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

(11) **EP 4 306 176 A1**

(12) **EUROPEAN PATENT APPLICATION**

(43) Date of publication:
17.01.2024 Bulletin 2024/03

(21) Application number: **22185017.5**

(22) Date of filing: **14.07.2022**

(51) International Patent Classification (IPC):
A62C 2/10 *(2006.01)*

(52) Cooperative Patent Classification (CPC):
A62C 2/10

(84) Designated Contracting States:
AL AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HR HU IE IS IT LI LT LU LV MC MK MT NL NO PL PT RO RS SE SI SK SM TR
Designated Extension States:
BA ME
Designated Validation States:
KH MA MD TN

(71) Applicant: **Coopers Fire**
Waterlooville Hampshire PO7 3DU (GB)

(72) Inventor: **The designation of the inventor has not yet been filed**

(74) Representative: **Boynton, Juliette Alice Schlich**
9 St. Catherine's Road
Littlehampton, West Sussex BN17 5HS (GB)

(54) **FIRE CURTAIN**

(57) A fire and/or smoke curtain assembly comprising first and second fire and/or smoke curtain elements, the curtain elements sized to cover a span between them with an overlap of at least 100 mm. A bottom bar assembly connects both curtains, with the bottom bar comprising a first section connected to the first curtain element, a second section connected to the second curtain element, with at least one of the first or second sections having a hinged portion extending from the overlap. In addition, the bottom bar assembly has a lower bar connected to the first and second sections, but not the hinged portion(s). In use, the hinged section of the bottom bar allows partial opening of a curtain to enable passage of a person, the weight of the hinged section ensuring that the curtain returns to its original position after egress and the overlap ensures the curtains form a seal.

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Description

Introduction

[0001] The present invention relates to a fire curtain and in particular the provision of an egress opening in a fire curtain.

Background to the Invention

[0002] In the event of a fire, fire and/or smoke curtains often deploy automatically and there is a risk of a person being on the wrong side, i.e., the fire side, of a fire and/or smoke curtain. Even when such fire and/or smoke curtains do not deploy automatically, but are deployed by an authorised person, there is still a risk of someone being on the fire side, often referred to as the wrong side, of the curtain.

[0003] In order to enable passage from one side of a fire and/or smoke curtain to the other without causing damage to the curtain egress openings can be provided in the curtain.

[0004] Such openings must be relatively easy to open to enable a person escaping from a fire or from smoke to find and pass through the opening, but also must close automatically after use to retain the protection afforded by the curtain, and not significantly reduce its effectiveness.

[0005] Current egress openings in fire and smoke curtains are generally based on an opening provided in a curtain, for example by cutting the curtain, or providing a pair of adjacent curtains possibly having a very small overlap. Sealing edges, typically based on hook and loop fastenings, are provided on each edge to create a resealable overlap. A person on one side of the opening can either pull a portion of the curtain to break the seal and reveal an opening to pass through or push the other side of the opening to allow them to pass through.

[0006] Generally, the opening will not extend the entire height of the curtain, but typically to approximately 2 - 3 metres from the ground upwards to allow the passage of the or each person.

[0007] While such openings can be satisfactory, the provision of a closure device does not always ensure closure, for example if there is a misalignment in height when closing, or if the two sides are pushed past each other so that the closures are on outward facing edges. This prevents complete or even any sealing of the opening, allowing fire and/or smoke to pass through and weakening the integrity of the curtain. Alternatively, if this occurs during the weekly test deployment of a curtain (as recommended by most providers), it can prevent correct re-rolling of the curtain, causing a fault and requiring considerable time, effort and sometimes expense to resolve.

[0008] In addition, the provision of the sealing surfaces imbalances the curtain, resulting in difficulties in rolling and unrolling the curtain. This is because as at a small section of the width of the curtain, rather than one layer, the curtain has at least four layers, i.e. two of the curtain material, and two of the sealing material. This can reduce the lifespan of the curtain, resulting from damage thereto, and cause incorrect and/or uneven deployment.

[0009] Thus, there is a need for an improved egress opening that does not suffer from the problems outlined.

[0010] The objection is the invention is to provide an improved egress opening in a fire and/or smoke curtain.

Summary of the Invention

[0011] According to the invention there is provided a fire and/or smoke curtain assembly comprising:-

- at least first and second fire and/or smoke curtain elements, the curtain elements sized to cover a span between them with an overlap of at least 100 mm;
- a bottom bar assembly connected to both curtains, the bottom bar comprising:-
    - o a first section connected to the first curtain element,
    - o a second section connected to the second curtain element,
    - o at least one of the first or second sections having a hinged portion extending from the overlap; and
    - o a lower bar connected to the first and second sections, but not the hinged portion(s).

[0012] When deployed, the hinged section of the bottom bar allows one of the curtains to open to allow egress of a person, the weight of the hinged section ensuring that the curtain returns to its original position after egress.

[0013] It has been found that no additional seal, such as by way of hook and loop fasteners, between the first and second curtains is necessary, the overlap and the resultant touching surfaces of respective curtain overlapping portions ensure that the curtain remains fire and smoke proof with the pressure from the fire urging the curtains together, forming a closure. Consequently, there is adequate sealing through the overlap, and no additional fasteners to form or secure seal is provided.

[0014] It has also been found that the size of the overlap and structure of the bottom bar arrangement reduces the likelihood of mis-alignment of the curtain element, and in particular reduces the overlap being pushed through. In addition, it has been found that even if this occurs during routing testing, the re-rolling of the curtains causes the curtains to re-align correctly.

[0015] The curtains may be provided on one or more rollers when not deployed. The curtains may be wound onto one roller or may be wound onto separate rollers, in which case they may be wound in opposite directions to ensure that the rollers do not interfere with each other. Alternatively, another deployment mechanisms may be used.

[0016] Preferably the overlap is 100 - 1000 mm, more

preferably 100 - 800 mm, and most preferably 200 - 600 mm. In a preferred embodiment the overlap is approximately 300 mm.

[0017] Preferably each section of the bottom bar assembly comprises pairs of L-shaped lengths. Conveniently, each curtain may be sandwiched between uprights of the L-sections, with horizontal members connected to the lower bar.

[0018] Typically, at the overlap each section of the bottom bar comprises a single L-shaped section only, with the uprights of the Ls being on the outside of each curtain.

[0019] Alternatively, a bottom bar having a cross section including a lower rectangular element and an upper triangular element may be used. The curtain may be sandwiched between portions having an uppermost upright element, a middle element extended therefrom angled away from the curtain, a further upright element, and a lower element extending horizontally underneath the curtain. In use the pair of horizontal elements can be placed on top of one another and secured together. The portion can also be secured at the uppermost upright elements, through the curtain. At the overlap a single section of the bottom bar may be provided on each curtain.

[0020] Advantageous, reinforcement may be provided on a curtain portion above a hinge forming the hinged portion. Typically, this will be in the form of a second, or second and third layers of curtain material.

[0021] Conveniently, the curtain may be printed or otherwise labelled with directions to the overlap and instructions on how to open.

[0022] While a hinged portion may be provided on one of the curtains only, it may alternatively be provided on both curtains, allowing opening of a flap from either curtain.

[0023] While typically a span may be covered by two curtains, if the span is particularly long additional curtains may be provided, for example three or even four curtains, with each curtain overlapping the or each adjacent curtain by at least 100 mm. Egress openings may be provided at any or all of the overlaps

Detailed Description of the Invention

[0024] To help understanding of the invention, a specific embodiment thereof will now be described by way of example and with reference to the accompanying drawings, in which:-

Figure 1 is front view of a fire and smoke curtain assembly according to a first embodiment of the present invention;

Figure 2 is a cross-sectional view of the bottom bar assembly of the embodiment of Figure 1;

Figure 3 is a top view of the bottom bar assembly of the embodiment of Figure 1;

Figure 4 is a cross sectional view of the bottom bar assembly at the overlap of the arrangement of Figure 1;

Figure 5 is a cross-sectional view of the bottom bar assembly at the openable portion of the curtain of the embodiment of Figure 1;

Figure 6 is a cross-section of an alternative bottom bar at position 1 of Figure 1;

Figure 7 is a cross-section of the alternative bottom bar at position 2 of Figure 1;

Figure 8 is a cross-section of the alternative bottom bar at position 3 of Figure 1;

Figure 9 is a front view of a fire and smoke curtain assembly according to a second embodiment of the present invention;

Figure 10 is a front view of a fire and smoke curtain assembly according to a third embodiment of the present invention;

Figure 11 is a top view of the fire and smoke curtain assembly of Figure 10;

Figure 12 is a front view of a fire and smoke curtain assembly according to a fourth embodiment of the present invention; and

Figure 13 is a top view of the fire and smoke curtain assembly of Figure 12.

[0025] Referring to Figures 1 - 5, the curtain 1 thereshown is of heat resistant material, for example EFP4/1000 material from Coopers Fire Limited, of Waterlooville, Hampshire, UK and is sized to cover an opening A.

[0026] The curtain assembly 2 comprises the curtain 1, normally, i.e., when not deployed, rolled on a roller 10 provided in a head box 12, mounted in or on a ceiling 14. The head box may be provided with a seal (not shown) positioned to bear against the curtain, when the latter is deployed, to prevent any smoke flow through the head box 12 and past the roller 10.

[0027] The curtain assembly 2 is provided with a bottom bar assembly 20 which rests on the floor 18 when the curtain 1 is deployed and acts as a closure to the head box 12 when the curtain is not deployed.

[0028] Side guides 22 are provided extending from the ceiling 14 to the floor 18. The side guides 22 have a general C-shaped cross-section with in-turned lips, in between which the curtain can pass. The curtain 1 is provided with edge formations 26 sized to prevent removal of the curtain 1 from between the lips of the side guides 22.

[0029] The curtain assembly 2 is provided as two curtains 31, 32 (which may also be regarded as curtain portions) designed to cover the opening A between them, with some overlap 34. This overlap is at least 100 mm, and usually 200 - 400 mm. As shown the overlap is about 300 mm.

[0030] As shown in this embodiment both curtains 31, 32 are rolled onto the same roller 10. While this creates a double thickness of curtain 34 in a middle section of the roller 10, as the total curtain width is quite wide, this does not cause any difficulty in the rolling and unrolling

of the roller / curtains.

[0031] The two curtains hang down when deployed and in the area of overlap hang down in overlapping manner and alongside against each other. Overlapping portions touch each other over some or most of their area. One of the curtains, here 32, has a portion 33 that is designed to open to create a gap through which a person on the wrong side of the curtain, usually the fire side, can pass through. This openable portion 33 has a width of 800 mm in the assembly shown, although it may have a width of 500 - 1000 mm in other embodiments.

[0032] The bottom bar assembly 20 includes a first section 36 attached to the bottom of the first curtain 31, a second section 38 attached to the bottom of the second curtain 32, and a lower connecting element 40 joining both the first 36 and second 38 sections. Together these can be a single bar. The first 36 and second 38 sections of the bottom bar assembly 20 are comprised of two essential L-shaped lengths 42, the upright 44 of each L being attached either side 48, 50 of each curtain 31, 32, and connected together therethrough, with the horizontal 46 elements forming a flat base, in contact and generally connected to the lower element 40.

[0033] The assembly 20 is slightly different at the openable portion 33 and overlap 34 to allow for opening of this portion 33. The bottom bar assembly on the openable portion 33 is in the form of a bar 52 fixed to the end of curtain 32. This is attached by a hinge 54 to the fixed portion 38 of the bottom bar assembly 20. It is also notable that this bar element 52 attached to the openable portion 33 is not connected to the lower connecting element 40 and is thus free to move away therefrom.

[0034] At the overlap portion 34 of the curtains, the fixed curtain 31, i.e., the one without the openable portion 33, the bottom bar comprises a single L-shaped length 56 only, this being provided on the side away from the second curtain 32.

[0035] Additionally, at the overlap 34, connection means, for example steel Velcro 58, may be provided on the bottom bar element 42 of the openable portion 33 of the curtain 32 and on the bottom bar element 56 of the fixed curtain 31. While this element 58 is shown in this embodiment, it is not essential and will not always be provided.

[0036] The provision of first and second curtains 31, 32 allows a person to pass through the curtain 1. To aid this, a portion 44 of the bottom bar attached to one of the curtains, adjacent the overlap 34, is not connected to the lower element 40, and is hinged 54 to the remainder of that section of the bottom bar.

[0037] In use it does not matter whether this is considered to be the first or second curtain, but as shown here it is described as the first curtain 31, and thus in relation to the first section 36 of the bottom bar assembly.

[0038] The arrangement allows the openable portion 52 to move away from the lower element 40 with the curtain 31 attached thereto.

[0039] A person on one side of the curtain 1, can pull the curtain 31 towards themselves, causing the hinged portion 44 of the associated section 36 of the bottom bar assembly 20 to swing towards them, creating an opening at the point of curtain overlap and between the curtains 31, 32 for them to pass through. On release of the curtain 31, the weight of the portion 44 of the bottom bar will ensure the curtain 31 is returned to its normal closed position - closed in the sense that the overlapping portions once again hang down alongside each other. Alternatively, if coming from the other direction, the person can push on the curtain 31, causing the associated section 36 of the bottom bar assembly 20 to swing away from the, again creating an opening between the curtains 31, 32 through which they can pass. The opening will essentially be approximately triangular in shape, the lower side of the triangle being the hinged portion 44 of the bottom bar, the length of the hinged portion 44 defining the bottom of the triangle, and the height of the triangle being determined by the person creating the opening.

[0040] The curtain assembly 2 is sized to cover an opening A between two wall sections, W. Such an opening may typically be anything between 2 - 10 meters in length, and have a height of, for example, 2 - 20 meters. The hinged portion 44 of the bottom bar assembly 20 will generally be approximately 0.5 - 1 m in length as this allows an opening of sufficient size for a person to pass though, while maintaining the integrity of the curtain. As noted, the opening is not height limited.

[0041] It has been found that there is no need to include any sealing means, for example hook and loop fasteners, magnets or other arrangements, as in use in the event of fire the fire pressure urges the curtains against each other over the area of overlap contact closing the curtain assembly. In addition, the presence and weight of the bottom bar assembly 20 ensures that after use the curtain will return to its correct, normal, position, with respective curtain overlapping portions hanging down in touching contact adjacent each other.

[0042] In order to protect the curtain 31 from damage due to repeated opening and closing, reinforcement 52 is provided above the hinge 46 to the hinged portion of the bottom bar section 36. As shown the reinforcement 52 is an additional layer of curtain fabric in a rectangular shape. However, a double or even triple layer of fabric may be used, and the shape may be square or semi-circular, or any shape with an essentially straight edge against the bottom bar assembly 20.

[0043] Now turning to Figures 6 - 8, these shown an alternative bottom bar for use with the invention. Such a bottom bar could be used in the embodiment of Figure 1 as an alternative to the bottom bar assembly 20 thereshown.

[0044] The bottom bar assembly 120 of Figure 6 comprises two portions 142 and 144 secured together with the curtain therebetween, the curtain being either the first curtain 131 or the second curtain 132. Both portions 142, 144 are also secured to the lower element 140. Specifically, the portions comprise an uppermost section 152,

which in use lie vertically against the curtain, an upper middle section 153 extending downward therefrom, and extending diagonally away from the curtain, a lower middle section 154 extending vertically downwards from the upper middle section 153, and a lower section 155 extending horizontally underneath the curtain and towards the other portion 142, 144. The two portions are connected at the uppermost section, typically by a bolt 156 as shown. Both portions 142, 144 are also attached to uprights 146 extending from the lower element 140, the uprights 146 attaching to the lower middle sections 155, again typically using a bolt 157.

[0045] This bottom bar arrangement can be used a position 1 as shown in Figure 1, which is where either end of the curtain is held down to the bottom bar without the ability to egress therethrough.

[0046] Figure 7 shows the bottom bar arrangement 120 at position 2, namely, at the overlap between the two curtains 131, 132. Here a single portion, either 142 or 144 is attached to each curtain. This enables the curtains to sit together on the lower element, ensuring closure of the curtain when not used during egress. Each portion is as described above, having an uppermost section 152 that sits flat against the curtain and is secured thereto typically using a bolt 156, and upper middle section 153 extending downwards and diagonally away from the curtain, a lower middle section 154 extending vertically downwards, and a lower section 155 extending horizontally under the curtain. The portion 142 is not connected to portion 144 and is not connected to the lower element 140, although this element does extend underneath portion 142 being connected to the bottom bar assemblies at positions 1.

[0047] At this position, namely position 2, the two curtains 131, 132 overlap and thus if each curtain were to be provided with a full bottom bar assembly, the curtains would be held apart and prevented from creating a closure. By providing a single portion 142 or 144 of the bottom bar assembly 120, each curtain is provided with a sufficient weight to return the curtain to its correct position and thus in direct contact with the other curtain forming a closure, but free enough to be able to allow egress by a person on the wrong side of the curtain. The lower bar 140 remains in contact with the floor, enabling persons egressing to step thereover.

[0048] Figure 8 shows the bottom bar arrangement 120 at position 3, where there is a single curtain only, but designed to allow egress therethrough. As seen, the bottom bar assembly 120 comprises both portions 142, 144 as described with reference to Figure 5, with the curtain 132 secured therebetween. Thus, each portion comprises an uppermost section 152, which in use sit vertically against the curtain, and thus on either side of the curtain 132, an upper middle section 153 extending downward therefrom and diagonally away from the curtain, a lower middle section 154 extending vertically downwards from the upper middle section 153, and a lower section 155 extending horizontally underneath the curtain and towards the other portion 142, 144. The two portions are connected at the uppermost section, typically by a bolt 156 as shown. The difference between this arrangement and that of position 1, shown in Figure 5, is that the portions 142, 144 are not connected to the lower bar 140. This enables the curtain to move away from the lower bar 140 to allow egress through the opening there created.

[0049] Referring now to Figure 9, and the curtain assembly 202 thereshown. The arrangement here is very similar to that of the first embodiment, but here the curtains 231, 232 are wound onto separate rollers 210, 211. The curtains are wound in opposition directions, so that the rollers 210, 211 can be positions adjacent each other along the width of the opening A with the curtains deploying between the rollers and thus in very close contact.

[0050] While the Figure appears to show the rollers arranged one 211 above the other 210, this will not typically be the case, although this option can be used.

[0051] Despite the curtains 231, 232 being provided on separate rollers 210, 211, they are still both connected to the same bottom bar assembly 220, each one connected to respective sections 236, 238 and the sections being connected to the lower connecting element 240. As such the arrangement of the bottom bar assembly 220 is essentially identical to that described with reference to the bottom bar assembly 20 of the first embodiment. The assembly 120 could equally be as described with reference to Figure 6 - 8.

[0052] A person on one side of this curtain assembly 202 when deployed is able to pass through the curtain as described with reference to the first embodiment. The person can pull the curtain 231 towards themselves, causing the hinged portion 244 of the associated section 236 of the bottom bar assembly 220 to swing towards them, creating an opening between the curtains 231, 232 for them to pass through. On release of the curtain 231, the weight of the portion 244 of the bottom bar will ensure the curtain 231 is returned to its normal position. Alternatively, if coming from the other direction, the person can push on the curtain 231, causing the associated section 236 of the bottom bar assembly 220 to swing away from the, again creating an opening between the curtains 231, 232 through which they can pass. The opening will essentially be triangular in shape, the lower side of the triangle being the hinged portion 244 of the bottom bar, the length of the hinged portion 244 defining the bottom of the triangle, and the height of the triangle being determined by the person creating the opening.

[0053] Usually, signs will be placed onto the curtain to direct a person to the correct place to pass through and whether to push or pull.

[0054] A handle, typically made from the fabric of the curtain elements, may be provided.

[0055] Figures 10 and 11 shows a further curtain assembly according to the invention. In this example three curtain elements 330, 331 and 332 are provided. All of the three curtain elements 330, 331, 332 are rolled on a

single roller 310. As a result there are two overlap portions 334, 335 between the second curtain element 331 and each of the others 330, 332.

[0056] As described with the examples above, each curtain element 330, 331, 332 is attached to a bottom bar assembly 320, including a first section 336 attached to the first curtain element 330, a second section 337 attached to the second curtain element 331, and a third portion 338 attached to the third curtain element 332. These sections 336, 337, 338 are connected together by connection to a lower element 340.

[0057] Middle curtain 331 is provided with two hinged portions 344, 345, creating two openable portions 333, 334. In each case the hinged portion 344, 345 opens in the same direction. As described with reference to the other examples, the bottom bar elements 352, 353 of the hinged portions are not secured to the lower element 340 and are thus free to move away therefrom.

[0058] The structure of the bottom bar assembly 320 is as described in either of the examples above.

[0059] In use, if a person is on the wrong side of the curtain assembly 301, when deployed, they will be able to open one of the hinged portions to allow themselves to pass through the opening there created.

[0060] In another embodiment, not shown, the two openings or hinged portions 344, 345, could open in different directions to ensure that any person on either side of the curtain could open one of the hinged portions and pass though the opening there created.

[0061] Now turning to Figure 12 and 13, thereshown is a curtain assembly 402 in which two hinged portions 444, 445 are provided, one associated with each curtain 431, 432. The arrangement for each is the same, and the same as describe above. Each section 436, 438 is provided with a hinged portion 444, 445 adjacent the overlap 434, and reinforcement 452 is provided on each curtain above the hinge 446, 447. The sections 436, 438 are connected via a lower connecting element 440.

[0062] In this arrangement, egress though the curtain is essentially identical to that described above, with the exception that egress may be made though either side of the overlap 434.

[0063] The invention is not intended to be restricted to the details of the above-described embodiments. For example, the curtain does not have to be deployed on a roller mechanism, a rouche deployment or concertina system can be used.

Claims

1. A fire or smoke curtain assembly comprising:-

- at least first and second fire and/or smoke curtain elements, the curtain elements sized to cover a span between them with an overlap of at least 100 mm;
- a bottom bar assembly connected to both curtains, the bottom bar comprising:-
  - a first section connected to the first curtain element,
  - a second section connected to the second curtain element,
  - at least one of the first or second sections having a hinged portion extending from the overlap; and
  - a lower bar connected to the first and second sections, but not the hinged portion(s).

2. The fire or smoke curtain assembly according to claim 1, wherein the curtain elements are provided on one or more rollers.

3. The fire or smoke curtain assembly according to claim 2, wherein the curtain elements are wound onto a single roller.

4. The fire or smoke curtain assembly according to claim 2, wherein the curtain elements are wound onto separate rollers, in opposite directions.

5. The fire or smoke curtain assembly according to claim 1, further comprising a non-roller deployment mechanism.

6. The fire or smoke curtain assembly according to any preceding claim, wherein each section of the bottom bar assembly comprises at least one L-shaped length.

7. The fire or smoke curtain assembly according to claim 6, wherein each curtain element is sandwiched between pairs of L-shaped lengths, with the exception of the overlap where each curtain element has a single L-shaped length only.

8. A fire or smoke curtain assembly according to claim 6 or claim 7, wherein the lower bar is connected to horizontal arms of the L-shaped lengths.

9. A fire or smoke curtain assembly according to any preceding claim, further comprising a reinforcement provided on the curtain element above a hinge forming the hinged portion.

10. A fire or smoke curtain assembly according to claim 9, where in the reinforcement is one or more additional layers of material from which the curtain elements are made.

11. A fire or smoke curtain assembly according to any preceding claim, wherein one or both curtain elements are printed or otherwise labelled with directions to the overlap and instructions on how to open.

12. A fire or smoke curtain assembly according to any preceding claim, wherein a hinged portion is provided on each of the curtain elements.

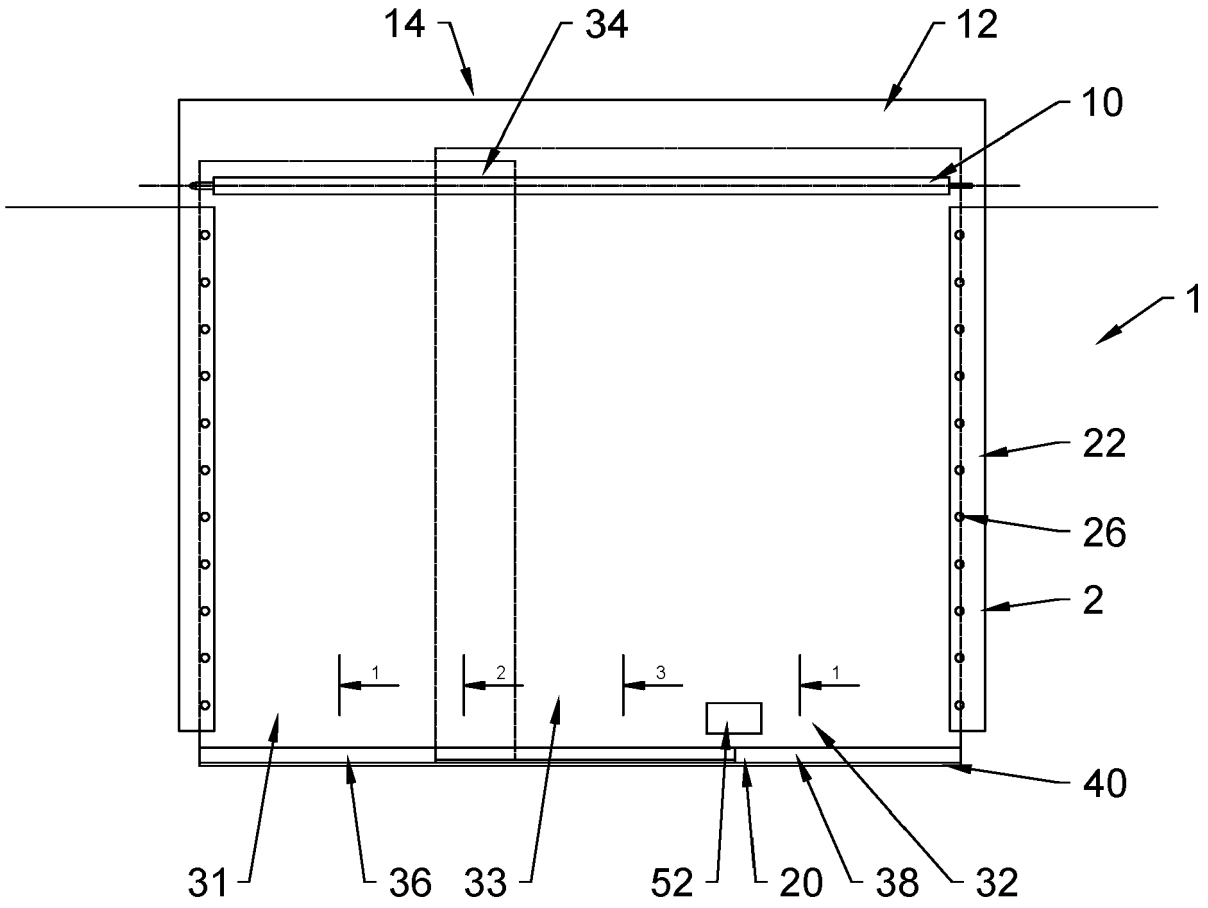

FIGURE 1

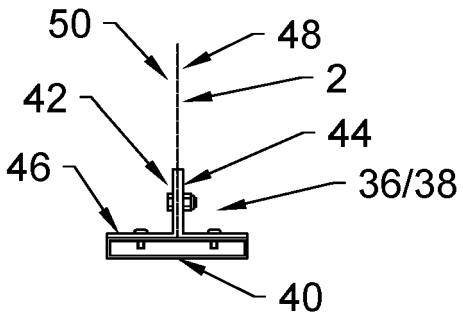

FIGURE 2

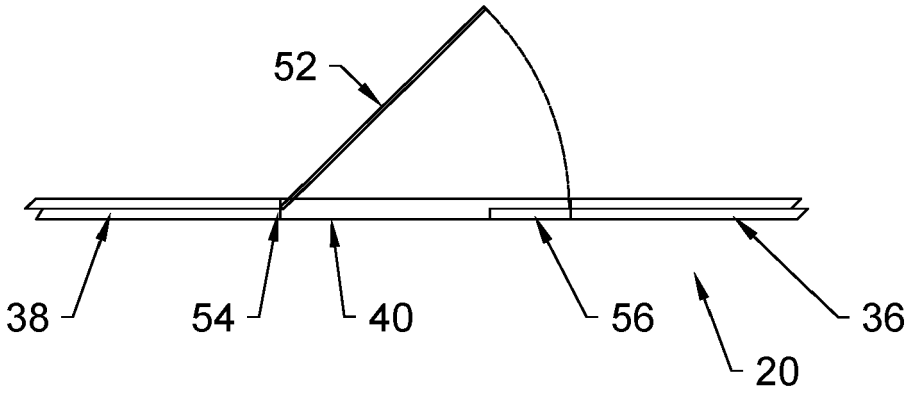

FIGURE 3

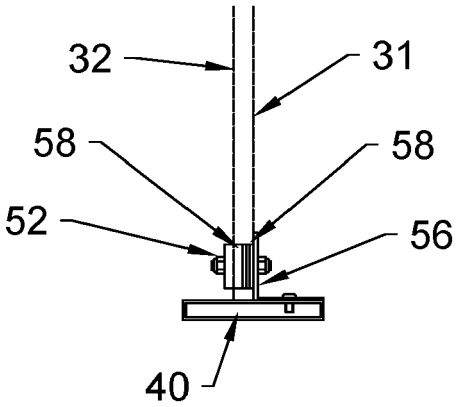

FIGURE 4

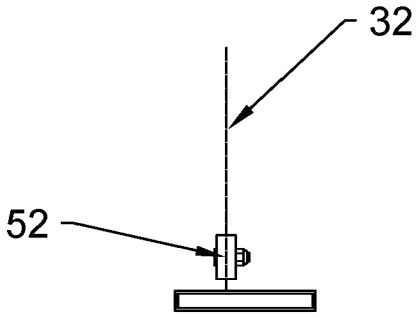

FIGURE 5

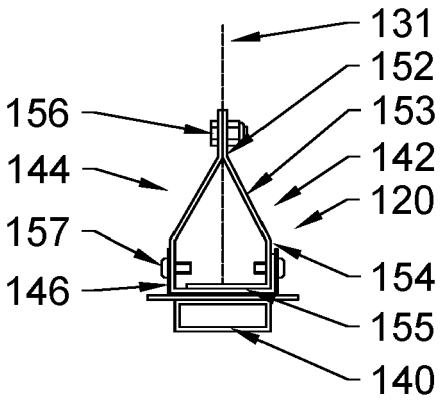

FIGURE 5

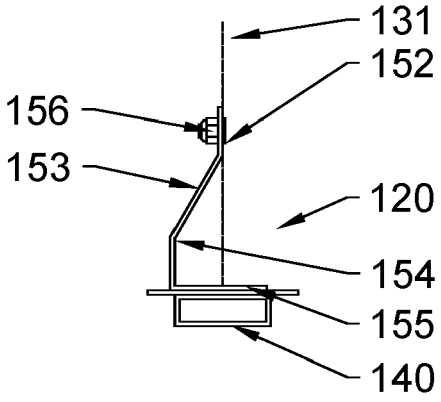

FIGURE 7

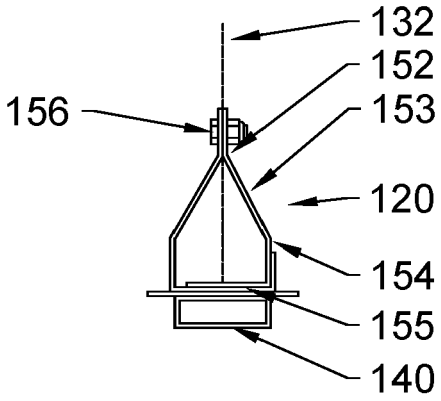

FIGURE 8

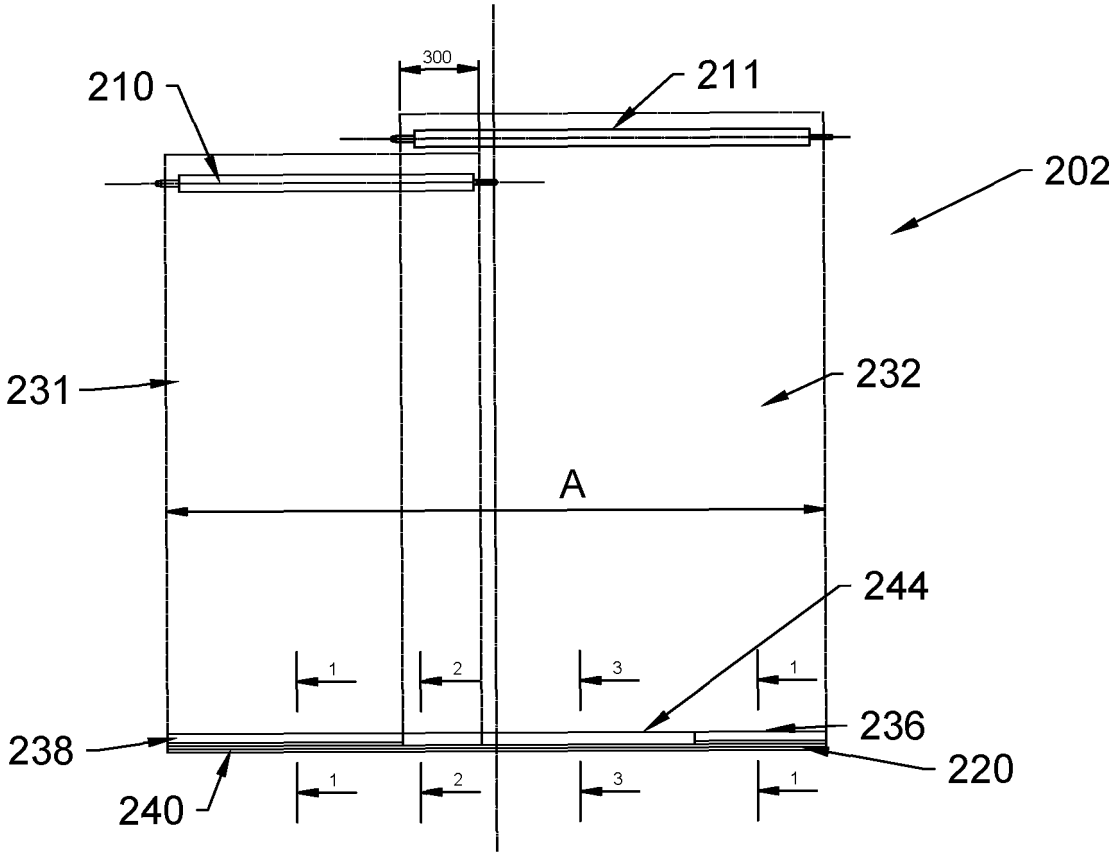

FIGURE 9

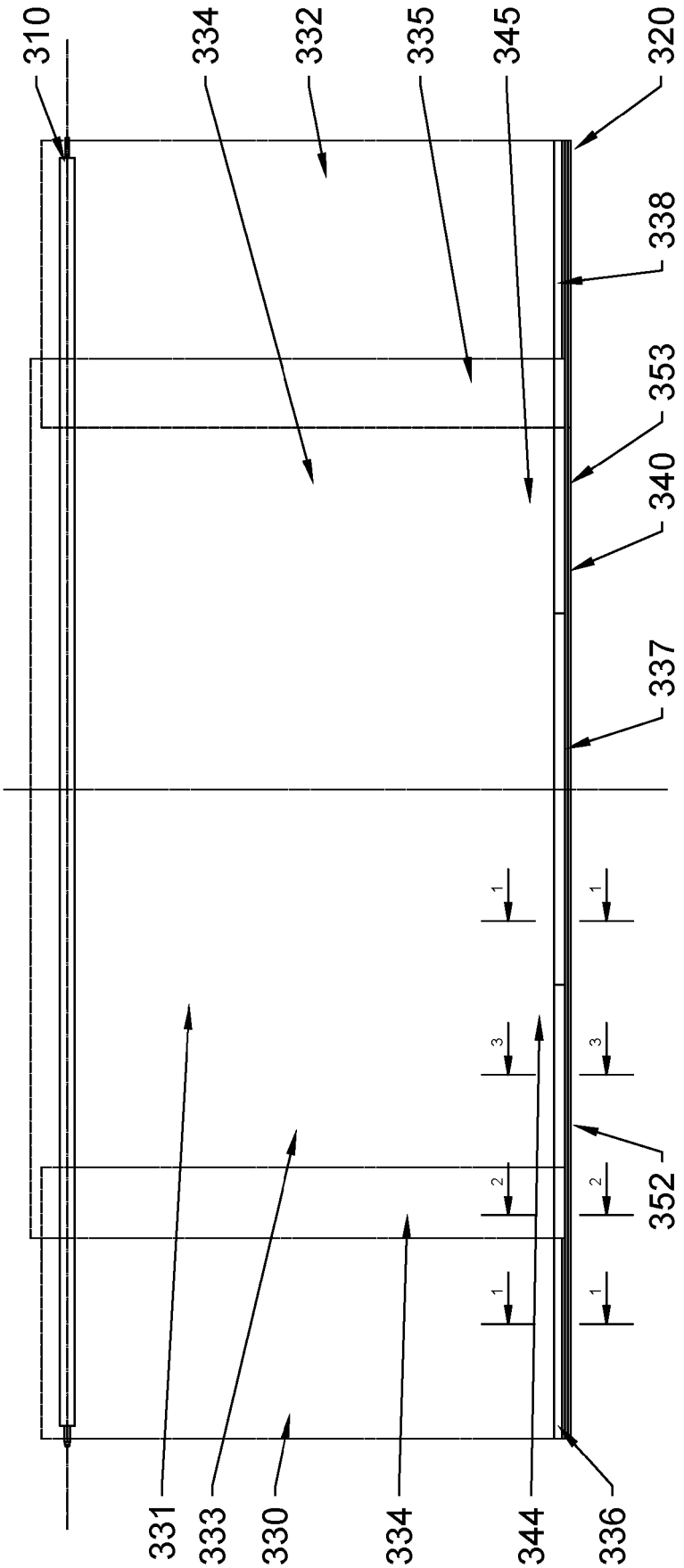

FIGURE 10

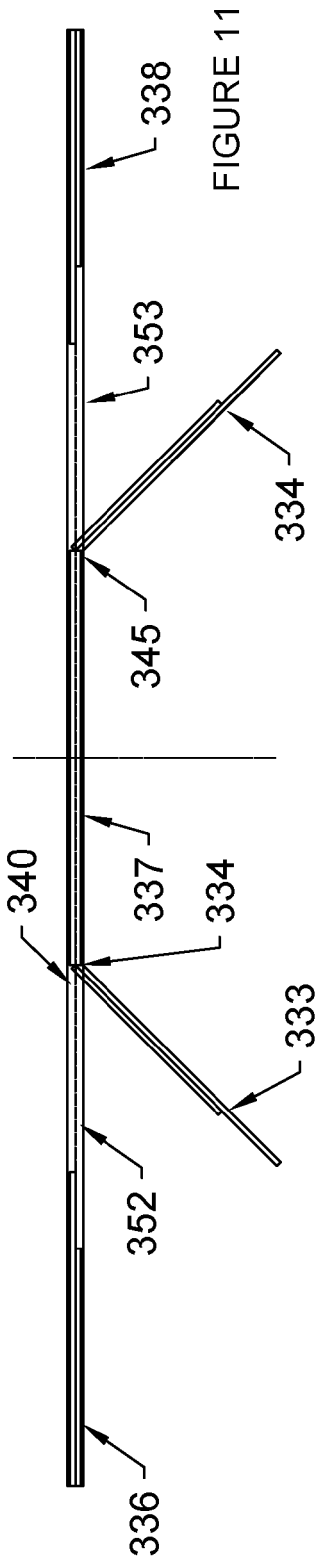

FIGURE 11

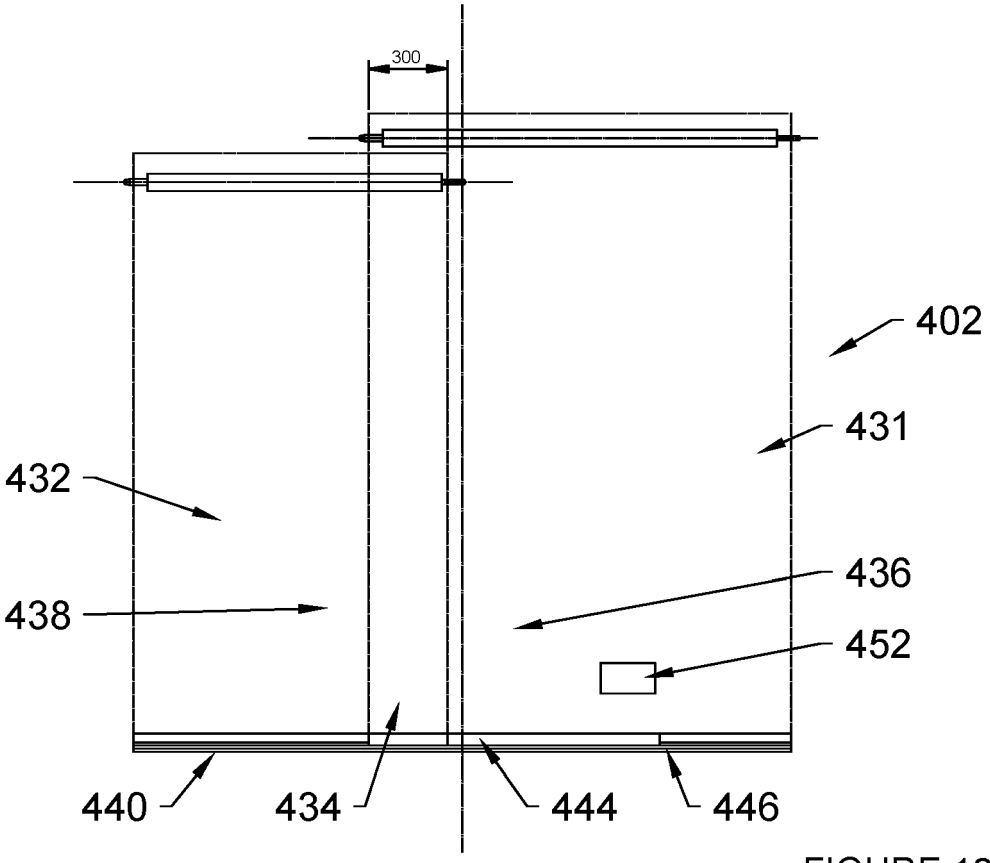

FIGURE 12

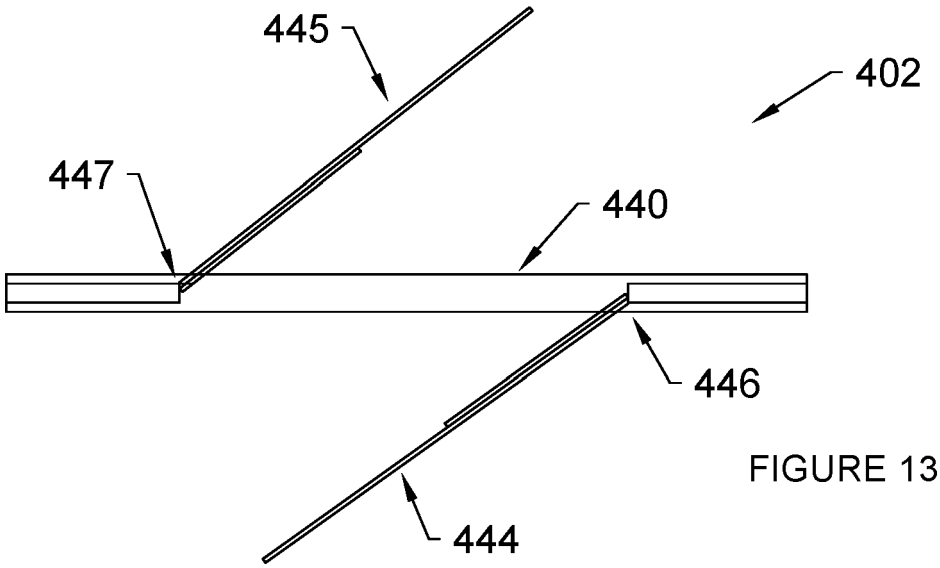

FIGURE 13

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EUROPEAN SEARCH REPORT

Application Number
EP 22 18 5017

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X	EP 0 838 238 A1 (OHBAYASHI CORP [JP]) 29 April 1998 (1998-04-29) * figures 1-6 *	1-3,12	INV. A62C2/10
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			A62C

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
The Hague	25 November 2022	Andlauer, Dominique

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report. The members are as contained in the European Patent Office EDP file on
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25-11-2022

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For more details about this annex : see Official Journal of the European Patent Office, No. 12/82