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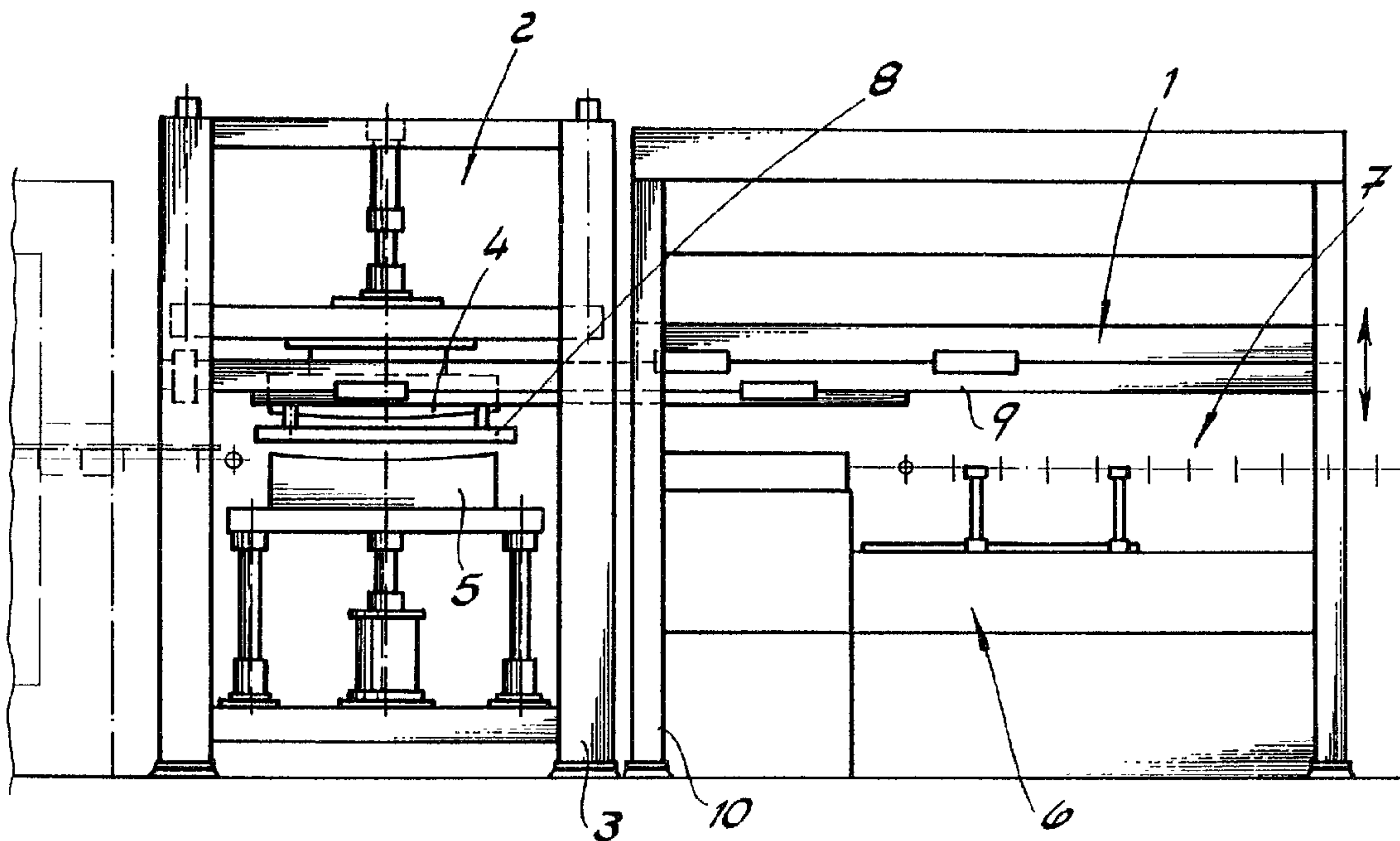
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(54) Titre : DISPOSITIF DE TRANSFERT DE FEUILLES DE VERRE CINTREES

(54) Title: TRANSFER DEVICE FOR BENT GLASS SHEETS



(57) Abrégé/Abstract:

Transfer device for bent glass sheets during the course of automated production of motor vehicle glass windows on a production line with continuous furnace, bending press, toughening station and device for onward conveyance of the toughened glass sheets. The transfer device operates between bending press and toughening station. The transfer device is a shuttle transfer device whose shuttle is guided on shuttle guide rails. The shuttle guide rails are supported statically on the one hand on the press frame of the bending press and on the other hand on the station frame of the toughening station as beams on two supports or as continuous beams. The shuttle incorporates a shuttle frame as well as a shuttle ring mounted therein and the shuttle frame is guided on the shuttle guide rails by means of a shuttle frame mounting which movable on the shuttle guide rails. The shuttle ring is adjustable in relation to the shuttle frame mounting and thus in relation to the male bending mould. The shuttle ring incorporates on its edges positioning devices for the glass sheets received. At least the areas of the shuttle guide rails which project into the press frame of the bending press are removable for the purpose of carrying out maintenance and/or repair work on the bending press.

Abstract

Transfer device for bent glass sheets during the course of automated production of motor vehicle glass windows on a production line with continuous furnace, bending press, toughening station and device for onward conveyance of the toughened glass sheets. The transfer device operates between bending press and toughening station. The transfer device is a shuttle transfer device whose shuttle is guided on shuttle guide rails. The shuttle guide rails are supported statically on the one hand on the press frame of the bending press and on the other hand on the station frame of the toughening station as beams on two supports or as continuous beams. The shuttle incorporates a shuttle frame as well as a shuttle ring mounted therein and the shuttle frame is guided on the shuttle guide rails by means of a shuttle frame mounting which movable on the shuttle guide rails. The shuttle ring is adjustable in relation to the shuttle frame mounting and thus in relation to the male bending mould. The shuttle ring incorporates on its edges positioning devices for the glass sheets received. At least the areas of the shuttle guide rails which project into the press frame of the bending press are removable for the purpose of carrying out maintenance and/or repair work on the bending press.

TRANSFER DEVICE FOR BENT GLASS SHEETS

The invention concerns a transfer device for bent glass sheets during the course of automated production of motor vehicle windows on a production line with continuous furnace for heating the glass sheets to be bent to bending temperature, bending press with male bending mould and female bending mould installed in the press frame, where the male bending mould and/or the female bending mould can be raised and lowered, in which the heated glass sheets are bent consecutively in horizontal position in accordance with specified nominal geometry, toughening station for cooling the finish-bent glass sheets and a device for onward conveyance of the cooled glass sheets, where the transfer device operates between bending press and toughening station.

Production lines of the construction described and of the function described are known in practice in various configurations. At least the bending press and the toughening station operate cyclically. In modern technology, such production lines must meet a number of basic requirements, that is to say on the one hand operate with high output and thus short cycle times, on the other hand supply products such as for example bent glass sheets, which maintain close and extreme tolerances in respect of production accuracy. In addition, they would have to be able to be set up at short notice and in a simple manner for different bending geometry if different glass sheets have to be bent differently in batches and frequently as well with relatively small batch sizes.

In the case of the known production line to which the transfer device belongs, on which the invention is based (WO 90/11973), the transfer device is a shuttle transfer device whose shuttle is located in the station frame. For this purpose, mounting cross-beams are provided as shuttle mounting, to which the shuttle is attached. The mounting cross-beams are movably supported on cross-beam guides of the station frame and are freely retractable into the press frame of the bending press. This has proved satisfactory, but is capable of improvement if short cycle times, high levels of accuracy in relation to the bent glass sheets are required and in addition it is to be ensured that even with extremely short cycle

times, deformation faults caused by vibration and resulting from high forces from positive or negative acceleration do not occur on the glass sheets.

The invention is based on the technical problem of developing the configuration of a transfer device for the purpose described above such that even with extremely short cycle times, glass sheets are produced with a high degree of precision and free from faults. In addition, the transfer device should be readily and quickly re-settable for the manufacture of different products.

To solve this problem, the subject of the invention is a transfer device of the configuration described at the beginning, where combination of the following features is realized:

transfer device for bent glass sheets during the course of automated production of motor vehicle glass windows on a production line with

continuous furnace for heating the glass sheets to be bent to bending temperature,

bending press with male bending mould and female bending mould installed in the press frame, where the male bending mould and/or the female bending mould can be raised and lowered, in which the heated glass sheets are bent consecutively in horizontal position in accordance with specified nominal geometry,

toughening station for cooling the finish-bent glass sheets and

device for onward conveyance of the cooled glass sheets,

where the transfer device operates between bending press and toughening station and combination of the following features is realized:

- a) the transfer device is a shuttle transfer device whose shuttle is guided on its sides facing in direction of travel on shuttle guide rails,
- b) the shuttle guide rails are supported statically on the one hand on the press frame of the bending press and on the other hand on the station frame of the toughening station as beams on two supports or as continuous beams,
- c) the shuttle incorporates a shuttle frame as well as a shuttle ring mounted therein and the shuttle frame is guided on the shuttle guide rails by means of a shuttle frame mounting,
- d) the shuttle ring is adjustable in relation to the shuttle frame mounting and thus in relation to the male bending mould,
- e) the shuttle ring incorporates at its edges positioning devices for the accepted glass sheets,

where at least the areas of the shuttle guide rails which project into the press frame of the bending press are removable for the purpose of carrying out maintenance and/or retooling work on the bending press.

The invention is based on the principle that with a transfer device which incorporates mounting cross-beams for the shuttle projecting into the press frame and moved in the manner described, undesirable vibrations are unavoidable when it is necessary to operate with high cycle times. Such vibrations do not occur if additional shuttle guide rails are used which are statically arranged as beams on two supports or as continuous beams. In addition however exact positioning of the shuttle ring in relation to the male bending mould must be ensured and in addition there must be further measures which so to speak neutralize the acceleration forces which act on the still soft, bent glass sheets accepted by the shuttle. All this takes place as a result of combining features a) to e), where matching to different operating conditions is also possible without difficulty because at least the areas of the shuttle guide rail which project into the press frame of the bending press are

removable from the bending press for the purpose of carrying out maintenance and retooling operations. As a result, bent glass sheets are produced which comply with the specified geometry within very close tolerances and do not incorporate faults resulting from acceleration forces or vibration.

In detail there are several options for further configuration and design within the scope of the invention. Usefully, the male bending mould incorporates a vacuum locating device for retaining and locating a glass sheet for transfer to the shuttle. For matching to different operating conditions, for example for matching to female bending moulds of differing geometry, the shuttle guide rail can be supported on the press frame as well as on the station frame so as to be vertically adjustable and are there adjustable for different male bending moulds and differently equipped male bending moulds. The shuttle frame mounting can be configured in various ways. It consists preferably of mounting cross-beams traversable or movable along the shuttle guide rails. The shuttle ring is usefully attached to the shuttle frame with mounting brackets. In this respect, it is also possible to realize degrees of freedom of adjustment. To equip the shuttle frame and thus the shuttle ring, it is sufficient in the simplest instance for the shuttle frame to be attached to the shuttle frame mounting in direction of travel, on the one hand rigidly and on the other hand adjustably. This can be done for example with adjustable screw fastenings. The positioning devices preferably taking the form of positioning clamping devices do not according to experience lead to undesirable marks on the still soft glass sheets if they act on the cut edge faces of the bent glass sheets. For this purpose, the positioning clamping devices can incorporate rotary cylinders and clamping levers or clamping cams which act against the cut edge faces of the glass sheets.

In the case of the transfer device according to the invention, the shuttle guide rails can take the form of rigid rails and can be extendable horizontally from the press frame and also retractable again into the press frame. This extension and retraction is realized if the bending press has to be retooled for any reason, for example for the purpose of changing the male bending mould and

female bending mould. For this purpose, it is also possible for the shuttle guide rails to incorporate a folding joint and that the areas of shuttle guide rails projecting into the press frame can be folded out of it. The shuttle ring usefully takes the form of a rigid component. This means that in the event of modifications of the bending geometry, the shuttle ring will have to be changed. In the case of the embodiment according to the invention, this is possible without difficulty.

If a transfer device according to the invention is installed and integrated in the automated production of motor vehicle glass windows in a production line, control of the various components of the transfer device according to the invention is effected with the equipment of modern drive and control engineering without difficulty, particularly as well with computer control of the entire production range.

The invention is explained in detail with the aid of a drawing illustrating only one embodiment. It shows the following:

Fig. 1: the side elevation of a transfer device according to the invention,

Fig. 2: a perspective view on a significantly larger scale than Fig. 1, the shuttle frame with shuttle ring from the subject of Fig. 1,

Fig. 3: on a larger scale than Fig. 2, the shuttle ring from the subject of Fig. 2 and

Fig. 4: in a plan view of the subject according to Fig. 3, details of a positioning device in the form of a positioning clamping device on the shuttle ring of Fig. 3,

Fig. 5: the subject of Fig. 4 in a different functional position.

The transfer device 1 for bent glass sheets illustrated in the Figures is intended for automated production of motor vehicle glass windows. The production line as a whole has not been illustrated.

In this respect, to avoid repetition, reference is made to the state of the art described at the beginning (WO 90/11973). In Fig. 1 one can recognize the bending press 2 with the press frame 3, raisable and lowerable male bending mould 4 and raisable and lowerable female bending mould 5, where in this bending press 2, the glass sheets previously heated in a continuous furnace are bent consecutively in a horizontal position in accordance with specified nominal geometry. On the right is adjoined a toughening station 6 for toughening the finish-bent glass sheets, which in turn operated on a device 7 for onward conveyance of the toughened glass sheets. The transfer device 1 operated between bending press 2 and toughening station 6.

The transfer device 1 is a shuttle transfer device whose shuttle 8 is guided along its sides in direction of conveyance along shuttle guide rails 9. The shuttle guide rails 9 are supported on the one hand on the press frame 3 of the bending press 2, and on the other hand on the station frame 10 statically as beams on two supports or as continuous beam.

From comparative consideration of Figs. 2 and 3, it can be seen that the shuttle 8 incorporates a shuttle frame 11 and a shuttle ring 12 supported in it. The shuttle frame 11 is guided, by means of a shuttle frame mounting 13 traversable along the shuttle guide rails 9, along the shuttle guide rails 9. The shuttle ring 12 is adjustable in relation the shuttle frame mounting 13 and thus in relation to the male bending mould 4. The shuttle ring 12 incorporates at its edges automatically operable positioning clamping devices 14 for the accepted glass sheets. At least the areas of the shuttle guide rails 9 which project into the press frame 3 of the bending press 2 are removable for the purpose of carrying out maintenance and/or retooling operations on the bending press 2.

In Fig. 1, arrows indicate that the shuttle guide rails 9 are supported on the press frame 3 as well as on the station frame 10 so as to be vertically adjustable. They are thus adjustable for different female bending moulds 5 and variously installed male bending moulds 4. In the example and according to a preferred embodiment of the invention, the shuttle frame mounting 13 is

constructed from the mounting cross-beams 16 traversable along the shuttle guide rails 9. By traversable is meant an embodiment where rollers are not used, but slide-like traversing takes place.

From Figs. 2 and 3 it can also be seen that the shuttle ring 12 is attached with mounting brackets 17 to the shuttle frame 11. These mounting brackets 17 for their part are adjustable, which is not shown.

The shuttle frame 11 is fixed on one side and on the other side adjustably attached to the shuttle frame mountings 13. Adjustment can be effected by means of corresponding positioning gear units, cams or the like.

From comparative consideration of Figs. 3 to 5, it can be seen that the positioning clamping devices 14 act on the cut edge faces 18 of the glass sheets 19. In the example, the positioning clamping devices are rotary cylinders with clamping lever or cams 20. Of course, they permit remote control.

Fig. 1 indicates that the shuttle guide rails 9 take the form of rigid rails. They are retractable and extendable horizontally into the press frame 3 and as illustrated can be supported in the station frame 10. The shuttle guide rails 9 can also however incorporate a folding joint and areas of the shuttle guide rails projecting into the press frame 3 could be folded out of the press frame 3. The shuttle ring 12 takes the form of a rigid component; it must be changed when bending of different glass sheets is involved which are to be bent in accordance with different nominal geometry. - Alignment and adjustment of the shuttle ring 12, matching it to the male bending mould 4, can be carried out simply and with great accuracy with the use of an auxiliary device.

Claims

1. Transfer device for bent glass sheets during the course of automated production of motor vehicle glass windows on a production line with

continuous furnace for heating the glass sheets to be bent to bending temperature,

bending press with male bending mould and female bending mould installed on the press frame, where the male bending mould and/or the female bending mould can be raised and lowered, in which the heated glass sheets are bent consecutively in horizontal position in accordance with specified nominal geometry,

toughening station for cooling the finish-bent glass sheets and

device for onward conveyance of the cooled glass sheets,

where the transfer device operates between bending press and toughening station and combination of the following features is realized:

- a) the transfer device is a shuttle transfer device whose shuttle is guided on its sides facing in direction of travel on shuttle guide rails,
- b) the shuttle guide rails are supported statically on the one hand on the press frame of the bending press and on

the other hand on the station frame of the toughening station as beams on two supports or as continuous beams,

- c) the shuttle incorporates a shuttle frame as well as a shuttle ring mounted therein and the shuttle frame is guided on the shuttle guide rails by means of a shuttle frame mounting,
- d) the shuttle ring is adjustable in relation to the shuttle frame mounting and thus in relation to the male bending mould,
- e) the shuttle ring incorporates at its edges positioning devices for the accepted glass sheets,

where at least the areas of the shuttle guide rails which project into the press frame of the bending press are removable for the purpose of carrying out maintenance and/or retooling work on the bending press.

- 2. Transfer device in accordance with claim 1, where the shuttle guide rails are supported on the press frame as well as on the station frame so as to be vertically adjustable.
- 3. Transfer device in accordance with one of claims 1 or 2, where the shuttle frame mounting is constructed of mounting cross-beams movable on the shuttle guide rails.
- 4. Transfer device in accordance with one of claims 1 to 3, where the shuttle ring is attached to the shuttle frame with mounting brackets.
- 5. Transfer device in accordance with one of claims 1 to 4, where the shuttle frame in direction of travel is attached on the one hand rigidly and on the other hand adjustably to the shuttle frame mounting.
- 6. Transfer device in accordance with one of claims 1 to 5, where the positioning devices are automatically operated positioning

clamping devices which act on the cut edge faces of the glass sheets.

7. Transfer device in accordance with claim 6, where the positioning clamping devices incorporate rotary cylinders and clamping levers or clamping cams.
8. Transfer device in accordance with one of claims 1 to 7, where the shuttle guide rails take the form of rigid rails and are horizontally extendable from the press frame and retractable into it.
9. Transfer device in accordance with one of claims 1 to 7, where the shuttle guide rails incorporate a folding joint and the areas of the shuttle guide rails projecting into the press frame can be folded out from the latter.
10. Transfer device in accordance with one of claims 1 to 9, where the shuttle ring takes the form of a rigid component.

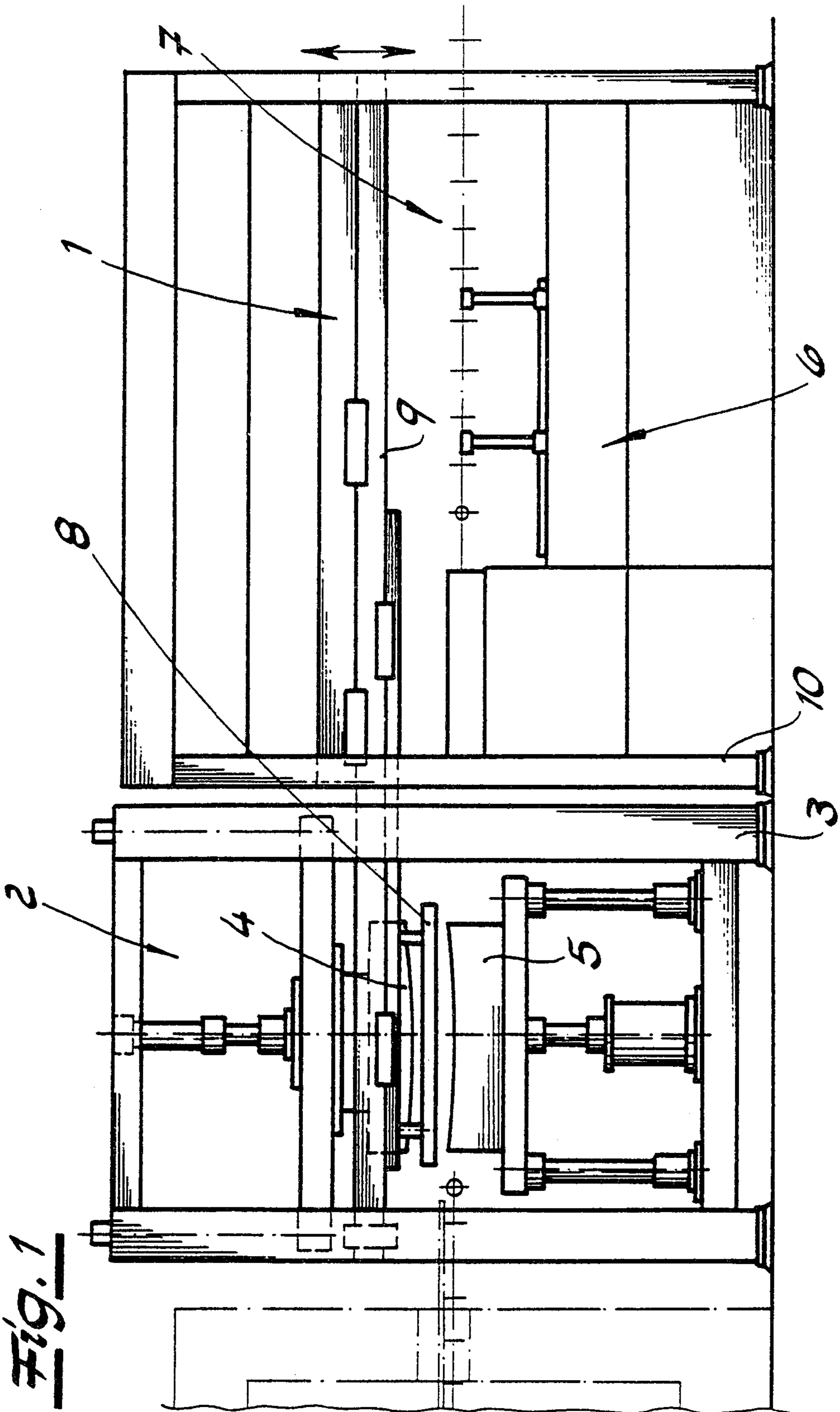


Fig. 1

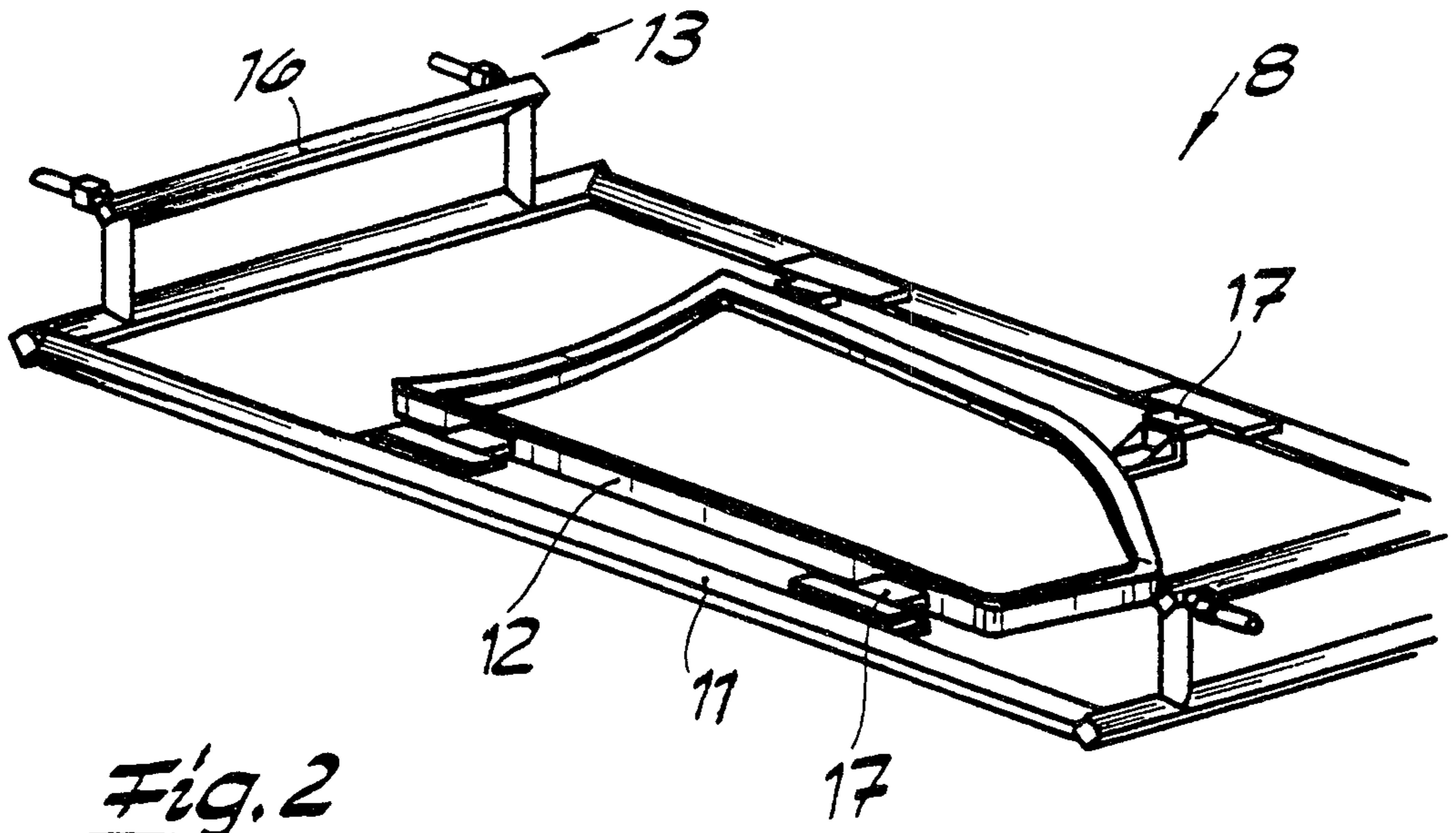


Fig. 2

Fig. 3

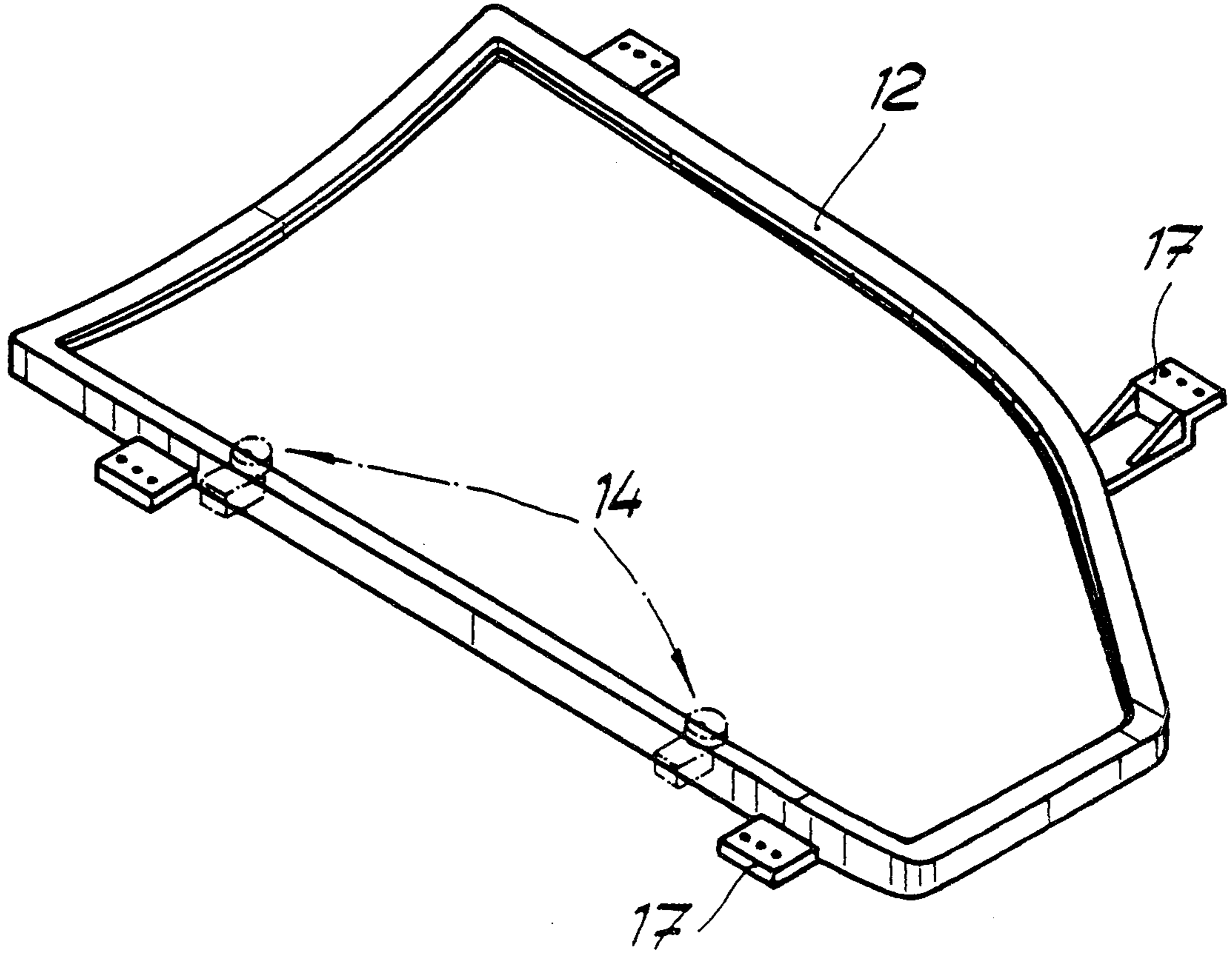


Fig. 4

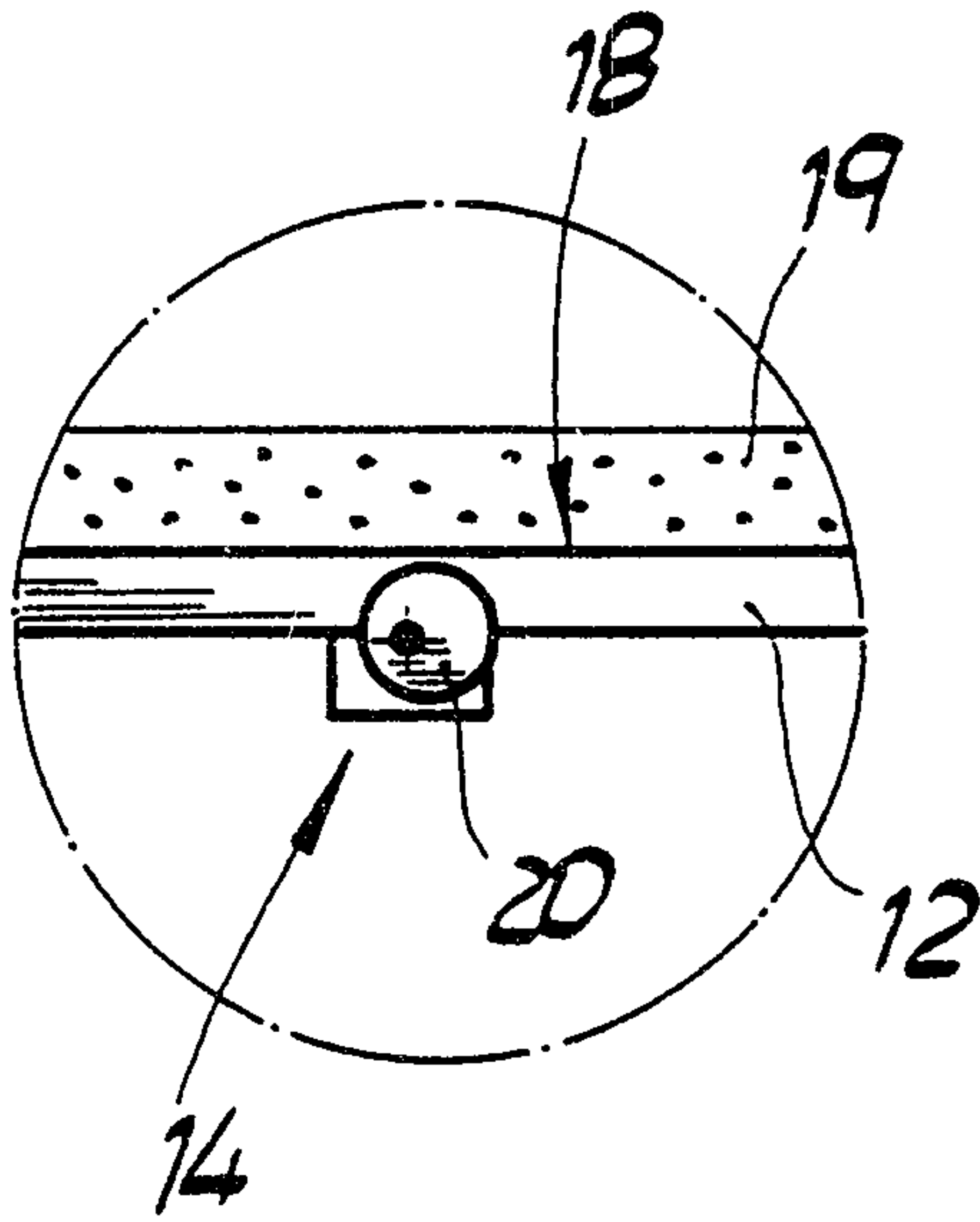


Fig. 5

