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

(11) **EP 3 372 743 A1**

(12) **EUROPEAN PATENT APPLICATION**

(43) Date of publication:
12.09.2018 Bulletin 2018/37

(51) Int Cl.:
E04B 2/74 *(2006.01)* *E06B 9/24* *(2006.01)*

(21) Application number: **18160765.6**

(22) Date of filing: **08.03.2018**

(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

(30) Priority: **09.03.2017 NL 2018486**

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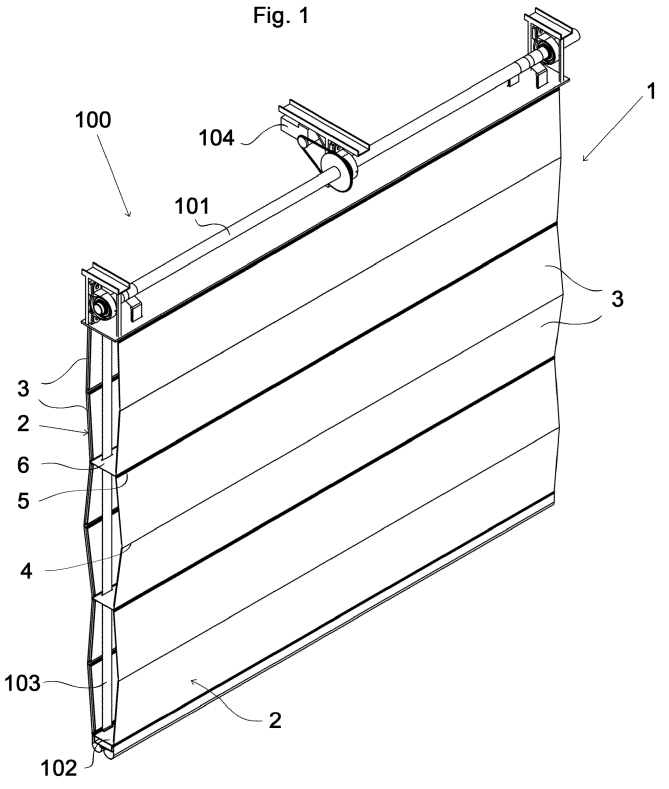
(54) **ACOUSTIC PARTITION SYSTEM AND METHOD FOR MOUNTING AN ACOUSTIC PARTITION SYSTEM**

(57) The invention relates to a partition system (1) for use in halls, such as sports halls, comprising a partition carrier (100), at least one pair of partition screens (2) comprising sound absorbing material, that are interconnected at a predetermined mutual distance and arranged on the partition carrier and motorized moving means (104) for simultaneously moving the partition screens (2) with respect to the partition carrier (100).

The partition screens (2) are interconnected by a series of strips (6) of sound isolating material essentially extending over the width of the partition screens.

Fig. 1



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Description

[0001] The present invention relates to a partition system for use in halls, such as sports halls.

[0002] The acoustics in sport halls is known to give rise to complaints from users, especially from people who must work in such halls, such as trainers and teachers. To improve the acoustic characteristics of sports halls it is known to cover the walls, ceiling and floor with panels of sound absorbing material.

[0003] Most sports halls are provided with one or more partition systems to divide the sports hall into smaller sections. Unfortunately, the acoustic characteristics deteriorate significantly, as soon as the partition systems are closed. Particularly, when a middle part of the hall is closed with partition systems at two sides, a considerable reverberation time combined with flutter-echoes is observed in the middle part of the hall.

[0004] The invention relates to an acoustic partition system, comprising a partition carrier, at least one pair of partition screens comprising sound absorbing material, that are interconnected at a predetermined distance and arranged on the partition carrier and motorized moving means for simultaneously moving the partition screens with respect to the partition carrier.

[0005] EP1174063 describes a partition curtain for use in halls, such as sports halls, comprising a curtain carrier, at least one pair of curtain sheets comprising sound absorbing material, that are interconnected at a predetermined mutual distance and arranged on the curtain carrier and motorized moving means for simultaneously moving the curtain sheets with respect to the curtain carrier. In the known partition curtain a layer of sound absorbing material is arranged on the outside of the curtain sheets.

[0006] The invention has for its object to provide a partition system with improved sound isolation and improved sound absorption. More specifically the invention has for its object to provide a partition system that can full fill the noise standards for sports halls that are formulated as directives by several institutions, such as NOC NSF and ISA/Kiwa.

[0007] This object is achieved by the partition system described above, wherein the partition system comprises two or more chambers defined between the partition screens and the partition screens are interconnected by a series of strips essentially extending over the width of the partition screens. The strips are preferably made of sound isolating material. The strips effectively define the chambers between the partition screens in which sound waves are attenuated. The chambers are acoustic chambers wherein sound waves are effectively attenuated. In addition, the chambers allow use of different partition screen materials with different acoustic characteristics for different chambers, thus providing an instrument for detailed sound control. Applicant expects the partition system to have high sound absorbing ability, particularly with respect to mid- and low frequency sounds.

[0008] In a first preferred embodiment the partition screens are interconnected by a series of the strips spaced apart in height direction of the partition system. The strips or vanes offer a better sound control by forming a barrier for sound travel in height direction of the partition system. The chambers allow use of different partition screen materials with different acoustic characteristics in height direction of the partition system, thus providing an instrument for detailed sound control.

[0009] According to an elegant preferred embodiment of a partition system according to the invention each partition screen comprises a series of alternated screen panels and folding areas. The predefined folding areas allow for a controlled folding of the screen panels during lifting of the partition system. This results in a compact package of screen panels in the opened position and a relatively shallow partition system in the closed position. Preferably the strips are connected at the folding areas.

[0010] According to a further elaboration of the elegant preferred embodiment one or more of the screen panels comprise plates of sound absorbing material. The plates enhance the stiffness of the screen panels and contribute to controlled folding of the partition system.

[0011] According to an even further elaboration of the elegant preferred embodiment the moving means comprise pairs of pull bands that run parallel to the partition screens through the strips outside the centre of the strips. The features of this embodiment force adjacent screen panels to fold onto each other.

[0012] In an additional or alternative even further elaboration of the elegant preferred embodiment the distance between the partition screens enlarges in the direction towards the partition carrier. This can be achieved by enlarging the width of the strips in the direction towards the partition carrier. Consequently, adjacent screen panels are urged to fold onto each other.

[0013] In an efficient preferred embodiment the partition system according to the invention comprises two or more partition modules, wherein each partition module is provided with module connecting means for releasably connecting partition modules at connecting areas. The partition modules of this preferred embodiment can be prefabricated and interconnected in the sports hall. Consequently, mounting time is considerably reduced. Each partition module can be separately replaced for maintenance or repair which advantageously is cost saving. In addition thereto the partition modules allow for a wide variety of possibilities for composing the optimal acoustic characteristics of the partition system.

[0014] According to another efficient preferred embodiment the partition system according to the invention further comprises strip connecting means for releasably connecting the strips to the partition screens. The same advantages

apply as for the partition modules: the strips of this preferred embodiment can be prefabricated and interconnected in the sports hall. Thereby mounting time is considerably reduced. Each strip can be separately replaced for maintenance or repair which advantageously is cost saving. Each strip can be optimized to contribute to sound reduction. Preferably the strips are connected at the connecting areas.

[0015] Preferably the module and/or strip connecting means are zippers. The zippers are reliable connecting means and can function as folding areas to contribute to the controlled lifting and folding of the partition system.

[0016] In an optimized preferred embodiment each partition module comprises at least one pair of partition screens interconnected by at least one strip.

[0017] In a practical preferred embodiment each partition screen of a partition module comprises two screen panels alternated by a folding area. Advantageously the panels of each module fold onto each other and adjacent folded modules fold onto each other.

[0018] The invention further relates to a method of assembling a partition system according to the invention, comprising the steps of:

a) Selecting a first partition module with specific acoustic characteristics;
b) Selecting a second partition module with specific acoustic characteristics; and
c) Releasably connecting the second partition module to the first partition module to form the partition screens;
d) Optionally selecting a subsequent partition module with specific acoustic characteristics;
e) Releasably connecting the subsequent partition module to the partition screens; and
f) Optionally repeating steps d) and e) until the partition screens are finished;
g) Arranging the partition screens on the partition carrier.

[0019] The invention will be explained referring to the accompanying drawings in which

Figure 1 schematically shows a preferred embodiment of a partition system according to the invention;
Figure 2 schematically shows the partition system of figure 1 in cross section;
Figure 3 schematically shows a part of the partition system of figure 2 in more detail; Figure 3A schematically shows a detailed section of figure 3;
Figure 3B schematically shows a variant of the detailed section of figure 3A;
Figure 4 schematically shows a part of the partition system of figure 1 in more detail; and
Figure 5 schematically shows the partition system of figure 1 in pulled up position.

[0020] The figures show a partition system 1 according to the invention in a preferred embodiment that is intended for use in a sports hall. Figure 1 schematically shows a preferred embodiment of a partition system 1 according to the invention. Figure 2 schematically shows the partition system 1 in cross section.

[0021] The partition system 1 comprises a pair of partition screens 2 comprising sound absorbing material. The partition screens 2 are interconnected at a predetermined mutual distance and arranged on a partition carrier 100. The partition carrier 100 is provided with motorized moving means 104 for simultaneously moving the partition screens 2 with respect to the partition carrier 100.

[0022] The partition screens 2 are interconnected by a series of strips 6 essentially extending over the width of the partition screens 2. Preferably the strips 6 are connected along both longitudinal sides thereof to the partition screens 2.

[0023] Each partition screen 2 comprises a series of screen panels 3 alternated by folding areas 4. A preferred embodiment of a panel 3 is shown in more detail in figure 3.

[0024] In the preferred embodiment the partition system 1 comprises two or more partition modules 10. Each partition module comprises at least one pair of partition screens 2 interconnected by one or more strips 6. A preferred embodiment of a strip 6 is shown in more detail in figure 4. Each partition module 10 is provided with connecting means 5 for releasably connecting the partition modules 10 at connecting areas to form the partition system 1. The connecting means are chosen such that the connecting areas 5 are further folding areas. Preferably the connecting means are zippers 5.

[0025] In the preferred embodiment each partition screen 2 in a partition module 10 comprises two screen panels 3 alternated by a folding area 4.

[0026] Figure 3 schematically shows the two lowest modules 10 of the partition system 1 in more detail. Figure 3A schematically shows a detailed section of figure 3. Figure 3B schematically shows a variant of the detailed section of figure 3A.

[0027] The partition screen of the partition module 10 comprises two panels 3 connected by a folding area. In the embodiment of figure 3A each panel 3 comprises several layers: an outer layer 31, an inner layer 32 and an intermediate layer 33 in between. Preferably the outer layer 31 is made of sound isolating material, for instance artificial leather. Preferably the outer layer 31 is made of reinforced material. Preferably the inner layer 32 is made of gauze screen. Preferably the intermediate layer 33 comprises plate like sound absorbing material, like PE or mineral wool. The folding

area 4 is formed by attaching the outer layer 31 and the inner layer 32 together, preferably by stitching. At both outer ends of the partition module 10 (parts of) zippers 5 are present. The embodiment of figure 3B differs over the embodiment of figure 3A in that it lacks the inner layer 32. Instead the layer 33 of sound absorbing material is fastened to the outer layer 31. Preferably the layer 33 of sound absorbing material is directly attached to the outer layer 31, for example by bonding or gluing. The folding area 4 is formed at the outer layer 31, more specifically in areas of the outer layer 31 to which no layer 33 is attached.

[0028] Several types of modules 10 with different acoustic characteristics can be made based on the information disclosed herein. For instance, perforations can be provided in one or more of the panels 3 in a module 10. As another example the characteristics of the intermediate layer 32 of each panel 3 can be changed. Optionally the intermediate layer 32 can be omitted in one or more of the panels in a module. A tailor-made partition system 1 can be constructed by a person skilled in the art out of any combination of partition modules 10.

[0029] Figure 4 schematically shows a preferred embodiment of a strip or vane 6. Many types of materials are suitable for use in the strips. For instance, the same material that is used for the outer layer 31 of the panels 3 can be used for the strips. Preferably the material of the strips is a substantially closed material. The length of strip 6 is substantially equal to the width of the partition screen 2. The strip 6 is provided with strip connection means 26 along one or both longitudinal sides. Preferably the strip connection means 26 enable releasable connection of the strip 6 to the partition screen 2. In the preferred embodiment the strip connection means 26 comprise zippers.

[0030] Strip 6 has opening 16 for pull bands 103. The openings lie outside the centre of the strips or vanes. Preferably one pair of openings 16 is present near each of the outer ends of the strips 6. Preferably the surface of the strips is closed, apart from the openings 16.

[0031] The partition carrier 100 comprises a head shaft 101 and a bottom beam 102. Pull bands 103 run from the head shaft 101 to the bottom beam 102 through the openings 16 in the strips 6. The partition screens 2 are connected to the bottom beam 102. Preferably beam connection means 7 are provided for releasable connection of the lowest module 10 to the bottom beam 102. In the preferred embodiment the beam connection means 7 comprise a kador bead 7 connected by sheet material 8 to the connection means 5.

[0032] The motorized moving means 104 drive the shaft 101 to wind up respectively unwind the pull bands 103 to pull up respectively let down the partition system 1. During pulling up the panels 3 of a module 10 move outwardly and the inner layers 32 fold onto each other. Next the outer layers of adjacent folded modules 10 fold onto each other. In pulled up position the panels of a partition system are arranged adjacently in vertical position under the head shaft 101. The folded position is shown in figure 5.

[0033] The partition system according to the invention can be easily assembled by the method according to the invention, comprising the following steps: selecting a first partition module with specific acoustic characteristics, selecting a second partition module with specific acoustic characteristics and releasably connecting the second partition module to the first partition module to form the partition screens. The acoustic characteristics of the second partition module can be equal to or can differ from the acoustic characteristics of the first partition module. In the preferred embodiment the releasable connection is made by zippers.

[0034] Optionally the method according to the invention further comprises the steps of: selecting a subsequent partition module with specific acoustic characteristics and releasably connecting the subsequent partition module to the partition screens. The acoustic characteristics of the subsequent partition module can be equal to or can differ from the acoustic characteristics of the first and second partition module. Optionally steps d) and e) are repeated until the partition screens are finished.

[0035] The method according to the invention further comprises the step of arranging the partition screens on the partition carrier. This step involves the sub steps of attaching the lowest partition module to the bottom beam and running the pull bands 103 through the partition system and attaching the pull bands 103 to the head shaft 101. These sub steps are not necessarily all performed in the last step. A person skilled in the art can change the order in which the sub steps are performed to optimize the assembly in each specific situation.

[0036] In the preferred embodiment shown the number of strips 6 equals the number of partition modules plus 1. Adjacent chambers 10 share a strip 6. The resulting material reduction leads to weight reduction, which is favourable, but not necessary. In the partition system chambers are formed by two opposing partition screens 2 and two opposing strips 6.

[0037] Applicants expectation regarding the high sound absorbing ability, particularly with respect to mid- and low frequency sounds, of the partition system according to the invention has been confirmed by tests of which the results for the sound absorption coefficient are shown in the following table.

	frequency [Hz]					
Sound Absorption Coefficient	***125***	***250***	***500***	***1.000***	***2.000***	***4.000***
sporTIG partition wall 66% sound absorbing	0,40	0,68	0,66	0,52	0,53	0,43
sporTIG partition wall 100% sound absorbing	0,33	0,76	0,82	0,71	0,73	0,60
sporTIG partition wall 100% sound reflecting	0,53	0,50	0,24	0,13	0,09	0,05

[0038] The invention is of course not limited to the described and shown preferred embodiment, which is developed for use in sports accommodations or halls, such as gymnasiums, fitness rooms, ice rinks, indoor halls for tennis, squash, climbing et cetera. The partition system according to the invention is suitable for use as a motorized acoustic screen to divide spaces in any kind of facility or accommodation. Some non-limiting examples of other facilities or accommodations, wherein the partition system according to the invention can be used include factories, industry halls, exhibition halls and stock rooms.

[0039] The invention therefore extends to any embodiment falling within the scope of protection as defined in the claims and as seen in the light of the foregoing description and accompanying drawings.

Claims

1. Partition system for use in halls, such as sports halls, comprising a partition carrier, at least one pair of partition screens comprising sound absorbing material, that are interconnected at a predetermined distance and arranged on the partition carrier and motorized moving means for simultaneously moving the partition screens with respect to the partition carrier, wherein the partition system comprises two or more chambers defined between the partition screens and wherein the partition screens are interconnected by a series of strips, preferably made of sound isolating material, essentially extending over the width of the partition screens.

2. Partition system according to claim 1, wherein the strips, preferably made of sound isolating material, are spaced apart in height direction of the partition system.

3. Partition system according to claim 1 or 2, wherein each partition screen comprises a series of alternated screen panels and folding areas.

4. Partition system according to claim 3, wherein the strips are connected at the folding areas.

5. Partition system according to claim 3 or 4, wherein one or more of the screen panels comprise plates of sound absorbing material.

6. Partition system according to one or more of the preceding claims, wherein the moving means comprise pairs of pull bands that run parallel to the partition screens through the strips outside the centre of the strips.

7. Partition system according to one or more of the preceding claims, wherein the distance between the partition screens enlarges in the direction towards the partition carrier.

8. Partition system according to one or more of the preceding claims, comprising two or more partition modules, wherein each partition module is provided with module connecting means for releasably connecting partition modules at connecting areas.

9. Partition system according to one or more of the preceding claims, further comprising strip connecting means for releasably connecting the strips to the partition screens.

10. Partition system according to claim 8 and 9, wherein the strips are connected at the connecting areas.

11. Partition system according to claim 8 or 9, wherein the module connecting means and/or the strip connecting means are zippers.

12. Partition system according to one or more of the preceding claims 8 - 11, wherein each partition module comprises

at least one pair of partition screens interconnected by at least one strip.

13. Partition system according to claim 12, wherein each screen of a partition module comprises two screen panels alternated by a folding area.

14. Method of assembling a partition system according to one or more of the preceding claims 8-13, comprising the steps of:

a) Selecting a first partition module with specific acoustic characteristics;
b) Selecting a second partition module with specific acoustic characteristics; and
c) Releasably connecting the second partition module to the first partition module to form the partition screens;
d) Optionally selecting a subsequent partition module with specific acoustic characteristics;
e) Releasably connecting the subsequent partition module to the partition screens; and
f) Optionally repeating steps d) and e) until the partition screens are finished; and
g) Arranging the partition screens on the partition carrier.

Fig. 1

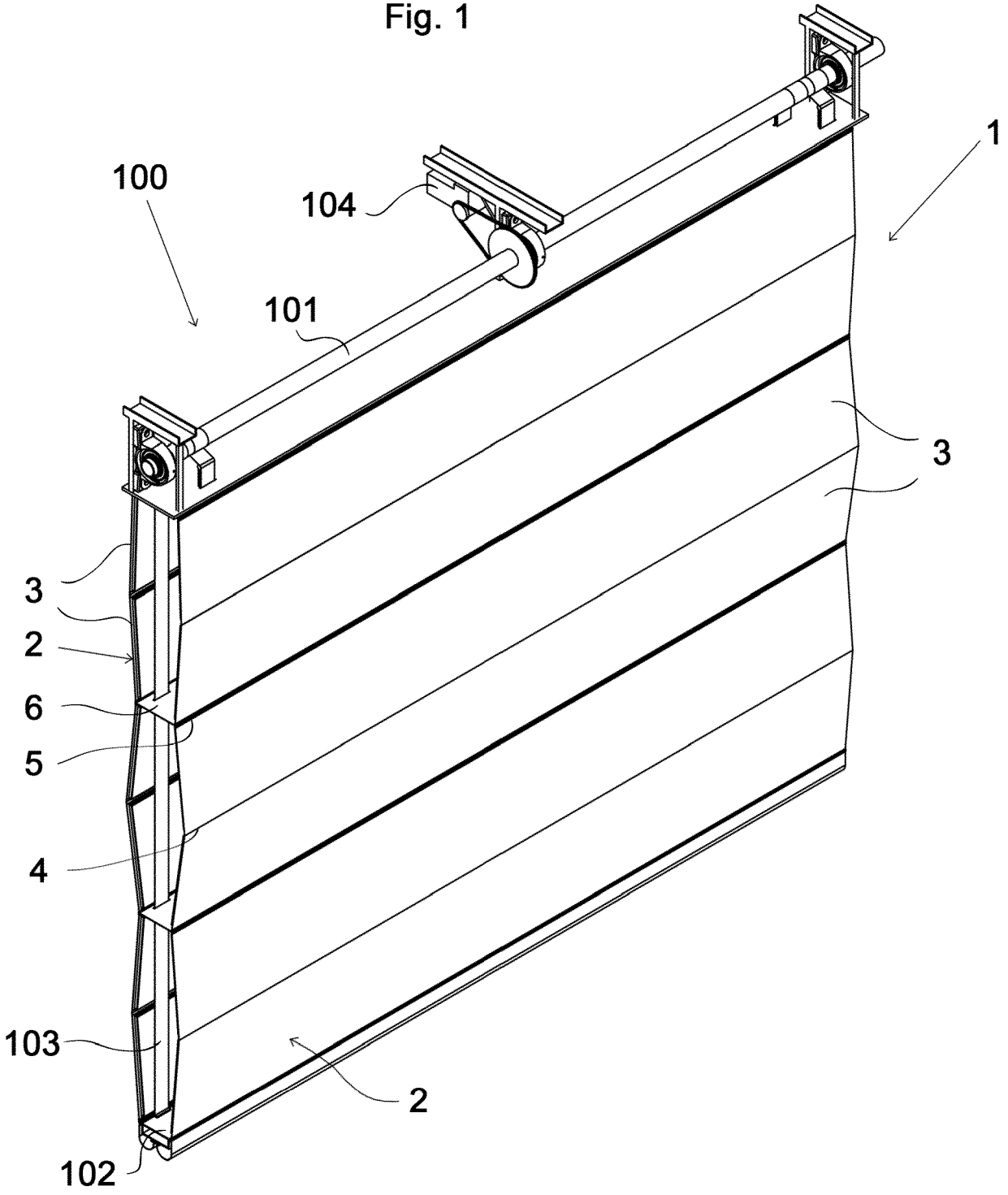


Fig. 2

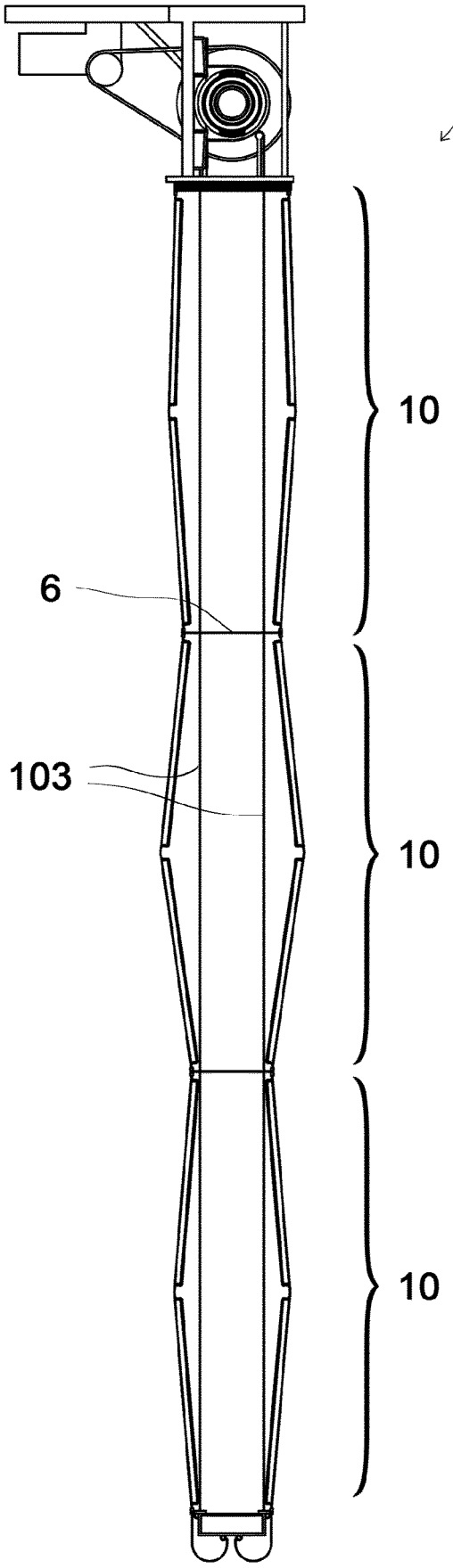


Fig. 3

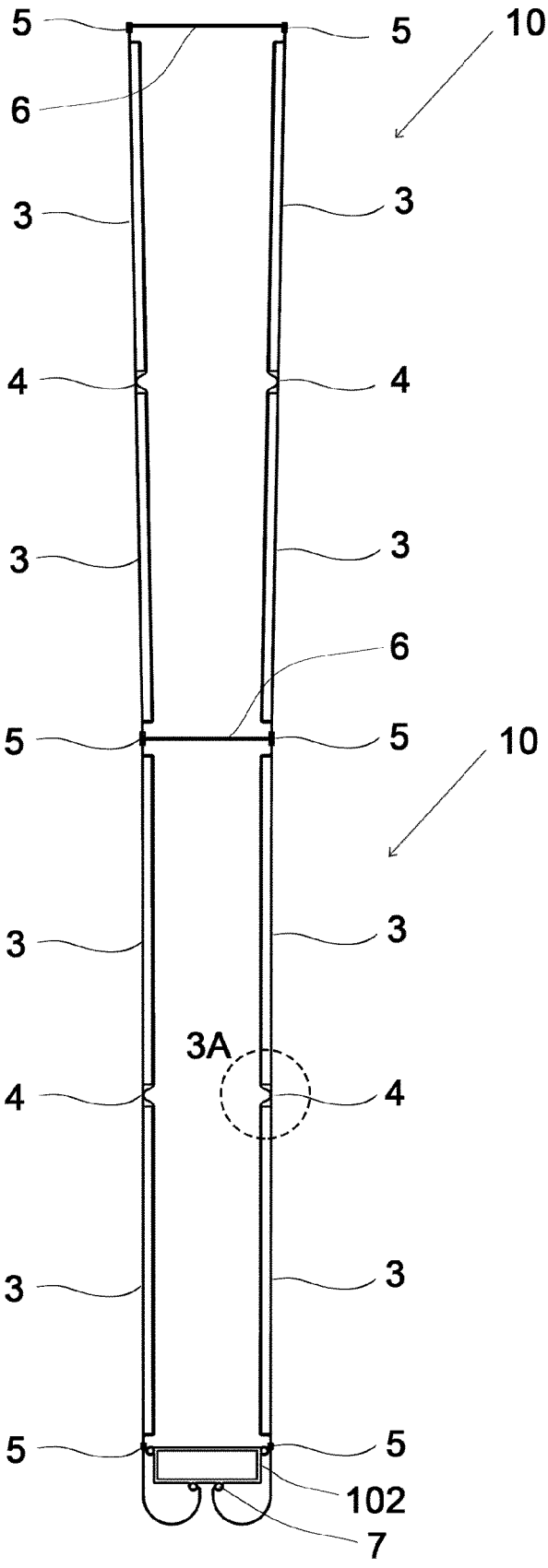


Fig. 3A

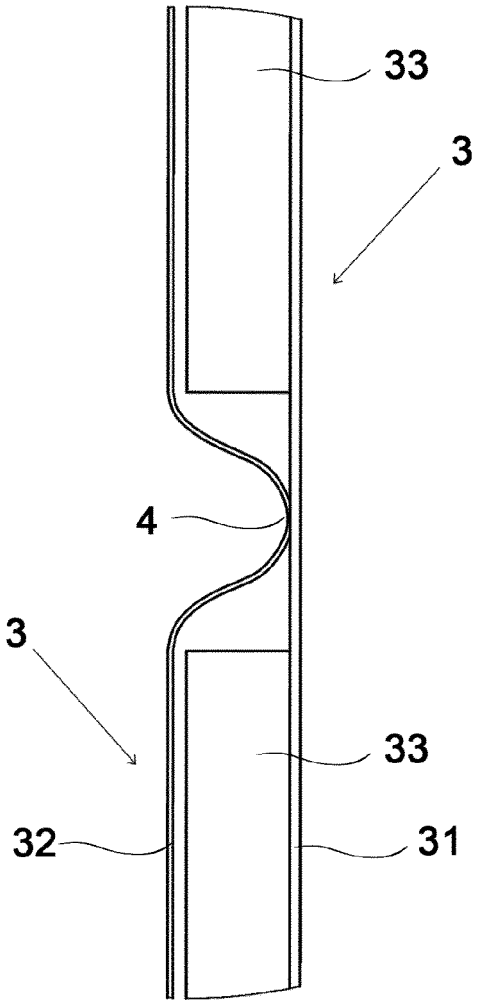


Fig. 3B

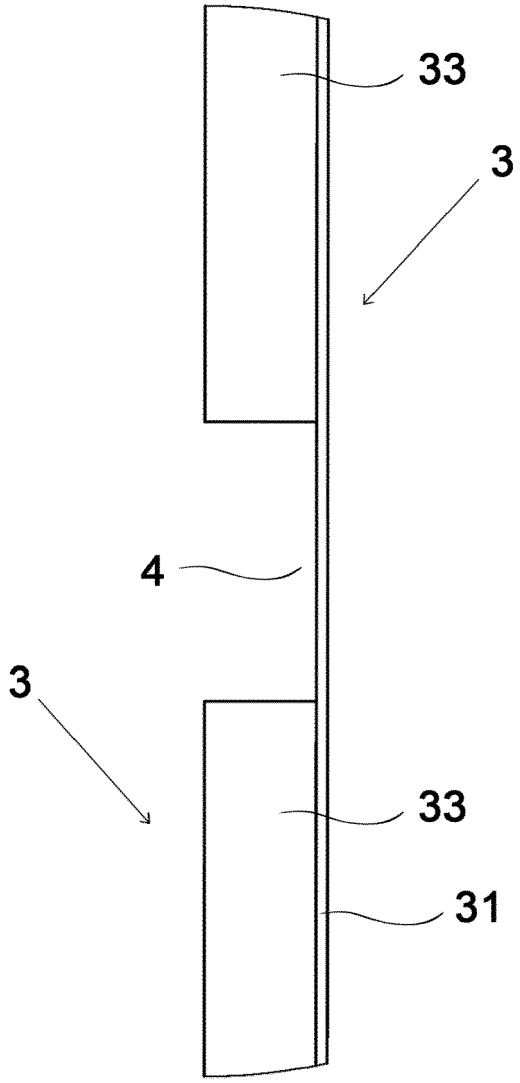


Fig. 4

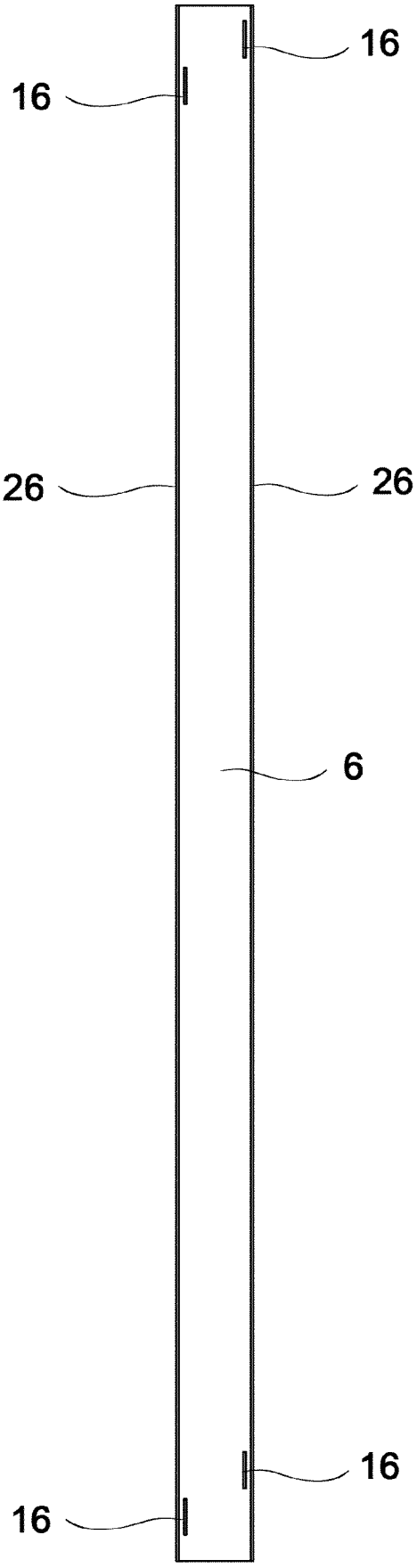
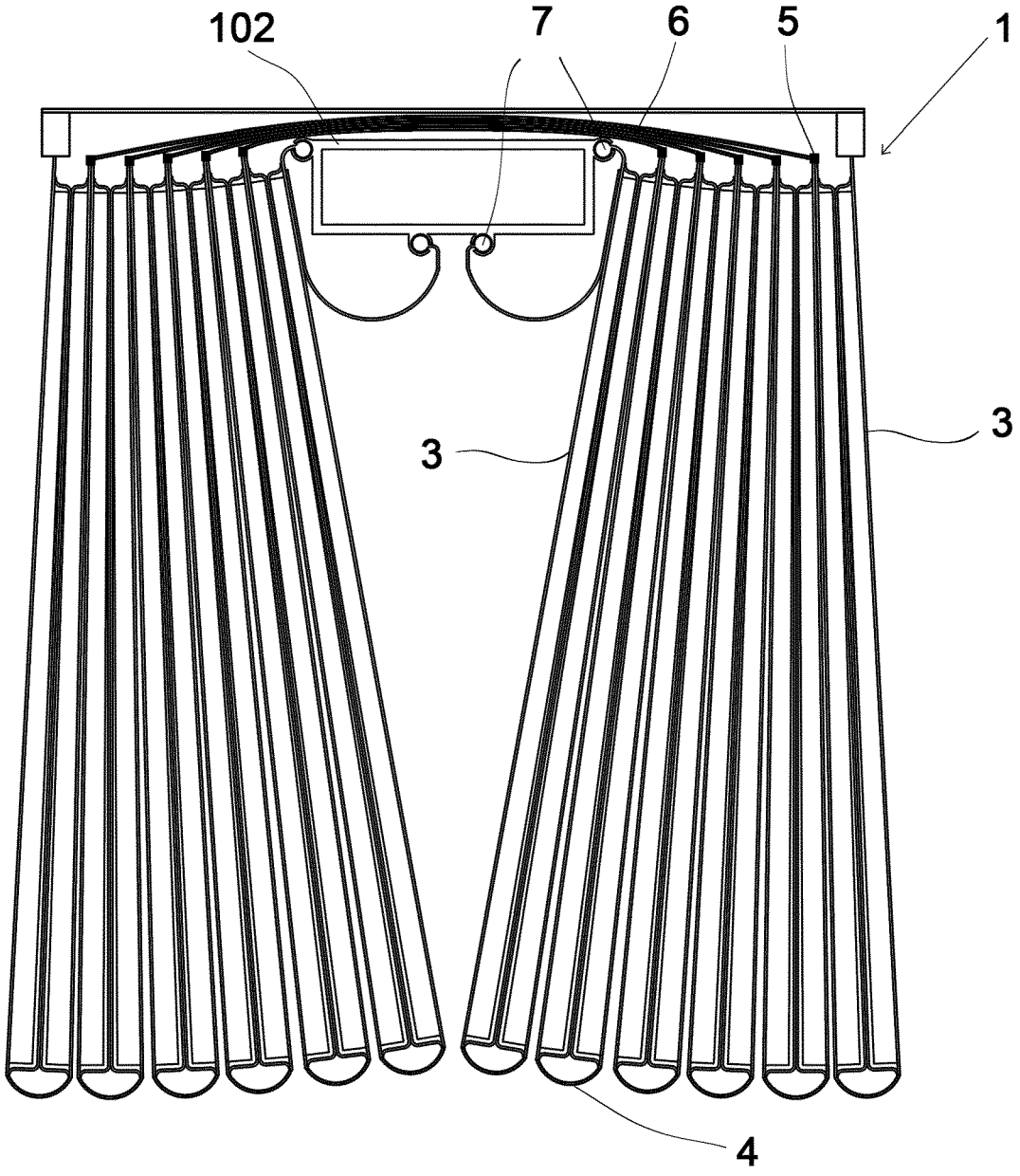


Fig. 5



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EUROPEAN SEARCH REPORT

Application Number
EP 18 16 0765

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Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X A	US 5 664 613 A (JELIC RALPH [US]) 9 September 1997 (1997-09-09) * figures 1,4,11,12, 5-10, 2 * * column 4, line 55 - line 58 * * column 3, line 47 - line 51 * -----	1-10, 12-14 11	INV. E04B2/74 ADD. E06B9/24
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A,P	EP 3 211 171 A1 (TRENOMAT GMBH & CO KG [DE]) 30 August 2017 (2017-08-30) * figure 6 * -----	1-14	

TECHNICAL FIELDS SEARCHED (IPC)
E04B E06B

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
The Hague	25 July 2018	Petrinja, Etiel

CATEGORY OF CITED DOCUMENTS

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