(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) Publication number: **0 683 080 A1**

(12) # EUROPEAN PATENT APPLICATION

(21) Application number: **95101797.9**

(51) Int. Cl.[6]: **B61D 17/20**

(22) Date of filing: **09.02.95**

(30) Priority: **20.05.94 JP 106821/94**

(43) Date of publication of application:
22.11.95 Bulletin 95/47

(84) Designated Contracting States:
DE FR GB

(71) Applicant: **NARITA MFG., Ltd.**
12, Takocho-1-chome,
Mizuho-ku
Nagoya (JP)

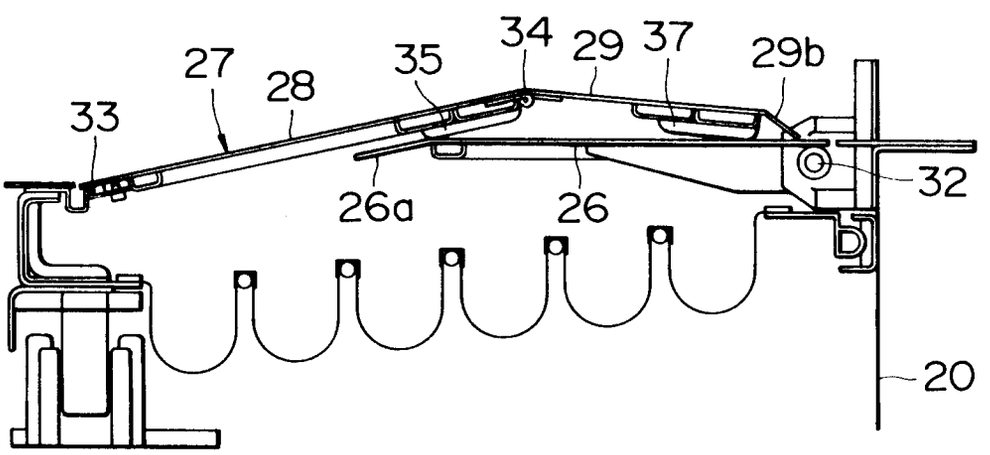
(72) Inventor: **Hatano, Mikio, c/o Narita Mfg., Ltd.**
20-12, Hanaomotecho,
Atsuta-ku
Nagoya-shi (JP)

(74) Representative: **Strehl Schübel-Hopf Groening & Partner**
Maximilianstrasse 54
D-80538 München (DE)

(54) **Footplate apparatus for connecting pathway between vehicles.**

(57) In a footplate apparatus between vehicles, a gap between one footplate and the distal end of the other footplate placed on the former is closed to prevent a passenger or the like from stumbling over the footplate or catching his or her foot between the footplates. For this purpose, the footplate apparatus has a structure in which the first footplate 26 is extended below the second footplate 27, and the second footplate 27 is cut over its entire length in a direction perpendicular to a direction of a railroad and divided into sections in the direction of the railroad, these footplate sections being vertically movably connected to each other through a hinge 34.

FIG. 3B



EP 0 683 080 A1

BACKGROUND OF THE INVENTION

Industrial Field of the Invention

The present invention relates to a footplate apparatus for a connecting pathway between vehicles.

Description of Related Art

A conventional footplate apparatus for a connecting pathway between vehicles of a train is shown in Figs. 8 and 9. This footplate apparatus is divided into two sections in a direction of the railroad. These two footplates 1 and 2 are vertically movably supported by hinges 3 and 4, respectively, but are restricted not to move downwardly from their horizontal positions, and a distal portion of the upper footplate 2 is mounted on the upper surface of a distal portion of the lower footplate 1 which is formed of a single plate. The upper footplate 2 comprises a main plate 5 and auxiliary plates 6 and 7. The main plate 5 is formed of a single plate including opposite slant portions which extend from the vicinity of a distal-end center portion 5a in a direction of the vehicles toward opposite sides. The auxiliary plates 6 and 7 are vertically movably attached to edges of the above-mentioned opposite slant portions through hinges 8 and 9, respectively.

Figs. 8 and 9 show a type of the footplate apparatus where a connecting hood which constitutes the connecting pathway is divided into two sections in the direction of the railroad, and these two hood sections 10 and 11 are detachably connected by free-end frames 12 and 13. The lower footplate 1 is provided on the side of the vehicle 14 while the upper footplate 2 is provided on the free-end frame 12. Also, the similar footplates as described above are mounted between the free-end frame 13 and the vehicle 14' on the other side, and the similar components as described above are denoted by common reference numerals with primes so that their explanations will be omitted.

When gaps are formed between the two footplates 1 and 2 on both sides at the time of rolling of the vehicles, the auxiliary plates 6 and 7 are moved downwardly around the hinges 8 and 9, thereby closing the gaps between side portions of the footplates 1 and 2. In this conventional footplate apparatus, however, no consideration is given on the case where pitching of the vehicles occurs or the distance between the vehicles is decreased at the same time as pitching.

More specifically, the main plate 5 of the upper footplate 2 is formed of a single plate from a portion adjacent to the hinge 4 to the distal-end central portion 5a. Consequently, when the pitching amount is zero, the footplate apparatus is in a state shown in Fig. 10A, but when pitching of the vehicles occurs as shown in Fig. 10B (Fig. 10B illustrates the case in which the pitching amount is 55 mm), the hinges 3 and 4 of the footplates 1 and 2 are located at different levels. In such a case, the upper footplate 2 is pressed upwardly, as shown in Fig. 10B, by the lower footplate 1 at a distal-end center portion 1a or its vicinity, and the distal-end central portion 5a of the main plate 5 of the upper footplate 2 moves apart from the upper surface of the lower footplate 1, thus forming a large gap D_1 therebetween.

Further, when the distance between the opposite end surfaces is decreased in this pitching state, as shown in Fig. 10C, the distal-end center portion 1a of the lower footplate 1 is moved toward the proximal side of the lower surface of the upper footplate 2 and presses the main plate 5 of the upper footplate 2 further upwardly, thereby forming an even larger gap D_2 between the distal-end center portion 5a of the upper footplate 2 and the upper surface of the lower footplate 1.

When the above-mentioned gap D_1 or D_2 is abruptly formed due to pitching of the vehicles while a passenger or the like is walking on a connecting pathway during traveling of the vehicles, there is some danger of the passenger or the like stumbling over the distal end of the raised footplate and falling down, or putting his or her foot in the gap D_1 D_2 and catching it between the two footplates 1 and 2.

Moreover, with the structure which does not include the above-mentioned auxiliary plates 6 and 7, such a gap is formed over the entire length of the distal end of the footplate.

SUMMARY OF THE INVENTION

An object of the present invention is to provide a footplate apparatus for a connecting pathway which solves the problem of danger at the time of pitching which has not been solved by the conventional structure described above.

In order to solve this problem, according to the invention, there is provided a footplate apparatus for a connecting pathway, comprising a pair of footplates, a first footplate being extended below a second footplate, wherein the second footplate is divided at at least one portion over its entire length in a direction perpendicular to a direction of the railroad so as to form a first footplate section and a second footplate section in the direction of the railroad, and these footplate sections are vertically movably connected to each other.

When the pitching amount of the vehicles is large and the distal portion of the first footplate presses the second footplate upwardly, the distal

footplate section of the second footplate is bent and inclined downwardly as a whole including its distal-end center portion due to the weight, thereby closing the gap between the distal end portion of this footplate section and the upper surface of the first footplate.

Moreover, the second footplate may be divided into more sections in the direction of the railroad. As a result, when the pitching amount of the vehicles is large and the distance between the end surfaces of the coupled vehicles is decreased so that the first footplate is moved toward the proximal side of the lower surface of the second footplate, the second footplate is inclined at a gentle angle, and also, the gap between the distal portion of this second footplate and the upper surface of the first footplate is closed.

BRIEF DESCRIPTION OF THE DRAWINGS

Fig. 1 is a vertical cross-sectional view of a connecting pathway portion, showing a first embodiment according to the present invention;

Fig. 2 is a horizontal cross-sectional view of the same;

Figs. 3 are vertical cross-sectional views of the same in operating states, in which Fig. 3A shows the case where the pitching amount is 0 mm, Fig. 3B shows the case where pitching occurs, and Fig. 3C shows the case where pitching occurs and the distance between the end surfaces of vehicles is simultaneously decreased;

Figs. 4 are vertical cross-sectional views of a connecting pathway portion in operating states, showing a second embodiment according to the invention, in which Fig. 4A shows the case where the pitching amount is 0 mm, Fig. 4B shows the case where pitching occurs, and Fig. 4C shows the case where pitching occurs and the distance between the end surfaces of vehicles is simultaneously decreased;

Fig. 5 is a horizontal cross-sectional view of a connecting pathway portion, showing a third embodiment according to the invention;

Fig. 6 is a vertical cross-sectional view of the same;

Figs. 7 are vertical cross-sectional views of the same in operating states, in which Fig. 7A shows the case where pitching occurs, and Fig. 7B shows the case where pitching occurs and the distance between the end surfaces of vehicles is simultaneously decreased;

Fig. 8 is a vertical cross-sectional view of a connecting pathway portion, showing conventional footplates;

Fig. 9 is a horizontal cross-sectional view of the connecting pathway portion shown in Fig. 8; and

Figs. 10 are vertical cross-sectional views of the footplates of Fig. 8 in operating states, in which Fig. 10A shows the case where the pitching amount is 0 mm, Fig. 10B shows the case where pitching occurs, and Fig. 10C shows the case where pitching occurs and the distance between the end surfaces of vehicles is simultaneously decreased.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

A first embodiment according to the present invention will be described with reference to Figs. 1 to 3.

Figs. 1 and 2 are a vertical cross-sectional view and a horizontal cross-sectional view showing footplate apparatus of the type in which a connecting pathway between coupled vehicles 20 and 21 is covered with a connecting hood divided into two sections 22 and 23. Reference numerals 24 and 25 denote free-end frames of the two hood sections 22 and 23, respectively.

An explanation will be given on a right footplate apparatus mounted between the first vehicle 20 and the free-end frame 24 shown in Fig. 1.

Reference numeral 26 denotes a first footplate or a lower footplate which is provided on the first vehicle 20, and 27 denotes a second footplate or an upper footplate which is provided on the free-end frame 24. The upper footplate 27 is divided into a first footplate section 28 and a second footplate section 29 in a direction of the railroad, and the upper footplate 27 includes auxiliary plates 30 and 31 provided on opposite sides of the distal end of the second footplate section 29.

Since a left footplate apparatus mounted between the second vehicle 21 and the free-end frame 25 has substantially the same structure as the foregoing right footplate apparatus, the similar components as described above are denoted by common reference numerals with primes so that their explanations will be omitted.

The structure of the foregoing right footplate apparatus will now be described more specifically with reference to Figs. 2 and 3A.

The lower footplate 26 is formed of a single rectangular plate. A longer proximal portion of the lower footplate 26 is located along an end surface of the vehicle 20 and connected thereto vertically movably by a horizontal hinge 32 which is provided on the end surface of the vehicle 20, so that the lower footplate 26 will vertically move around the hinge 32. The lower footplate 26 further includes a downward movement preventing stopper (not shown) which allows the lower footplate 26 to move upwardly from the illustrated horizontal position but prevents it from moving downwardly. A distal por-

tion 26a of the lower footplate 26 is bent slightly downwardly.

The upper footplate 27 is divided into the first and second footplate sections 28 and 29 in the direction of the railroad. A proximal portion of the first footplate section 28 is pivotally connected to the free-end frame 24 by a hinge 33 which extends horizontally and perpendicular to the direction of the railroad so that the first footplate section 28 will vertically move around the hinge 33. A distal portion of the first footplate section 28 projects toward the above-mentioned lower footplate 26, and a distal end surface 28a of the first footplate section 28 is cut straight over the entire length along a direction perpendicular to the direction of the railroad.

A proximal end 29a of the second footplate section 29 is located along the distal end surface 28a of the first footplate section 28, and the second footplate section 29 is vertically movably connected to the distal portion of the first footplate section 28 by a hinge 34 which extends horizontally and perpendicular to the direction of the railroad. As shown in Fig. 2, the second footplate section 29 has a plane shape which is cut to have opposite slant portions which extend from the vicinity of a distal-end center portion 29b toward opposite sides of the proximal end portion.

As shown in Fig. 3A, the hinges 32 and 33 are arranged at different levels such that when the pitching amount is 0 mm, the above-described first and second footplate sections 28 and 29 will be horizontally placed on the lower footplate 26 in the horizontal position.

Reference numeral 35 denotes a sliding plate secured on the lower surface of the first footplate section 28 through a bracket 36, and 37 denotes a sliding plate secured on the lower surface of the second footplate section 29 through a bracket 38. The sliding plates 35 and 37 are slidably placed on the lower footplate 26. By providing the sliding plate 37 and the bracket 38, a slight gap is formed between the second footplate section 29 and the lower footplate 26. Consequently, the distal-end center portion 29b of the second footplate section 29 is bent slightly downwardly to decrease a gap between the distal-end center portion 29b and the lower footplate 26.

As shown in Fig. 2, the auxiliary plates 30 and 31 are pivotally connected to the opposite slant portions of the second footplate section 29 by hinges 39 and 40, respectively. Further, as shown in Fig. 2, outer side portion 30a, 31a of the auxiliary plates 30, 31 have a shape which is cut to have slant portions which extend from the vicinity of the center toward sides of the proximal end portion.

In Figs. 1 and 2, reference numerals 41 and 42 denote pressing device for pressing the free-end frames 24 and 25 toward each other, 43 and 44 denote side panels, and 45 and 46 denote ceiling panels.

The function of this embodiment will now be described.

When the pitching amount between the vehicles or between the vehicle and the free-end frame is zero, as shown in Fig. 3A, the first and second footplate sections 28 and 29 of the upper footplate 27 are horizontally placed on the lower footplate 26 in the horizontal position. Therefore, the distal-end center portion 29b of the second footplate section 29 is located close to the upper surface of the lower footplate 26. Also, the distal ends of the auxiliary plates 30 and 31 are located close to the upper surface of the lower footplate 26.

When the pitching amount between the vehicles or between the vehicle and the free-end frame is large, for example, when the hinge 32 of the lower footplate 26 moves upwardly, as shown in Fig. 3B, to a level higher than the hinge 33 of the upper footplate 27 (Fig. 3B illustrates the state in which the pitching amount is 55 mm), the distal portion of the first footplate section 28 of the upper footplate 27 is pressed upwardly by the distal portion of the lower footplate 26, as shown in Fig. 3B, and the first footplate section 28 is moved upwardly around the hinge 33. At this time, the second footplate section 29 is inclined due to its own weight so that the distal portion is moved downwardly around the hinge 34, thereby maintaining the sliding plate 37 close to the lower footplate 26. Consequently, the distal-end center portion 29b maintains the gap-closed condition in which it is located close to the upper surface of the lower footplate 26. Also, the auxiliary plates 30 and 31 are inclined downwardly, and their distal ends are located close to the upper surface of the lower footplate 26 so as to close the gaps therebetween.

Therefore, a large gap is not formed between the upper surface of the lower footplate 26 and the distal end portion of the upper footplate 27, so as to prevent a passenger or the like from stumbling over the footplate or catching his or her foot between the footplates.

When the distance between the vehicles or between the vehicle and the free-end frame is decreased in the above-described pitching state, as shown in Fig. 3C, the first footplate section 28 of the upper footplate 27 is pressed further upwardly by the distal portion of the lower footplate 26, and the distal end of the first footplate section 28 moves apart from the upper surface of the footplate 26. However, the second footplate section 29 is inclined due to its own weight so that the distal portion is moved downwardly in substantially the same manner as described above, thereby closing the gap from the upper surface of the lower footplate 26. Also, the auxiliary plates 30 and 31 are

inclined downwardly, and their distal ends are located close to the upper surface of the lower footplate 26 so as to close the gaps therebetween.

Therefore, as described before, it is possible to prevent a passenger or the like from stumbling over the footplate or catching his or her foot between the footplates.

Next, a second embodiment according to the present invention will be described with reference to Fig. 4.

In the second embodiment, the lower footplate 26 in the first embodiment has an inclined surface extending toward the distal portion slightly downwardly at an angle α with respect to the horizontal plane when it lies down. Since the structure is otherwise the same as that of the first embodiment, the similar components as described above are denoted by common reference numerals so that their explanations will be omitted.

According to the second embodiment, as shown in Fig. 4C, when the pitching amount is as large as shown in Fig. 3C of the first embodiment and when the distance between the end surfaces of the vehicles or between the vehicle and the free-end frame is decreased, a distal portion of the lower footplate 26 is located at a lower level than that of the first embodiment. Consequently, a first footplate section 28 of an upper footplate 27 is pressed upwardly by a less degree than that of the first embodiment, and the gap between a distal portion of the first footplate section 28 and the lower footplate 26 is decreased. Therefore, the height of bending of the first and second footplate sections 28, 29 is decreased, further lessening the above-mentioned danger.

The other functions and effects of the second embodiment are substantially the same as the first embodiment.

A third embodiment according to the present invention will now be described with reference to Figs. 5 to 7.

In the third embodiment, the first footplate section 28 of the upper footplate 27 in the first embodiment is further divided in the direction of the railroad so as to provide a third footplate section 28a, which is connected to a free-end frame 24 through a hinge 33 in substantially the same manner as described above.

The first footplate section 28 and the third footplate section 28a are pivotally connected by a horizontal hinge 47 which extends in a direction perpendicular to the direction of the railroad. Retainer members 48 and 49, which abut against each other, are located on both sides of the hinge 47 and fixed on the upper surfaces of the first and third footplate sections 28 and 28a. The retainer members 48 and 49 have vertical contact surfaces 48a and 49a which abut against each other when the footplate sections 28 and 28a extend straight and which are separated from each other when the footplate sections 28 and 28a are bent downwardly from the hinge 47. The contact surfaces 48a and 49a prevent the footplate sections 28 and 28a extending straight from being bent upwardly but allow them to be bent only downwardly. Since the structure is otherwise the same as that of the first embodiment, the similar components as the first embodiment are denoted by common reference numerals so that their explanations will be omitted.

According to the third embodiment, as shown in Fig. 7B, when the pitching amount is large and the distance between the end surfaces of the vehicles or between the vehicle and the free-end frame is decreased, the first and third footplate sections 28 and 28a are bent in the illustrated manner, and the upper footplate 27 is bent to have a less angular cross section than the foregoing embodiments, thereby further lessening the danger. Moreover, by means of the retainer members 48 and 49, the footplate sections 28 and 28a can be normally maintained to extend straight, so that a passenger or the like will have no trouble in walking on them.

The other functions and effects of the third embodiment are substantially the same as the first embodiment.

Each of the above-described embodiments is an example of application of the type in which the connecting hood is divided into two sections, and the footplate apparatus are mounted between the free-end frames of the hood sections and the vehicles. However, the present invention may be applied to the type in which a single connecting hood is mounted between the vehicles, and the above-mentioned lower footplate 26 is provided on an end surface of the first vehicle while the above-mentioned upper footplate 27 is provided on an end surface of the second vehicle.

Moreover, the invention may be applied to a footplate apparatus which does not include the auxiliary plates 30 and 31 in the foregoing embodiments.

According to the present invention, as has been described heretofore, even if the pitching amount of the vehicles is large, the gap between one footplate and the distal end of the other footplate can be maintained at an extremely small size, thereby preventing danger such as a passenger or the like stumbling over the distal end of the footplate and falling down, or catching his or her foot between the footplates.

Claims

1. A footplate apparatus for a connecting pathway between vehicles, comprising a pair of foot-

plates (26, 27), the first footplate (26) being extended below the second footplate (27), wherein said second footplate (27) is divided at at least one portion over its entire length in a direction perpendicular to a direction of a railroad so as to form a first footplate section (28) and a second footplate section (29) in the direction of the railroad, and said footplate sections are vertically movably connected to each other.

2. A footplate apparatus according to Claim 1, wherein said first footplate (26) has an inclined surface extending toward the distal portion slightly downwardly at an angle α with respect to the horizontal plane when it lies down.

3. A footplate apparatus according to Claim 1, wherein said first footplate section (28) of the second footplate (27) is further divided into two sections in the direction of the railroad so as to provide a third footplate section (28a), said third footplate section (28a) and said first footplate section (28) being pivotally connected through a hinge (47).

4. A footplate apparatus according to Claim 3, wherein retainer members (48, 49), which abut against each other, are provided on the upper surface of said first footplate section (28) and the upper surface of said third footplate section (28a), said retainer members (48, 49) being located on both sides of said hinge (47), so as to maintain the positions of said footplate sections.

5. A footplate apparatus according to any one of Claims 1 to 4, which is applied to a type including a connecting hood between the vehicles, said connecting hood being divided into two sections in a direction of the railroad and separably connecting both of said divided hood sections with each other by free-end frames, said footplate apparatus being provided between one of said free-end hood frame and the vehicle.

6. A footplate apparatus according to any one of Claims 1 to 4, which is applied to a type including a single connecting hood between the vehicles, said first footplate (26) being provided on an end surface of the first vehicles while said second footplate (27) is provided on an end surface of the second vehicle.

7. A footplate apparatus according to any one of Claims 1 to 6, wherein said second footplate (27) includes said second footplate section (29) and auxiliary plates (30, 31) which are vertically movably connected through hinges (39, 40).

FIG. 1

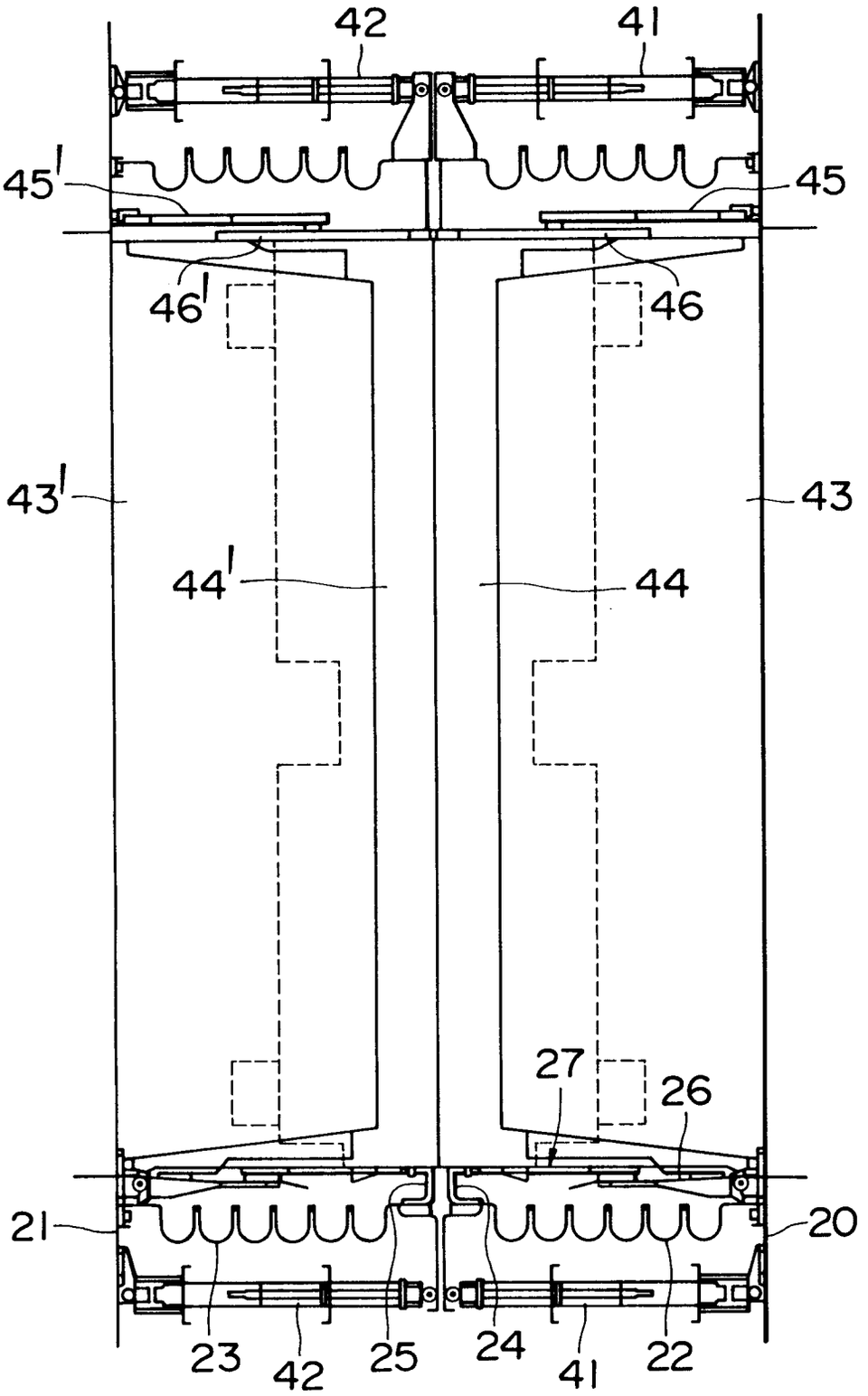


FIG. 2

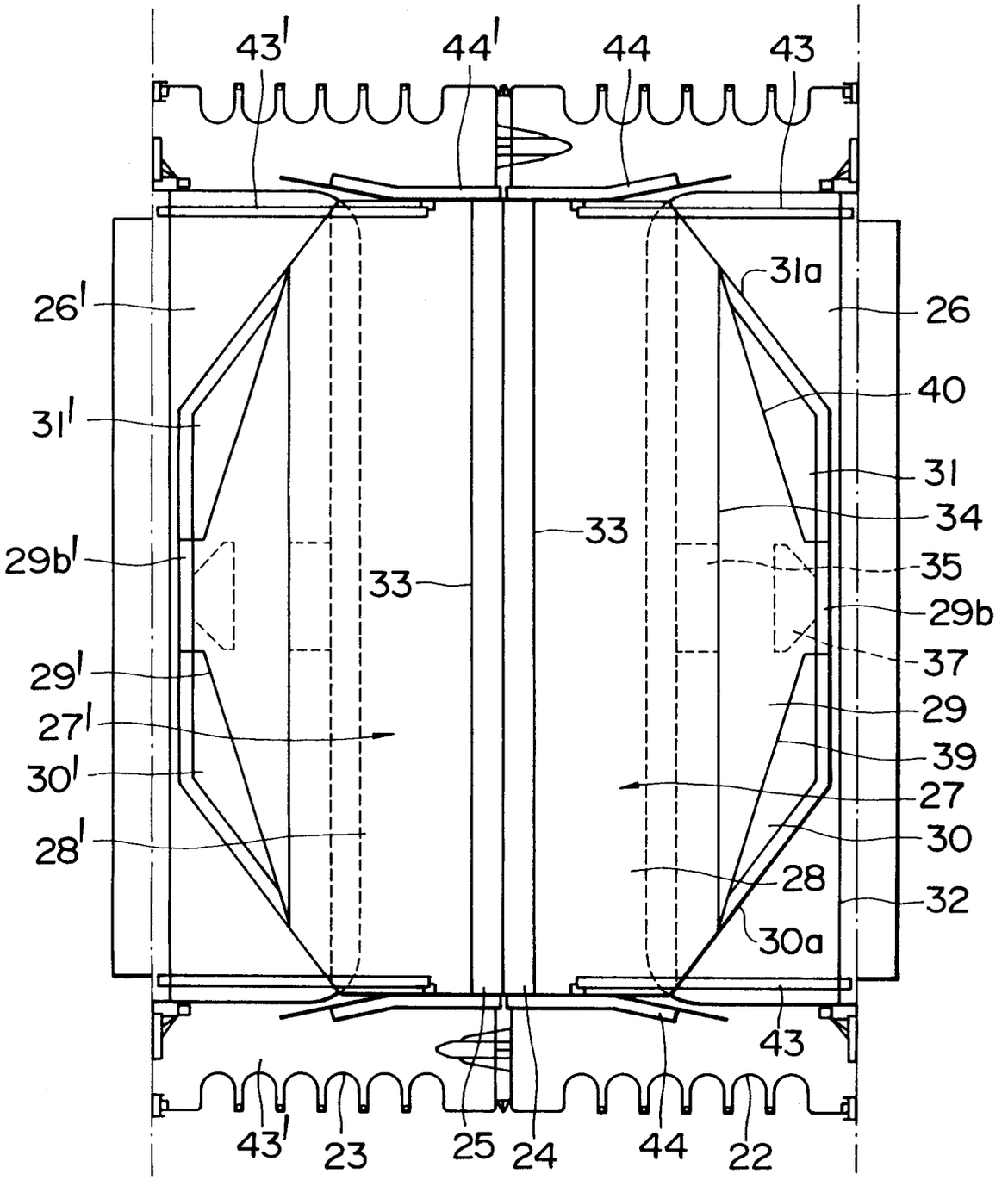

43'
44'
44
43
26'
31'
29b'
29'
27'
30'
28'
33
33
31a
26
40
31
34
35
29b
37
29
39
27
30
28
32
30a
43
43'
23
25
24
44
22

FIG. 3A

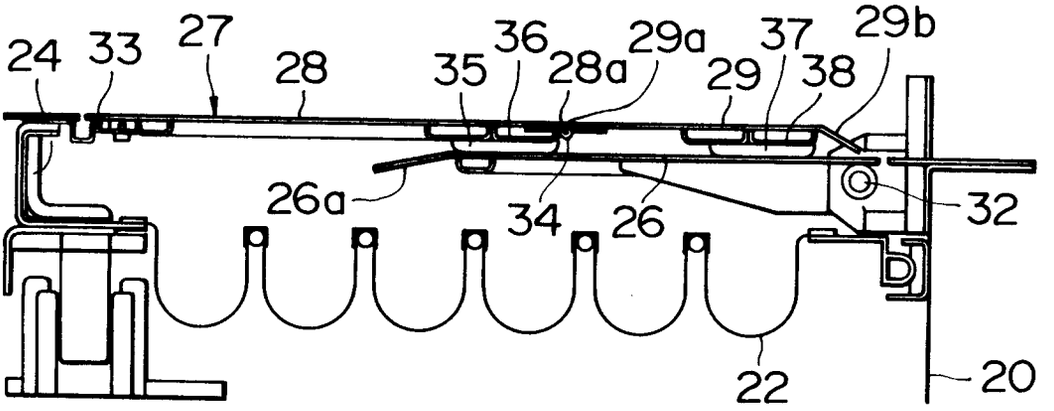


FIG. 3B

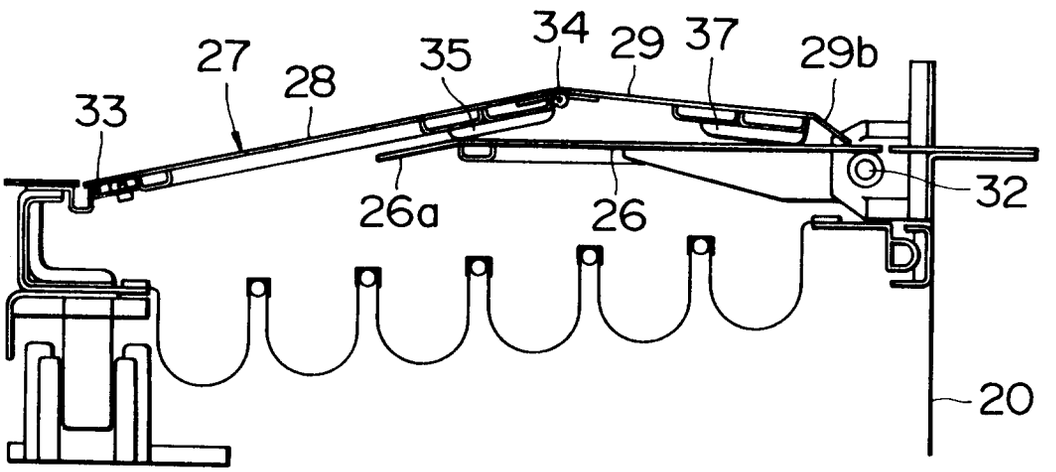


FIG. 3C

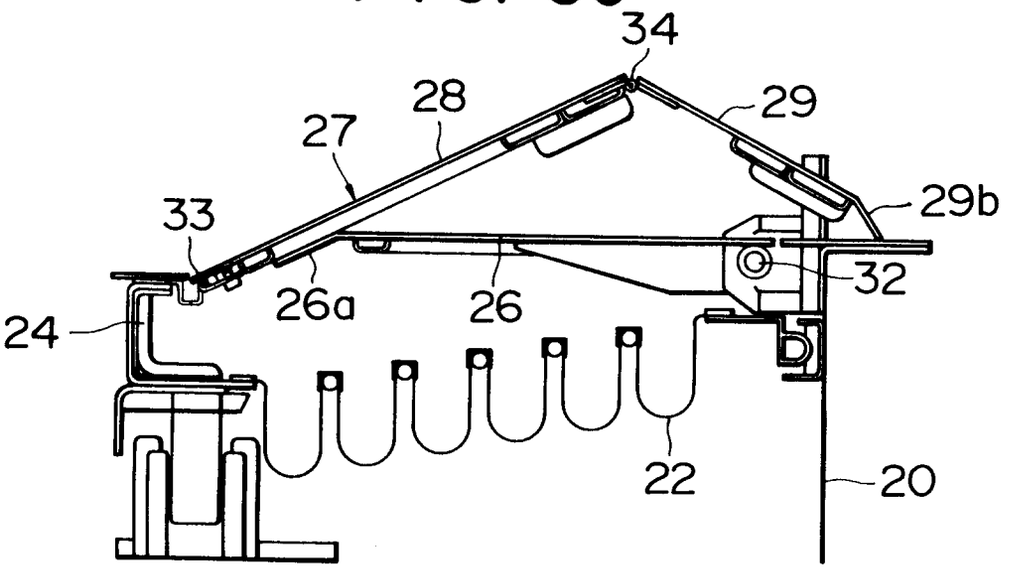


FIG. 4A

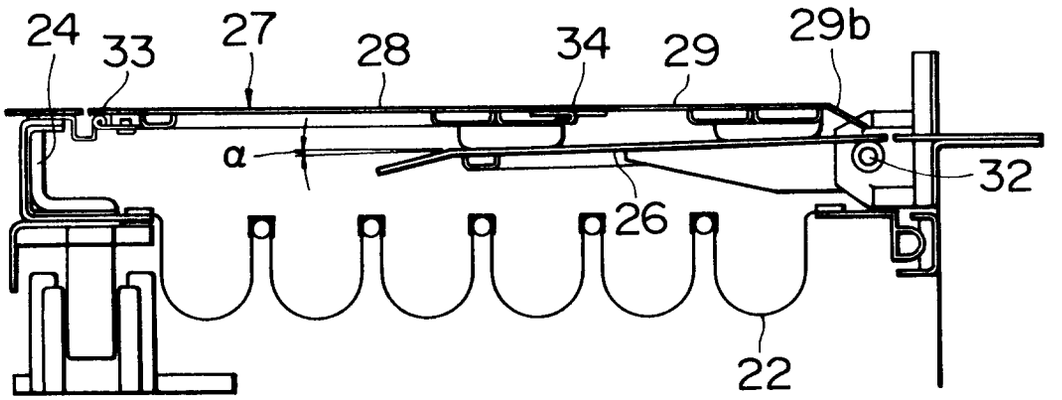


FIG. 4B

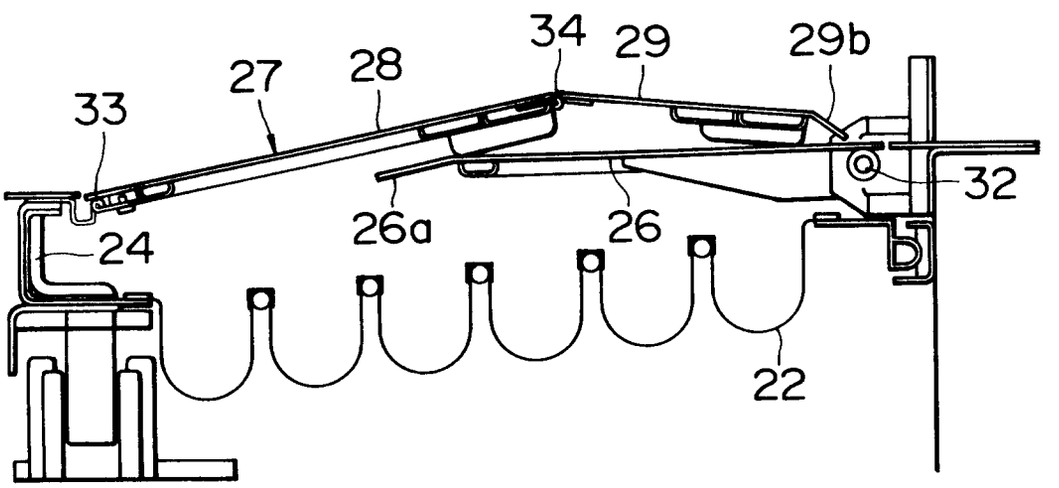


FIG. 4C

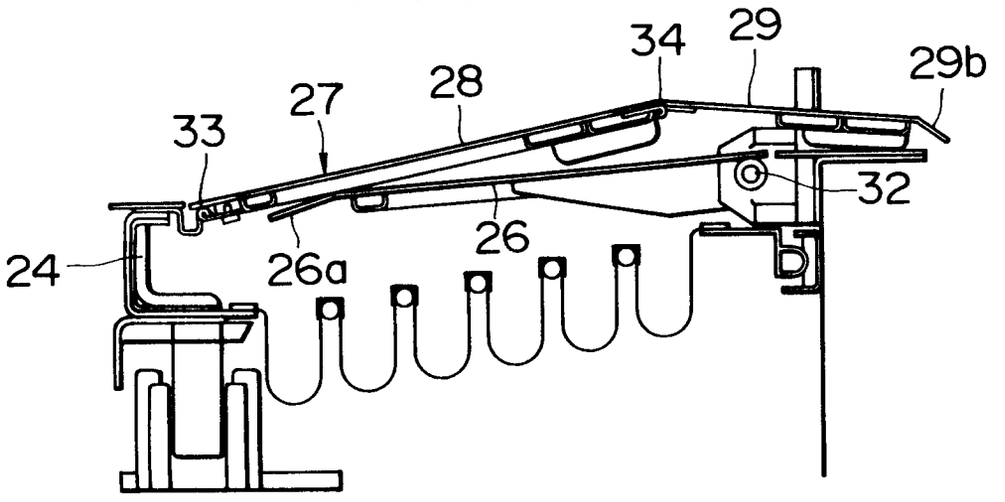


FIG. 5

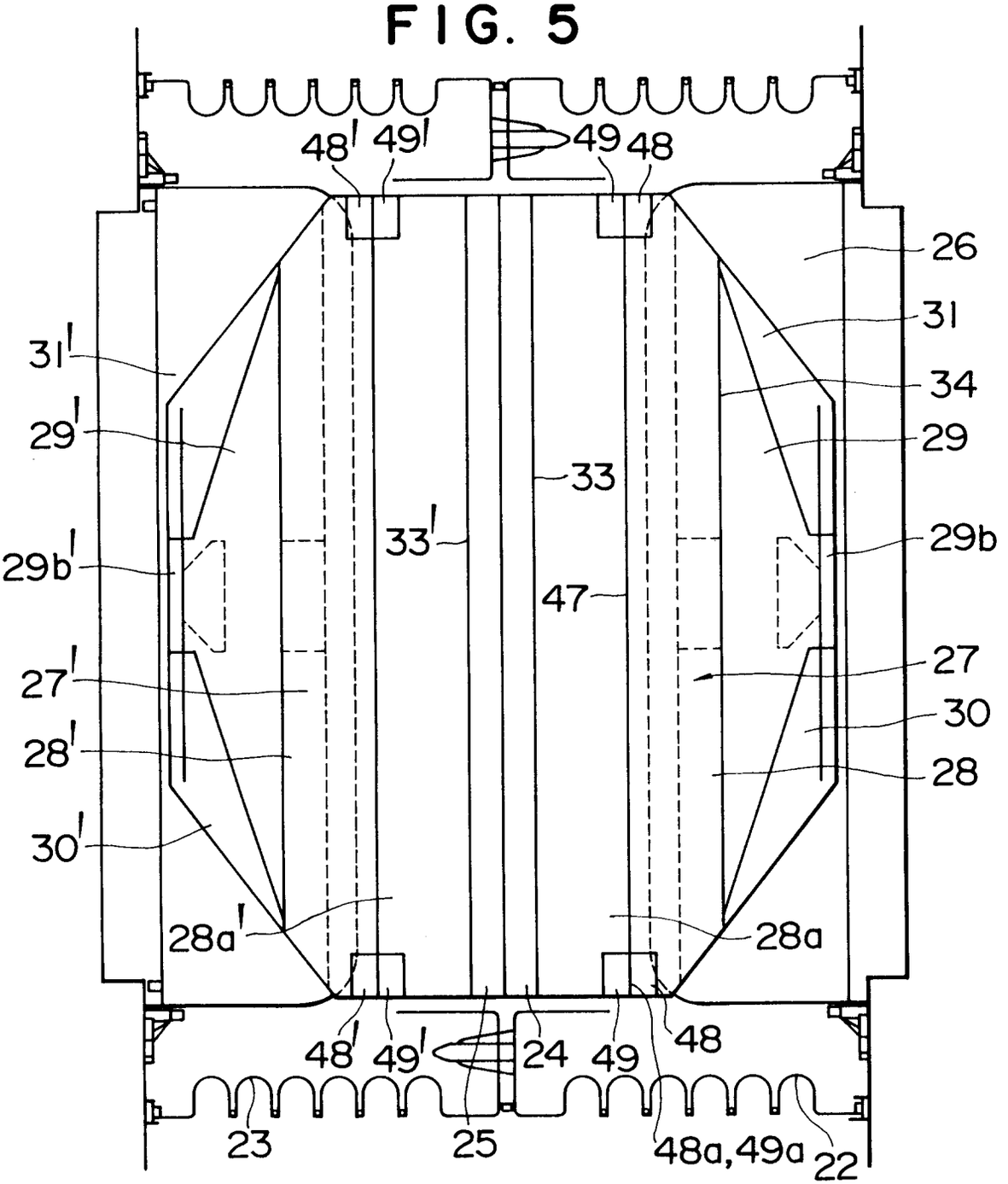

48'
49'
49
48
26
31
31'
34
29'
29
33
33'
29b'
29b
47
27'
27
28'
30
30'
28
28a'
28a
48'
49'
24
49
48
23
25
48a,49a
22

FIG. 6

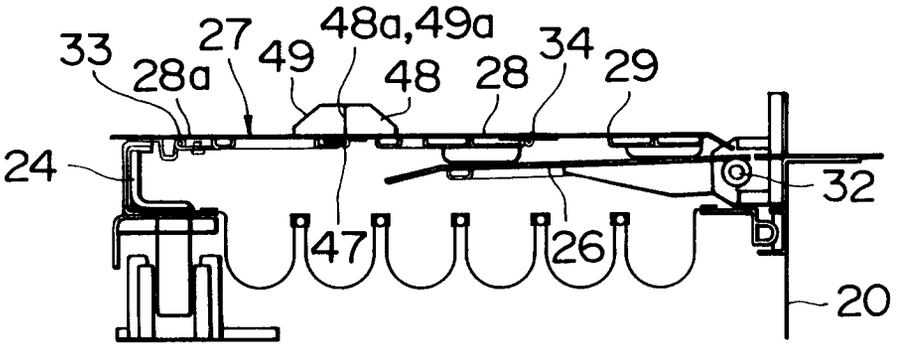

48a,49a
33
27
49
28a
48
28
34
29
24
32
47
26
20

FIG. 7A

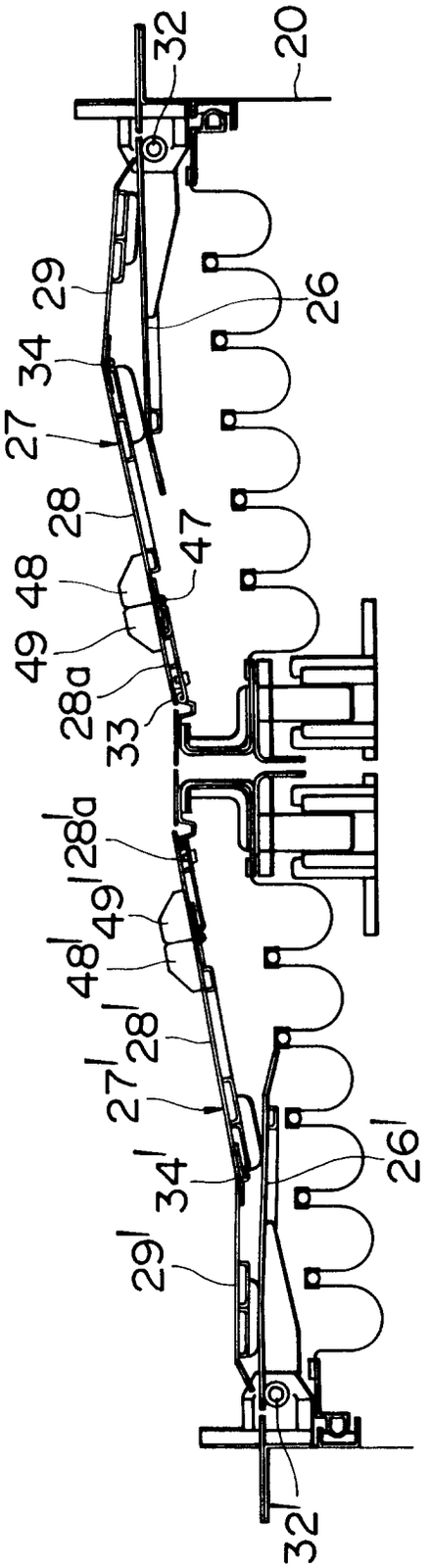

32
20
29
34
27
28
48
49
28a
33
47
26
28'a
49'
48'
28'
27'
34'
29'
26'
32'

FIG. 7B

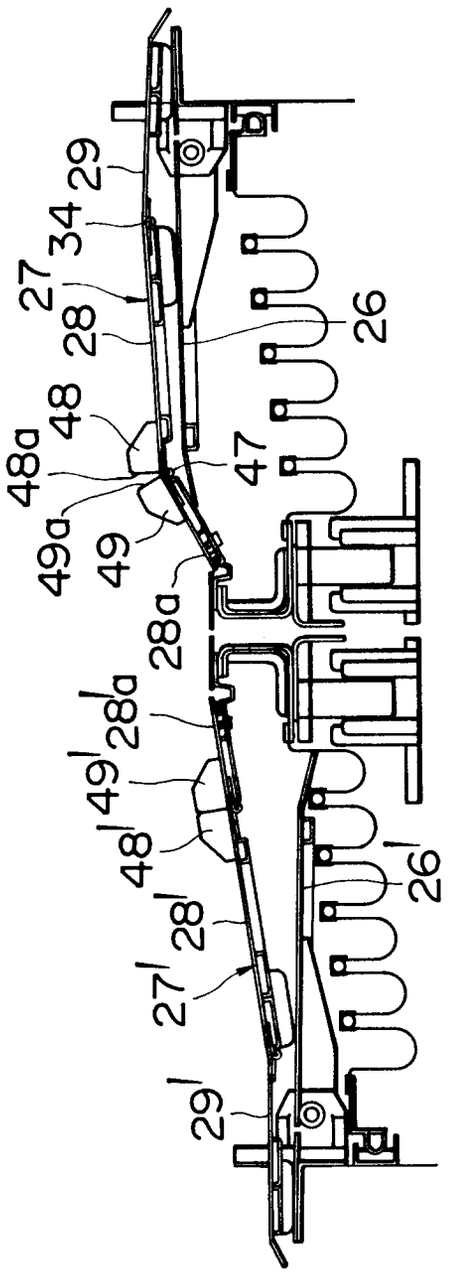

29
34
27
28
48a
48
49a
49
28a
47
26
28'a
49'
48'
28'
27'
29'
26'

FIG. 8

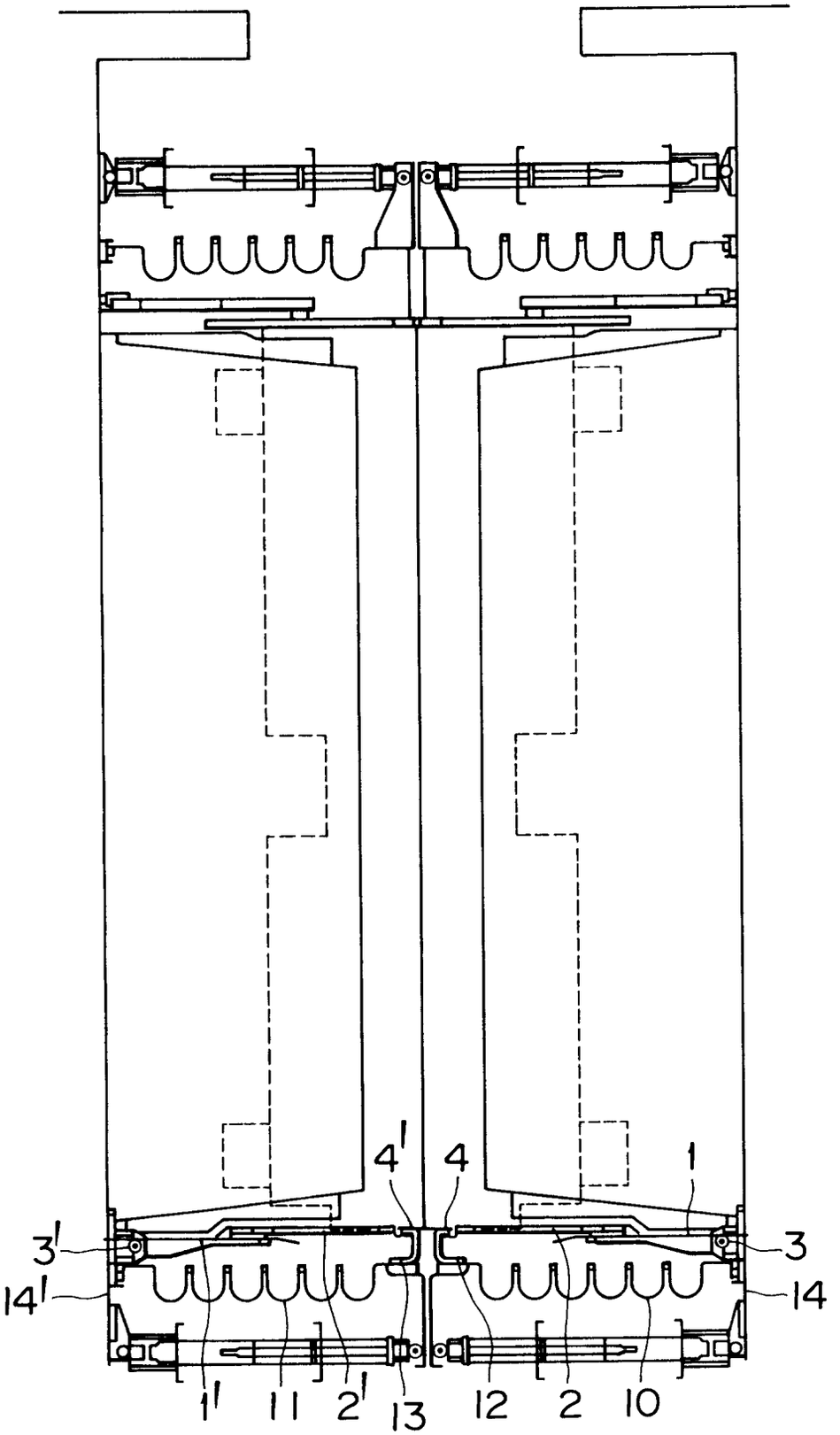


FIG. 9

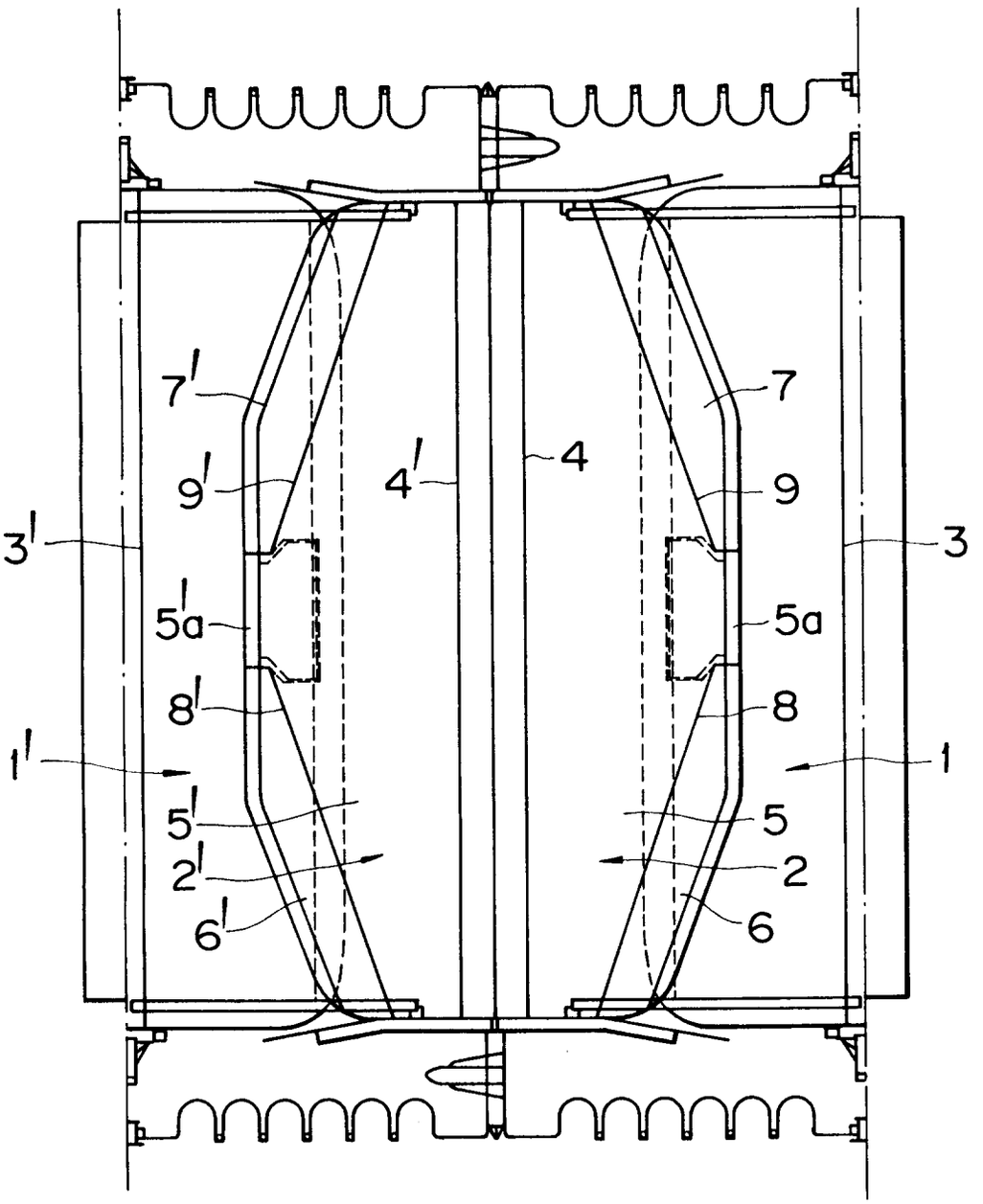


FIG. 10A

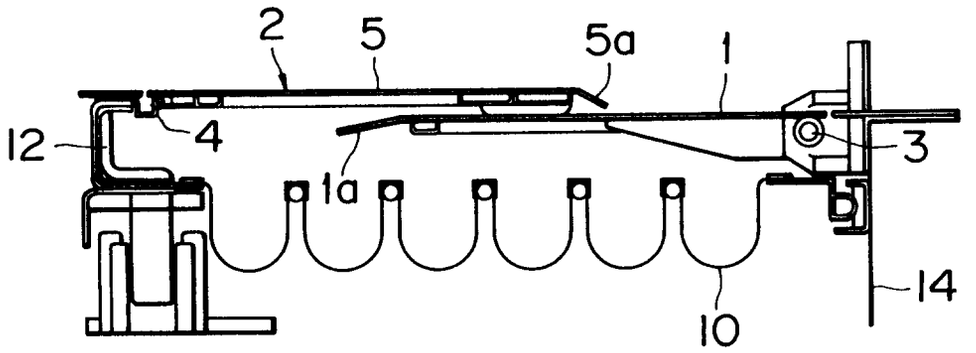


FIG. 10B

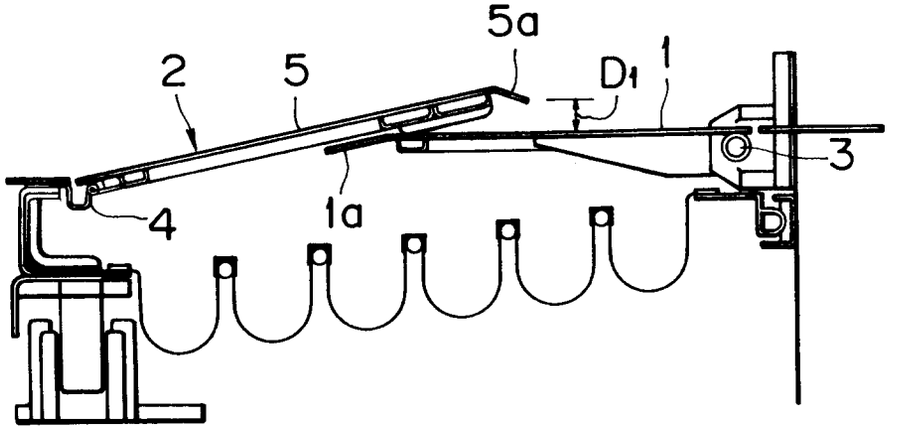
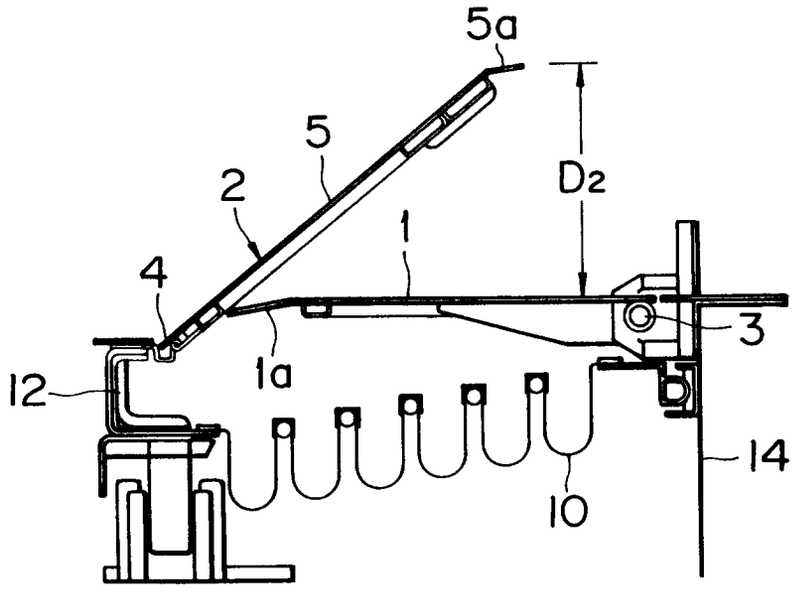


FIG. 10C



European Patent Office

EUROPEAN SEARCH REPORT

Application Number
EP 95 10 1797

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.6)
A	DE-B-12 48 087 (MASCHINENFABRIK AUGSBURG-NÜRNBERG AG) 24 August 1967 * column 3, line 65 - column 5, line 52; figures 1,2 *	1	B61D17/20
A	EP-A-0 207 682 (NARITA MFG LTD) 7 January 1987 * claims 1-3; figures 1-6 *	1	

TECHNICAL FIELDS SEARCHED (Int.Cl.6)

B61D
B60D

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	25 August 1995	Chlosta, P

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
Y : particularly relevant if combined with another document of the same category
A : technological background
O : non-written disclosure
P : intermediate document

T : theory or principle underlying the invention
E : earlier patent document, but published on, or after the filing date
D : document cited in the application
L : document cited for other reasons

& : member of the same patent family, corresponding document

EPO FORM 1503 03.82 (P04C01)