realised for buffering the different forces and moments that are active on the glass structure according to the invention.

[0024] As regards the transfer of forces it is advantageous in this case if on either side of the main surfaces of the first and second bearing glass construction parts third connection members have been placed, and particularly when the third connection members are placed substantially parallel and mirror symmetrical with respect to the main surfaces of the first and second bearing glass construction parts. In practice the coupling member will as a result usually be loaded by forces that are oriented substantially parallel to the connection surfaces. Said forces of the coupling member are transferred onto the bonding disks. It is advantageous here when the dimensions of the axle and the through-openings in the bonding disks have been selected such that the axle can be fittingly placed in said through-openings. In other words, the circumferential surface of the axle abuts the internal surface of the through opening, for transferring the forces.

[0025] Preferably the connection surfaces have a rotation-symmetrical shape. Preferably the bonding disks also have a rotation-symmetrical shape. As a result the connection surfaces can be loaded in any direction and the manufacturing and mounting is relatively simple.

[0026] In practice it has turned out that using an epoxy-based glue as adhesive may result in a proper connection.

[0027] It is advantageous here when the thickness of the connection formed by the adhesive is smaller than 1 mm, preferably smaller than 0.2 mm. Little deformation can occur in the thin layer of glue, so that a highly rigid and creep-proof connection is realised.

[0028] From a further aspect the invention provides a connection member or a glass construction part for a glass structure as described above.

[0029] From a further aspect the invention provides an assembly for interconnecting glass construction parts provided with at least one main surface, particularly bearing glass panels, comprising

a first bonding disk comprising a first connection surface and a first through-opening extending substantially perpendicular to the connection surface, a second bonding disk comprising a second connection surface and a second through-opening ex-

tending substantially perpendicular to the connection surface, and

a coupling member extending through the first and second through-openings for mutually coupling the first and second bonding disk, wherein the coupling member comprises biasing means for exerting a clamping force on the first and second bonding disk,

wherein the first and second connection surface are placed opposite each other for confining a glass construction part therebetween, wherein the connection surfaces are attachable to said main surface by means of an adhesive for transferring constructive forces, preferably substantially parallel to the main surface of the glass construction part.

[0030] From a further aspect the invention provides a glass construction part comprising two opposite main surfaces, a through-opening extending substantially perpendicular to the opposite main surfaces, and an assembly as described above, wherein the first and second connection surface near the through-opening are attached to the opposite main surfaces of the glass construction part by means of an adhesive, and wherein the coupling member extends through the substantially aligned through-opening in the glass construction part and the first and second through-openings.

[0031] The aspects and measures described and/or shown in the application may where possible also be used independent from each other. Said individual aspects, such as the connection members, bonding disks, coupling members, composed connection members and glass construction parts, and other aspects may be the subject of divisional patent applications related thereto.

[0032] The invention will be elucidated in the basis of an exemplary embodiment shown in the attached drawings, in which:

Figure 1 shows a schematic side view of a glass span;

Figure 2 shows a schematic view of a detail II of figure 1;

Figure 3 shows a schematic cross-sectional view of an exemplary embodiment of a device for interconnecting glass construction parts;

Figure 4 shows a schematic cross-section of a second exemplary embodiment of a device for interconnecting glass construction parts, used on a laminated glass plate;

Figure 5 shows a schematic cross-section of a third exemplary embodiment of a device for interconnecting glass construction parts comprising two laminated glass plates placed parallel; and

Figure 6 shows a further development of the device for interconnecting glass construction parts wherein a third glass plate is coupled to the two interconnected glass construction parts, wherein the third glass plate is substantially perpendicular to the plane of the two glass construction parts.

[0033] For realising a glass bridge having a large span, according to the invention glass construction parts can be interconnected as shown for instance in figure 1. It is noted that with the bearing structure of bearing glass plates that are connected to each other so as to transfer forces, girder structures and column structures and other bearing structures can be made, such as an overhanging girder, a bearing column, etcetera. The glass plates are situated in a vertical plane, or at a small angle thereto, so that the glass is able to transfer forces in its plane.

[0034] Figure 1 schematically shows a design of a glass bridge 1 having a large span S wherein the bearing structure is formed by (in this example) seven glass construction parts, such as for instance glass panels 2. The drawing only shows one vertical or upright longitudinal wall 1 a. It will be understood that behind the longitudinal wall 1 a shown a second longitudinal wall, spaced apart therefrom, will be present.

[0035] The glass panels 2 are interconnected by means of connection assemblies comprising first and second connection members 3, which devices 3 are connected to the glass construction parts 2 by means of a glue connection as described below. The first and second connection members 3 are mutually coupled by means of third connection members 4 which in the shape of strips or rods preferably made of steel and at the ends are hingingly attached (in a plane parallel to glass plate 2, direction A) on the connection members, so that they form rods with hinge ends.

[0036] A moment-fixed connection can be realised by placing first and second connection members 3 at the upper and lower side of both glass plates 2 to be coupled and interconnect them by means of steel strips 41. Transverse forces can be absorbed by means of a diagonal rod 42. By interconnecting each of the glass panels 2 placed in series, a span built up from bearing glass plates can be realised that is able to reliably bridge the distance S between the points of support 5. The longitudinal walls 1 a here as it were form a girder or beam.

[0037] Figure 2 shows a connection assembly between two glass construction parts 2 in more detail. Each of the first and second connection members 3 in this exemplary embodiment comprises a round and disk-shaped bonding disk 31 which by means of a glue connection is connected to the glass construction parts 2. Also on the other side of the glass construction parts 2 such a bonding disk 32 is glued, wherein the opposite bonding disks 31, 32 are mutually coupled by means of a coupling member 33 as schematically shown in the cross-sectional view of figure 3.

[0038] The first exemplary embodiment of the device for interconnecting glass construction parts as shown in figure 3 comprises a first bonding disk 31 and an identical second bonding disk 32 that are glued substantially opposite each other onto a glass plate 2. Both bonding disks 31, 32 are each provided with a connection surface 311, 321 forming an annular glue surface that remains placed at a distance around a through-hole 21 in the glass plate 2 and thus leaves the edge area of the glass around the hole free.

[0039] In this exemplary embodiment the bonding disks 31, 32 are round stainless steel disks having a diameter of approximately 120 mm and a thickness of approximately 15 mm. In the centre there is a through-hole 312, 322 for passing a coupling member 33 through. The annular connection surface 311, 321 is situated between two circles of approximately 50 and 104 mm in cross-section. In order to obtain a proper and controllable gluing together, flow-out ducts 313, 314, 323, 324 for the glue have been disposed around the connection surface 311, 321. In this exemplary embodiment said flow-out ducts 313, 314, 323, 324 are formed as a recess having a radius of approximately 2 mm. The transition between the connection surface 311, 321 and the flow-out ducts 313, 314, 323, 324 has a radius of approximately 1 mm. This detail ensures a lower tension in the outer edge of the glue layer. The part of the bonding disks 31, 32 that sits within the innermost flow-out duct 313, 323 is elevated approximately 1 mm, thus sits 1 mm above the glass plate 2 and thus is not glued together on the glass plate 2. Due to the high rigidity of the stainless steel disks 31, 32 with respect to the glass 2 (approximately factor 5) said centre section will almost not be loaded and deform. The outermost edge area of the bonding disk 31, 32 beyond the outermost flow-out duct 314, 324 is approximately 1 mm above the glass plate 2 in order not to let glue run out from underneath the disk and to be able to monitor the flow-out of the glue in the outermost flow-out duct 314, 324.

[0040] The bonding disks 31, 32 preferably are glued together on the glass 2 using a two-component epoxy by a glue layer that is 0.1 to 0.2 mm thick. Such a thin glue layer results in a glue connection having a large strength and rigidity.

[0041] Good results can be achieved with the quick-setting two-component epoxy glue. Because during the setting process said glue first becomes very thin liquid, it is necessary to keep the bonding disks 31, 32 in their places during setting using a template. During setting no pressure needs to be exerted on the glue connection.

[0042] By using two bonding disks 31, 32 that are placed opposite each other the glue connections are at least partially protected against possible adverse effects of UV radiation.

[0043] The device as shown in figure 3 further comprises a coupling member 33 that interconnects the bonding disks 31, 32. Said coupling member 33 comprises a threaded end 331. The threaded end 331 can

be placed fittingly in the bonding disks 31, 32 without contacting the glass 2, where the hole is wider than the diameter of the axle 331. The threaded end 331 is provided with two nuts 332 which after the glue has fully set need to be tightened for further pre-biasing the bonding disks 31, 32 against the glass.

[0044] Due to this pre-biasing which presses the bonding disks 31, 32 towards each other, peaks in the peeling-tensions may at least be largely compensated. The bonding disks 31, 32 have an annular glue surface that goes widely around the hole 21 in the glass plate 2 so that the weak edges of the hole 21 in the glass 2 are not glued and therefore are not loaded either. The hole 21 in the glass 2 is broad enough to compensate the tolerances in the placement of the hole 21 and to make some bending and scoring of the threaded end 331 possible.

[0045] The first connection member as shown in figure 3 can be coupled with a further identical second connection member on another glass plate by means of a third connection member in the form of steel tension members, strips or rods that are coupled on both sides of the glass plate 2 with the coupling member 33.

[0046] Due to the rotation symmetrical shape of the bonding disk 31, 32, as shown in figure 2, the disk can be loaded in any direction and the manufacturing and mounting is simple. The round shape together with the hole 312, 322 in the disk 31, 32 ensure an advantageous narrowing width that decreases from the centre towards the ends. As a result a better distribution of the tensions in the glue layer is realised. The annular shape of the connection surface 311, 321 results in an efficient tension distribution, wherein small connection surfaces (smaller than 25 mm) have a higher efficiency because, as the length of the overlap becomes larger the centre section contributes less to the tension transfer. Two separate small connection surfaces behind each other therefore result in a larger strength than one large connection surface does.

[0047] In a glass plate 2 that is laminated one-sided or two-sided with a layer 22, 23, for instance in the form of thin glass plates, the bonding disks 31, 32 are preferably glued onto the thick centre glass plate 2 as shown in figure 4. In the layers 22, 23 a hole is made that fits freely around the bonding disks 31, 32. At their side facing away from the glass plate 2 the bonding disks 31, 32 are provided with a circumferential edge 315, 325 which substantially extends over the layers 22, 23 so that no border of the hole is visible in the layers 22, 23 around the bonding disks 31, 32. In order to be able to place the bonding disks 31, 32 directly onto the glass plate 2 the intermediate layers 221, 231 will have to be removed.

[0048] The bonding disks 31, 32 can be connected with the third connection members 4 by means of coupling members as is also shown in figure 5 to be discussed below.

[0049] Figure 5 shows a further exemplary embodi-

ment wherein two glass plates 2a, 2b are placed parallel and wherein two connection members are placed in series and share a common coupling member in the form of a threaded end 331. As a result the two glass plates 2a, 2b are mutually coupled by the connection members placed in series. The first glass plate 2a and the second glass plate 2b are both provided with a through-hole around which the laminated layers 22a, 23a, 22b, 23b have been removed. Bonding disks 31 a, 32a, 31 b, 32b have subsequently been connected with the two glass plates 2a, 2b by means of their bonding surfaces. Between the bonding disks 32a, 31 b situated within the two glass plates 2a and 2b a filler piece 412 has been placed that defines the distance between the parallel placed glass plates 2a, 2b at that location. The filler piece 412 may also serve for connecting one or more third connection members 41 thereto, such as for instance a coupling rod, for coupling the two glass plates 2a, 2b placed parallel to further glass plates of a glass structure according to the invention. On both ends of the coupling member 331 end bushes or end caps 411 have also been placed for covering the ends of the threaded end 331 and the nuts 332. Said end caps 411 can also be adapted for connection thereto of one or more third connection members 41. It is advantageous here for the force distribution if the exemplary embodiment as shown in figure 5 is mirror-symmetrical with respect to the plane that is parallel to the glass plates 2a, 2b and is situated in the middle between said glass plates 2a, 2b.

[0050] The end bushes 411 and the bush 412 are rotatable about centre line X, in directions A, in a plane parallel to the main surfaces. For instance the bushes 411 and 412 can be rotatable about inner bushes 413 and 414, which themselves may be rotation-fixed with the axle 331 and the bonding disks. In a direction perpendicular to the main surfaces, however, the connection of the rod 41 with the bonding disk 31 a, 31 b, 32a, 32b is moment-fixed.

[0051] Figure 6 shows that the connection assembly 3, 41 according to the invention, after some adjustments can also be used for interconnecting two glass plates 2, 6 that are perpendicular to each other. To that end the coupling member of the first and second connection member 3 of the glass plates 2 is lengthened 43 in the direction of the coupling member 33 of a first connection member 31 of the glass plate 6, and connected thereto. It is noted here that a tensile force in the plane of the glass plate 6 butt loads the first connection member 31 of the glass plate 6, whereas here the first and second connection members 3 of the glass plates 2 are loaded by means of an axial pressure (perpendicular to the plane of the glass panels 2). Thus as described above the forces are transferred by means of substantially shearing stresses in the first connection member 31 of the glass plate 6 only.

[0052] Whereas the invention has been shown and described with reference to certain exemplary embodi-

ments thereof, it will be clear to the expert that various adaptations in shape and details can be made without deviating from the spirit and scope of protection of the invention as defined by the attached claims.

[0053] For instance a first connection member or assembly according to the invention may instead of or in addition to a connection with a second connection member or further assembly, be connected to the points of support or a bearing structure for the glass structure, for transferring constructive forces from the glass structure to the points of support or bearing structure.

Claims

1. Glass structure comprising a first and a second glass construction part, particularly bearing glass panels, each provided with at least one main surface, wherein both construction parts are interconnected by means of at least one connection assembly so as to transfer forces, the connection assembly comprising:

a first connection member which with a first connection surface is attached by means of an adhesive to said main surface of the first glass construction part,
a second connection member which with a first connection surface is attached by means of an adhesive to said main surface of the second glass construction part, and
a third connection member connecting the first and second connection member for transferring constructive forces,

wherein the first connection surface of the first and second connection member are each spaced apart from an edge of the first and second glass construction part, respectively.

2. Glass structure according to claim 1, wherein the glass construction parts preferably are panel-shaped and situated in a plane that is approximately or entirely vertically oriented, and wherein the first connection surface preferably has a rotation-symmetrical shape.

3. Glass structure according to claim 1 or 2, wherein the first connection surface is provided with a recessed edge area, such as a slot running along its circumference, wherein a bounding edge of the slot facing away from the first connection surface is recessed, so that it is spaced apart from said main surface of the glass construction part.

4. Glass structure according to any one of the preceding claims, wherein each connection member comprises a bonding disk provided with the connection

surface, wherein the bonding disk preferably is provided with coupling members for coupling the third connection member thereto, wherein the third connection member preferably is connected with the bonding disk so as to hinge about a centre line that is substantially perpendicular to the main surface.

5. Glass structure according to any one of the preceding claims, wherein at least the first glass construction part has two opposite main surfaces, and wherein at least the first connection members further comprise a second connection surface, wherein the first and second connection surface are placed opposite each other and on either side of the opposite main surfaces of the first glass construction part, wherein the first and second connection surface preferably are substantially congruent. 5 10
6. Glass structure according to claim 5, wherein at least the first glass construction part comprises a through-opening extending substantially perpendicular to the opposite main surfaces, wherein at least the first connection member comprises a first bonding disk provided with the first connection surface, and a second bonding disk provided with the second connection surface and a coupling member extending through the through-opening for mutually coupling the first and second bonding disk, wherein the first and second connection surface are placed near the through-opening and spaced apart from an edge of said through-opening. 20 25 30
7. Glass structure according to claim 6, wherein the coupling member comprises biasing means for exerting a clamping force oriented towards each other on the first and second bonding disk, wherein the first and second bonding disk preferably comprise a through-opening through which the biasing means have been passed, wherein the biasing means preferably abut a side of the first and second bonding disk that faces away from the glass plate. 35 40
8. Glass structure according to claim 7, wherein the biasing means preferably comprise a nut and an axle, wherein the axle is provided with an external thread near at least one of its ends, wherein the nut can be screwed onto the end of the axle provided with the external thread for adjusting the clamping force on the first and second bonding disk. 45 50
9. Glass structure according to any one of the claims 6-8, wherein the bonding disks are made from one piece of metal or a metal alloy or a synthetic material, wherein the bonding disks preferably are made of stainless steel. 55
10. Glass structure according to any one of the claims 6-9, wherein the third connection member engages

onto the coupling member.

11. Glass structure according to any one of the claims 5-10, wherein on either side of the main surfaces of at least the first glass construction part third connection members have been placed, wherein said third connection members preferably are placed substantially parallel and mirror-symmetrical with respect to the main surfaces of the first glass construction parts.
12. Glass structure according to any one of the preceding claims, wherein the adhesive comprises an epoxy-based glue, wherein the thickness of the connection layer formed by the adhesive preferably is smaller than 1 mm, preferably smaller than 0.2 mm.
13. Connection member suitable and intended for a glass structure according to any one of the preceding claims.
14. Assembly for interconnecting glass construction parts provided with at least one main surface, particularly glass panels, comprising
 - a first bonding disk comprising a first connection surface and a first through-opening extending substantially perpendicular to the connection surface,
 - a second bonding disk comprising a second connection surface and a second through-opening extending substantially perpendicular to the connection surface,
 - a coupling member extending through the first and second through-openings for mutually coupling the first and second bonding disk, wherein the coupling member comprises biasing means for exerting a clamping force on the first and second bonding disk,
 wherein the first and second connection surface are placed opposite each other for confining a glass construction part therebetween, wherein the connection surfaces are attachable to said main surface by means of an adhesive for transferring constructive forces.
15. Glass construction part comprising two opposite main surfaces, a through-opening extending substantially perpendicular to the opposite main surfaces, and an assembly according to claim 14,
 - wherein the first and second connection surface near the through-opening and spaced apart from an edge of said through-opening are attached to the opposite main surface of the glass construction part by means of an adhesive, and wherein the coupling member extends through the substantially

aligned through-opening in the glass construction part and the first and second through-openings.

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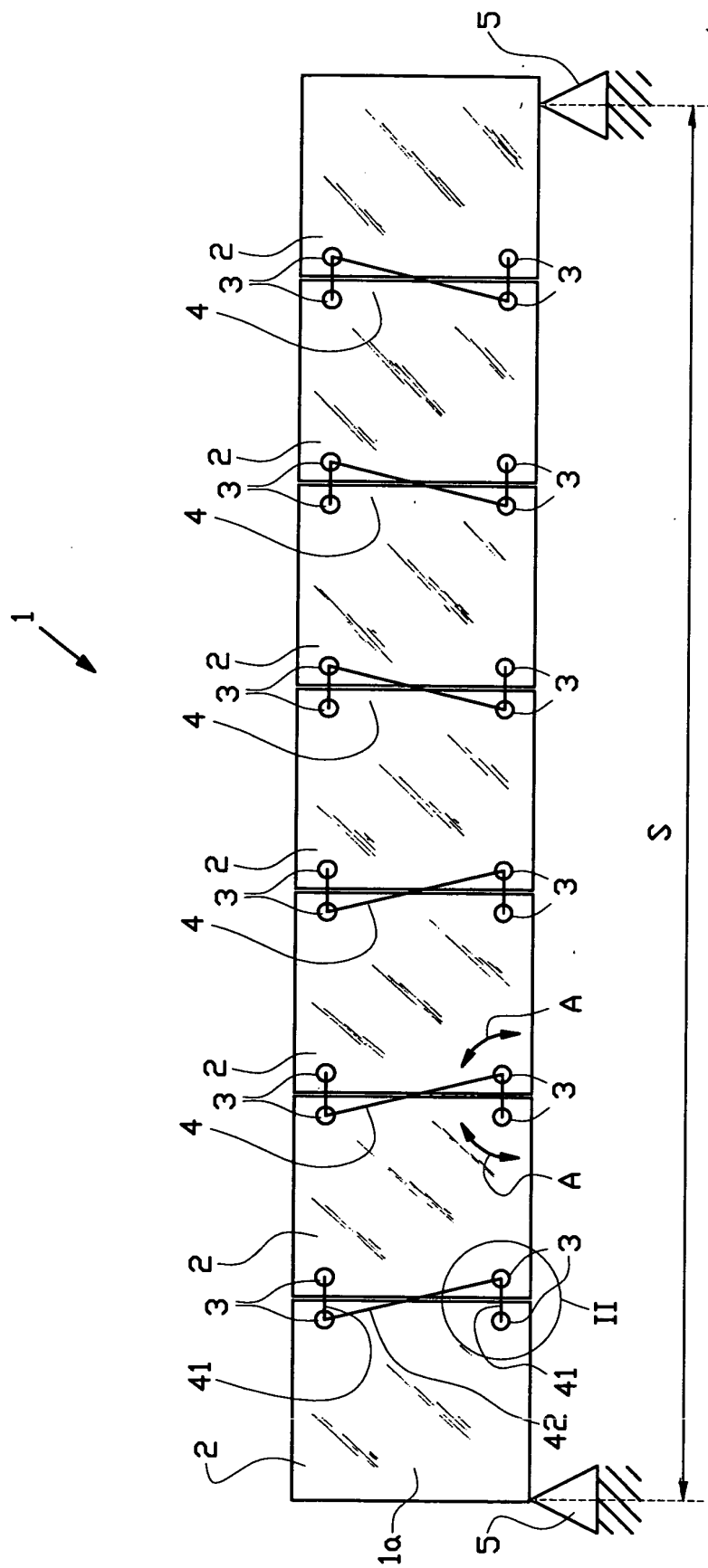


FIG. 1

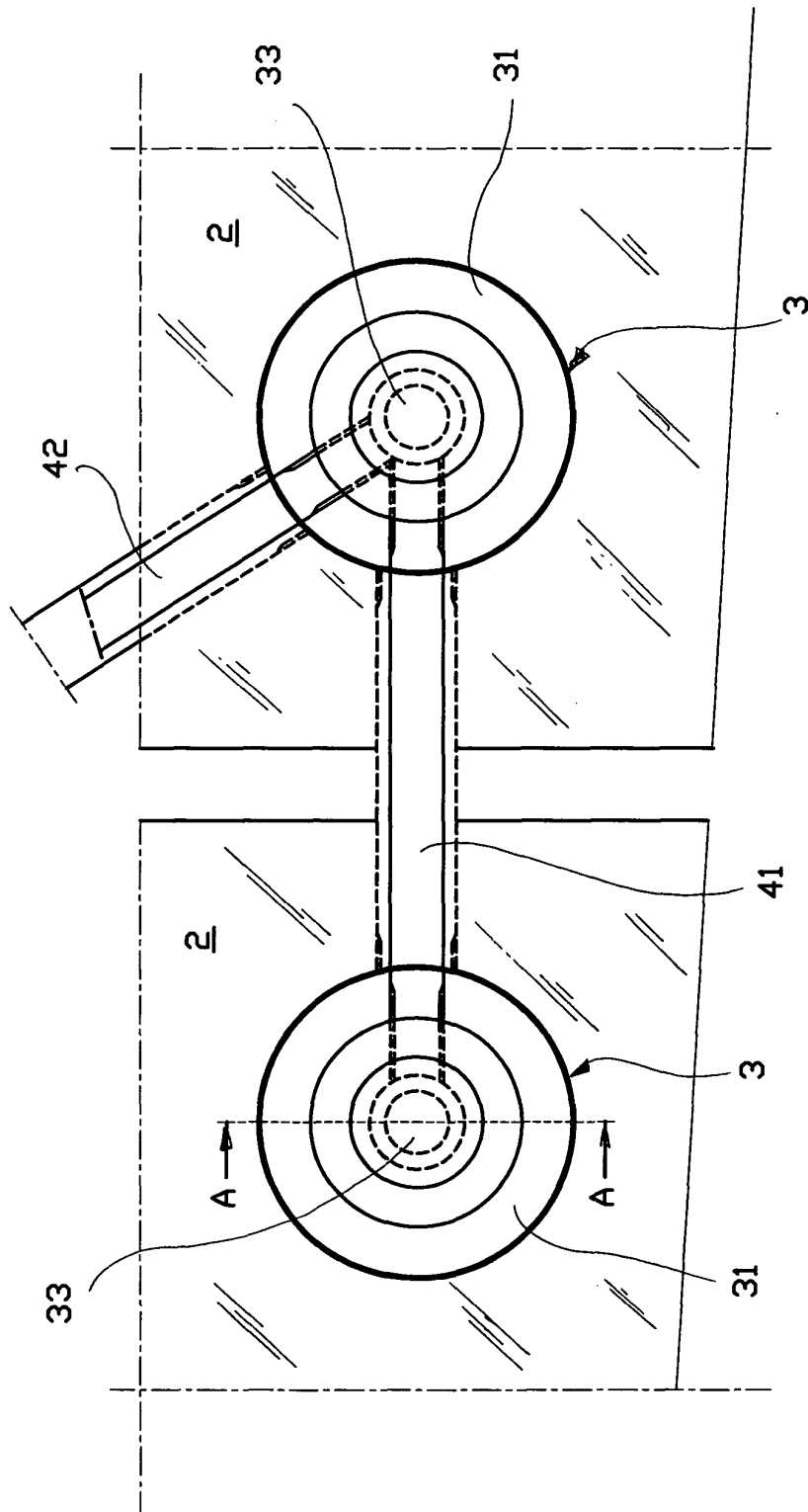


FIG. 2

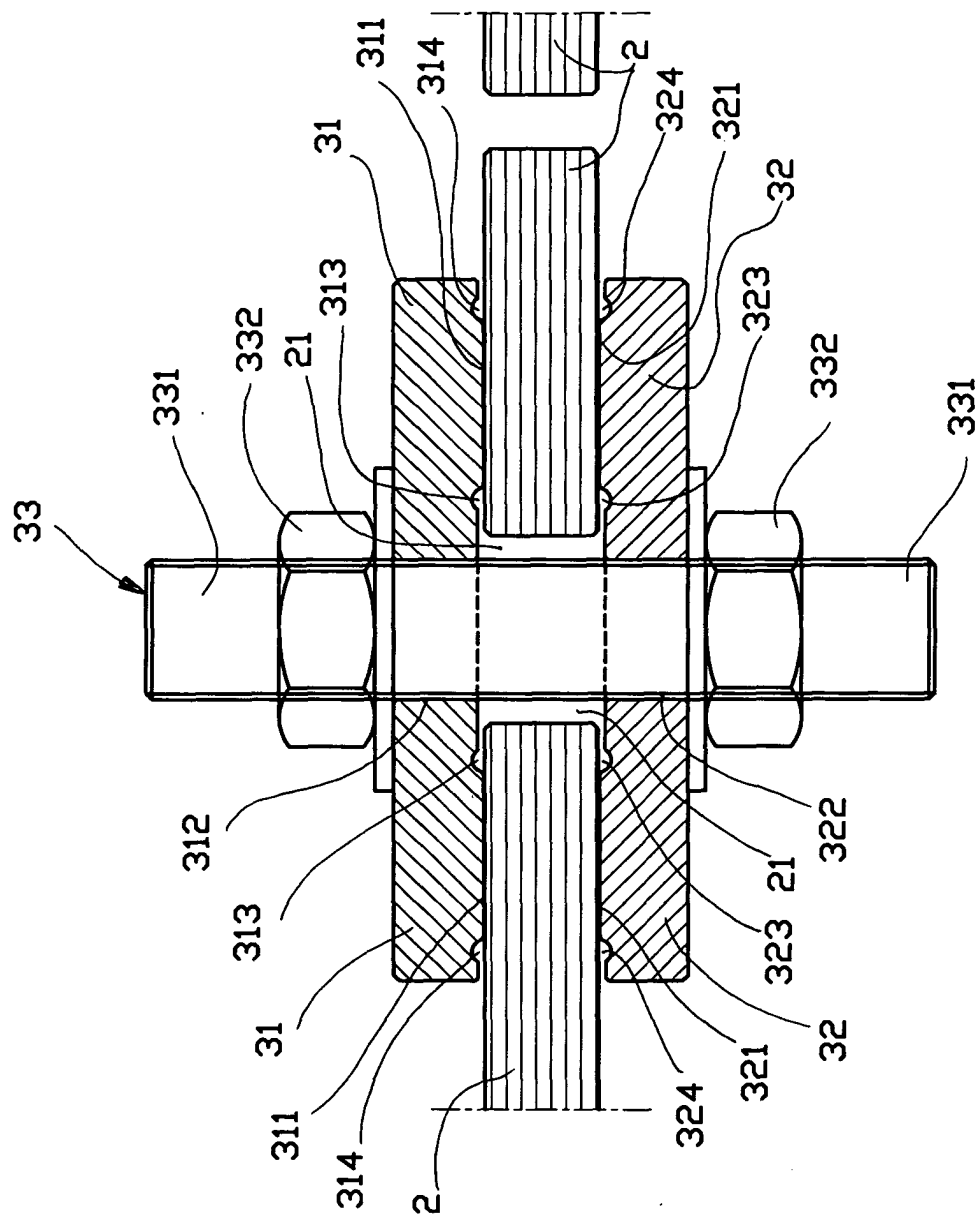


FIG. 3

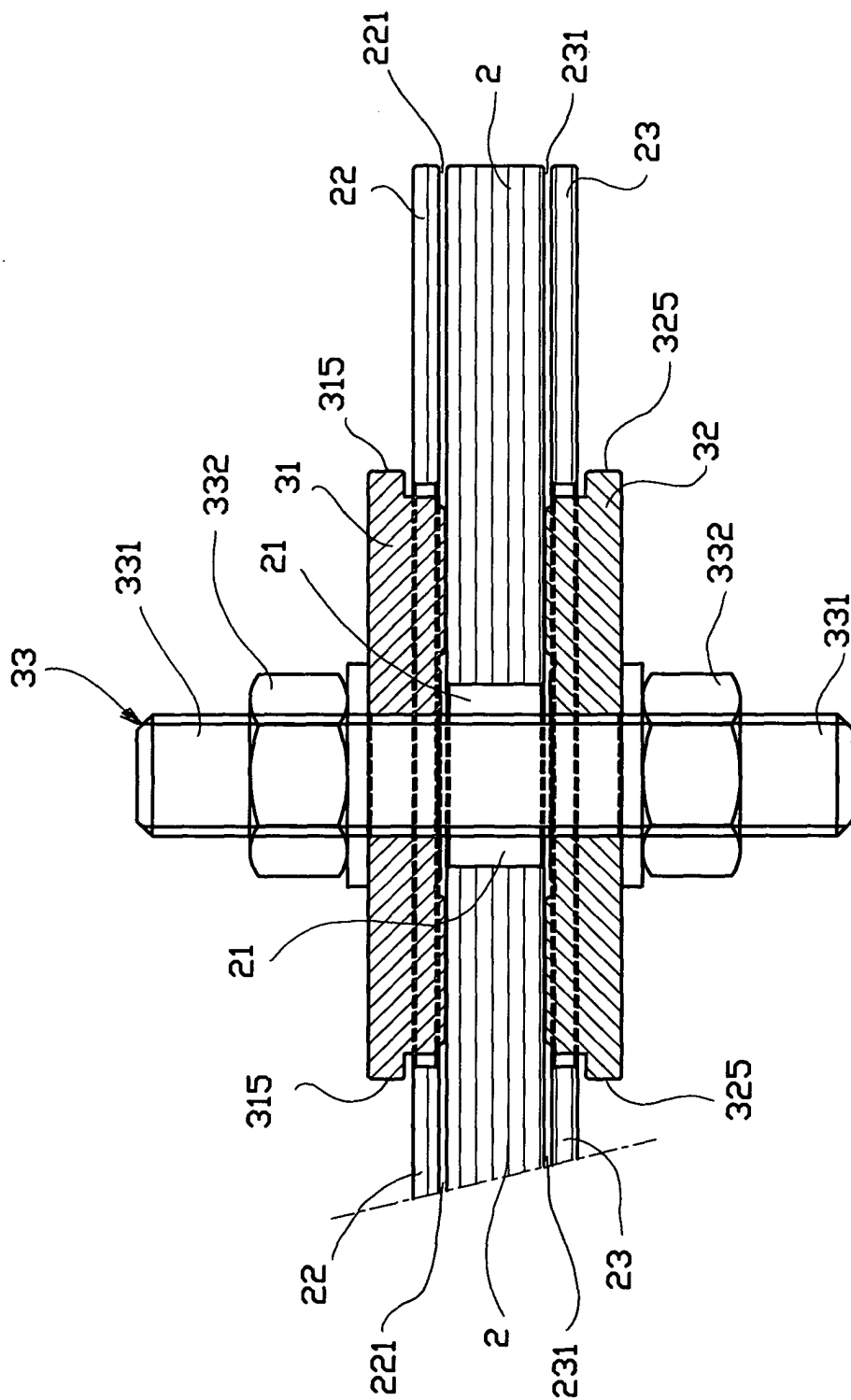


FIG. 4

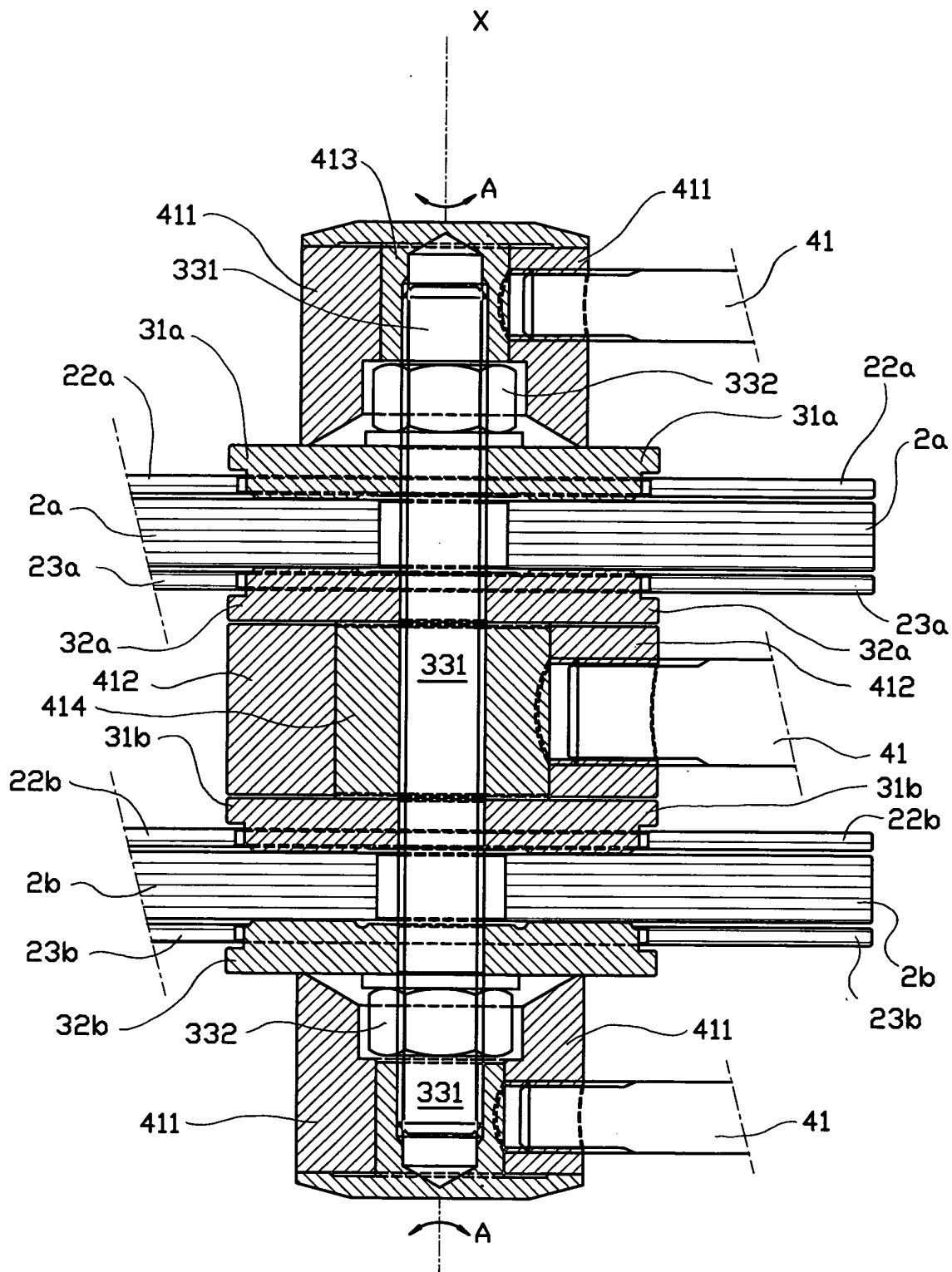


FIG. 5

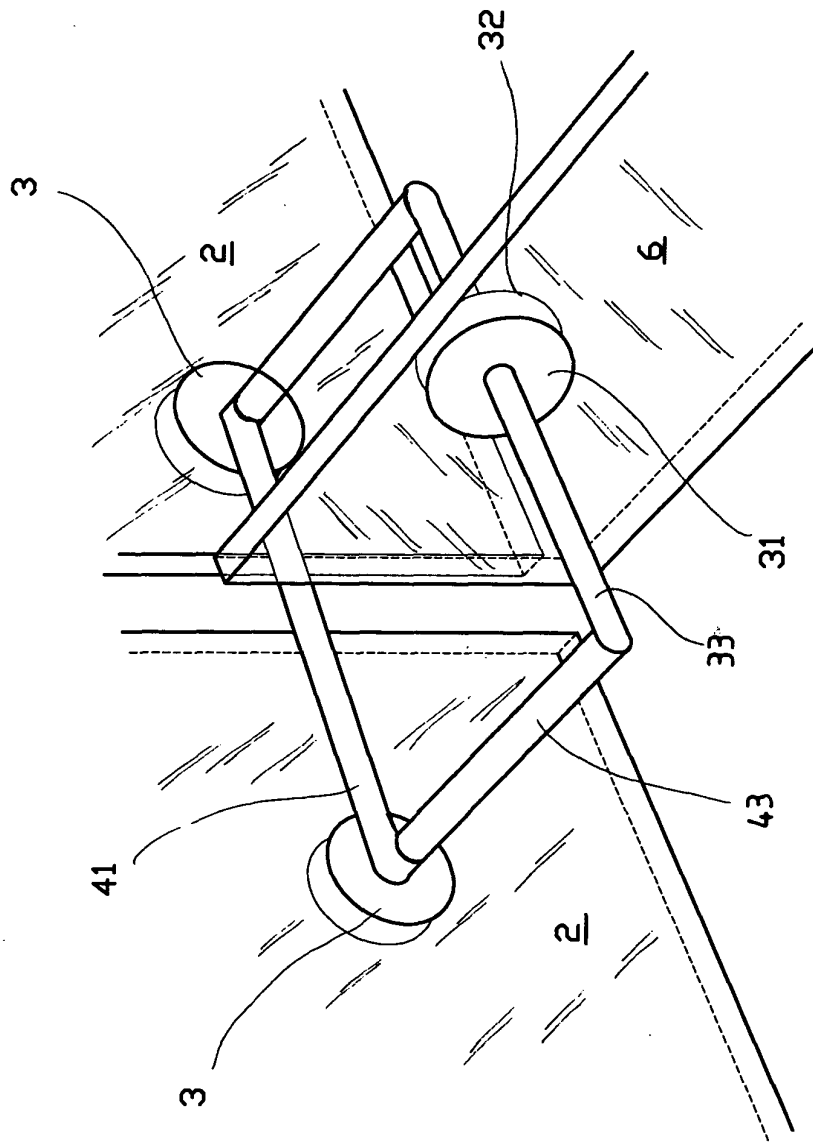


FIG. 6



European Patent
Office

EUROPEAN SEARCH REPORT

Application Number
EP 05 07 6418

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.7)
X	DE 20 2004 003357 U1 (HUNS RUECKER GLASVEREDELUNG WAGENER GMBH & CO. KG) 6 May 2004 (2004-05-06) * paragraph [0040] - paragraph [0042]; figure 1 *	1-4,12,13	E04C3/28 E01D1/00 E06B3/54
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