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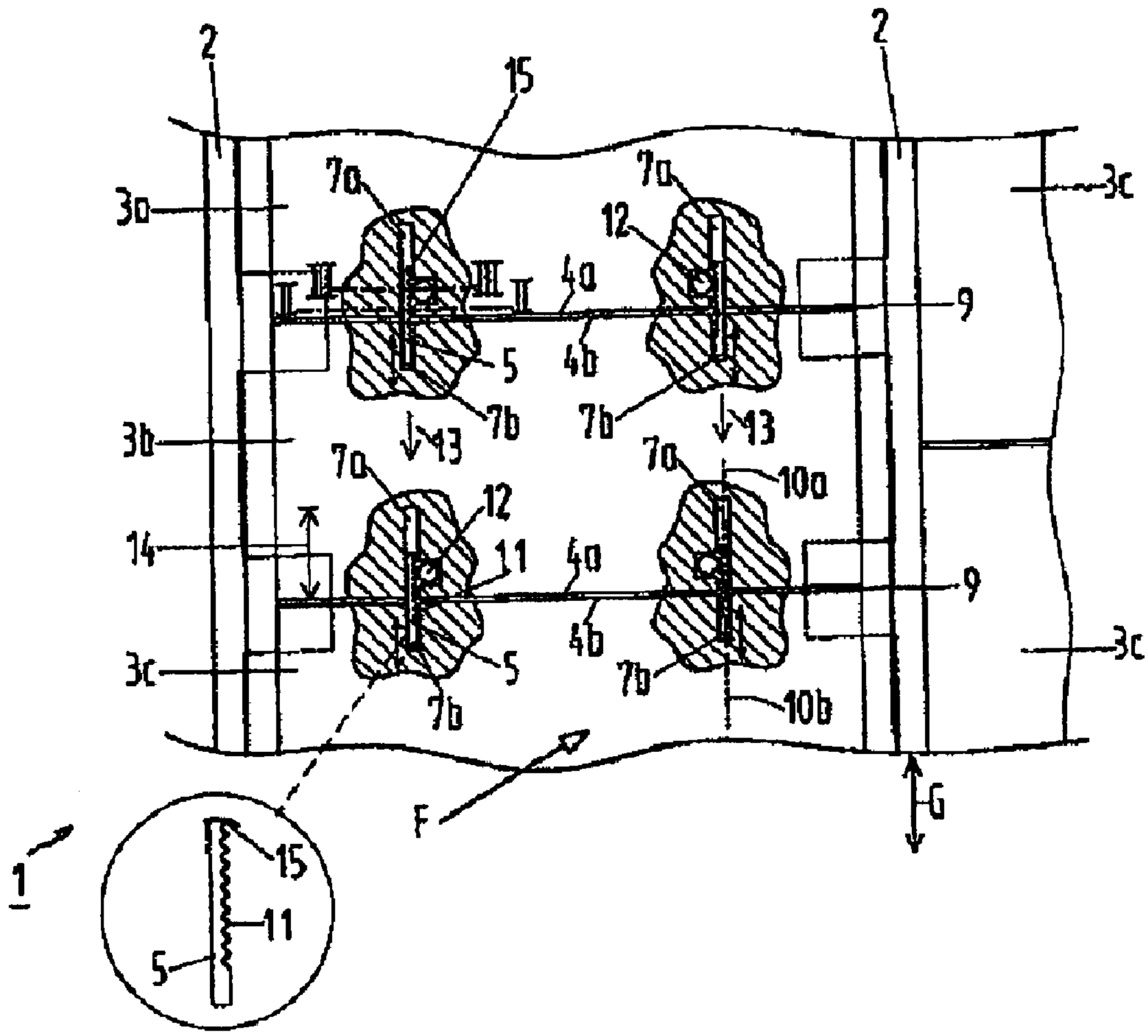
(54) Titre : SURFACE DE CIRCULATION
(54) Title: CIRCULATION AREA



(57) Abrégé/Abstract:
A circulation area (1) formed by plate-like cover elements (3a, 3b) laid so as to adjoin one another. In the mutually facing edges (4a, 4b) of mutually adjacent cover elements (3a, 3b), recesses (7a, 7b, 7c, 7d) are provided, which extend into the cover elements

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(57) Abrégé(suite)/Abstract(continued):
parallel to the surface extension of the cover elements from said edges (4a, 4b). Oppositely disposed recesses (7a, 7b, 7c, 7d) are aligned with each another. Alignment bars are each movably mounted in one of two mutually aligned recesses and partially movable into the other of the two aligned recesses by the aid of an adjustment shaft (8a, 8b) so as to engage with both of the mutually aligned recesses (7a, 7b, 7c, 7d), while bridging the separation (9) present between adjacent cover elements (3a, 3b).

Abstract:

A circulation area (1) formed by plate-like cover elements (3a, 3b) laid so as to adjoin one another. In the mutually facing edges (4a, 4b) of mutually adjacent cover elements (3a, 3b), recesses (7a, 7b, 7c, 7d) are provided, which extend into the cover elements parallel to the surface extension of the cover elements from said edges (4a, 4b). Oppositely disposed recesses (7a, 7b, 7c, 7d) are aligned with each another. Alignment bars are each movably mounted in one of two mutually aligned recesses and partially movable into the other of the two aligned recesses by the aid of an adjustment shaft (8a, 8b) so as to engage with both of the mutually aligned recesses (7a, 7b, 7c, 7d), while bridging the separation (9) present between adjacent cover elements (3a, 3b).

Circulation Area

The invention relates to a circulation area, in particular a circulation area of a level crossing, which circulation area is formed by plate-like cover elements laid so as to adjoin one another.

In circulation areas of the afore-mentioned type, the plate-like cover elements, as a rule, are to form continuously step-free surfaces. This will, however, frequently not be accomplished, if the substructure supporting the plate-like cover elements is unable to provide the stable cover element support that is required for a continuously step-free extension of the circulation area. Vehicles passing such a circulation area exert loads on the cover elements, with the points of application of such loads constantly changing and migrating from one element to the other, while possibly pressing down to a more or less large extent the respective just-stressed cover element relative to the cover elements that are unstressed at that very moment. Thus, temporarily undesired gradations of the circulation area will occur on the mutually facing edges of adjacent cover elements. This will, in particular, apply if the cover elements are elastically mounted, as is, for instance, the case with cover elements that are elastically supported on the rails of a rail track to form the circulation area of a level crossing. When heavy road vehicles run on such level crossings obliquely to the direction of the track course, the above-mentioned adverse effect can occur to a special degree. But also on other circulation areas formed by plate-like cover elements, e.g. on public squares on which plate-like cover elements are laid, a more or less pronounced vertical movement of adjacently disposed cover elements relative to one another will occur under the influence of the mostly asymmetrically acting traffic loads, which will upset the intended step-free extension of the circulation area.

It is an intended object of the present invention to provide a circulation area of the initially-defined kind, which is intended to eliminate the drawbacks mentioned above. The circulation area of the initially-defined kind and designed according to embodiments of the invention.

According to a broad aspect of the present invention, there is provided a circulation area, formed by plate-like cover elements laid so as to adjoin one another, wherein in the cover elements, at least one recess serving to receive an alignment bar is provided on at

least one edge of the respective cover element facing an adjacent cover element, said recesses extending into the cover elements parallel to the surface extension of the cover elements from the edges thereof, wherein recesses provided on mutually facing edges of mutually adjacent cover elements are aligned with one another, wherein heights of the recesses correspond to the vertical dimensions of the alignment bars, wherein the alignment bars are each displaceably mounted in a recess and partially movable out of the recess mounting the respective alignment bar by the aid of an externally operable adjustment means leading to the respective recess, so as to engage with a recess of an adjacent cover element that is aligned with the recess mounting the respective alignment bar while bridging the separation present between adjacent cover elements, wherein the recesses are configured in a channel-like manner, with geometric axes of recesses provided on mutually facing edges of mutually adjacent cover elements being in alignment with one another, wherein the alignment bars are designed as slide bars and the depth of a recess in which an alignment bar is mounted being at least as large as the length of the respective alignment bar, and wherein the slide bars each include a toothing extending in the longitudinal direction thereof and, furthermore, have a cross section resulting in a slide seat of the slide bars in the channel-like recesses, and gears each respectively rotatably disposed in that recess of every pair of mutually aligned recesses in which an alignment bar designed as a slide bar is mounted, while reaching into said channel-like recess, the gears each being capable of engaging with the toothing of the alignment bar for the longitudinal displacement thereof and sitting on an adjustment shaft provided as an adjustment means and leading to the outside, each gear being rotatable with said adjustment shaft.

This configuration is intended to properly accomplish the above-mentioned aim. The configuration according to the embodiments of the invention is intended to counteract the formation of undesired and detrimental steps in a simple manner and, at the same time, is intended to facilitate the manipulations required in the laying of the cover elements in order to obtain a step-free extension of the circulation area while offering the additional intended advantage that the

connections provided between adjacent cover elements will be readily detachable at a later point of time if this is necessary to perform maintenance work, wherein it is also intended to be readily possible to remove individual cover elements from a larger assembly.

The alignment bars and their mounting in the cover elements are dimensioned in such a manner as to be intended to enable the safe absorption, and transmission to the respectively adjacent cover element, of the transverse forces to be expected, which occur perpendicularly to the surface extension of the cover elements and derive from asymmetrically acting traffic loads, thus intending to counteract any tilting movement of the cover elements.

An illustrative embodiment, which is of intended advantage where heavy loads are to be expected, is characterized in that the recesses are configured in a channel-like manner, with the geometric axes of recesses provided on mutually facing edges of mutually adjacent cover elements being in alignment with one another, that the alignment bars are designed as slide bars each including a toothing extending in the longitudinal direction

thereof and, furthermore, having a cross section resulting in a slide seat of the alignment bar in the channel-like recesses, and that a gear is each rotatably disposed in that recess of every pair of mutually aligned recesses in which an alignment bar designed as a slide bar is mounted, while reaching into said channel-like recess, which gear is capable of engaging with the toothing of the alignment bar for the longitudinal displacement thereof and sits on an adjustment shaft leading to the outside, and is rotatable with said adjustment shaft, the depth of said recess being at least as large as the length of the respective alignment bar. In this respect, it is a further intended advantage if it is contemplated that a securing means against inadvertent rotation of the respective gear is provided. It may, moreover, be beneficial if a limit stop is each provided on the slide bars to restrict the outward displacement path, said limit stop being illustratively designed as a platelet disposed on the inner end of the respective slide bar.

Concerning the configuration of the channel-like recesses, a structurally simple embodiment that may also be beneficial in many cases in terms of the loads to be absorbed will result, if it is contemplated that the channel-like recesses are designed as blind bores. A variant frequently offering intended advantages in respect of the manufacture of the cover elements is characterized in that the cover elements have two parallel edges on which channel-like recesses are provided, said channel-like recesses extending continuously from one of these edges to the other.

Both from a manufacturing point of view and in view of the absorption of loads acting on the cover elements from outside, it may be advantageous to contemplate that the channel-like recesses are lined with tubes.

A mode of construction that is intended to enable a simple access to the structural elements to be operated when laying the cover elements and, if necessary, removing the same from the assembly is characterized in that gears each sitting on a shaft leading in the cover element to the outside perpendicularly to the surface extension of the cover elements are provided. A variant which is characterized in that gears each sitting on a shaft leading in the cover element to the outside in parallel with the surface extension of the cover elements are provided will in many cases, e.g. when forming the circulation area of a level

crossing in which a single row of cover elements is laid between the two rails of a track, enable the achievement of a uniform surface on the upper side of the cover elements. In respect to the formation of gears and in respect to insertion of said gears in the cover elements for engagement with the toothings of the alignment bars configured as slide bars, it may be advantageous if it is contemplated that the teeth of the gears are configured as a toothing incorporated in the shaft leading to the outside.

An embodiment of the cover elements that may be advantageous in regard to the laying of the cover elements for the formation of a circulation area is characterized in that the cover elements each comprise two parallel edges with two recesses provided on each of these edges, and the mutual distance of the recesses provided on one edge is equal to the mutual distance of the recesses provided on the other edge, and that a recess provided on one edge is each aligned with a recess provided on the other edge, wherein a recess forming a bearing for an alignment bar is each aligned with a recess into which an alignment bar projecting from a bearing recess engages, and both a bearing recess and a recess provided for engagement are provided on each edge. In this embodiment, all cover elements can be assembled without having to keep a specific shape orientation of the cover elements. A variant in this respect is characterized in that the cover elements have two parallel edges with at least one recess, yet illustratively several and, in particular, two recesses provided on each of these edges, and that, where several recesses are provided, the mutual distance of the recesses provided on one edge is equal to the mutual distance of the recesses provided on the other edge, and that a recess provided on one edge is each aligned with a recess provided on the other edge, wherein recesses each mounting an alignment bar are provided on one edge and recesses into which an alignment bar projecting from a bearing recess engages are provided on the other edge.

A further embodiment of a circulation area designed according to the invention, which may be particularly suitable for circulation areas where low loads are to be expected, wherein the alignment bars are intended to be very simply structured and readily and rapidly operable to form connections between adjacent cover elements and undo such connections is characterized in that the alignment bars are comprised of wing-shaped pivot bars which are

each attached to a shaft mounted in the cover element mounting the respective alignment bar, while extending perpendicularly to the surface extension thereof, and which are pivotable out of the recess of the bearing cover element by the aid of said shaft. In this respect, it may also be advantageous in the sense of a simple manipulation of the alignment bars and in respect to achieving a good stability of the connections to be formed with these alignment bars, if it is contemplated that the recesses, in regard to the pivot bar, are configured to limit the pivot angle.

In the drawing:

Fig. 1 illustrates, in a top view, a first exemplary embodiment of a circulation area designed according to the invention, with several subregions having been broken up and hence shown in horizontal sections;

Fig. 2 shows a vertical section along line II-II of Fig. 1;

Fig. 3 shows a vertical section along line III-III of Fig. 1;

Fig. 4 illustrates, in a top view, a portion of a cover element provided for a circulation area designed according to an embodiment of the invention and a broken-up zone of said cover element in a horizontal section;

Fig. 5 illustrates, in a top view, a variant of a cover element provided for a circulation area designed according to an embodiment of the invention and a broken-up zone thereof in a horizontal section;

Fig. 6 illustrates, in a top view, another exemplary embodiment of a circulation area designed according to the invention;

Fig. 7 depicts a broken-up subregion of this circulation area in a horizontal section along line VII-VII of Fig. 8;

Fig. 8 depicts said subregion in a vertical section along line VIII-VIII of Fig. 7;

Fig. 9 illustrates, in a top view, a further exemplary embodiment of a circulation area designed according to the invention, in which the cover elements are laid in a two-dimensionally adjoining manner;

Fig. 10, likewise, in a top view, illustrates a variant of the exemplary embodiment depicted in Fig. 9; and

Fig. 11, likewise, in a top view, illustrates a variant of

the exemplary embodiment depicted in Fig. 1.

Fig. 1 illustrates an exemplary embodiment of a circulation area 1 designed according to the invention and forming the circulation area of a level crossing. This circulation area is formed by of plate-like cover elements 3a, 3b which are mutually adjoiningly laid between the rails 2 of a track and supported on said rails. In an illustrative manner, elastic shims (not illustrated in the drawing) are provided between the edges of the cover elements facing the rails and the rails. As is schematically indicated in Fig. 1, cover elements 3c to be designed in a manner identical with, or similar to, the cover elements 3a, 3b are also provided, laid so as to externally adjoin the rails 2.

In the individual cover elements 3a, 3b, recesses 7a, 7b are provided on the edges 4a, 4b thereof and serve to accommodate alignment bars which, in the the present exemplary embodiment, are designed as slide bars 5. For each individual alignment bar, a pair of recesses 7a, 7b is provided in a relatively opposite relation on mutually facing edges 4a, 4b of adjacently disposed cover elements, said recesses 7a, 7b, in parallel with the surface extension of the cover elements, reaching into the cover elements from the edges 4a, 4b thereof. In a manner corresponding to the configuration of the alignment bars in the form of slide bars 5, the recesses 7a, 7b are designed like channels, and the geometric axes 10a, 10b of recesses 7a, 7b provided on mutually facing edges 4a, 4b of mutually adjacent cover elements 3a, 3b and arranged in a relatively opposite relation are in mutual alignment. The slide bars 5 each have a cross section resulting in a slide seat within the channel-like recess 7a, 7b. In this respect, the height H of the recesses 7a, 7b, in particular, corresponds to the vertical dimension of the alignment bars designed as slide bars 5. The recesses 7a have depths 14 that are at least as large as the lengths of the alignment bars designed as slide bars 5, and these alignment bars will remain inserted in the recesses 7a until the laying of the cover elements has been completed. After this, the alignment bars will be moved out of the recesses 7a over a portion of their lengths, whereby the alignment bars, while bridging the separation 9 present between adjacent cover elements, will each come into engagement with a recess 7b of an adjacent cover

element, that is aligned with the respective recess 7a. In order to induce such a movement of the slide bars 5, the slide bars are each provided with a toothing 11 extending in the longitudinal direction of the same, and gears 12 are provided, which can each be placed into engagement with the toothing 11 for the longitudinal displacement of the alignment bars designed as slide bars. Said gears 12 are rotatably disposed in such a manner as to reach into the channel-like recess 7a provided for the respective alignment bar. Each of said gears 12 sits on an adjustment shaft 8a leading to the outside and, in the exemplary embodiment illustrated in Fig. 1, extending perpendicularly to the surface extension of the cover elements. The said longitudinal displacement of the slide bars 5 is indicated by arrow 13. An intended structurally simple and sturdy embodiment of the gears, which may also require relatively little power to move the adjustment bars 5, will be obtained if the teeth of the gears are designed in the form of a toothing worked into the adjustment shaft. In an illustrative manner, a limit stop 15 is also provided on each adjustment bars 5 to restrict the outward displacement path. Such a limit stop may, for instance, be realized in the form of a platelet provided on the inner end of the respective slide bar, which platelet will abut on the respective gear 12 when reaching the maximum outward displacement length of the slide bars, thus preventing any further rotational movement of the gear. It is, moreover, beneficial to provide a securing means against inadvertent rotation of the respective gear. Such a securing means may, for instance, be designed in the form of a pin or strap to be inserted into the toothing.

On the outer end of the adjustment shaft 8a are illustratively provided attachment surfaces for turning tools which are to be placed at the adjustment shaft 8a for turning the gear 12. These may comprise a simple slot for inserting a screw driver, or also a triangular, rectangular or hexagonal formation on the end of the adjustment shaft 8a, such formations being realizable on the outer surface of the adjustment shaft or in the form of a hollow provided in the same.

By the engagement of the slide bars 5 with the recesses 7a, 7b, which are provided in mutually adjacent cover elements in a relatively opposite relation and mutually aligned manner, with

said slide bars bridging the separation present between adjacent cover elements, transverse forces caused by non-uniform loads on the cover elements and trying to change the altitude of the individual cover elements will be taken up in a stabilizing manner, and the undesired emergence of steps in the circulation area will be counteracted. Such asymmetric loads of considerable magnitude can, for instance, occur on level crossings that are often frequented by very heavy road vehicles, particularly when the direction of traffic F extends obliquely to the longitudinal direction G of a track, as indicated in Fig. 1, rather than perpendicularly thereto.

In the exemplary embodiment illustrated in Fig. 1, the channel-like recesses 7a, 7b are configured as blind bores, such recesses occupying only a small portion of the overall cross sections of the cover elements. Such recesses may simply be formed into the cover elements during their manufacture.

In order to intend to achieve precisely formed inner surfaces of the recesses with relatively little operational efforts during the manufacture of the cover elements, the channel-like recesses 7a, 7b may illustratively be lined with tubes 16 as illustrated in Fig. 4 at 7b. With a view to simplifying the incorporation of the channel-like recesses into the cover elements, and with a view to achieving an exactly aligned extension of such recesses, it will frequently also be beneficial if it is contemplated that the channel-like recesses extend continuously from one edge 4a of a cover element to its other edge 4b as is illustrated in Fig. 5. In such an embodiment, the provision of a lining tube 16 is of particular intended advantage, such a tube 16 not only facilitating the formation of the recesses, but also intended to advantageously contributing to the strength of the cover elements.

In the exemplary embodiment according to Fig. 5, the gear 12 engaging with the toothing 11 of a slide bar 5 sits on a shaft 8b leading to the outside in parallel with the surface extension of the respective cover element within the same such that the upper side of the respective cover element can be designed to be closed and any inadvertent penetration of foreign matter along the shaft leading from the gear to the outside will be counteracted.

In the exemplary embodiment represented in Figs. 6 to 8, the alignment bars, which are provided to safeguard the continuously

step-free extension of the circulation area 1 formed by mutually adjacently laid plate-like cover elements 3a, 3b, are comprised of wing-shaped pivot bars 6. Said pivot bars 6 are each attached to a shaft 8a extending through a recess 7c perpendicularly to the surface extension of the respective cover element. By turning the shaft, the pivot bar 6 by a portion of its length can be moved out of the recess 7c in which said pivot bar is mounted, and introduced into the recess 7d that is aligned with the recess 7c, as indicated by arrow 17. The height H of the recesses 7c, 7d corresponds to the vertical dimension of the pivot bar 6, and in this manner the occurrence of a relative height displacement between the mutually adjacently laid cover elements 3a, 3b may be counteracted. The recesses 7c, 7d, in respect to the pivot bar 6, are formed to limit the pivot angle by comprising end faces 7c', 7d' on which the pivot bar 6 engaging with the recess 7d will come to abut.

Fig. 9 is a top view on a circulation area that is formed by plate-like cover elements laid in a two-dimensionally adjoining manner. Alignment bars as shown in Figs. 7 and 8 are disposed on the mutually facing edges 4a, 4b of mutually adjoiningly laid cover elements 3a, 3b.

Fig. 10 depicts a variant in which alignment bars as are encountered in the exemplary embodiment illustrated in Fig. 1 are provided.

In the exemplary embodiment illustrated in Fig. 1, the cover elements 3a, 3b have two parallel edges 4a, 4b, with two recesses for receiving adjustment bars being provided on each of said edges. The mutual distance between the recesses provided on such an edge equals the mutual distance between the recesses provided on the respective other edge. Thus, a recess provided on one edge 4a of a cover element 3b is each aligned with a recess provided on the other edge 4b of the cover element, wherein recesses 7a forming bearings for alignment bars are provided on one edge and recesses 7b each engaged by an alignment bar projecting out of a bearing recess 7a are provided on the other edge. This embodiment requires consistently identical positioning of the individual cover elements that together form the circulation area. A modification would comprise just one recess on each of the two parallel edges of the cover elements or even more than two recesses.

A variant of the exemplary embodiment according to Fig. 1 is illustrated in Fig. 11, this variant not requiring any arrangements for keeping a defined orientation of the individual cover elements when assembling the same to form a circulation area. In this case, both a bearing recess 7a and a recess 7b intended for engagement are provided in a mutually offset manner on each of the edges 4a, 4b of the respective cover element 3a, 3b, wherein, as for the rest, identical conditions as in the exemplary embodiment according to Fig. 1 apply for the alignment and mutual distances of the recesses 7a, 7b.

Claims:

1. A circulation area, formed by plate-like cover elements laid so as to adjoin one another, wherein in the cover elements, at least one recess serving to receive an alignment bar is provided on at least one edge of the respective cover element facing an adjacent cover element, said recesses extending into the cover elements parallel to a surface extension of the cover elements from edges thereof, wherein recesses provided on mutually facing edges of mutually adjacent cover elements are aligned with one another, wherein heights of the recesses correspond to vertical dimensions of the alignment bars, wherein the alignment bars are each displaceably mounted in a recess and partially movable out of the recess mounting the respective alignment bar by the aid of an externally operable adjustment means leading to the respective recess, so as to engage with a recess of an adjacent cover element that is aligned with the recess mounting the respective alignment bar while bridging a separation present between adjacent cover elements, wherein the recesses are configured in a channel-like manner, with geometric axes of recesses provided on mutually facing edges of mutually adjacent cover elements being in alignment with one another, wherein the alignment bars are designed as slide bars and the depth of a recess in which an alignment bar is mounted being at least as large as the length of the respective alignment bar, and wherein the slide bars each include a toothing extending in the longitudinal direction thereof and, furthermore, have a cross section resulting in a slide seat of the slide bars in the channel-like recesses, and gears each respectively rotatably disposed in that recess of every pair of mutually aligned recesses in which an alignment bar designed as a slide bar is mounted, while reaching into said channel-like recess, the gears each being capable of engaging with the toothing of the alignment bar for the longitudinal displacement thereof and sitting on an adjustment shaft provided as an adjustment means and leading to the outside, each gear being rotatable with said adjustment shaft.

2. A circulation area according to claim 1, wherein the circulation area is associated with a level crossing.

3. A circulation area according to any one of claims 1 and 2, wherein a securing means against inadvertent rotation of the respective gears is provided.

4. A circulation area according to any one of claims 1 to 3, wherein the channel-like recesses are designed as blind bores.

5. A circulation area according to any one of claims 1 to 3, wherein the cover elements have two parallel edges on which channel-like recesses are provided, said channel-like recesses extending continuously from one of these edges to the other.

6. A circulation area according to any one of claims 1 to 5, wherein the channel-like recesses are lined with tubes.

7. A circulation area according to any one of claims 1 to 6, wherein the gears each sitting on an adjustment shaft provided as an adjustment means and leading to the outside are disposed perpendicularly to the surface extension of the cover elements.

8. A circulation area according to any one of claims 1 to 6, wherein the gears each sitting on an adjustment shaft provided as an adjustment means and leading to the outside are disposed in parallel with the surface extension of the cover elements.

9. A circulation area according to any one of claims 1 to 8, wherein teeth of the gears are configured as a toothing incorporated in the shaft leading to the outside.

10. A circulation area according to any one of claims 1 to 9, wherein the cover elements each comprise two parallel edges with two recesses provided on each of these edges, and a mutual distance of the recesses provided on one edge are equal to a mutual distance of the recesses provided on the other edge, wherein recesses provided on one edge are each respectively aligned with recesses provided on the other edge, and wherein each recess forming a bearing for an alignment bar is aligned with a recess into which an alignment bar projecting from a bearing recess engages, and both a bearing recess and a recess provided for engagement are provided on each edge.

11. A circulation area according to any one of claims 1 to 9, wherein the cover elements each have two parallel edges with at least one recess, provided on each of these edges, a mutual distance of at least one recess provided on one edge being equal to a mutual distance of the at least one recess provided on the other edge, wherein each recess provided on one edge is

respectively aligned with each recess provided on the other edge, and wherein recesses mounting an alignment bar are provided on one of said edges and recesses into which a said alignment bar engages are provided on the said other edge.

12. A circulation area according to claim 11, wherein a plurality of recesses is provided on each of the two parallel edges of the cover elements.

13. A circulation area according to claim 11, wherein two recesses are provided on each of the two parallel edges of the cover elements.

14. A circulation area according to claim 1, wherein a limit stop is provided on each of the slide bars to restrict the outward displacement path.

15. A circulation area according to claim 14, wherein each limit stop is designed as a platelet disposed on an inner end of its respective slide bar.

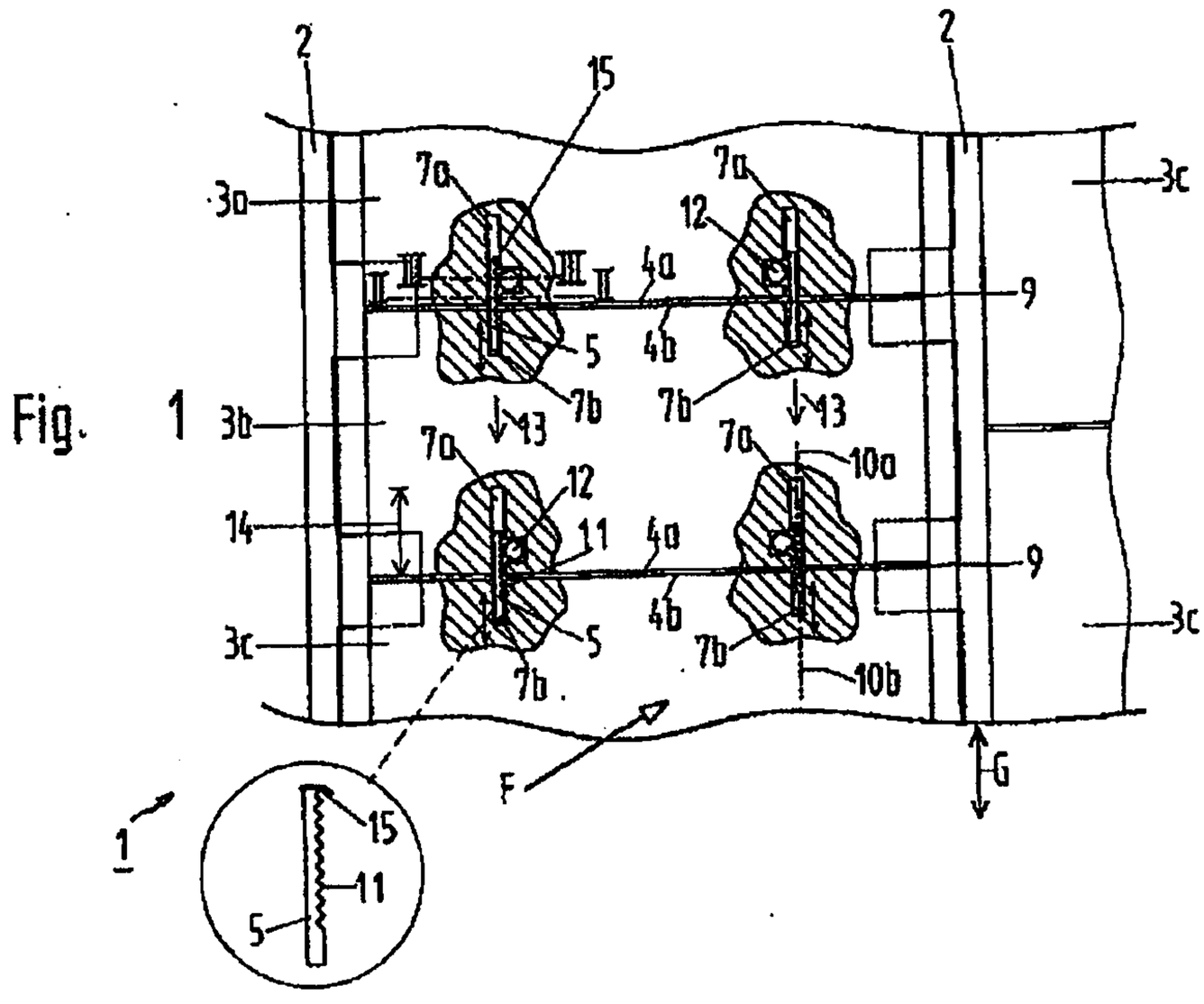

Fig. 1

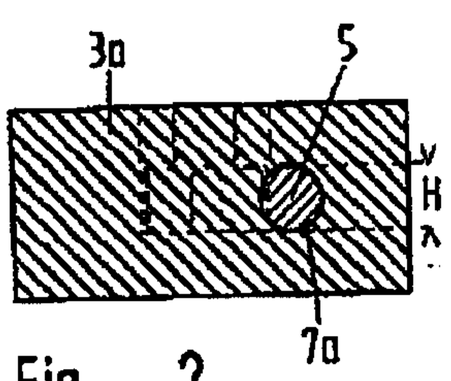

Fig. 2

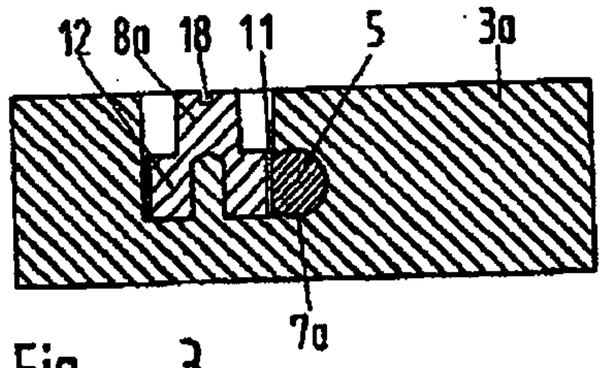

Fig. 3

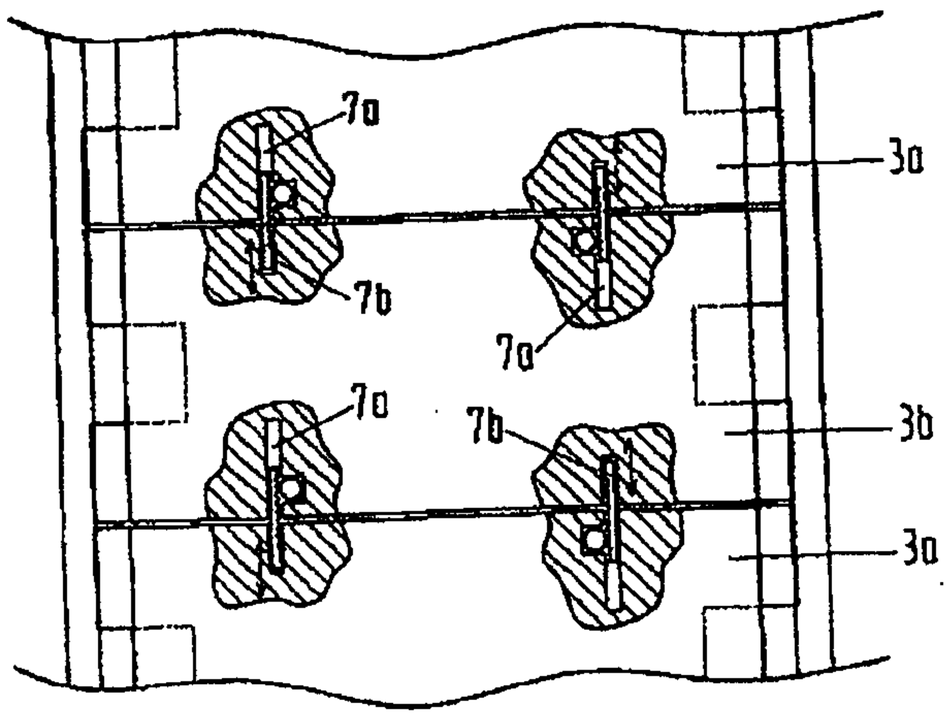

Fig. 11

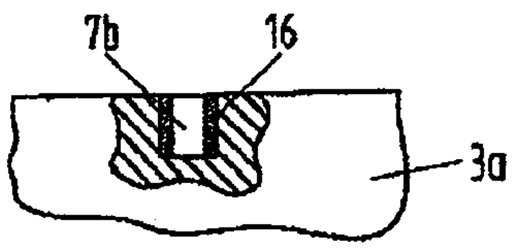

Fig. 4

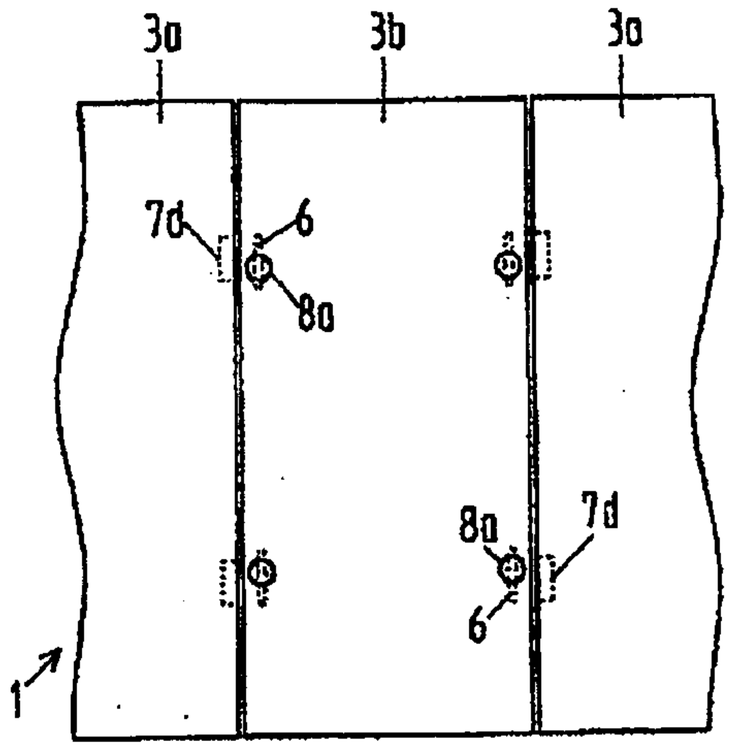

Fig. 6

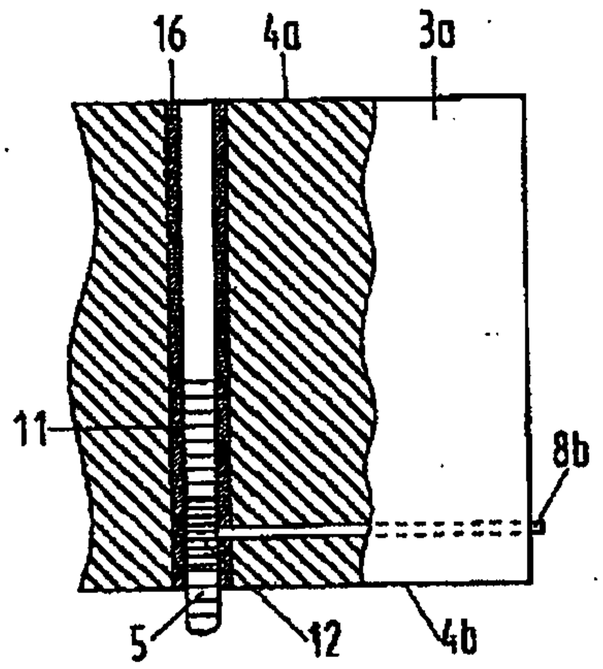

Fig. 5

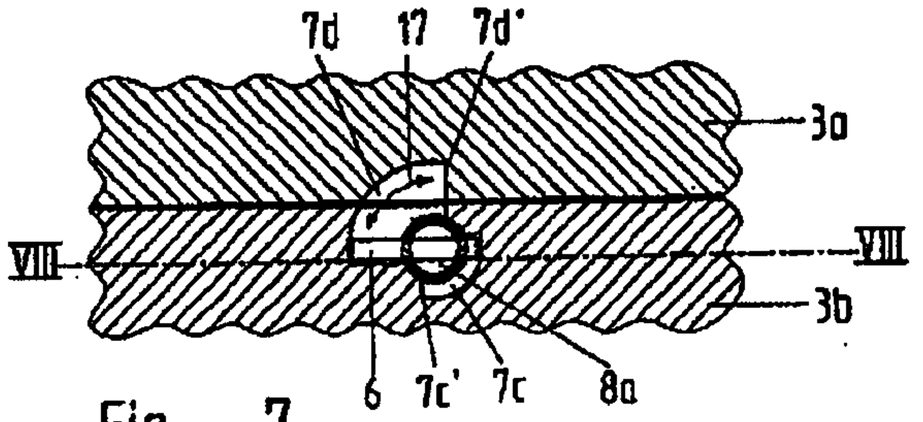

Fig. 7

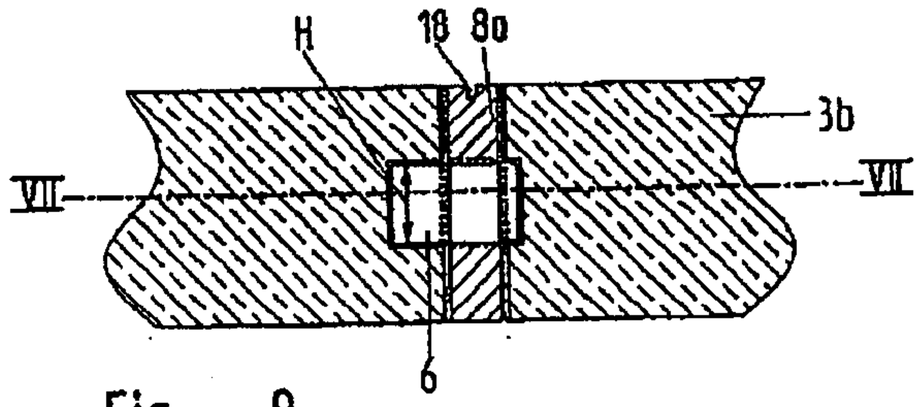

Fig. 8

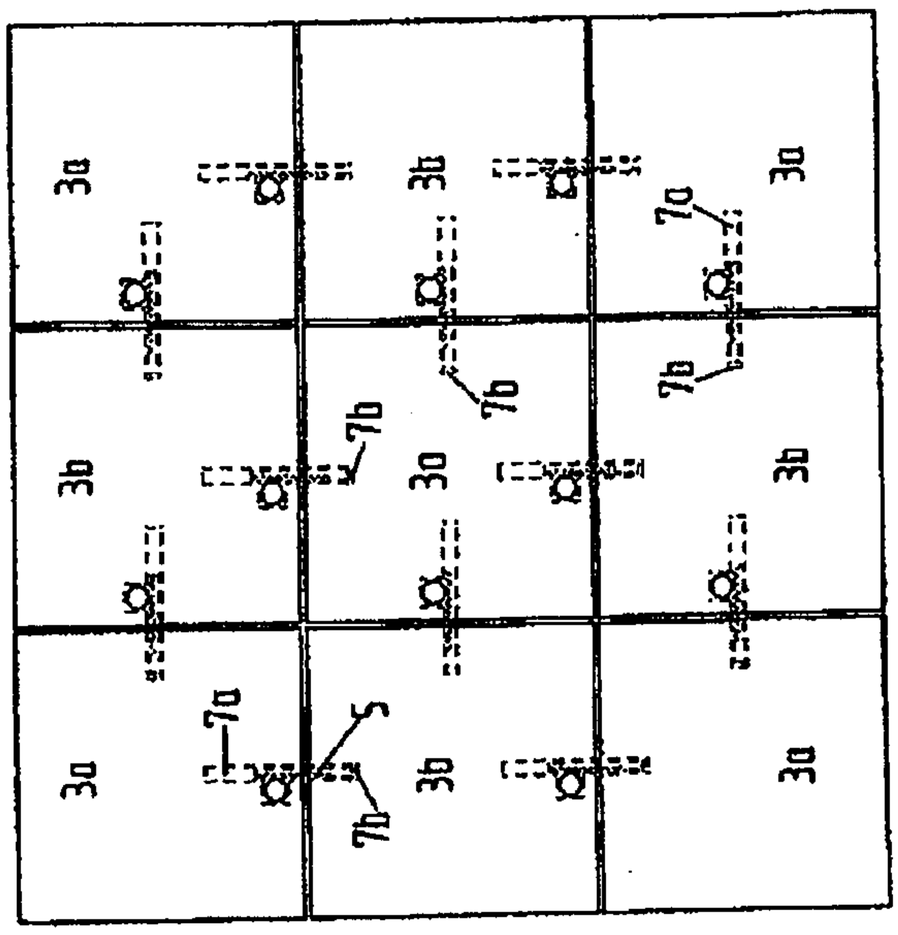

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Fig. 10

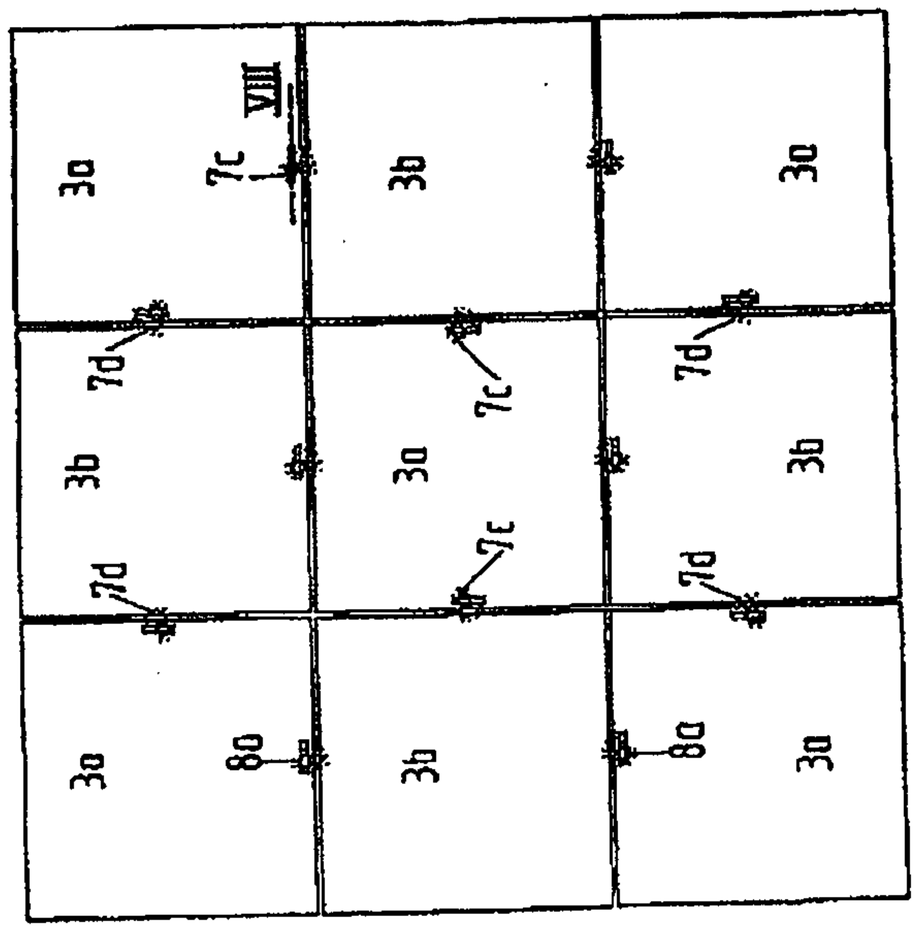
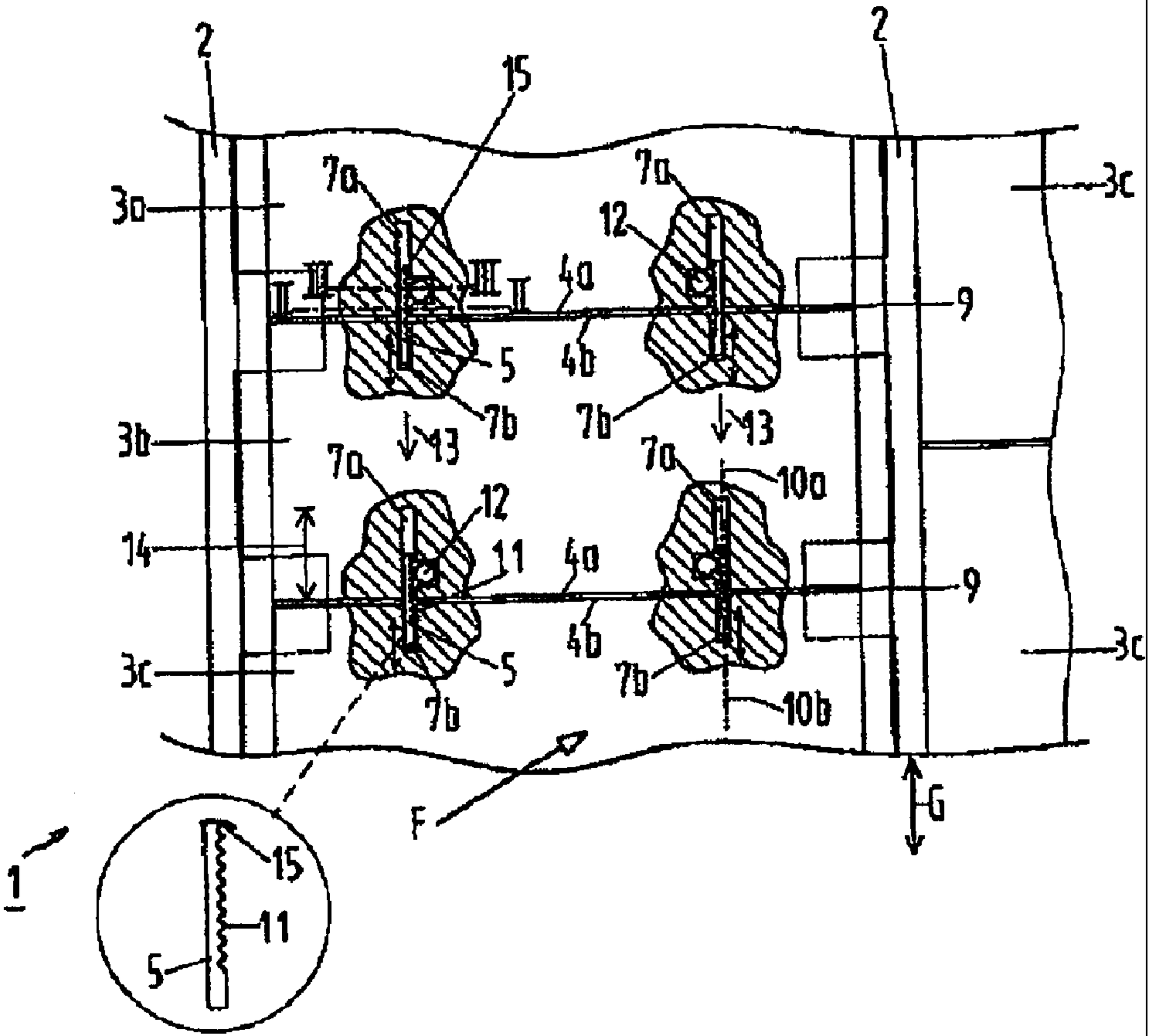


Fig. 9


2
15
2
7a
7a
3a
3c
12
II
III
III
II
4a
9
5
4b
7b
7b
13
13
3b
7a
7a
10a
12
14
11
4a
9
4b
3c
5
7b
7b
10b
3c
F
G
1
15
11
5