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(54) **QUICK CLOSING FOLD UP DEVICE**

(57) A quick closing fold up device comprises a flexible curtain (20) movable between a lowered configuration and a raised configuration, or vice-versa, with respect to a portal structure (12) including a pair of parallel uprights (16) and an upper cross member (18) for connecting said uprights (16). The uprights (16) define respective grooves (32) for the engagement of the opposite side edges of the curtain (20) and of the opposite ends of transverse stiffening members (24) associated with the curtain (20), the width of said grooves in the portion adjacent to the upper cross member (18) is such as to allow a series of loops (22a) of the curtain (20), which are formed as a result of raising the curtain (20), wherein the groove (32) of each upright (16) has a substantially V-shaped bottom wall (34), the vertex (38) of which constitutes a rectilinear seat for sliding the opposite ends of the transverse stiffening elements (24).

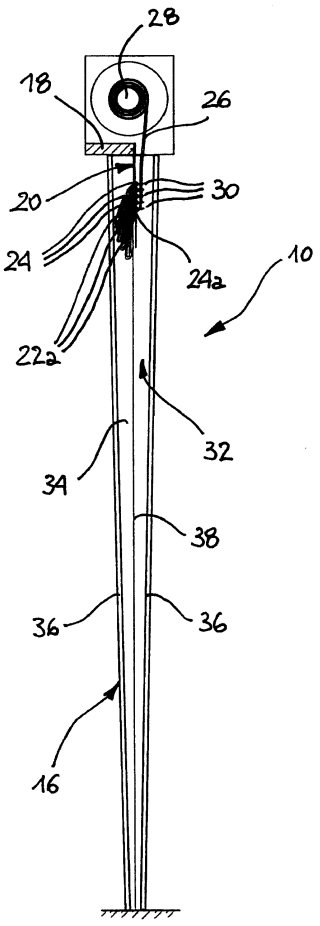

Fig. 3

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Description

[0001] The present invention generally refers to closing devices, particularly for industrial use, such as quick vertical sliding doors, in which the opening and closing steps occur at a relatively high speed.

[0002] More particularly, the invention relates to a quick closing device of the so-called "fold up" type.

[0003] These known closures comprise a flexible curtain slidably mounted with respect to an opening defined by a portal structure, such that the curtain can assume a lowered configuration or a raised configuration. The portal structure includes an upper cross member and two vertical uprights in which guide grooves are formed, which are engaged by the side edges of the curtain and by the opposite ends of transverse bars for stiffening the curtain, which delimit a series of panels of it. In the most general case, a plurality of strips or belts are associated with one face of the curtain, which extend in the vertical direction, having their upper end fixed to a motorized winding shaft arranged close to the upper cross member of the portal structure, while the lower end is fixed in a lower region of the curtain, typically to the lowermost stiffening bar of the curtain. Moreover, the curtain is provided with a series of holding members in the form of belt loops or the like, in which the various strips are slidably engaged. During opening of the device, the winding shaft is driven in rotation so that the strips of the curtain are wound on it in order to drag the curtain upwards. In this situation, the various panels of the curtain close as an "accordion", so as to form a series of loops on the face of the curtain opposite to the strips.

[0004] These loops of the curtain that accumulate on one side of it cause the overall thickness of the curtain to increase, such increasing being greater the more the curtain rises upwards, and entailing the fact that the width of the guide grooves of the side uprights of the portal structure, at least at the portion of the uprights adjacent to the cross member, is substantially greater than that of the curtain in the extended condition, so that it can contain the various loops in the fully raised condition of the curtain.

[0005] Usually, the width of the grooves of the uprights of the fastening devices of the "fold up" type is constant between the upper end, adjacent to the cross member of the portal structure, and the lower end, and they have therefore a rectangular shape the width of which corresponds at least to the thickness of the curtain with the relevant loops in its completely raised configuration.

[0006] Because of this, when the curtain is in the lowered configuration, there is a fairly wide clearance between the lower part of the curtain and the gap defined by each guide groove of the uprights, whereby the lower portion of the curtain can move transversely with respect to the grooves, for example owing to the different pressure existing in the upstream and downstream environments with respect to the curtain, and/or owing to the wind, and oscillate within the gap defined by the grooves, which could lead, over time, to undesirable wear of the curtain edges, as well as to a little effective lateral air tightness.

[0007] The main object of the present invention is to solve the aforementioned drawbacks of the known quick closing "fold up" devices.

[0008] This object is achieved by virtue of the features mentioned in the appended claims.

[0009] In particular, the groove of each upright has a substantially V-shaped bottom wall, the vertex of which constitutes a rectilinear seat for the sliding movement of the opposite ends of the transverse stiffening members associated with the curtain.

[0010] In this manner, since the opposite ends of the transverse stiffening members of the curtain are constrained to move along the rectilinear seats consisting of the vertices of the bottom walls of the uprights of the portal structure, the curtain extends on a fixed vertical plane passing through the parallel lines of the vertices of the two uprights of the structure. Hence, oscillations of the curtain in its unfolded configuration, are avoided with respect to the grooves of the uprights of the portal structure, and therefore integrity of the side edges of the curtain is preserved.

[0011] According to a preferred feature of the invention, the shape of the groove of each upright is progressively tapered downwards, so that the width thereof grows towards said cross member for connecting the uprights.

[0012] In this manner, the clearance between the curtain and the parts of the uprights delimiting the transverse gap defined by them is substantially reduced or canceled, so as to avoid any transverse movement of the curtain with respect to the grooves of the uprights, and to further reduce a possible deterioration of the side edges of the curtain. Moreover, the advantage is obtained that the uprights, in their base portion close to the ground, have a narrow section, by virtue of which a space wider than that existing in the portal structures provided with traditional uprights is available near the ground, for the operation of machines and people.

[0013] According to another preferred feature of the invention, the uprights are made in a single piece of metal sheet folded so as to form said substantially V-shaped bottom wall, as well as a pair of containment side walls for holding the opposite side edges of the curtain and the opposite ends of the transverse stiffening members.

[0014] By virtue of this feature, the uprights of the portal structure can be made in a simple manner by a single piece of metal sheet intended to be folded and, in the case their shape is tapered, with the width of the groove increasing towards the top of the uprights, less sheet metal needs to be used than that required by their most common shape having a constant cross-section with a rectangular groove, whereby manufacturing costs of the uprights can be reduced, as well as those of the whole closing device.

[0015] According to yet another preferred feature of

the invention, a linear brush sealing member is fastened to at least one containment side wall of each upright, which member faces the curtain and is directed transversely to the general plane of the curtain.

[0016] The linear brush sealing members fastened to the edges of the uprights of the portal structure, allow a possible clearance between the sheet and the grooves of the uprights of the portal structure to be further reduced, as well as passing of air between the upstream and downstream environments with respect to the curtain to be considerably limited, helping to make the closure device of the invention substantially airtight in the lowered configuration of the curtain.

[0017] According to yet another preferred feature of the invention, the width of the curtain is greater than the length of said transverse stiffening members, so that the curtain has, at the opposite side edges thereof, respective flexible flaps projecting beyond the ends of the transverse stiffening members, which flaps engage the vertex of the substantially V-shaped bottom wall of the groove of the respective upright.

[0018] By virtue of this feature, air tightness between the side edges of the curtain and the uprights is further improved.

[0019] Further characteristics and advantages of the invention will be more clear from the following detailed description, given as a non-limiting example and referred to the appended drawings in which:

Figure 1 is a schematic perspective view of a quick closing fold up device according to the invention, in which the relevant curtain is in its fully lowered configuration,

Figure 2 is a view similar to Figure 1, with the curtain in its fully raised configuration,

Figure 3 is a front elevational view of one of the uprights of the portal structure of the device of the invention, from the side of arrow III of Figure 2,

Figure 4 is a view similar to Figure 3, with the curtain in the same configuration as of Figure 1,

Figure 5 is an enlarged top elevational view sectioned along line V-V of Figure 4, and

Figure 6 is an elevational view of a metal sheet, in its flat configuration, which is used to make a tapered upright of the portal structure of the device of the invention, compared with a metal sheet that can be used to make a similar upright having a constant cross-section, provided with a rectangular groove.

[0020] With reference to the drawings, a quick fold up closure device according to the invention, indicated 10 as a whole, comprises a stationary portal structure 12 that delimits an opening 14 of a wall of a building. The structure 12 includes a pair of vertical uprights 16, parallel to each other, and an upper cross member 18 for connecting the uprights 16. Moreover, the opening 14 is delimited below by a transverse plane, usually consisting of the ground.

[0021] A closing member 20 slidably mounted in the vertical direction is associated with the portal structure 12, which is made of a flexible curtain of plastic material, usually PVC, polyethylene or polyurethane, or of a textile material made waterproof, having the horizontal upper edge fixed with respect to the upper cross member 18 or close to it. The curtain 20 is movable between a lowered (Figures 1 and 4) or raised (Figures 2 and 3) configuration, in which it closes or opens, respectively, the opening 14, or vice-versa.

[0022] In particular, the curtain 20 comprises a series of panels 22 fixed to each other along the respective horizontal edges, transverse stiffening members usually consisting of substantially rigid bars 24 being provided, in a manner known per se, at the connection between pairs of adjacent panels 22.

[0023] A series of vertical strips or belts 26 is associated with the curtain 20, which extend along one of its faces. In particular, the upper end of each strip 26 is fixed to a motorized shaft 28 rotatably mounted about its own axis, which is arranged parallel to the cross member 18 and in a position close to such cross member, while the lower end of each strip 26 is fixed to the curtain 20 in the vicinity of its lowermost bar (indicated 24a), for example at the lower horizontal edge of the lowermost panel 22 of the curtain 20.

[0024] Moreover, each strip 26 passes through a series of eyelets usually formed by belt loops 30 that are fixed at the connecting zone between pairs of adjacent panels 22.

[0025] In this manner, when the curtain 20 is in its lowered configuration, driving the motor (not shown) that controls the rotation of the shaft 28, causes the strips 26 to wind around the shaft 28, in order to apply a tension to the strips 26 such as to cause rising of the curtain 20. As a result of this raising, a series of loops 22a (figure 3) are formed on the side of the curtain 20 opposite to the strips 26, which loops fold one on the other as an "accordion", thus causing the overall thickness of the curtain 20 received in the uprights 16 to be increased.

[0026] Each side edge of the curtain 20, as well as the respective ends of the various bars 24, engage a groove 32 of each upright 16, in order to hold transversely the side edges of the curtain 20 and the ends of the bars 24 with respect to the portal structure 12. In particular, the groove 32 of each upright 16 is delimited by a bottom wall 34 and by a pair of side containment walls 36 that, at least in their portion adjacent to the cross member 18, are spaced of a width such as to allow all the loops 22a that are formed in the curtain 20 to be collected, as the latter moves towards its fully raised configuration. In the most general case, the side containment walls 36 may be parallel, so that the groove 32 has a rectangular shape.

[0027] According to the invention, the bottom wall 34 of the groove 32 of each upright 16 is substantially V-shaped, and its vertex 38 constitutes a rectilinear guide seat for guiding the sliding of the respective ends of the

stiffening bars 24.

[0028] Conveniently, each upright 16 consists of a single piece of metal sheet (indicated 15 in Figure 6) which is folded, starting from its flat and extended shape, so as to form the aforesaid bottom wall 34 and the pair of side containment walls 36, as well as end edges 36a of the latter. In particular, the vertex of the bottom wall 34 is formed by a central rectilinear fold 38 of the bottom wall 34.

[0029] Preferably, the groove 32 of each upright 16 has a shape progressively tapered downwards, i.e. towards the transverse plane delimiting the opening 14 below, so that the width of the groove 32 of the uprights 16 grows towards the upper cross member 18, in order to allow all the loops 22a that are formed progressively as a result of raising the curtain 20, to be accommodated with a reduced clearance. In this case, the side containment walls 36 are inclined in order to diverge from their lower end close to the ground, so that the groove 32 has a tapered shape.

[0030] To guarantee an air tightness between the upstream and downstream environments with respect to the curtain 20, linear brush sealing members 40 are applied to at least one of the end edges 36a of the containment walls 36 of each upright 16, which are directed transversely to the general plane of the curtain 20 so as to face the curtain 20. Preferably, both the edges 36a of each upright 16 have a respective brush sealing member 40.

[0031] Moreover, in order to improve air sealing effectiveness along the side edges of the curtain 20, so as to effectively insulate the environments located on the opposite sides of the curtain 20 when the latter is in its fully lowered configuration, the width of the curtain 20 is slightly greater than the bars 24. In this manner, end side flaps 20a of the curtain 20 project beyond the ends of the bars 24, which flaps extend to the inside of the apex 38 of the bottom wall 34 of the grooves 32, and slidably engage it. These flaps 20a, which are as flexible as the curtain 20, constitute in practice lip seals interposed between the curtain 20, or the ends of the bars 24, and the sliding seat defined by the vertex 38 of the bottom wall 34 of the grooves 32.

[0032] The tapered shape of the grooves 32 of the uprights 16 allows to obtain, in addition to a better stability and planarity of the curtain 20 in its lowered configuration, and to a smaller overall dimensions of the base portions of the uprights 16, also a reduction of the manufacturing costs of the uprights 16, because it requires the use of less sheet material with respect to that having a traditional rectangular slot. This fact is highlighted in figure 6 of the drawings, where the flat and unfolded shapes of the surface of a metal sheet 15a (dotted lines) that can be used for manufacturing a rectangular groove, and of the surface of a metal sheet 15 (solid lines) of a sheet used to form a tapered groove 32, are compared.

[0033] In operation of the device of the invention, starting from the lowered configuration of the curtain 20, driving in rotating the shaft 28 causes the strips 26 to be wound on it and the resulting raising of the lower edge of the curtain 20, while the stiffening bars 24 are gathered since they approach one to the other. Owing to the fact that the strips 26 engage the belt loops 30 fixed to the curtain 20, a series of loops 22a are formed in the curtain 20 on its side opposite to the strips 26, which are collected one on the other in an "accordion" configuration, progressively increasing the thickness of the curtain 20 to be received in the grooves 32 of the uprights 16. The vertex 38 of the V-shaped bottom wall 34 of the groove 32 of each upright 16, is substantially engaged by the respective end of each bar 24 of the curtain, whereby such vertex constitutes a rectilinear vertical guide seat for guiding these ends. By virtue of these vertical guides, the curtain 20 is kept in a flat configuration both during its raising and in its completely lowered and extended configuration, so that transversal movements of the curtain 20 with respect to the uprights 16 are avoided.

[0034] If the uprights 16 have a downward tapered shape, the curtain 20 is kept in its flat configuration in an even more effective manner.

[0035] Once the fully raised configuration of the curtain 20 has been reached, an inverse rotation of the shaft 28 causes the strips 26 to unwind and, by gravity, the various bars 24 to move away one to the other and the curtain 20 and the loops 22a to spread out, until the lower end of the curtain 20 reaches the contact with the transverse plane delimiting the opening 14 below.

[0036] In this fully lowered and extended condition of the curtain 20, the linear brush sealing members 40 applied to the edges 36a of the containment walls 36 of the uprights 16, and/or the side flaps 20a of the curtain that engage the inner cavity formed by the vertex 38 of the base wall 34 of the uprights 16, allow an optimal seal to be assured against the passage of air between the upstream and downstream environments with respect to the curtain 20, and therefore an insulation between such environments to be provided.

Claims

1. Quick closing fold up device comprising a flexible curtain (20) vertically movable between a lowered configuration and a raised configuration, or vice-versa, with respect to a portal structure (12) that includes a pair of parallel uprights (16) and an upper cross member (18) for connecting said uprights (16), which uprights (16) define respective grooves (32) for the engagement of the opposite side edges of the curtain (20) and of the opposite ends of transverse stiffening members (24) associated with the curtain (20), and have, in their portion adjacent to the upper cross member (18), a width such as to allow a series of loops (22a) of the curtain (20) to be received, which loops are formed as a result of sliding the curtain (20) towards its raised configuration,

characterized in that the groove (32) of each upright (16) has a substantially V-shaped bottom wall (34), the vertex (38) of which constitutes a rectilinear seat for the sliding movement of the opposite ends of said transverse stiffening members (24).

2. Device according to claim 1, **characterized in that** the shape of the groove (32) of each upright (16) is progressively tapered downwards, so that the width thereof grows towards said cross member (18) for connecting the uprights (16).

3. Device according to claim 1 or 2, **characterized in that** said uprights (16) are made in a single piece of metal sheet (15) folded so as to form said substantially V-shaped bottom wall (34), as well as a pair of containment side walls (36) for holding the opposite side edges of the curtain (20) and the opposite ends of the transverse stiffening members (24).

4. Device according to claim 3, **characterized in that** the vertex (38) of the substantially V-shaped bottom wall (34) of the groove (32) of each upright (16) is formed by a rectilinear central fold of said bottom wall (34) .

5. Device according to any one of Claims 1 to 4, **characterized in that** a linear brush sealing member (40) is fastened to at least one containment side wall (36) of each upright (16), which member faces the curtain and is directed transversely to the general plane of the curtain (20).

6. Device according to any one of Claims 1 to 5, **characterized in that** the width of the curtain (20) is greater than the length of said transverse stiffening members (24), so that the curtain has, at the opposite side edges thereof, respective flexible flaps (20a) projecting beyond the ends of the transverse stiffening members (24), which flaps (20a) engage the vertex (38) of the substantially V-shaped bottom wall (34) of the groove (32) of the respective upright (16).

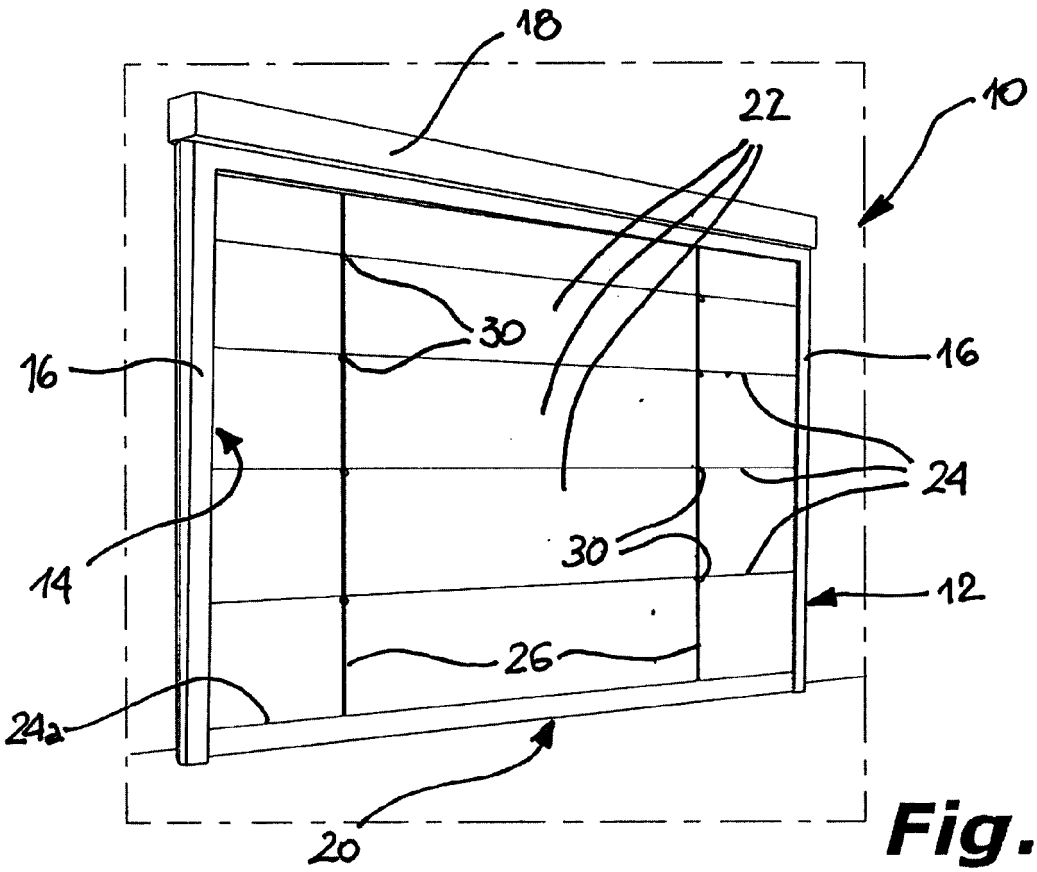
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Fig. 1

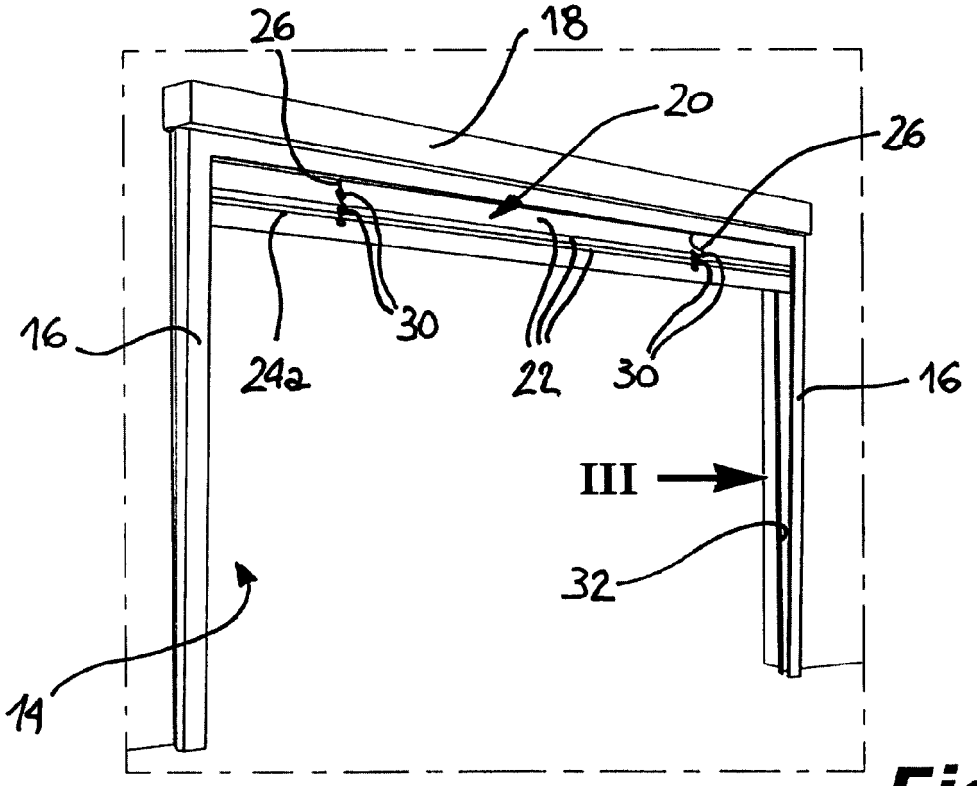
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Fig. 2

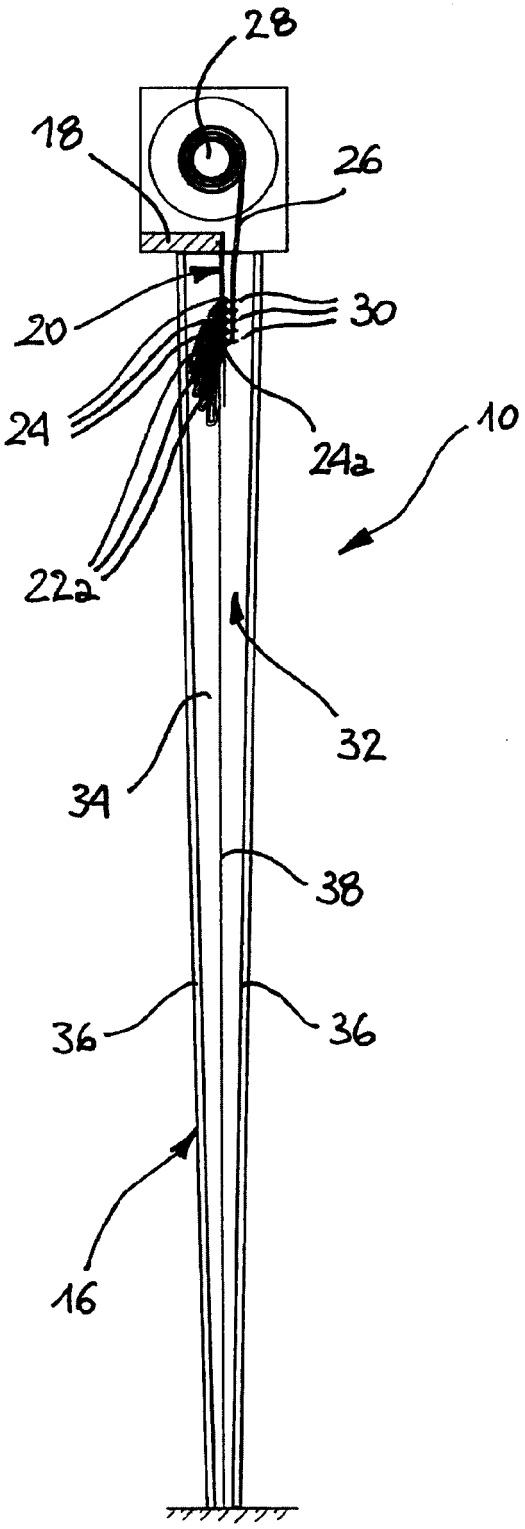
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Fig. 3

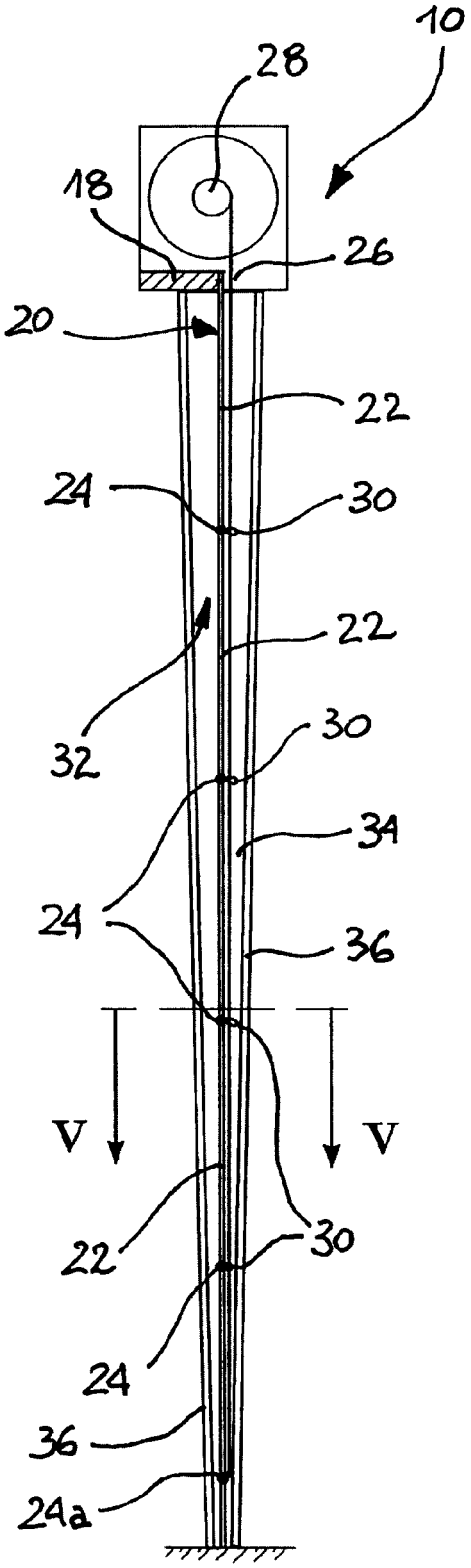
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Fig. 4

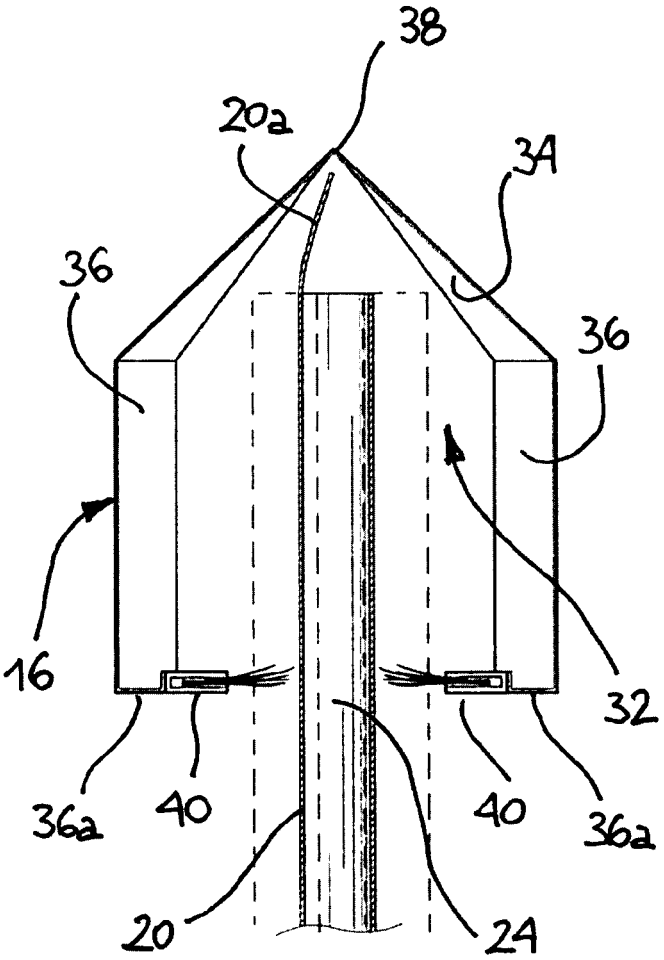

Fig. 5

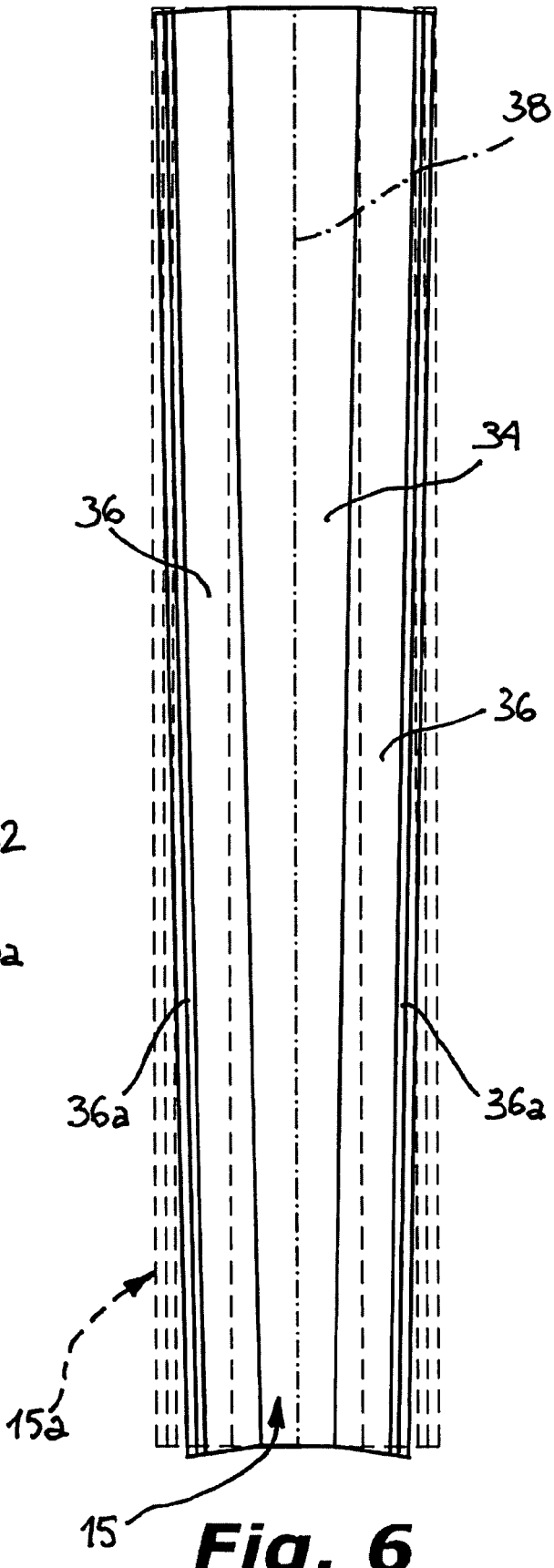

Fig. 6

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EUROPEAN SEARCH REPORT

Application Number
EP 18 00 0624

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
A	FR 2 785 639 A1 (SIMON BERNARD [FR]) 12 May 2000 (2000-05-12) * abstract * * page 5, line 13 - line 15; figures 1-4 * -----	1-6	INV. E06B9/06 E06B9/58

TECHNICAL FIELDS SEARCHED (IPC)

E06B

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	18 October 2018	Koulo, Anicet

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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18-10-2018

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
FR 2785639 A1	12-05-2000	NONE	

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