Office de la Propriété Intellectuelle du Canada
Un organisme d'Industrie Canada

Canadian Intellectual Property Office
An agency of Industry Canada

CA 2276799 C 2003/12/16

(11)(21) 2 276 799

(12) BREVET CANADIEN
CANADIAN PATENT

(13) C

(22) Date de dépôt/Filing Date: 1999/07/05

(41) Mise à la disp. pub./Open to Public Insp.: 2000/05/13

(45) Date de délivrance/Issue Date: 2003/12/16

(30) Priorité/Priority: 1998/11/13 (10-323860) JP

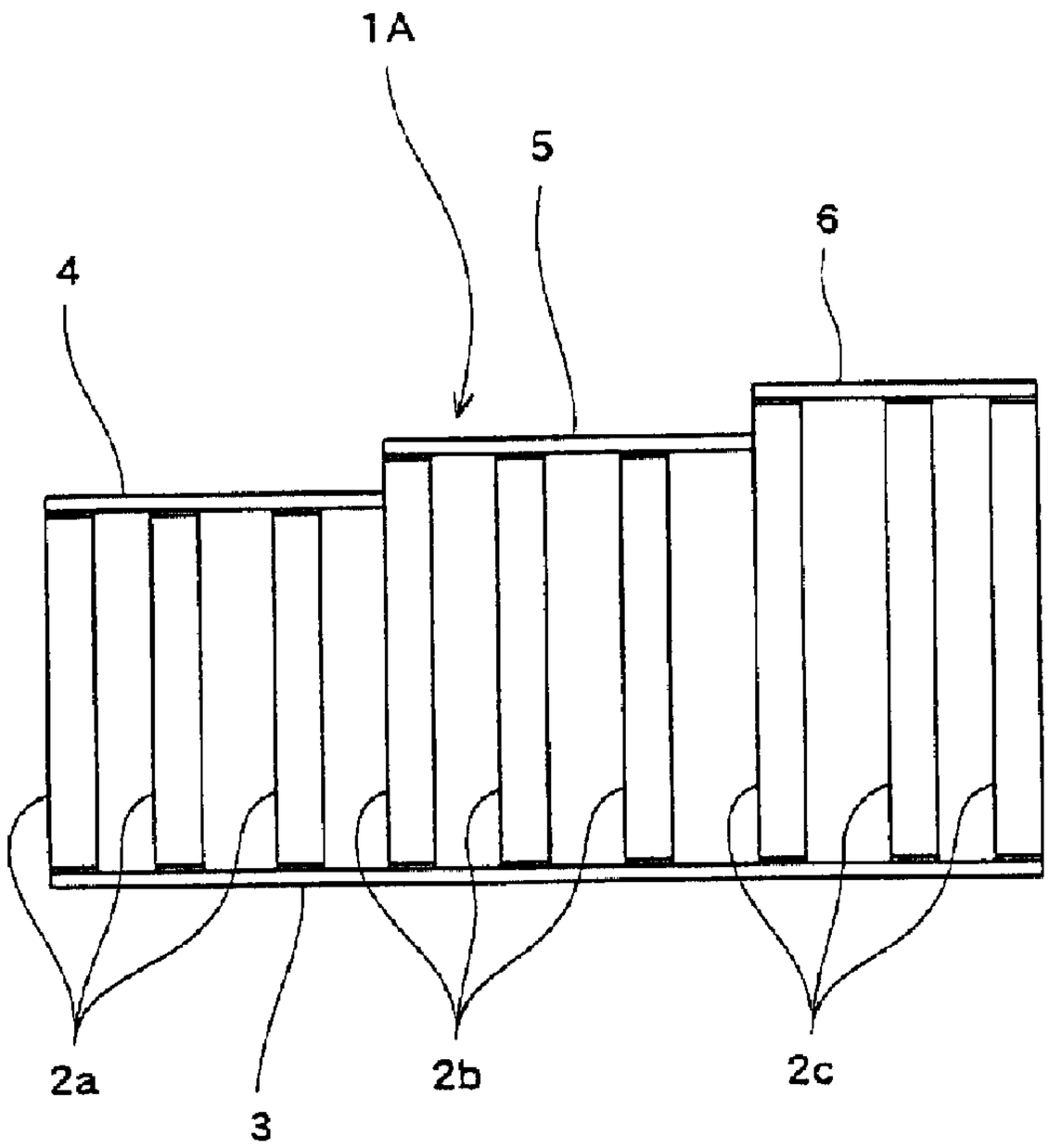
(51) Cl.Int.^{6}/Int.Cl.^{6} E01B 7/00

(72) Inventeurs/Inventors:
TOKUOKA, KENZO, JP;
DEMURA, MASAFUMI, JP;
EGO, MITSUKI, JP;
FUKUI, YOSHIHIRO, JP;
IRIE, TAKAAKI, JP;
YANO, TOMOKAZU, JP;
KONISHI, KATSUNARI, JP;
MARUYAMA, MOTOYOSHI, JP

(73) Propriétaires/Owners:
WEST JAPAN RAILWAY COMPANY, JP;
YAMATO KOGYO CO., LTD., JP

(74) Agent: KIRBY EADES GALE BAKER

(54) Titre : STRUCTURE DE BASE D'UN BRANCHEMENT
(54) Title: BASE STRUCTURE OF A TURNOUT



(57) Abrégé/Abstract:
Disclosed is a base structure of a turnout which has high durability and is capable of reliably preventing lateral displacement. The base structure of a turnout comprises a set of steel sleepers 1A which is installed on the track bed and can be filled with ballast. The set of steel sleepers 1A comprises a plurality of steel sleepers 2a, 2b, 2c having substantially the same configuration and different lengths which are arranged in parallel to each other at predetermined intervals with the varying length stepwise from the shortest steel sleeper 2a to the longest steel sleeper 2c. End faces on both sides of the longitudinal direction of all steel sleepers are capped with sleeper tie members 3, 4, and 5 or 6, and part or all of the sleeper tie members are embedded in the track bed.

ABSTRACT

Disclosed is a base structure of a turnout which has high durability and is capable of reliably preventing lateral displacement. The base structure of a turnout comprises a set of steel sleepers 1A which is installed on the track bed and can be filled with ballast. The set of steel sleepers 1A comprises a plurality of steel sleepers 2a, 2b, 2c having substantially the same configuration and different lengths which are arranged in parallel to each other at predetermined intervals with the varying length stepwise from the shortest steel sleeper 2a to the longest steel sleeper 2c. End faces on both sides of the longitudinal direction of all steel sleepers are capped with sleeper tie members 3, 4, and 5 or 6, and part or all of the sleeper tie members are embedded in the track bed.

BASE STRUCTURE OF A TURNOUT

Field of the Invention

The present invention relates to a base structure of a turnout for a permanent way and, more particularly, to a base structure of a turnout capable of reliably preventing alignment deviation from taking place.

BACKGROUND OF THE INVENTION

For a base structure of a turnout for a permanent way, it is conventional to place wooden sleepers for the turnout in the track bed ballast at predetermined intervals and at right angles to the rail. Most sleepers used for the turnout are made of wood. The reason for using wooden sleepers is that wooden sleepers make it possible to place a base plate on the sleepers and easily fix the base plate to the sleepers with track spikes or screw spikes by adjusting the position and mounting a rail on the base plate. Recently, sleepers made of synthetic resin or prestressed concrete are used in place of the wooden sleepers. An alternative steel sleeper 21 having a trapezoidal-shaped cross section and a hollow inner space which opens at the bottom has been proposed, as shown in Fig. 12. The inner space of the steel sleeper 21 is filled with ballast to prevent the sleepers from subsiding and both end faces of the sleeper in the longitudinal direction thereof are closed by press, thereby preventing the sleepers from moving in the direction of gage, the so-called alignment deviation, by means of the ballast which fills the inner space of the sleeper.

The turnout comprises, a point section 22, a lead section 23, a crossing section 24 and a guard section 25, as shown in Fig. 13. In any one of these sections, rails 27 are mounted on the sleepers 26 with a varying positional relationship. Rails 27 and sleepers 26 are not at right angles with each other, and the crossing angle is also varying. The length of the sleeper 26 must also be changed according to the place where it is used.

Thus the turnout is fragile because of the complicated structure compared to ordinary rail sections, and has a shorter service life due to the use of wooden sleepers which tend to rot. Moreover, sleepers used for a turnout are generally

longer than the regular sleepers as used in ordinary tracks, and are therefore more difficult to handle. Consequently, the sleepers used for turnout require more labor when being replaced, thus it is very desirable to prevent any trouble from taking place in the sleepers. However, a rail in a turnout has a radius of curvature which is generally smaller than those in ordinary tracks and causes a train running thereon to exert such a large lateral force that the displacement of the sleepers results. As a result, it is necessary to frequently carry out rail maintenance work for correcting the alignment deviation in order to prevent derailment accidents due to the alignment deviation.

In this respect, the conventional sleeper for a turnout provides a large resistive force in the longitudinal direction to prevent the displacement of the track by means of the ballast packed between the sleepers. However, with respect to the displacement in the direction perpendicular to the track, the conventional sleeper for a turnout provides a resistive force with only the ballast built up on the track bed shoulder of both ends of the sleeper, which is not enough to prevent alignment deviation caused by the lateral force exerted on the track.

On the other hand, sleeper 21 as shown in Fig. 12 is required to press the ballast toward the bottom of the sleeper by tamping the ballast from the side of the sleeper with a tie tamper in order to fill the inner space of the sleeper 21 with the ballast. This operation is very tedious and often ends up in insufficient packing of the ballast. Insufficient packing of the ballast leads to subsidence of the sleeper and poor resistance against a force exerted in the direction perpendicular to the track which causes a displacement in said direction.

OBJECTS AND SUMMARY OF THE INVENTION

The present invention has been accomplished to solve the problems of the above-described prior art. An object of the present invention is to provide a base structure of a turnout which has high durability and is capable of reliably preventing lateral displacement.

In order to accomplish the above-described object, the first aspect of the present invention provides a base structure of turnout used in a ballast track bed, comprising a plurality of sleepers having substantially the same cross section configuration but different lengths. The sleepers are placed in parallel to each other at predetermined intervals so that the length of the sleepers changes stepwise from the short sleepers to the long sleepers, and both end faces in the longitudinal direction are capped with sleeper tie members with part or all of the sleeper tie members being embedded in the ballast.

The second aspect of the present invention provides a base structure of a turnout used in the ballast track bed, comprising a plurality of sleepers having substantially the same cross section configuration but different lengths. The sleepers are placed in parallel to each other at predetermined intervals so that length of the sleepers change stepwise from the short sleepers to the long sleepers, and all the sleepers are tied to each other by two sleeper tie members at positions located inward from both ends of the sleeper in the longitudinal direction thereof.

The third aspect of the present invention provides the base structure of turnout of the second aspect, wherein the position at which the sleepers are tied to each other is located below rails.

According to the present invention, both end faces in the longitudinal direction of the plurality of sleepers of different lengths are capped with the sleeper tie members or sleepers are tied to each other by two sleeper tie members at positions located inward from both ends of the sleeper in the longitudinal direction thereof so that the plurality of sleepers act collectively as an integral base structure of turnout. Therefore, the base structure of turnout has a great resistive force against the force exerted in the direction perpendicular to the track, thus providing considerably greater resistance against the alignment deviation.

The third aspect of the present invention, where the sleepers are tied to each other by two sleeper tie members at positions located below rails, has such an advantage that there is no portion which causes trouble when tamping the ballast beneath the sleeper with a tie tamper.

The sleeper tie members, which tie a plurality of sleepers together, are joined to the sleepers by means of track spikes, screw spikes, bolts and nuts or welding and the like.

BRIEF DESCRIPTION OF THE DRAWINGS

Fig. 1 is a plan view of an embodiment of steel sleepers which constitutes the base structure of turnout of the present invention, showing a case where end faces on both sides of the longitudinal direction of the sleepers are capped with sleeper tie members;

Fig. 2(a) is a side view of one steel sleeper constituting the steel sleepers of Fig. 1, and Fig. 2(b) is a plan view thereof;

Fig. 3 shows an end face of the steel sleeper of Fig. 2;

Figs. 4 (a and b) shows a state of the sleeper tie members being joined to the sleeper by a different method from that of Fig. 2, Fig. 4(a) showing a side view thereof and Fig. 4(b) showing a plan view thereof;

Fig. 5 is a plan view of an embodiment where end faces on both sides of the longitudinal direction of the plurality of sleepers are capped with a single sleeper tie member respectively;

Fig. 6 is a plan view of another embodiment where end faces on both sides of the longitudinal direction of the plurality of sleepers are capped with a single sleeper tie member respectively;

Fig. 7 is a plan view of another embodiment of steel sleepers which constitute the base structure of turnout of the present invention, showing a case where the sleepers are tied to each other by two sleeper tie members at positions located inward from both ends of the sleepers in the longitudinal direction thereof;

Fig. 8(a) is a left side view of the steel sleeper of Fig. 7, and Fig. 8(b) is a plan view thereof;

Fig. 9 shows an end face of the steel sleeper of Fig. 7;

Fig 10 is a drawing for explaining the action of the steel sleepers of the prior art;

Fig. 11 is a drawing for explaining the action of the steel sleeper of the present invention;

Fig. 12 is a cross sectional view showing an example of the sleeper of the prior art;

Fig. 13 is a schematic plan view of the turnout

DETAILED DESCRIPTION

Preferred embodiments of the present invention will be described below with reference to the accompanying drawings. Fig. 1 is a plan view of a set of steel sleepers 1A which constitutes a base structure of a turnout according to the first embodiment of the present invention, where the set of steel sleepers 1A comprises a plurality of steel sleepers (2a, 2b, 2c) of different lengths. Placed on these steel sleepers (2a, 2b, 2c) are turnout rails being fastened by means of an elastic fastening device without using a screw or spike. In the case of Fig. 1, the set of steel sleepers 1A comprises three steel sleepers 2a having the least length, three steel sleepers 2b having medium length and three steel sleepers 2c having the greatest length, which are arranged in parallel to each other at predetermined intervals in the longitudinal direction of rail so that the length of sleepers (2a, 2b, 2c) changes stepwise from the shortest steel sleeper 2a to the longest steel sleeper 2c. End faces on one side of the longitudinal direction of steel sleepers 2a, 2b and 2c are all aligned in the same plane and capped with a sleeper tie member 3. End faces on the other side of the longitudinal direction of steel sleepers 2a, 2b and 2c are capped with sleeper tie members 4, 5 and 6 respectively. Steel sleepers (2a, 2b, 2c) and sleeper tie members (3, 4, 5, 6) are joined together by means of tie bolts (see numeral 12 in Fig. 2).

The steel sleepers (2a, 2b, 2c) have the same configuration except for differences in the length, as shown in Fig. 2. In Fig. 2, reference numeral 7 denotes a track bed. Each steel sleeper (2a, 2b, 2c) has a top flange 8 and a bottom flange 9, and a vertical web 10 which is formed to continue in the longitudinal direction of the sleeper (2a, 2b, 2c) and connects to the top flange 8 and bottom

flange 9 at the center in the direction of width thereof, so that the cross section in the direction of width of the sleeper (2a, 2b, 2c) has an I-shaped configuration. Sleeper tie members 3, 4 (or 5, 6) except for the top surfaces thereof are embedded in a track bed ballast 11. The space surrounded by the top flange 8, vertical web 10, bottom flange 9 and sleeper tie members 3, 4 is open to the outside on the side thereof, and forms a ballast packing space 11 which may be filled with ballast. Sleeper tie members (3, 4, 5, 6) act together with the ballast to resist a force exerted on the rail in the lateral direction, thereby preventing the steel sleeper (2a, 2b, 2c) from being displaced in the direction perpendicular to the track, namely preventing the alignment deviation. Fig. 3 shows an end face of the steel sleeper (2a, 2b, 2c) of Fig. 2.

Fig. 4 shows another method of joining sleeper tie members 3, 4 to the steel sleeper (2a, 2b, 2c), while Fig. 4(a) being a side view thereof and Fig. 4(b) being a plan thereof.

Fig. 5 shows an example of configuration where end faces on one side of the longitudinal direction of the steel sleepers (2a, 2b, 2c) of gradually increasing lengths are aligned on the same plane and capped with a single sleeper tie member 3, and end faces on the other side of the longitudinal direction of the steel sleepers (2a, 2b, 2c) are capped with a curved sleeper tie member 13. Further, as shown in Fig. 6, end faces on both sides of the longitudinal direction of the steel sleepers (2a, 2b, 2c) of gradually increasing lengths may also be capped with curved sleeper tie members 13.

Fig. 7 is a plan view of a set of steel sleepers 1B which constitutes a base structure of a turnout of the second embodiment. This embodiment is different from the first embodiment in the position of the sleeper tie member 3. That is, the steel sleepers 1B are tied to each other by two sleeper tie members 14 at positions located inward from both ends of the steel sleepers (2a, 2b, 2c) in the longitudinal direction thereof, and sleeper tie member 14 and steel sleepers (2a, 2b, 2c) are joined by welding. Sleeper tie member 14 is located below rail 15. Fig. 8(a) is a left side view of the steel sleeper 1B of Fig. 7, Fig. 8(b) is a plan view thereof, and Fig. 9 shows an end face of the steel sleeper (2a, 2b, 2c) of Fig. 7. In Fig. 8, numeral 16 denotes a rail fastening device which is omitted in Fig. 7 to make it

easier to understand the method of fastening the sleepers (2a, 2b, 2c) with the sleeper tie members 14.

According to this embodiment of the present invention, since the cross section in the direction of width of the steel sleeper (2a, 2b, 2c) has an I-shaped configuration and the space surrounded by the top flange late 8, vertical web 10, bottom flange 9 and sleeper tie members 14 is open to the outside on the side of the steel sleeper (2a, 2b, 2c) the ballast may be filled through the open side face, making it easier to fill the inner space of the steel sleeper (2a, 2b, 2c) with the ballast. As a result, greater resistance against the lateral force is ensured, thus achieving greater effect in preventing the steel sleeper (2a, 2b, 2c) from subsiding and being displaced in the direction perpendicular to the track. Particularly according to the present invention, since both end faces in the longitudinal direction of a plurality of steel sleepers (2a, 2b, 2c) of different lengths are capped with sleeper tie members 14 or the plurality of steel sleepers (2a, 2b, 2c) are tied to each other by two sleeper tie members 14 at positions located inward from both ends of the steel sleepers (2a, 2b, 2c) in the longitudinal direction thereof, the plurality of steel sleepers (2a, 2b, 2c) act collectively as an integral base structure of turnout, and provide a very high resistance against a force exerted on the rail in the lateral direction thereof. This prevents alignment deviation even when a great lateral force is exerted on the rails.

The present invention also has such an effect that, in case a sleeper tie member 14 is located below rail 15 as shown in Fig. 7, there is no portion which causes trouble when tamping the ballast beneath the sleeper (2a, 2b, 2c) with a tie tamper.

While the cross section having an I-shaped configuration in the direction of width of the steel sleeper (2a, 2b, 2c) is preferable as a constituent member of the base structure of a turnout of the present invention for being easily tied together, other configurations may also be employed as long as filling of the ballast is not impeded. It is important that the top flange is strong enough to bear the load transmitted from the rails since the rails are fastened on the top flange. The vertical web 10 must be strong enough to bear the load transmitted from the top flange 8, since the vertical web connects the top flange 8 and the bottom flange 9

and transmits the load from the top flange 8 to the bottom flange 9. Strength of the top flange 8 and the bottom flange 9 can be ensured by employing a proper material and thickness.

In case the end faces on both sides of the longitudinal direction of the steel sleeper (2a, 2b, 2c) are capped with the sleeper tie members (3, 4, 5, 6), as shown in Fig. 1, the ballast packing space inside the sleeper is made greater than in the case of Fig. 7, and greater amount of ballast is packed, thus achieving increased effects of preventing the steel sleeper (2a, 2b, 2c) from subsiding and preventing the steel sleeper (2a, 2b, 2c) from being displaced in the direction perpendicular to the track. In this regard, the ballast of track bed 7 receives load from a steel sleeper 21 in a region S1 which extends from the bottom surface of the steel sleeper 21 at an angle of about 45 degrees on both sides of the bottom surface downward to the outside, as shown in Fig. 10 indicating the steel sleeper 21 of the prior art. In the case of the steel sleeper (2a, 2b, 2c) of the present invention, on the other hand, because the spaces between the top flange 8 and bottom flange 9 of the steel sleeper (2a, 2b, 2c) are filled with the ballast, as shown in Fig. 11, the ballast of the track bed 7 receives load not only from bottom flange 9 but also from top flange 8, and therefore the load carrying region of the ballast which receives the load from the steel sleeper becomes greater by the region S2, thus making it possible to prevent subsidence of steel sleeper (2a, 2b, 2c) more reliably.

While two sets of steel sleepers 1A, 1B, which constitute the base structure of a turnout, comprise steel sleepers (2a, 2b, 2c) of different lengths in the above-described embodiments, a variety of lengths and the number of steel sleepers are not limited to those of the embodiments and may vary depending on the turnout, as a matter of course.

The base structure of a turnout of the present invention has a very high resistance against a lateral force exerted on the rail and a considerably increased capability to prevent alignment deviation since the plurality of steel sleepers 1A, 1B tied to each other by the sleeper tie members (3, 4, 5, 6, 14) act collectively as an integral base structure of a turnout. When the sleepers 1A, 1B are tied to each other by two sleeper tie members (3, 4, 5, 6, 14) at positions located below rails as in the third aspect of the present invention, in particular, an effect can be obtained

such that there is no portion which causes trouble when tamping the ballast below the sleeper (2a, 2b, 2c) with a tie tamper.

BASE STRUCTURE OF A TURNOUT

Field of the Invention

The present invention relates to a base structure of a turnout for a permanent way and, more particularly, to a base structure of a turnout capable of reliably preventing alignment deviation from taking place.

BACKGROUND OF THE INVENTION

For a base structure of a turnout for a permanent way, it is conventional to place wooden sleepers for the turnout in the track bed ballast at predetermined intervals and at right angles to the rail. Most sleepers used for the turnout are made of wood. The reason for using wooden sleepers is that wooden sleepers make it possible to place a base plate on the sleepers and easily fix the base plate to the sleepers with track spikes or screw spikes by adjusting the position and mounting a rail on the base plate. Recently, sleepers made of synthetic resin or prestressed concrete are used in place of the wooden sleepers. An alternative steel sleeper 21 having a trapezoidal-shaped cross section and a hollow inner space which opens at the bottom has been proposed, as shown in Fig. 12. The inner space of the steel sleeper 21 is filled with ballast to prevent the sleepers from subsiding and both end faces of the sleeper in the longitudinal direction thereof are closed by press, thereby preventing the sleepers from moving in the direction of gage, the so-called alignment deviation, by means of the ballast which fills the inner space of the sleeper.

The turnout comprises, a point section 22, a lead section 23, a crossing section 24 and a guard section 25, as shown in Fig. 13. In any one of these sections, rails 27 are mounted on the sleepers 26 with a varying positional relationship. Rails 27 and sleepers 26 are not at right angles with each other, and the crossing angle is also varying. The length of the sleeper 26 must also be changed according to the place where it is used.

Thus the turnout is fragile because of the complicated structure compared to ordinary rail sections, and has a shorter service life due to the use of wooden sleepers which tend to rot. Moreover, sleepers used for a turnout are generally

longer than the regular sleepers as used in ordinary tracks, and are therefore more difficult to handle. Consequently, the sleepers used for turnout require more labor when being replaced, thus it is very desirable to prevent any trouble from taking place in the sleepers. However, a rail in a turnout has a radius of curvature which is generally smaller than those in ordinary tracks and causes a train running thereon to exert such a large lateral force that the displacement of the sleepers results. As a result, it is necessary to frequently carry out rail maintenance work for correcting the alignment deviation in order to prevent derailment accidents due to the alignment deviation.

In this respect, the conventional sleeper for a turnout provides a large resistive force in the longitudinal direction to prevent the displacement of the track by means of the ballast packed between the sleepers. However, with respect to the displacement in the direction perpendicular to the track, the conventional sleeper for a turnout provides a resistive force with only the ballast built up on the track bed shoulder of both ends of the sleeper, which is not enough to prevent alignment deviation caused by the lateral force exerted on the track.

On the other hand, sleeper 21 as shown in Fig. 12 is required to press the ballast toward the bottom of the sleeper by tamping the ballast from the side of the sleeper with a tie tamper in order to fill the inner space of the sleeper 21 with the ballast. This operation is very tedious and often ends up in insufficient packing of the ballast. Insufficient packing of the ballast leads to subsidence of the sleeper and poor resistance against a force exerted in the direction perpendicular to the track which causes a displacement in said direction.

OBJECTS AND SUMMARY OF THE INVENTION

The present invention has been accomplished to solve the problems of the above-described prior art. An object of the present invention is to provide a base structure of a turnout which has high durability and is capable of reliably preventing lateral displacement.

In order to accomplish the above-described object, the first aspect of the present invention provides a base structure of turnout used in a ballast track bed, comprising a plurality of sleepers having substantially the same cross section configuration but different lengths. The sleepers are placed in parallel to each other at predetermined intervals so that the length of the sleepers changes stepwise from the short sleepers to the long sleepers, and both end faces in the longitudinal direction are capped with sleeper tie members with part or all of the sleeper tie members being embedded in the ballast.

The second aspect of the present invention provides a base structure of a turnout used in the ballast track bed, comprising a plurality of sleepers having substantially the same cross section configuration but different lengths. The sleepers are placed in parallel to each other at predetermined intervals so that length of the sleepers change stepwise from the short sleepers to the long sleepers, and all the sleepers are tied to each other by two sleeper tie members at positions located inward from both ends of the sleeper in the longitudinal direction thereof.

The third aspect of the present invention provides the base structure of turnout of the second aspect, wherein the position at which the sleepers are tied to each other is located below rails.

According to the present invention, both end faces in the longitudinal direction of the plurality of sleepers of different lengths are capped with the sleeper tie members or sleepers are tied to each other by two sleeper tie members at positions located inward from both ends of the sleeper in the longitudinal direction thereof so that the plurality of sleepers act collectively as an integral base structure of turnout. Therefore, the base structure of turnout has a great resistive force against the force exerted in the direction perpendicular to the track, thus providing considerably greater resistance against the alignment deviation.

The third aspect of the present invention, where the sleepers are tied to each other by two sleeper tie members at positions located below rails, has such an advantage that there is no portion which causes trouble when tamping the ballast beneath the sleeper with a tie tamper.

The sleeper tie members, which tie a plurality of sleepers together, are joined to the sleepers by means of track spikes, screw spikes, bolts and nuts or welding and the like.

BRIEF DESCRIPTION OF THE DRAWINGS

Fig. 1 is a plan view of an embodiment of steel sleepers which constitutes the base structure of turnout of the present invention, showing a case where end faces on both sides of the longitudinal direction of the sleepers are capped with sleeper tie members;

Fig. 2(a) is a side view of one steel sleeper constituting the steel sleepers of Fig. 1, and Fig. 2(b) is a plan view thereof;

Fig. 3 shows an end face of the steel sleeper of Fig. 2;

Figs. 4 (a and b) shows a state of the sleeper tie members being joined to the sleeper by a different method from that of Fig. 2, Fig. 4(a) showing a side view thereof and Fig. 4(b) showing a plan view thereof;

Fig. 5 is a plan view of an embodiment where end faces on both sides of the longitudinal direction of the plurality of sleepers are capped with a single sleeper tie member respectively;

Fig. 6 is a plan view of another embodiment where end faces on both sides of the longitudinal direction of the plurality of sleepers are capped with a single sleeper tie member respectively;

Fig. 7 is a plan view of another embodiment of steel sleepers which constitute the base structure of turnout of the present invention, showing a case where the sleepers are tied to each other by two sleeper tie members at positions located inward from both ends of the sleepers in the longitudinal direction thereof;

Fig. 8(a) is a left side view of the steel sleeper of Fig. 7, and Fig. 8(b) is a plan view thereof;

Fig. 9 shows an end face of the steel sleeper of Fig. 7;

Fig 10 is a drawing for explaining the action of the steel sleepers of the prior art;

Fig. 11 is a drawing for explaining the action of the steel sleeper of the present invention;

Fig. 12 is a cross sectional view showing an example of the sleeper of the prior art;

Fig. 13 is a schematic plan view of the turnout

DETAILED DESCRIPTION

Preferred embodiments of the present invention will be described below with reference to the accompanying drawings. Fig. 1 is a plan view of a set of steel sleepers 1A which constitutes a base structure of a turnout according to the first embodiment of the present invention, where the set of steel sleepers 1A comprises a plurality of steel sleepers (2a, 2b, 2c) of different lengths. Placed on these steel sleepers (2a, 2b, 2c) are turnout rails being fastened by means of an elastic fastening device without using a screw or spike. In the case of Fig. 1, the set of steel sleepers 1A comprises three steel sleepers 2a having the least length, three steel sleepers 2b having medium length and three steel sleepers 2c having the greatest length, which are arranged in parallel to each other at predetermined intervals in the longitudinal direction of rail so that the length of sleepers (2a, 2b, 2c) changes stepwise from the shortest steel sleeper 2a to the longest steel sleeper 2c. End faces on one side of the longitudinal direction of steel sleepers 2a, 2b and 2c are all aligned in the same plane and capped with a sleeper tie member 3. End faces on the other side of the longitudinal direction of steel sleepers 2a, 2b and 2c are capped with sleeper tie members 4, 5 and 6 respectively. Steel sleepers (2a, 2b, 2c) and sleeper tie members (3, 4, 5, 6) are joined together by means of tie bolts (see numeral 12 in Fig. 2).

The steel sleepers (2a, 2b, 2c) have the same configuration except for differences in the length, as shown in Fig. 2. In Fig. 2, reference numeral 7 denotes a track bed. Each steel sleeper (2a, 2b, 2c) has a top flange 8 and a bottom flange 9, and a vertical web 10 which is formed to continue in the longitudinal direction of the sleeper (2a, 2b, 2c) and connects to the top flange 8 and bottom

flange 9 at the center in the direction of width thereof, so that the cross section in the direction of width of the sleeper (2a, 2b, 2c) has an I-shaped configuration. Sleeper tie members 3, 4 (or 5, 6) except for the top surfaces thereof are embedded in a track bed ballast 11. The space surrounded by the top flange 8, vertical web 10, bottom flange 9 and sleeper tie members 3, 4 is open to the outside on the side thereof, and forms a ballast packing space 11 which may be filled with ballast. Sleeper tie members (3, 4, 5, 6) act together with the ballast to resist a force exerted on the rail in the lateral direction, thereby preventing the steel sleeper (2a, 2b, 2c) from being displaced in the direction perpendicular to the track, namely preventing the alignment deviation. Fig. 3 shows an end face of the steel sleeper (2a, 2b, 2c) of Fig. 2.

Fig. 4 shows another method of joining sleeper tie members 3, 4 to the steel sleeper (2a, 2b, 2c), while Fig. 4(a) being a side view thereof and Fig. 4(b) being a plan thereof.

Fig. 5 shows an example of configuration where end faces on one side of the longitudinal direction of the steel sleepers (2a, 2b, 2c) of gradually increasing lengths are aligned on the same plane and capped with a single sleeper tie member 3, and end faces on the other side of the longitudinal direction of the steel sleepers (2a, 2b, 2c) are capped with a curved sleeper tie member 13. Further, as shown in Fig. 6, end faces on both sides of the longitudinal direction of the steel sleepers (2a, 2b, 2c) of gradually increasing lengths may also be capped with curved sleeper tie members 13.

Fig. 7 is a plan view of a set of steel sleepers 1B which constitutes a base structure of a turnout of the second embodiment. This embodiment is different from the first embodiment in the position of the sleeper tie member 3. That is, the steel sleepers 1B are tied to each other by two sleeper tie members 14 at positions located inward from both ends of the steel sleepers (2a, 2b, 2c) in the longitudinal direction thereof, and sleeper tie member 14 and steel sleepers (2a, 2b, 2c) are joined by welding. Sleeper tie member 14 is located below rail 15. Fig. 8(a) is a left side view of the steel sleeper 1B of Fig. 7, Fig. 8(b) is a plan view thereof, and Fig. 9 shows an end face of the steel sleeper (2a, 2b, 2c) of Fig. 7. In Fig. 8, numeral 16 denotes a rail fastening device which is omitted in Fig. 7 to make it

easier to understand the method of fastening the sleepers (2a, 2b, 2c) with the sleeper tie members 14.

According to this embodiment of the present invention, since the cross section in the direction of width of the steel sleeper (2a, 2b, 2c) has an I-shaped configuration and the space surrounded by the top flange late 8, vertical web 10, bottom flange 9 and sleeper tie members 14 is open to the outside on the side of the steel sleeper (2a, 2b, 2c) the ballast may be filled through the open side face, making it easier to fill the inner space of the steel sleeper (2a, 2b, 2c) with the ballast. As a result, greater resistance against the lateral force is ensured, thus achieving greater effect in preventing the steel sleeper (2a, 2b, 2c) from subsiding and being displaced in the direction perpendicular to the track. Particularly according to the present invention, since both end faces in the longitudinal direction of a plurality of steel sleepers (2a, 2b, 2c) of different lengths are capped with sleeper tie members 14 or the plurality of steel sleepers (2a, 2b, 2c) are tied to each other by two sleeper tie members 14 at positions located inward from both ends of the steel sleepers (2a, 2b, 2c) in the longitudinal direction thereof, the plurality of steel sleepers (2a, 2b, 2c) act collectively as an integral base structure of turnout, and provide a very high resistance against a force exerted on the rail in the lateral direction thereof. This prevents alignment deviation even when a great lateral force is exerted on the rails.

The present invention also has such an effect that, in case a sleeper tie member 14 is located below rail 15 as shown in Fig. 7, there is no portion which causes trouble when tamping the ballast beneath the sleeper (2a, 2b, 2c) with a tie tamper.

While the cross section having an I-shaped configuration in the direction of width of the steel sleeper (2a, 2b, 2c) is preferable as a constituent member of the base structure of a turnout of the present invention for being easily tied together, other configurations may also be employed as long as filling of the ballast is not impeded. It is important that the top flange is strong enough to bear the load transmitted from the rails since the rails are fastened on the top flange. The vertical web 10 must be strong enough to bear the load transmitted from the top flange 8, since the vertical web connects the top flange 8 and the bottom flange 9

and transmits the load from the top flange 8 to the bottom flange 9. Strength of the top flange 8 and the bottom flange 9 can be ensured by employing a proper material and thickness.

In case the end faces on both sides of the longitudinal direction of the steel sleeper (2a, 2b, 2c) are capped with the sleeper tie members (3, 4, 5, 6), as shown in Fig. 1, the ballast packing space inside the sleeper is made greater than in the case of Fig. 7, and greater amount of ballast is packed, thus achieving increased effects of preventing the steel sleeper (2a, 2b, 2c) from subsiding and preventing the steel sleeper (2a, 2b, 2c) from being displaced in the direction perpendicular to the track. In this regard, the ballast of track bed 7 receives load from a steel sleeper 21 in a region S1 which extends from the bottom surface of the steel sleeper 21 at an angle of about 45 degrees on both sides of the bottom surface downward to the outside, as shown in Fig. 10 indicating the steel sleeper 21 of the prior art. In the case of the steel sleeper (2a, 2b, 2c) of the present invention, on the other hand, because the spaces between the top flange 8 and bottom flange 9 of the steel sleeper (2a, 2b, 2c) are filled with the ballast, as shown in Fig. 11, the ballast of the track bed 7 receives load not only from bottom flange 9 but also from top flange 8, and therefore the load carrying region of the ballast which receives the load from the steel sleeper becomes greater by the region S2, thus making it possible to prevent subsidence of steel sleeper (2a, 2b, 2c) more reliably.

While two sets of steel sleepers 1A, 1B, which constitute the base structure of a turnout, comprise steel sleepers (2a, 2b, 2c) of different lengths in the above-described embodiments, a variety of lengths and the number of steel sleepers are not limited to those of the embodiments and may vary depending on the turnout, as a matter of course.

The base structure of a turnout of the present invention has a very high resistance against a lateral force exerted on the rail and a considerably increased capability to prevent alignment deviation since the plurality of steel sleepers 1A, 1B tied to each other by the sleeper tie members (3, 4, 5, 6, 14) act collectively as an integral base structure of a turnout. When the sleepers 1A, 1B are tied to each other by two sleeper tie members (3, 4, 5, 6, 14) at positions located below rails as in the third aspect of the present invention, in particular, an effect can be obtained

such that there is no portion which causes trouble when tamping the ballast below the sleeper (2a, 2b, 2c) with a tie tamper.

CLAIMS:

1. A base structure of a turnout used in a ballast track bed, comprising a plurality of sleepers having substantially the same cross section configuration but different length, wherein the sleepers are placed in parallel to each other at predetermined intervals so that length of the sleepers changes stepwise from the short sleepers to the long sleepers, and both end faces in the longitudinal direction of all the sleepers are capped with sleeper tie members with part or all of the sleeper tie members being embedded in the ballast.

2. A base structure of a turnout used in a ballast track bed, comprising a plurality of sleepers having substantially the same cross section configuration but different length, wherein the sleepers are placed in parallel to each other at predetermined intervals so that length of the sleepers changes stepwise from the short sleepers to the long sleepers, and all the sleepers are tied to each other by two sleeper tie members at the positions located inward from both ends of the sleeper in the longitudinal direction thereof.

3. The base structure of a turnout of claim 2, wherein the position at which the sleepers are tied to each other is located below the rails.

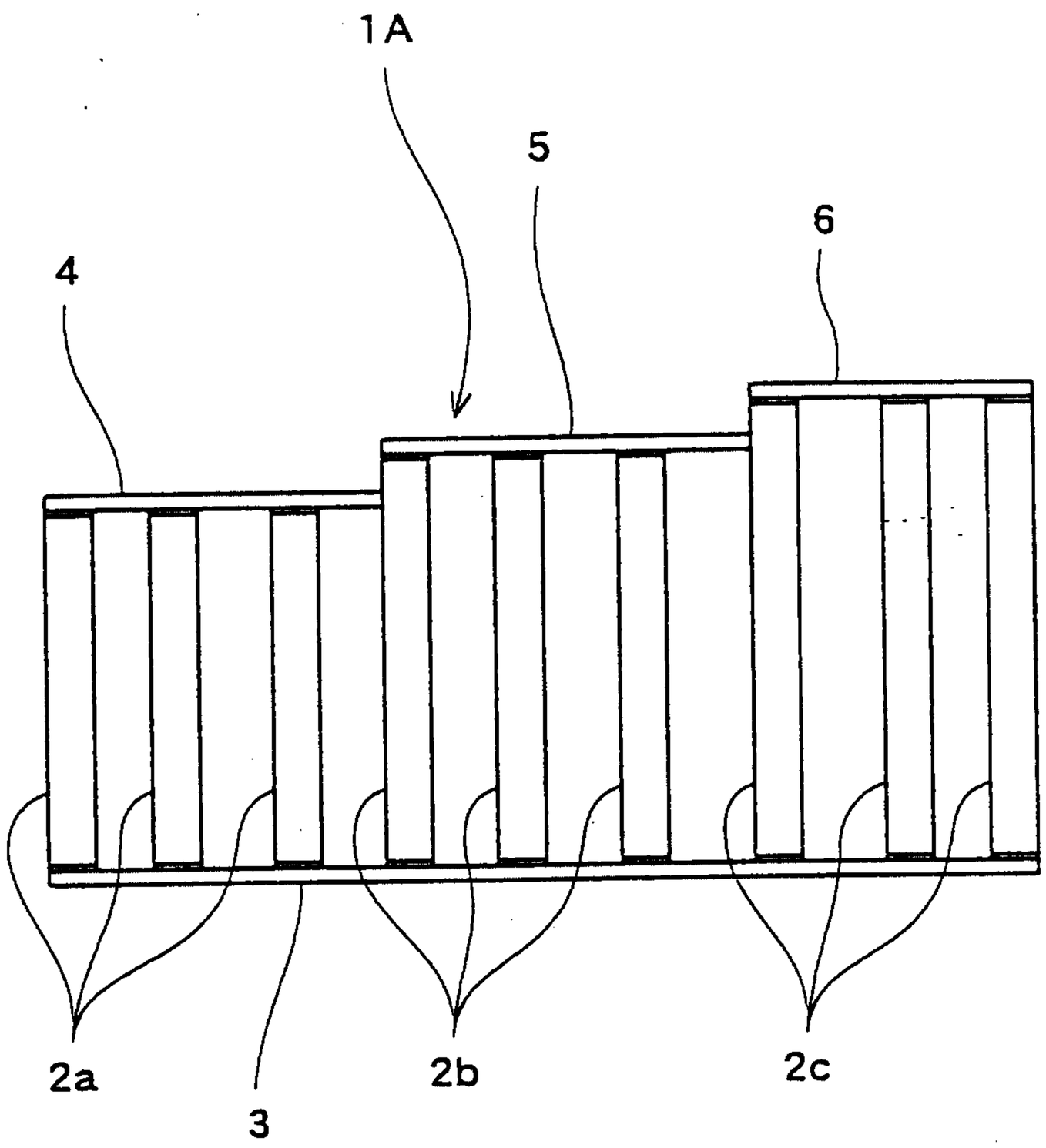


Fig.1

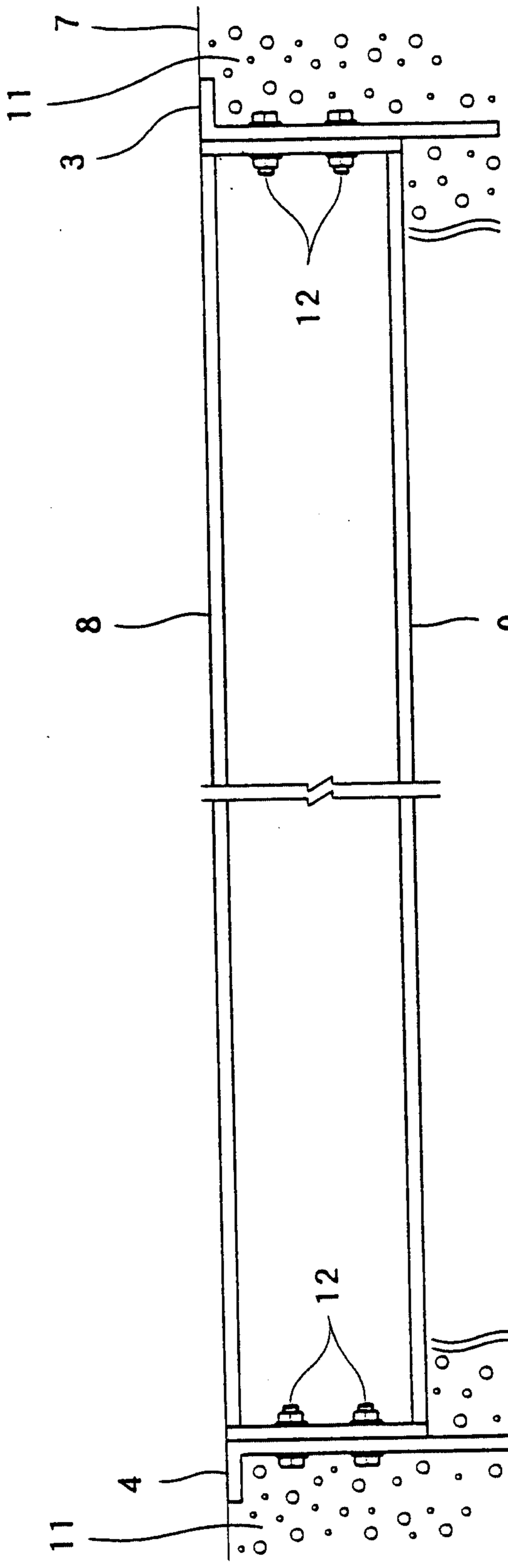


Fig.2

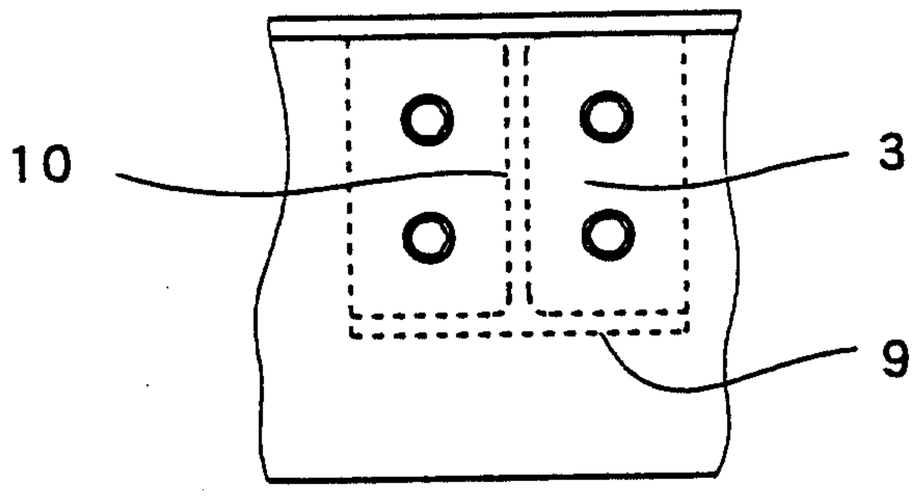
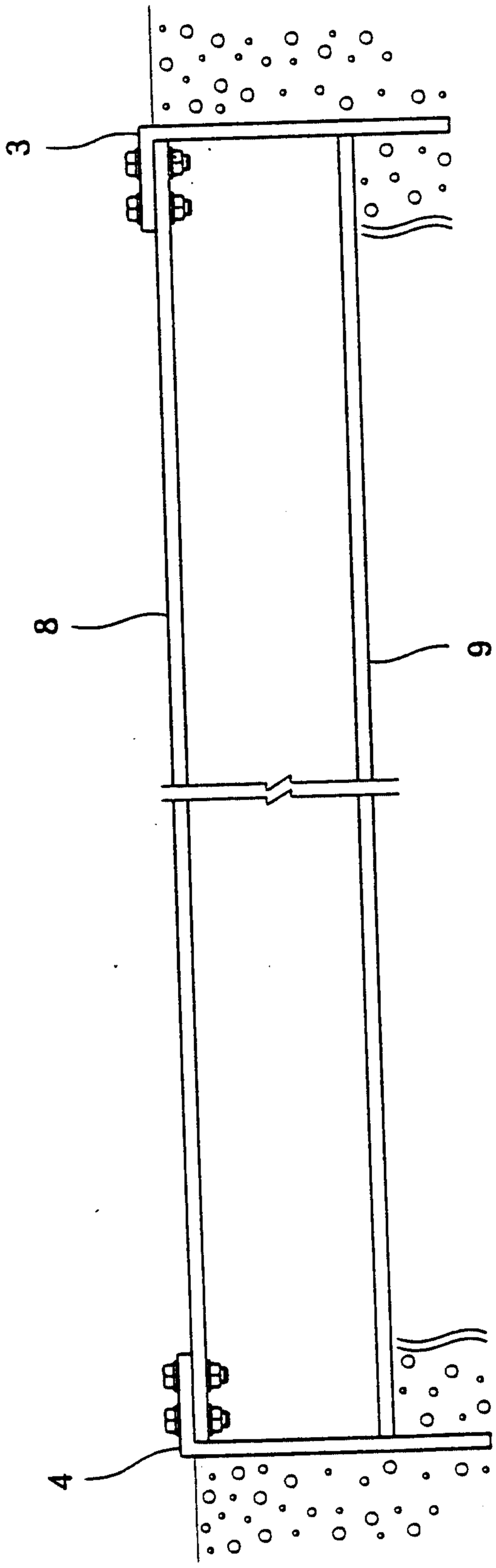
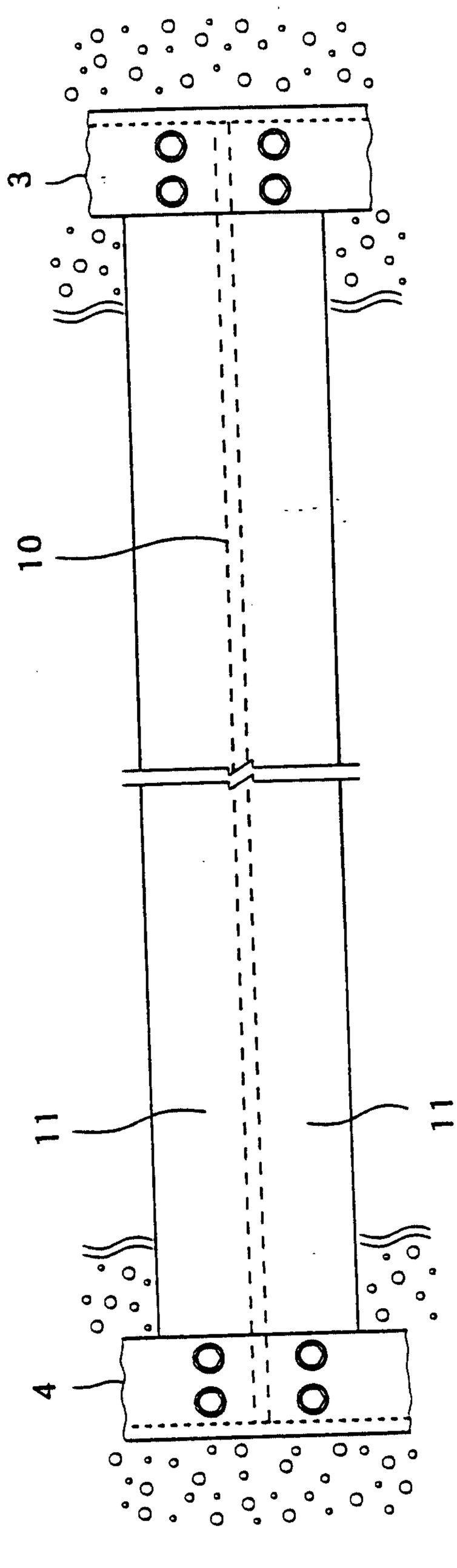


Fig.3



(a)



(b)

Fig.4

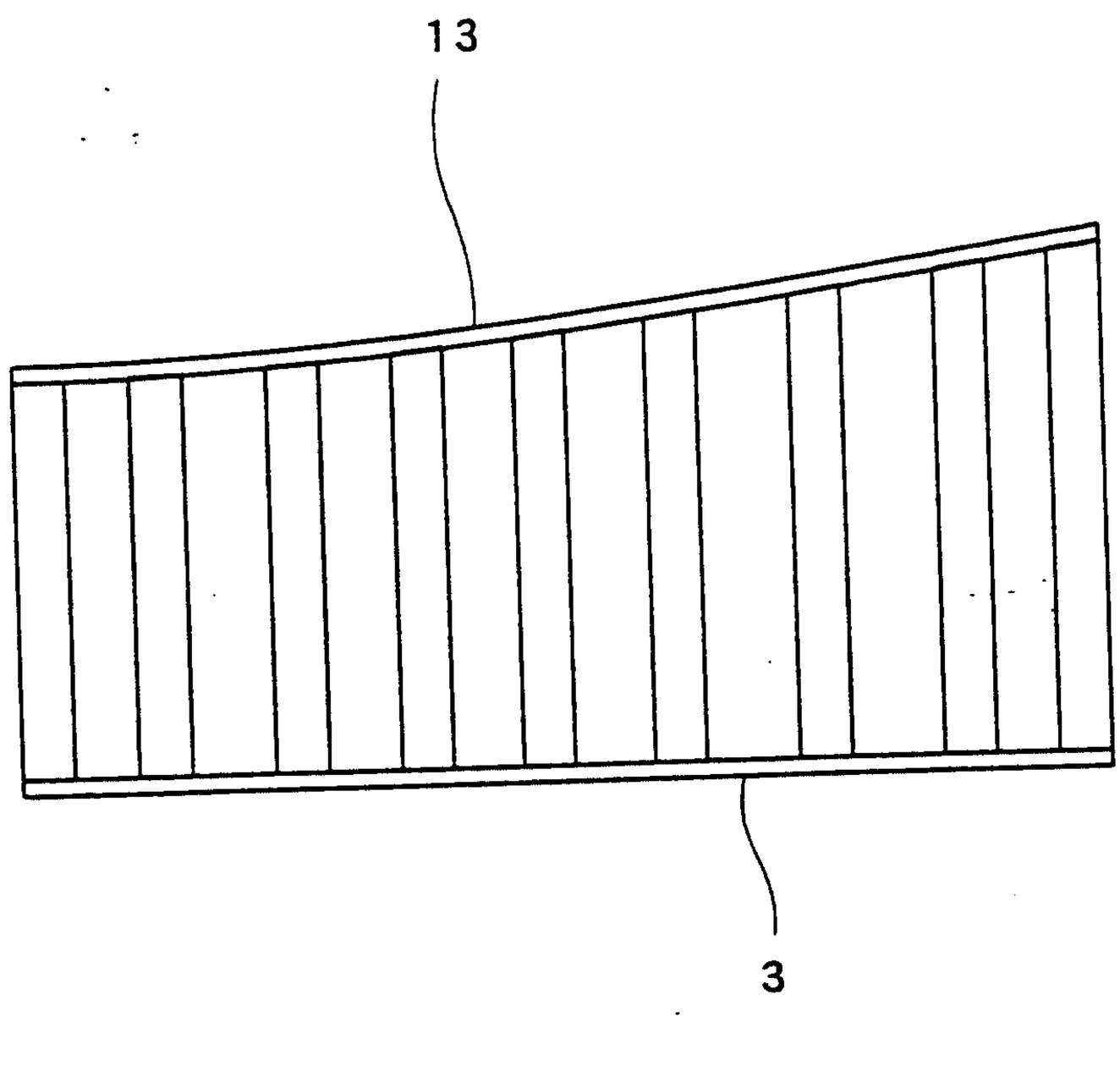


Fig.5

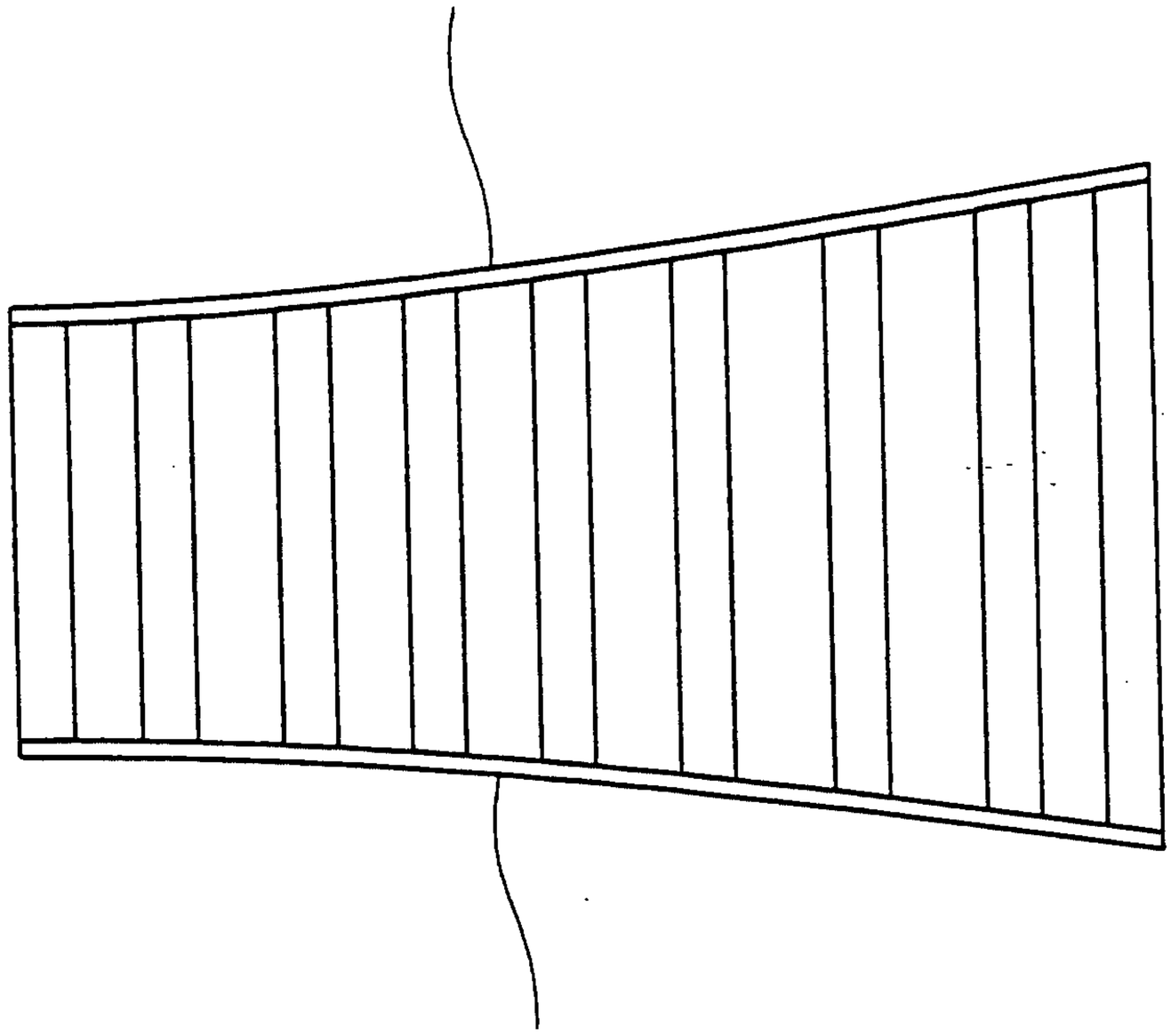


Fig.6

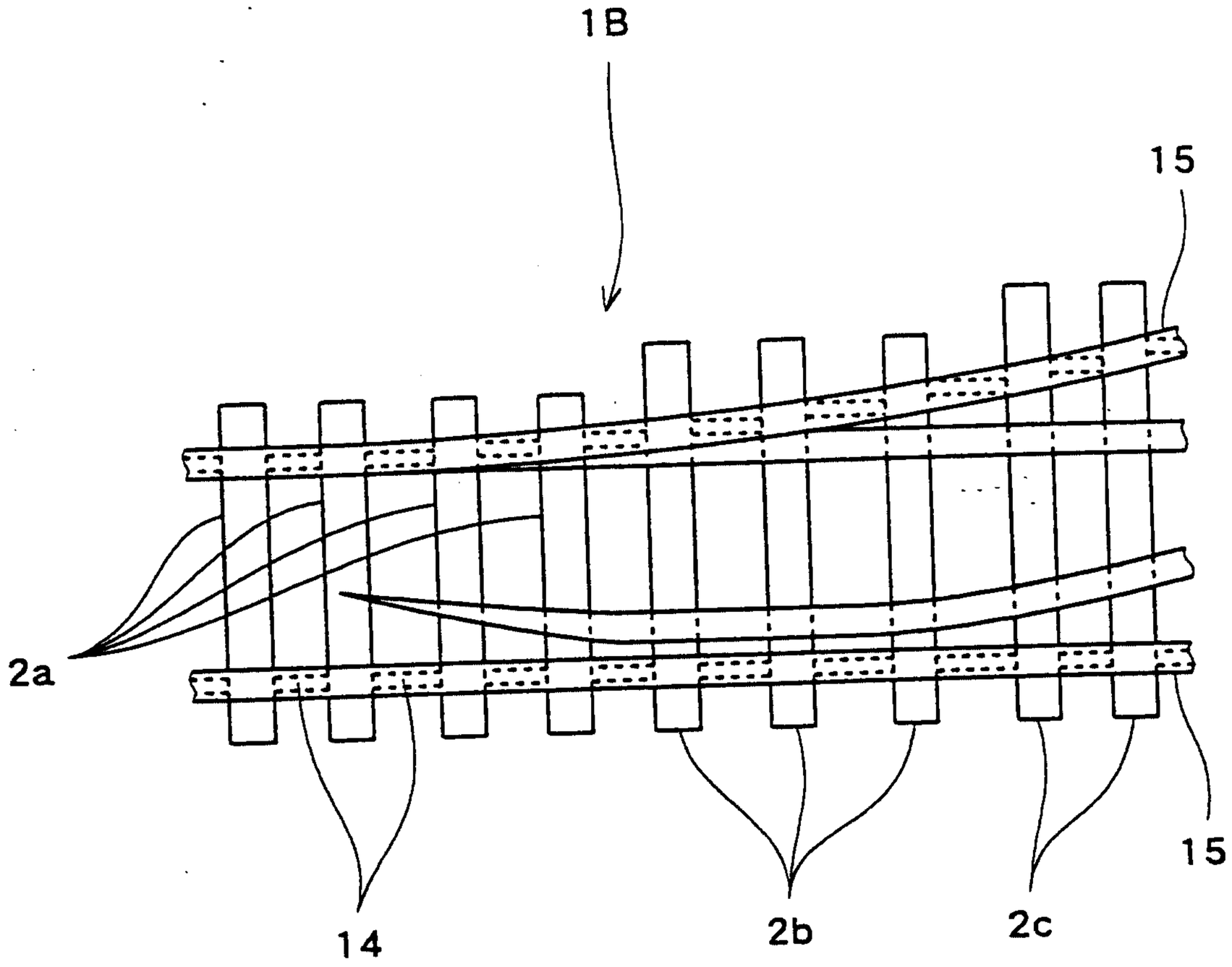
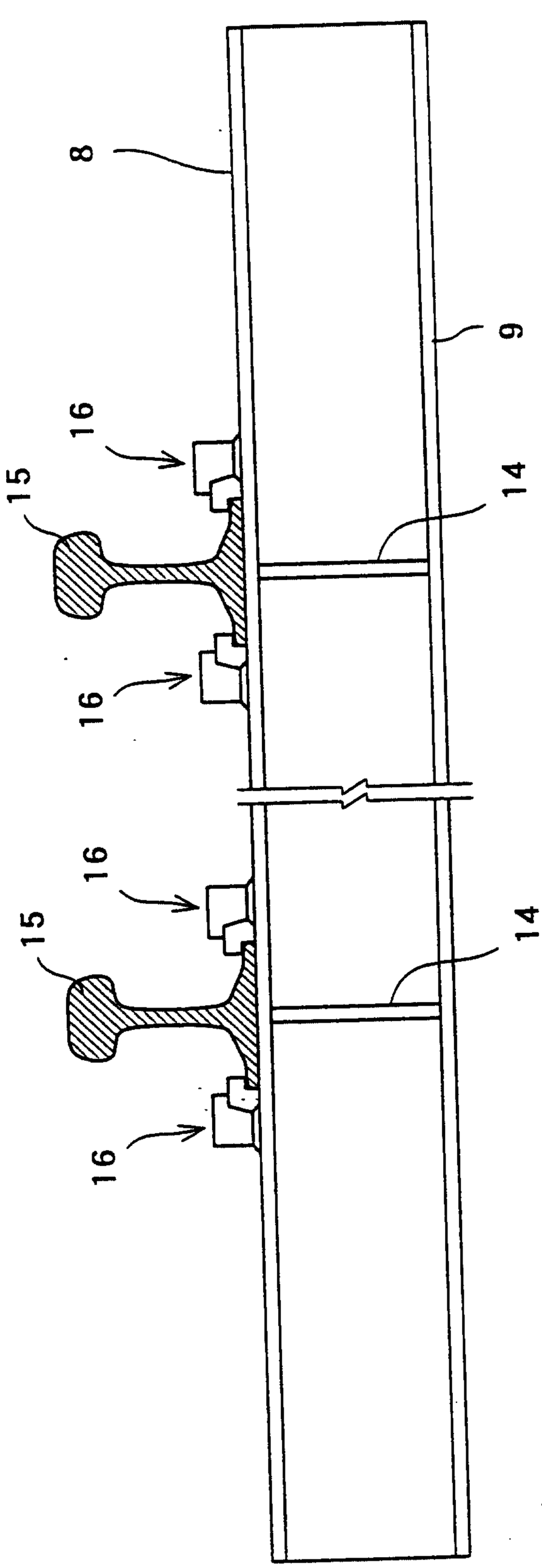
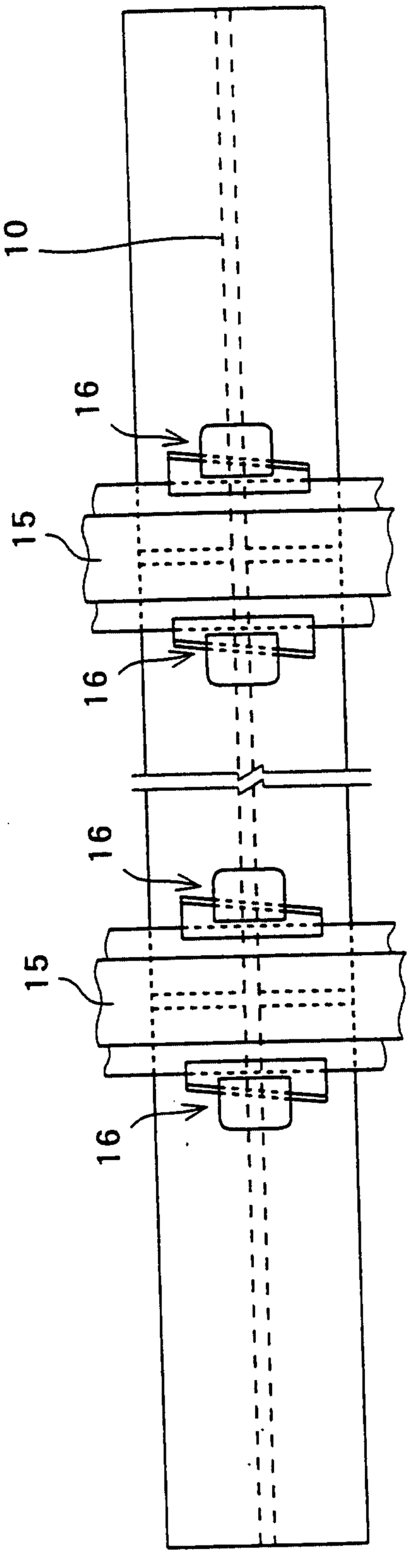


Fig.7



(a)



(b)

Fig.8

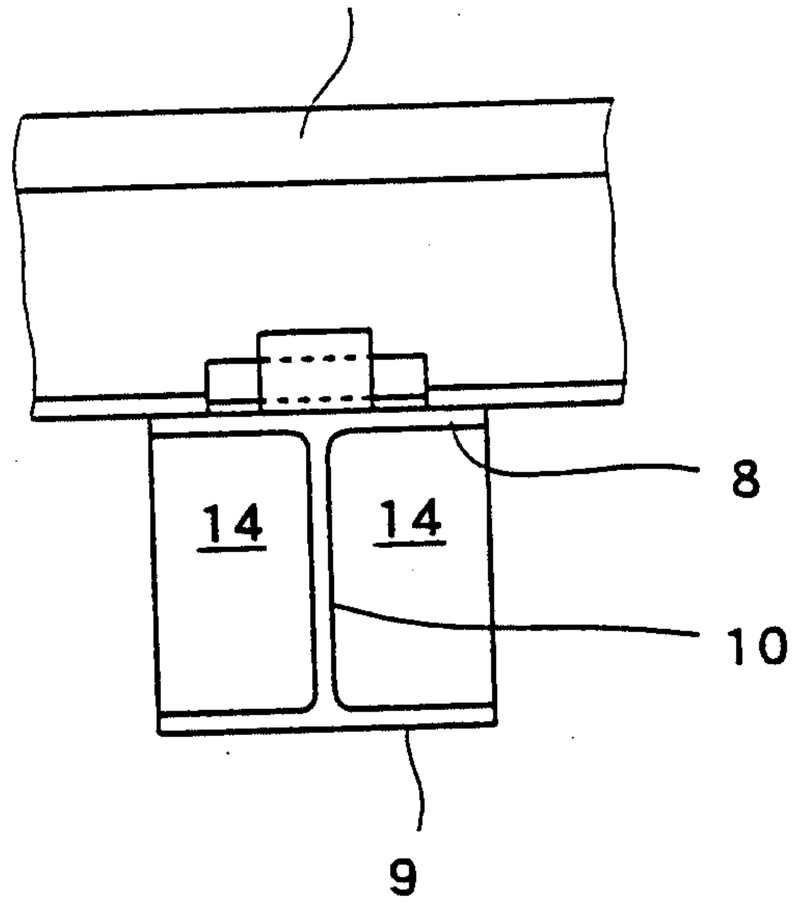


Fig.9

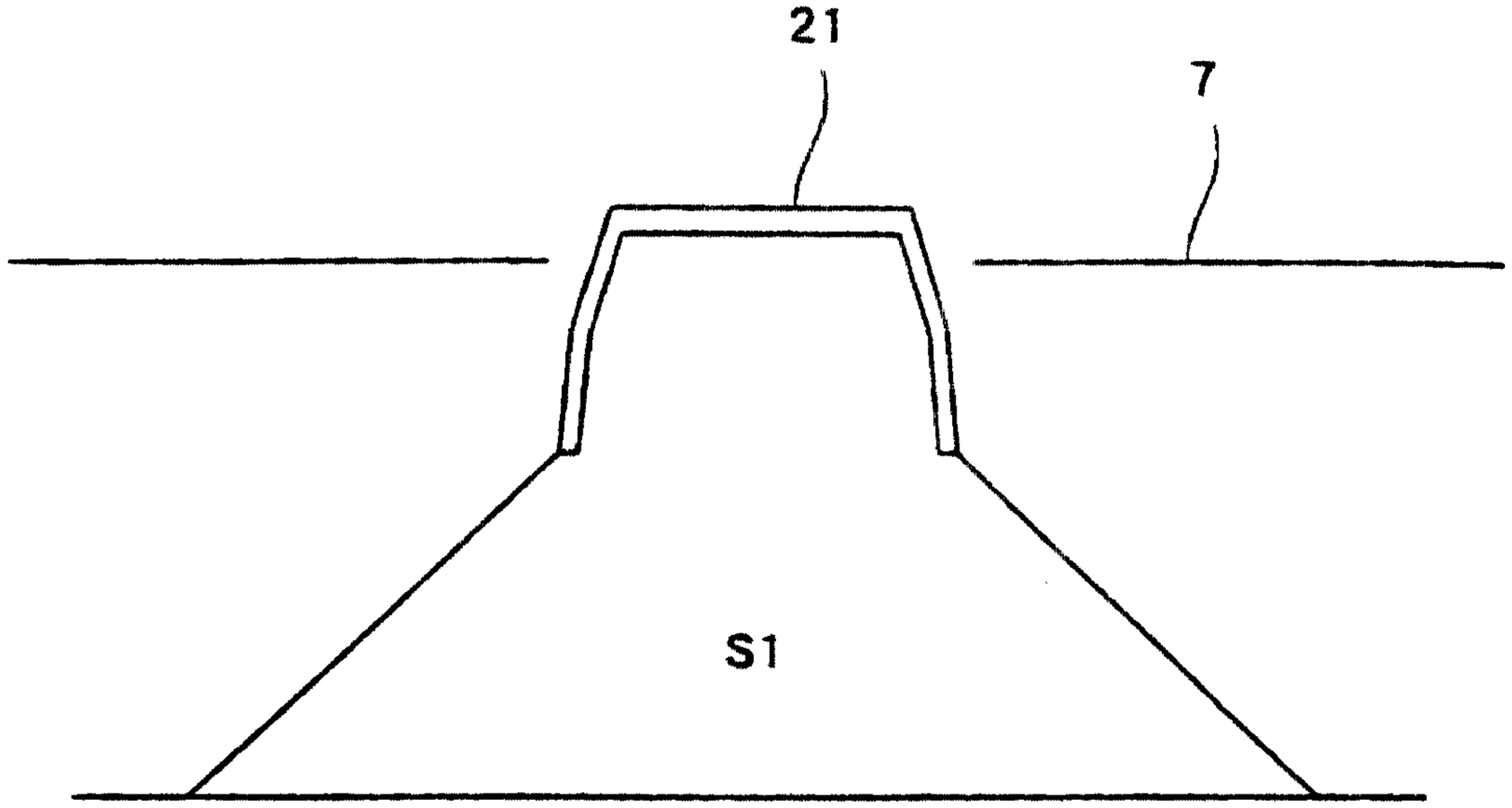


Fig.10 (PRIOR ART)

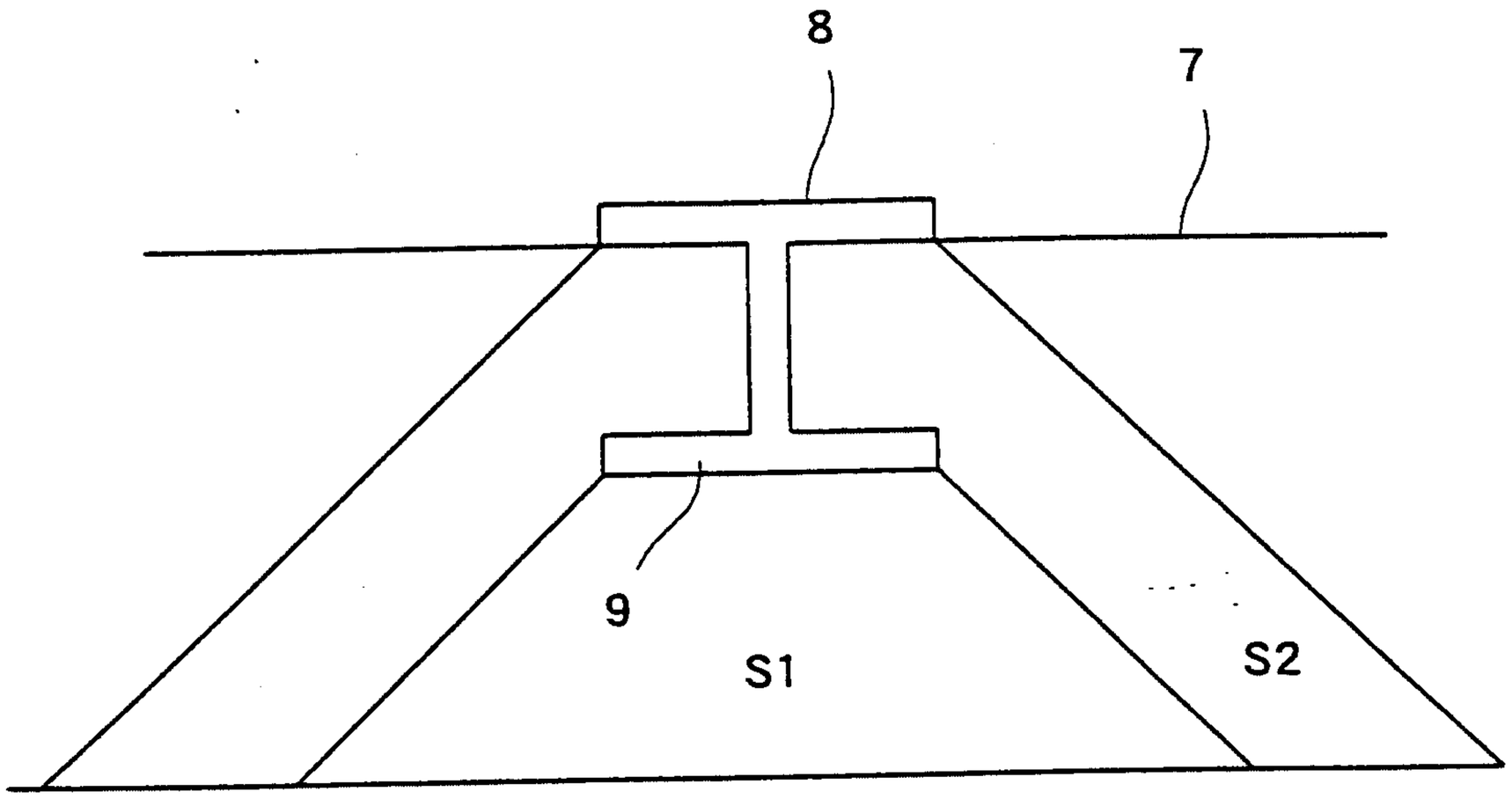


Fig.11

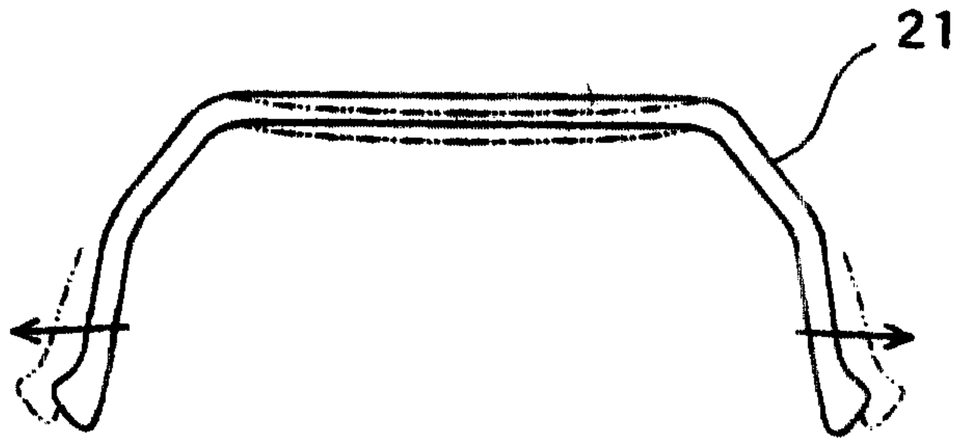


Fig.12 (PRIOR ART)

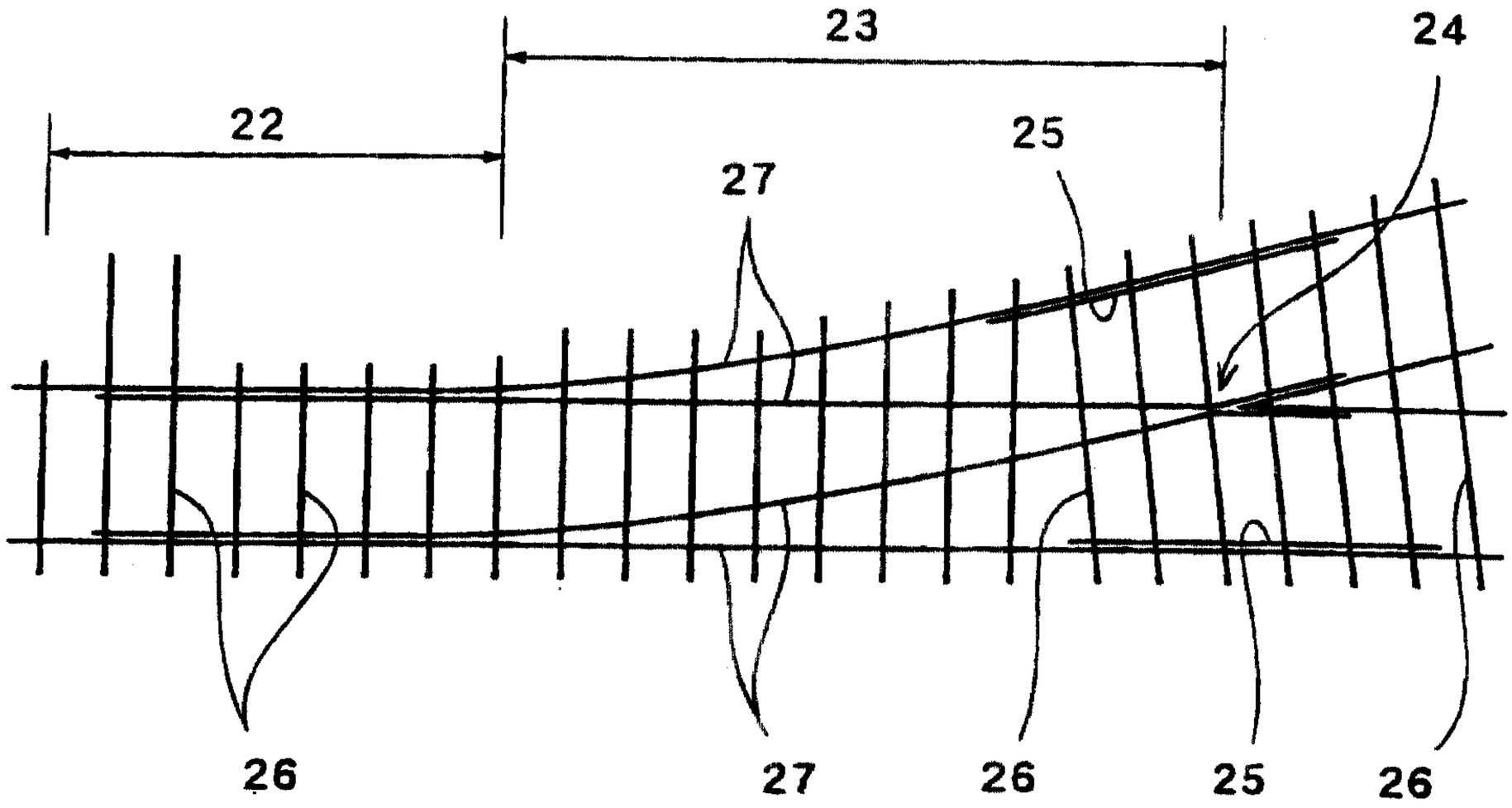
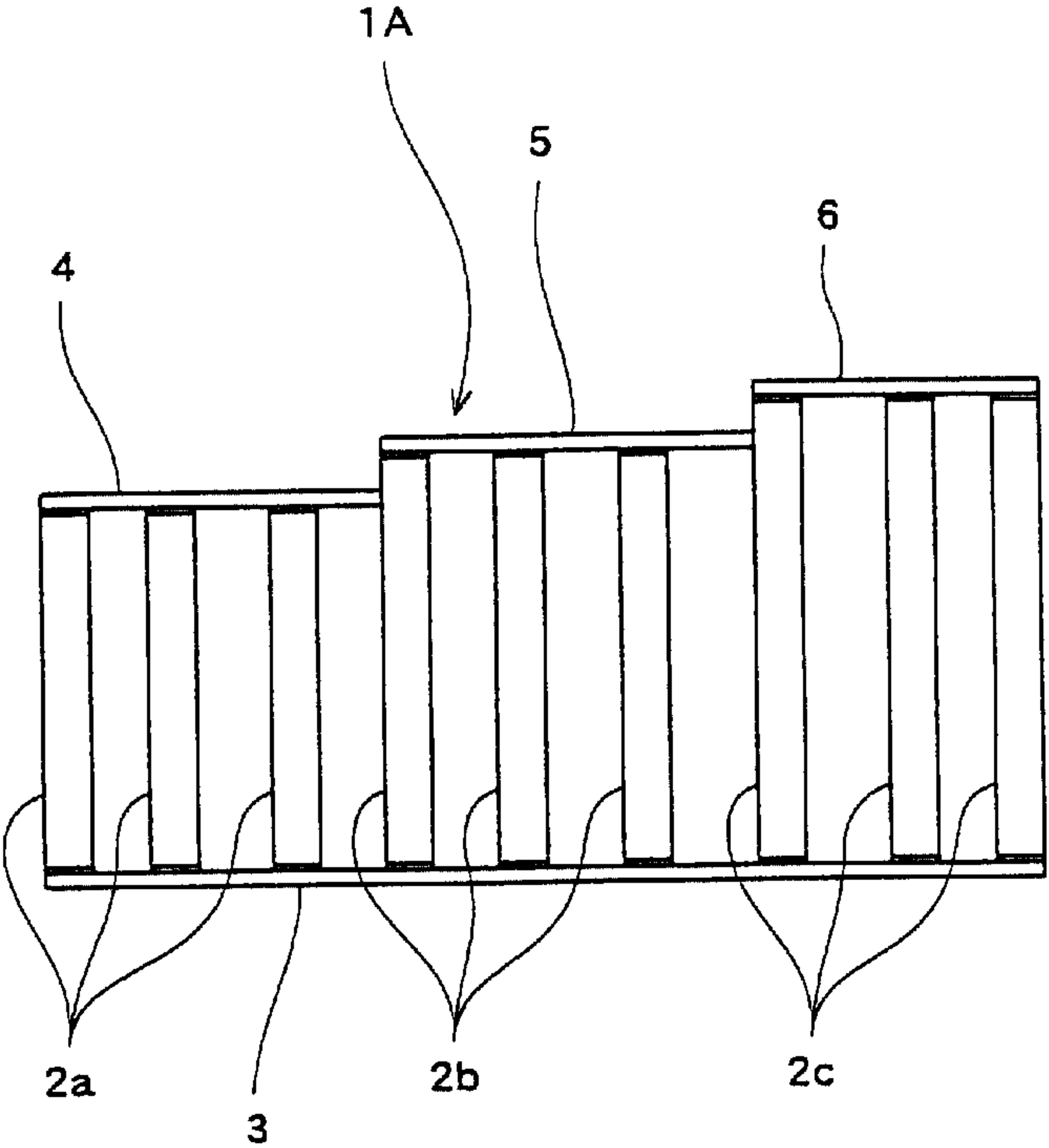


Fig.13 (PRIOR ART)


1A
5
6
4
2a
3
2b
2c