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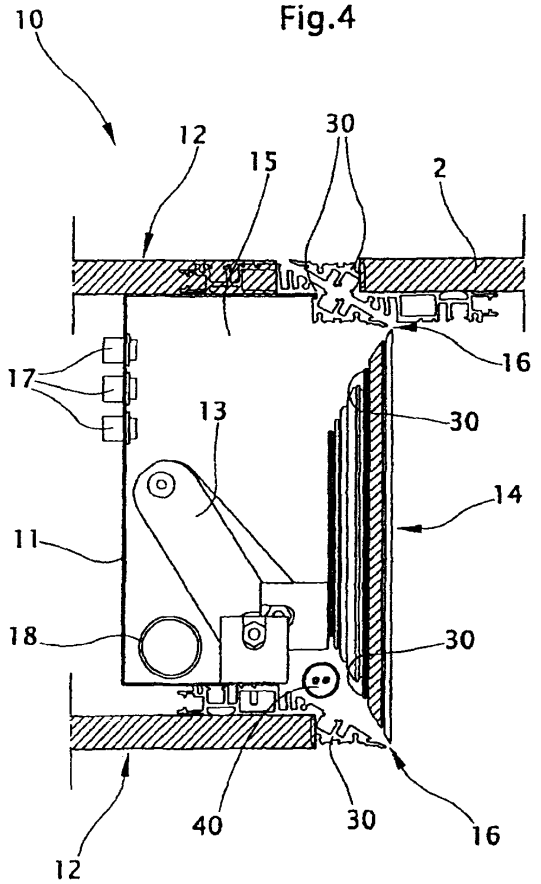
(54) Door frame arrangement

(57) Described is a door frame arrangement comprising at least one structural element (10, 20) equipped with at least one profiled element (14, 25, 26, 28) adapted to form at least part of a corner of the frame (1), at least one of the profiled elements (14, 25, 26, 28) defining, in conjunction with at least part of the frame (1), that is to say, with at least one structural element (10, 20), a gap (16) in a compartment (15, 29; 19) designed to house wave emitting means (13, 17, 18, 40).

Fig.4



EP 1 717 400 A2

Description

[0001] This invention relates to a door frame arrangement especially designed to be equipped with lighting units. The arrangement according to the invention is especially suitable for use in conjunction with a plasterboard element or wall constituting a jamb to which a door of any kind, however installed or operated, may be hinged, or constituting the door itself.

[0002] A typical problem, when installing doors on plasterboard walls, is that of making the rabbets in such a way that the doors will operate in the optimum manner. Indeed, during installation, it is difficult to finish plasterboard walls effectively to obtain the dimensional tolerances that will guarantee precise door operation, for example by providing a rabbet that is aligned and in the same plane as the surfaces concerned in such a way as to achieve a satisfactory closure.

[0003] Solutions to this problem are described in Italian patent application VI 2003-A-0000100 and San Marino patent application SM-A-200300016, which propose metal profile sections mounted near the edges of the plasterboard walls to create appropriate door rabbets. In other words, the profile sections define the end edges of walls, ceilings and doorways, that is to say, they are used to finish the architectural structures that delimit one room from another. The profile sections guarantee accurate dimensional tolerances without requiring specialised personnel for installation.

[0004] This invention focuses on door frames and proposes not only to solve the above mentioned problem connected with the use of plasterboard walls but also goes much further. In fact it proposes a solution applicable to any type of wall, constituting an architectural structure that includes at least one doorway, rather than to the door itself, and where the frame arrangement around the doorway can be fitted with functional elements for performing specific functions in the room where the frame arrangement is installed, in particular lighting means or units for illuminating the door or the room as a whole.

[0005] It is an aim of this invention to overcome the drawback of prior art, that is to say, the difficulty of obtaining good dimensional tolerances for the installation of door frames at the visible edges of plasterboard panels around doorways without requiring highly skilled personnel for installation, and to achieve this in a practical and inexpensive manner.

[0006] Another aim of the invention is to extend the use of door frames to include multiple functions enabling the door frames to be better integrated in the rooms where they are installed.

[0007] It is a further aim of this invention to provide a door frame which does not require additional masonry work to install electrical cables and/or to pass the cables through the walls adjacent to the frame.

[0008] Yet another aim of the invention is to achieve the above aims in a simple, practical and cost-effective manner.

[0009] To achieve the above mentioned aims, the invention provides a door frame arrangement and an element typical of the frame arrangement having the characteristics defined in the appended claims.

[0010] Further aims, characteristics and advantages of the invention will become more apparent from the following detailed description of preferred, non-restricting embodiments of it with reference to the accompanying drawings, in which:

- Figure 1 is a perspective view from above of a complete door structure including a frame arrangement according to this invention, with the parts at the top cut away transversally, and associated with plasterboard walls;
- Figures 2 and 3 are cross sections from above showing the arrangement of Figure 1 in two different operating configurations;
- Figures 4 and 5 are cross sections from above showing two details of the arrangement of Figures 1 to 3;
- Figure 6 is a schematic perspective view from above of another embodiment of a door frame arrangement according to this invention;
- Figure 7 is a plan view from above of the door frame of Figure 6;
- Figure 8 is a schematic and partly exploded perspective view of a detail of a door frame arrangement according to this invention.

[0011] With reference to Figure 1, the numeral 1 denotes in its entirety a door frame arrangement supporting a side-hung door 2 pivoted at the top and bottom of one side of it to a right-hand jamb 20, the fastening means being of known type and therefore not illustrated or described in detail. The frame 1 has a left jamb and a right jamb, labelled 10 and 20 as a whole. In particular, the right jamb 20 is cut along a transversal plane to delimit the top edge of the door 2, that is to say, at the pivoting elements between the door 2 and the right jamb 20, in order to better illustrate its internal structure. The structure of the frame arrangement 1 is illustrated in more detail in Figures 2 and 3, as well as in the cross section details of the left jamb 10 in Figure 4 and of the right jamb 20 in Figure 5.

[0012] The left jamb 10 consists of a first casing 11 having the shape of an open box or C, with the opening facing the right jamb 20 and attached in known manner to the floor 3. Rigidly attached to the short sides of the first casing 11 there are two parallel walls, typically of plasterboard, labelled 12 in their entirety, and ending with special profile sections labelled 30 in this specification.

[0013] The profile sections 30 are metal profile sections of a type described and claimed in patent application SM-A-200300016, the disclosure of which is incorporated herein by reference and which is filed in the name of the same Applicant as this invention. More specifically, the profile section 30 used is a metal profile section for finishing panels and the like, especially those of plaster-

board, comprising two substantially orthogonal walls designed to abut against two respective end surfaces of a panel, from which there extends a plurality of protrusions which, in their entirety, excluding the spaces between them, define two planes inclined at an angle to each other, one end edge of the profile section extending from one of the two walls in such a way as to lie, in use, on the extension of a visible panel surface against which the metal profile section abuts. Another feature of the metal profile section 30 is that the spaces between the protrusions are made in such a way as to accommodate accessory elements and the means for fastening such elements to the profile section.

[0014] With reference in particular to Figures 4 and 2, one profile section 30 is mounted on the edge of the wall 12 proximal to the door 2 in such a way as to form a stop for an inclined conjugate surface of another profile section 30 mounted on the free edge of the door 2, the respective inclined surfaces facing each other. Another profile section 30 is mounted on the edge of the wall 12 distal to the door 2 but in a manner different from the that described above and, in particular, as illustrated and described with reference to Figures 2 and 3 of patent application SM-A-200300016. In this configuration, the profile section 30 may act, instead of fastening means associated with the first casing 11, as a supporting element for one or more operating arms 13 aligned substantially vertically along the height of the frame 1.

[0015] These one or more operating arms 13 fasten to their free ends a first panel 14 substantially configured and shaped in such a way as to occupy the open side of the first casing 11, thus defining a compartment 15 inside the left jamb 10 and hence inside the frame arrangement 1. The shape of the first panel 14 is such as to facilitate the propagation of waves emitted by a wave source 40 located inside the compartment 15; for example with a substantially trapezoidal cross section consisting preferably of a main panel, in particular of plasterboard, having at its transversal ends, two profile sections 30 extending for the full height of the panel 14, with stop seals, if necessary. Externally, the panel 14 has a substantially flat configuration and may have any shape functionally required to achieve the technical effect connected with the presence of the source 40.

[0016] The first panel 14, in a first operating configuration illustrated in Figures 2 and 4, engages the open side of the first casing 11 and leaves a gap 16 giving access to the compartment 15; the gap 16 thus extends along the full height of the first panel 14 and, hence, of the frame 1, and is defined by the corner edges of the profile sections 30. More specifically, the profile sections 30 are positioned with their respective inclined surfaces facing the inside of the compartment 15 converging in the vicinity of the gap 16, in such manner as to facilitate outward propagation of the waves emitted by the source 40, which is preferably mounted and suitably oriented close to the gap 16.

[0017] The source 40 is, for example and without limiting the scope of the invention, a lighting unit or, more specifically, consists of one or more lamps, whether fluorescent or other, mounted and arranged inside the compartment 15 in such a way that the light is emitted towards the gap 16 along all or part of the height of the frame 1. Besides the source 40, the first casing 11 also houses other functional elements for the frame 1, such as switches 17 and a conduit 18 to accommodate electrical cables. In the preferred, non-restricting embodiment of the invention, the source 40, the switches 17 and the conduit 18 constitute lighting means, since the conduit 18 houses the cables for the switches 17 which in turn control the lighting unit 40. However, the conduit 18 might house cables and connections that need to pass through the frame 1, irrespective of the type of functional elements located in it.

[0018] In a second operating configuration of the frame arrangement 1 illustrated in Figure 3, the first panel 14 is shown in the detached position, away from the compartment 15, and, in particular, with its outside surface in line with the surface of the wall 12 distal to the door 2. This position is adopted thanks to the operating arm 13 acting in conjunction with a set of linkages which, for simplicity, are not described in detail, in such a way as to enable the first panel 14 to be actuated, in particular by a rotational movement, so as to open the compartment 15. Alternatively, the operating arm 13 might perform a translational or roto-translational movement, again for the purpose of freeing the open side of the first casing 11 and aligning or superposing the wall and panel surfaces.

[0019] Advantageously, this solution gives access to the interior of the compartment 15, for example by manually moving the first panel 14 using a handle attached to it, in order to inspect it or to mount in the frame arrangement 1 a plurality of functional elements such as the wave emitting means or sources 40.

[0020] The structure of the right jamb 20, on the other hand, similar to that of the left jamb 10, is illustrated in its preferred form in Figures 2 and 5, the door 2 being pivoted at the top and bottom of one side of it in known manner. The right jamb 20 forms a second and a third casing, the one proximal to the door 2 being labelled 21 and the one distal to it, being labelled 22, both casings having the shape of an open box, with the open sides facing the left jamb 10. The casings 21 and 22 are positioned relative to each other in such a way as to form a profile section with the shape of an upturned L, where the horizontal, parallel sides are rigidly attached to a second pair of walls, the wall connected to the second casing 21 being labelled 23 and the wall connected to the third casing 22 being labelled 24. The second casing 21 comprises a pair of substantially flat panels, namely, a second panel 25 and a third panel 26 that are rigidly attached to each other to form an upturned L, are adapted to close the open side of the casing 21 and are attached to the latter by means of an articulated joint 27 which connects the pair of panels 25, 26 to the upper wall of the second

casing 21, or to the proximal wall 23. In the assembled configuration, the pair of panels 25 and 26 has a profile section 30 fitted along each of its two ends in the same way as that described above with reference to the wall 12 of the left jamb 10 distal to the door 2. The proximal wall 23 is joined to the top of the second casing 21 and the distal wall 24 to the bottom of the third casing 22, in exactly the same way as described above with reference to the left jamb 10.

[0021] The open side of the third casing 22, which has the shape of a reverse C, is closed by a fourth panel 28 that is practically identical to the first panel 14 and, in particular, has profile sections 30 on the ends of it. The panel 28 is either attached to the third casing by another articulated joint in exactly the same way as the first panel 14, or is rigidly attached to the top and bottom of the frame 1, the fastenings not being illustrated for simplicity of illustration. These fastenings nevertheless enable the fourth panel 28 to form, with its profile sections 30 fitted on its edges and combining with the respective profile sections 30 fitted on the edges of the distal wall 24 and of the third panel 26, gaps 16 that communicate with a second compartment 29 in the third casing 22. The second compartment 29 houses a pair of sources 40 positioned, like the one described above with reference to the first casing 11, close to the respective gaps 16. The second casing 21 has the same structure, with a gap 16 formed by the profile sections 30 mounted on the edges of the proximal wall 23 and of the second panel 25, and having a source 40 positioned near it.

[0022] Figure 5 shows how the two casings 21 and 22 are fastened to each other by an arm 27A forming part of the articulated joint 27. It may also be noticed that other switches 17 may be mounted on the outside of the fourth panel 28.

[0023] From the above description, it is clear that in this specific, non-limiting embodiment, illustrated in Figures 1 to 5, only the first panel 14 and the fourth panel 28 can be moved in order to gain access to and inspect the first compartment 15 and the second compartment 29, respectively. It is thus possible to vary the size of the gaps 16 at these panels to some extent, advantageously making it possible to adjust door 2 illumination to create a desired dark and light effect and to illuminate the room where the door is installed to a required extent.

[0024] Advantageously, the frame arrangement according to the invention is multifunctional in that, besides optimally fulfilling the conventional function of enabling the door to be easily opened and closed, it can also be used for other purposes such as lighting and/or housing additional elements functional to the room where the frame arrangement is installed, such as panel movement arms, switches and cable conduits.

[0025] It also makes the inside of the structure accessible, permitting all the functional elements of the frame arrangement itself, such as light and sound sources, switches, cable conduits and the like, to be easily integrated and used. Further, these functional elements, in particular the electrical cables and switches can be conveniently protected by conduits, sheaths or other coverings to give the frame according to the invention a good overall finish.

[0026] No grooves need to be cut in the masonry to install electrical cables and/or to pass the cables through the walls adjacent to the frame, since the cables can be safely housed in the compartments inside the frame according to the invention from where they can be led wherever they are needed and where they can be easily inspected.

[0027] Using the profile sections based on the teachings of San Marino patent application SM-A-200300016 means that all the panels and walls can be inexpensively made of plasterboard, creating a practical and functional frame arrangement with good dimensional tolerances.

[0028] The use of these profile sections also permits a high degree of precision in fitting the operating arms or other fastening means, as explained in the cited document, to create a high quality end result.

[0029] Figure 6 shows a perspective view from above of a second embodiment of a door frame arrangement, once again denoted in its entirety by the numeral 1, and Figure 7 shows a plan view of this embodiment. In this embodiment, the arrangement 1 constitutes the door 2 itself, which may be associated with a jamb like the one of Figures 1 to 5. The door 2 consists, for example, of a central load-bearing element or frame which, for simplicity is not illustrated, and which is associated with a pair of plasterboard walls 12 ending with profile sections 30 of the type described above, one forming a structure that is substantially C-shaped when viewed from above, while the other is exactly the same as the first panel 14 shown in Figure 1; in other words, the known profile sections 30 of the first wall 12 are mounted at right angles in such a way that their inclined surfaces form a tapered guide at the open side of the C, while the profile sections of the second wall 12 are mounted in such a way as to form a smooth outside surface. The profile sections 30 are metal profile sections of a type described and claimed in patent application SM-A-200300016 filed in the name of the same Applicant as this invention, as in the embodiment described above, and the central load-bearing element or frame of the door is associated with the profile sections according to one of the teachings of that application.

[0030] In the assembled condition and as shown in particular in Figure 7, the two panels 12 form a large central compartment 19, that is box-shaped and substantially closed, and a pair of gaps 16 providing access to the central compartment 19 in the same way as described with reference to the second compartment 29 illustrated in particular in Figure 5. In this case, too, there are sources 40, in particular light sources, positioned near the gaps 16 in such a way that the waves emitted by them are directed at the gaps 16.

[0031] The same technical concepts, features and advantages described above with reference to the first embodiment of the invention illustrated in Figures 1 to 5 also

apply to the second embodiment. It will be understood that the invention can be modified and adapted in several different ways without departing from the spirit of the invention. Moreover, the technical details of the different embodiments can be substituted by technically equivalent elements.

[0032] For example, the door associated with the frame arrangement according to the invention may be of any type, that is to say, not only side-hung, as illustrated, but also of the folding, revolving or sliding type, since the frame arrangement according to the invention can be associated with customary fastening means used for doors of this type. Similarly, based on the same principles, the invention can be applied to insert doors or openings within a single doorway.

[0033] Figure 8 shows a hinge, labelled 50 as a whole, designed to be associated, in fixed or mobile manner, to the inclined surfaces of the profile sections 30 through a first body 51 and a second body 52. More specifically, the bodies 51 and 52 have the shape of a prism having inclined surfaces which, in the working position of Figure 7, face the inclined surfaces of the profile section 30 to which they are fastened by screws in customary manner. The hinge 50 is characterised by a hollow cylindrical articulation element, labelled 54, which fits into matching holes, also cylindrical, made in the bodies 51 and 52, in such manner as to allow the bodies 51 and 52 to rotate relative to each other about an axis parallel to the shared axes of the cylinders. The hollow cylindrical element 54 comes internally into contact with surfaces of the respective cavities 55 and 56 which, on one side, communicate with one end of the cylindrical element 54 and, on the other, with the internal portions of the compartments delimited by the walls to which the hinges are applied. Wiring, labelled 60, can thus be fed into the hinge 50 through the first cavity 55, the cylindrical element 54 and the second cavity 56, without interfering with the movement of the respective panels with the profile sections 30.

[0034] A hinge of this kind advantageously permits better and more practical use to be made of the compartments within the profile sections since it allows wiring to be passed through without leaving it dangerously exposed or hanging loosely inside the compartments.

[0035] The lighting units may consist of any arrangement of lamps, spotlights or luminaires in any way capable of emitting a beam of light in the direction of the gaps in the frame arrangement according to the invention.

[0036] The casings, too, can be substituted by technically equivalent elements such as box-shaped or mesh structures of metal or other materials capable of performing a load-bearing function within the jambs.

[0037] In a variant of the invention, with reference in particular to Figure 4, the operating arm 13 might be associated with control means designed to move the first panel 14 automatically according to a programmed control unit programmable, for example, by an installer or user. For example, the first panel might be moved automatically according to the extent to which the door is opened. In the same way, the operating arm 13 may follow any law of motion, depending on the mechanism used, or it may be substituted by other actuating means associated with the first panel 14, such as, for example, sliding or telescoping guides.

[0038] Advantageously, these variants of the invention allow the size of the gaps 16 to be varied in a practically continuous manner, offering an extremely wide range of possible embodiments, creating a multiplicity of effects with emitted light or other waves directed in different directions.

[0039] It will also be understood that the profile sections 30 may be modified in shape and geometry, especially by varying the shape and geometry of the inclined surfaces facing the inside of the casings in order to control the emitted waves to suit specific purposes. For the same reason, the inclined surfaces of the profile sections 30 might be coated and/or treated with special materials.

[0040] In other variants of the invention, with reference in particular to Figure 5, the frame arrangement 1 might have the following different configurations:

- the second panel 25 and the third panel 26 mobile independently or as one relative to the second casing 21 by means of a different articulation 27 and suitable fastening means such as, for example, an additional operating arm;
- the entire third casing 22 adjustably fastened relative to the walls 23 and 24 and to the second casing 21, for example, by means of articulation arms fastened to the second casing 21, the second casing 22 having rigidly fastened to it the fourth panel 28 and either the second panel 25 or the third panel 26 or both.

[0041] The above variants, which constitute only some of the possible embodiments of the invention, advantageously enable the size of the gaps to be varied in other ways or other gaps to be created to communicate with the inside of the casings.

[0042] In yet another variant of the invention, with reference to Figures 1 to 5, one of the casings might house other functional elements or wave emitting means, not described, such as sound propagating means, or control units connected to the components mounted inside the frame or door or in the room where the frame is installed.

[0043] It will also be understood that the walls 12 and the panels 14, 25, 26, 28 may be made not only of plasterboard but of any suitable material or self-bearing structure such, as, for example, wood and like materials or composites.

Claims

1. A door frame arrangement comprising at least one structural element (10, 20) equipped with at least one profiled element (14, 25, 26, 28) adapted to form at least part of a corner of the frame (1), **character-**

ised in that at least one of the profiled elements (14, 25, 26, 28) defines, in conjunction with at least part of the frame (1), that is to say, with at least one structural element (10, 20), a gap (16) giving access to a compartment (15, 29; 19) designed to house wave emitting means (13, 17, 18, 40).

2. The arrangement according to claim 1, **characterised in that** at least one of the profiled elements (14, 25, 26, 28) defines the access gap (16) at the corner it forms with another profiled element (14, 25, 26, 28).

3. The arrangement according to claim 1 or 2, **characterised in that** the compartment (15, 29; 19) in the frame (1) is made substantially inside the perimetric structural element (10, 20) of the frame (1) .

4. The arrangement according to any of the foregoing claims from 1 to 3, **characterised in that** the wave emitting means comprise lighting means (13, 17, 18, 40).

5. The arrangement according to claim 4, **characterised in that** the lighting means comprise lighting units (40), in particular one or more fluorescent lamps, designed to light a door (2) associated with the arrangement (1).

6. The arrangement according to any of the foregoing claims from 1 to 5, **characterised in that** the profiled elements comprise panels (14, 25, 26, 28) having a profile section (30) on at least one respective edge.

7. The arrangement according to claim 6, **characterised in that** the profile section is a metal profile section (30) for finishing panels and the like, especially those of plasterboard, comprising two substantially orthogonal walls designed to abut against two respective end surfaces of a panel (2, 12, 14, 23, 24, 25, 26, 28), from which there extends a plurality of protrusions which, in their entirety, excluding the spaces between them, define two planes inclined at an angle to each other, one end edge of the profile section (30) extending from one of the two walls in such a way as to lie, in use, on the extension of a visible surface of the panel (2, 12, 14, 23, 24, 25, 26, 28) against which the metal profile section abuts.

8. The arrangement according to claim 7, **characterised in that** the spaces between the protrusions on the metal profile section (30) are made in such a way as to accommodate accessory elements and the means for fastening such elements to the profile section itself.

9. The arrangement according to any of the foregoing claims from 1 to 8, **characterised in that** it comprises operating means (13) associated with at least one of the profiled elements (14, 25, 26, 28) and with the structural element (10, 20) for moving at least one of the profiled elements (14, 25, 26, 28) relative to the structural element (10, 20).

10. The arrangement according to claim 9, **characterised in that** the operating means comprise an operating arm (13) associated with a panel (14, 28) of the profiled elements (14, 25, 26, 28) and with a casing (11, 22) of the perimetric structural element, the operating arm (13) being designed to move the panel (14, 28), in particular by performing a rotational movement, but also a translational or roto-translational movement, in order to free an open side of the casings (11, 22).

11. The arrangement according to claim 9 or 10, **characterised in that** it comprises control means associated with the operating means (13) for automatically moving the profiled elements (14, 25, 26, 28), especially in such a way as to automatically change the form and/or size of the access gaps (16).

12. The arranegement according to claim 11, **characterised in that** the operating means (13) are designed to vary the size of the access gaps (16) in a practically continuous manner, creating a multiplicity of effects with the light or other waves emitted by the source (40) directed in different directions.

13. A profiled element adapted to form at least part of a corner of the door frame arrangement (1) according to any of the foregoing claims from 1 to 12, having a profile section (30) on at least one respective edge, the profile section (30) being a metal profile section for finishing panels and the like, especially those of plasterboard, comprising two substantially orthogonal walls designed to abut against two respective end surfaces of a panel (2, 12, 14, 23, 24, 25, 26, 28), from which there extends a plurality of protrusions which, in their entirety, excluding the spaces between them, define two planes inclined at an angle to each other, one end edge of the profile section extending from one of the two walls in such a way as to lie, in use, on the extension of a visible surface of the panel (2, 12, 14, 23, 24, 25, 26, 28) against which the metal profile section abuts.

14. The profiled element according to claim 13, **characterised in that** the spaces between the protrusions on the metal profile section (30) are made in such a way as to accommodate accessory elements and the means for fastening such elements to the profile section itself.

15. The profiled element according to claim 13 or 14, **characterised in that** it comprises a panel (14, 25, 26, 28), especially one made of plasterboard, having

a substantially flat outside surface with a substantially trapezoidal cross section.

16. The profiled element according to claim 13 or 14, **characterised in that** it comprises a panel (12), especially one made of plasterboard, having at least one metal profile section (30) mounted at right angles on its edge, in particular in such a way to form a substantially C-shaped configuration when viewed from above.

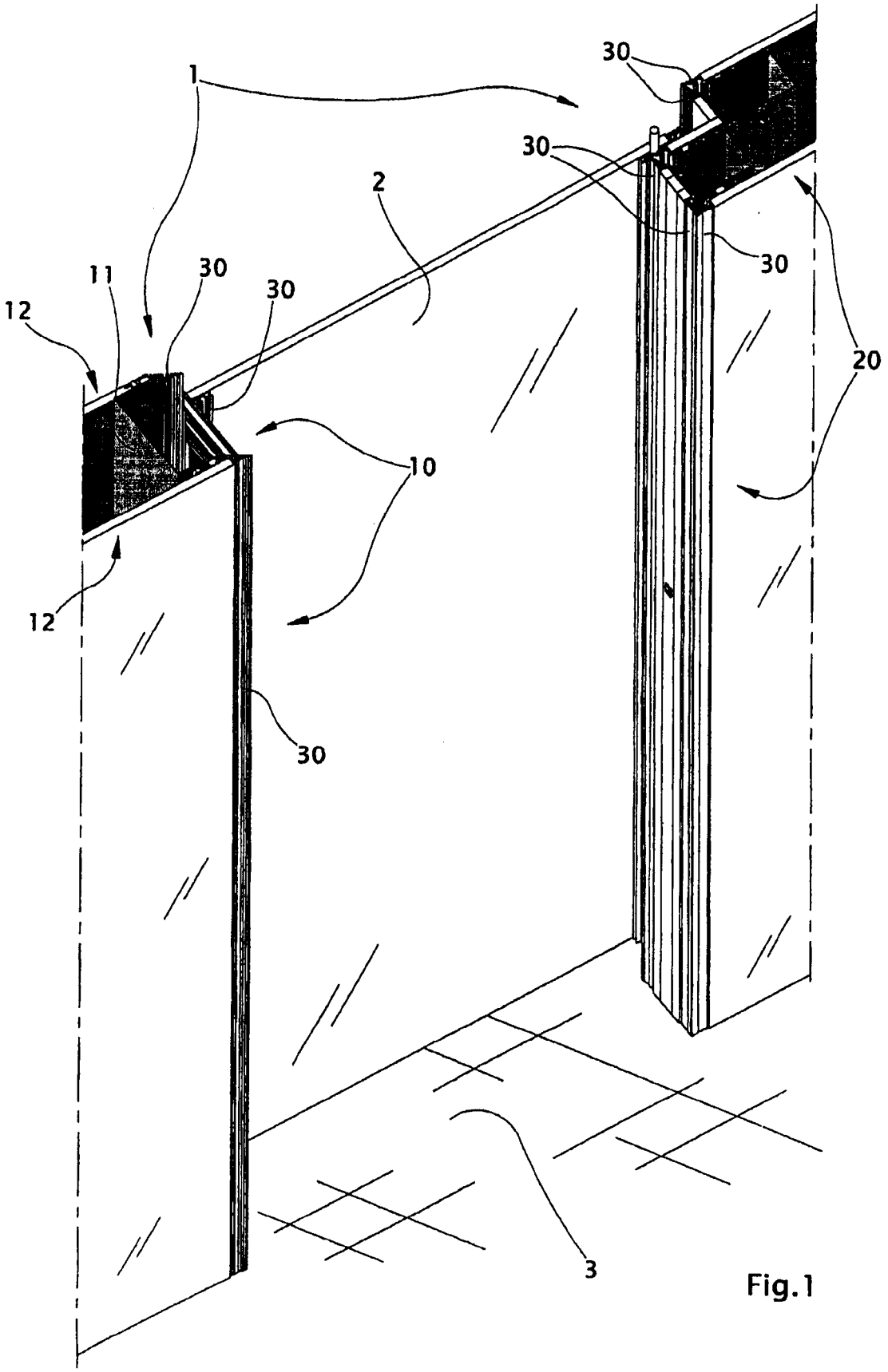


Fig.1

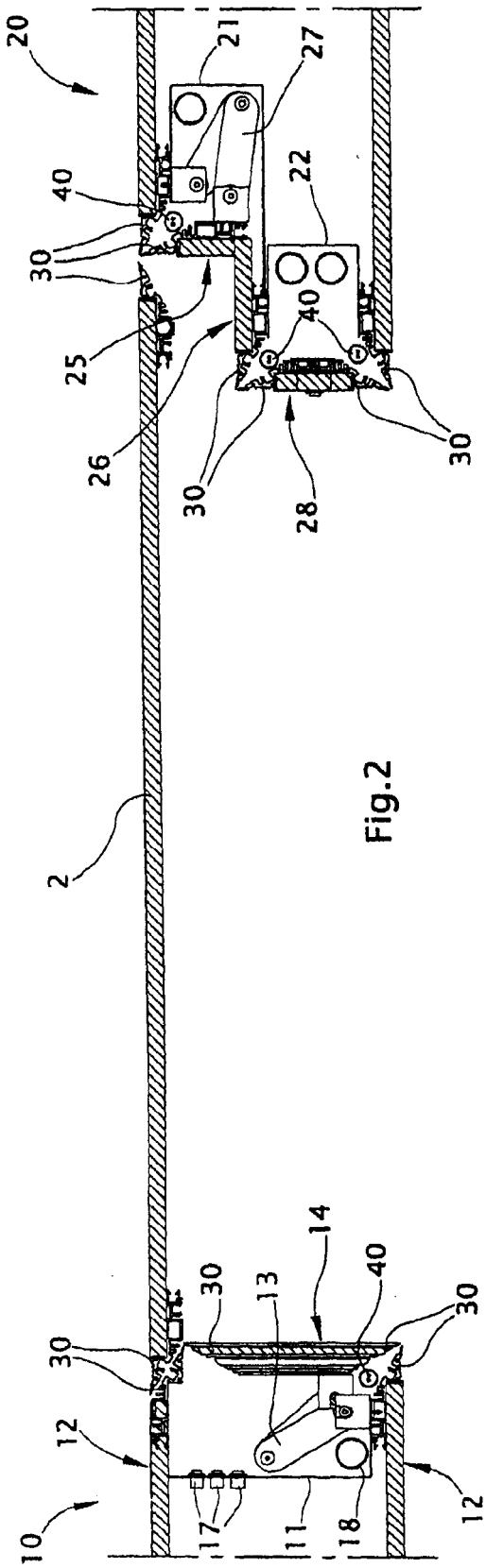

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Fig.2

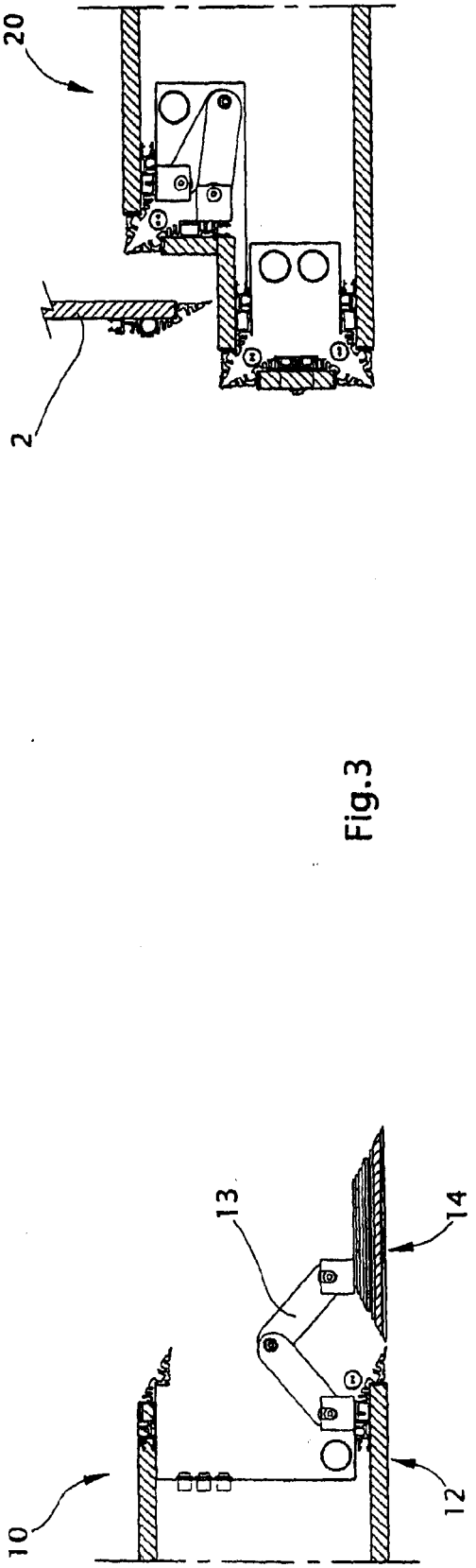
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Fig.3

Fig.5

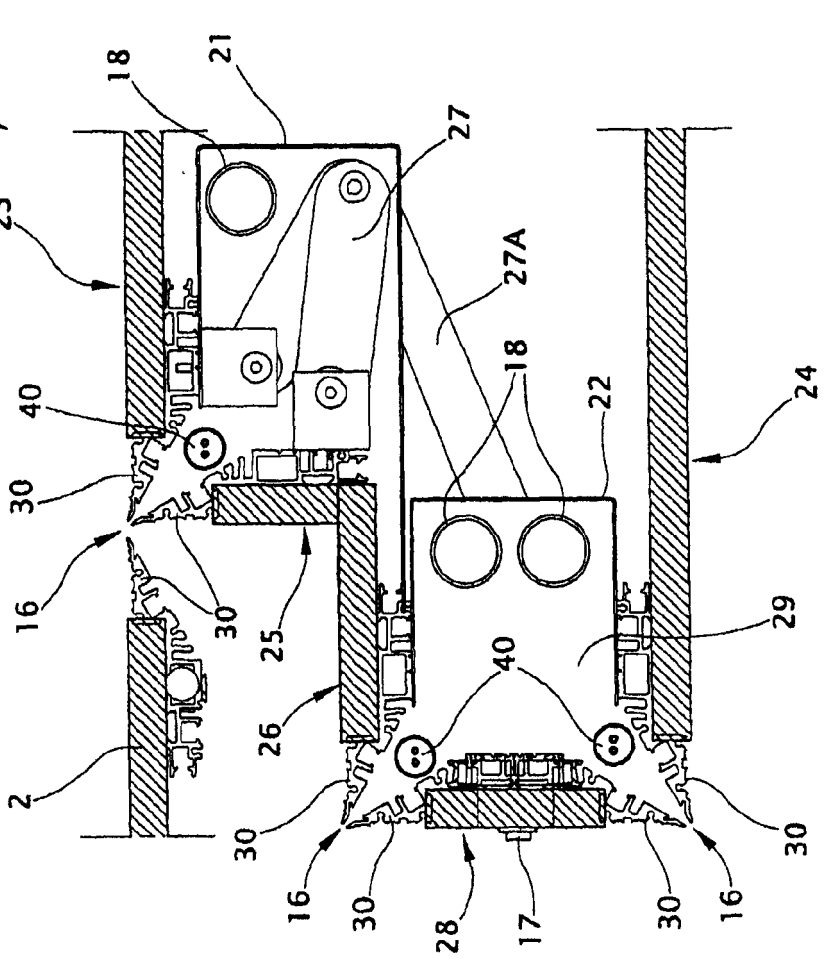
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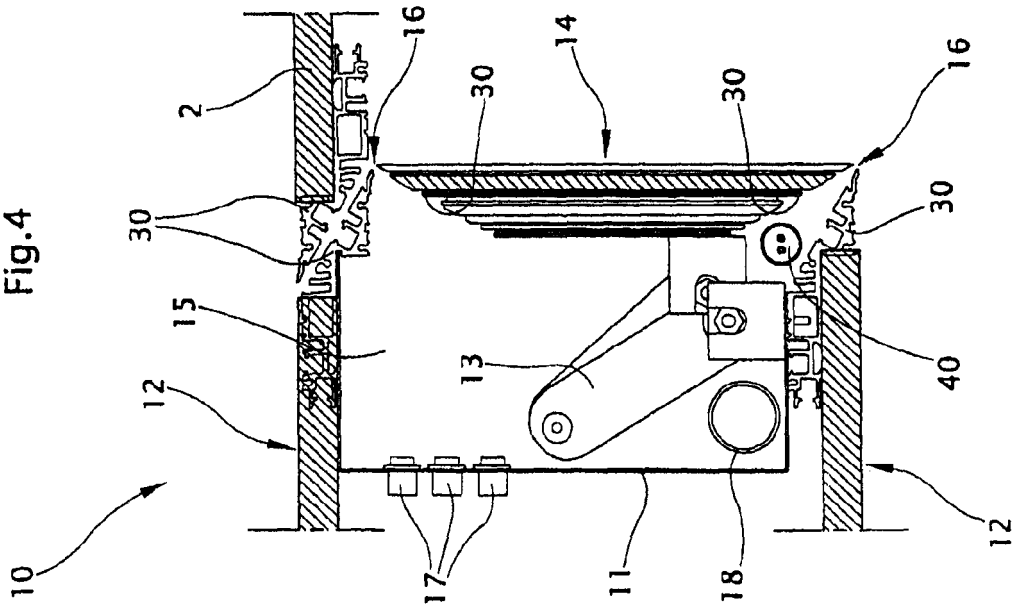
Fig.4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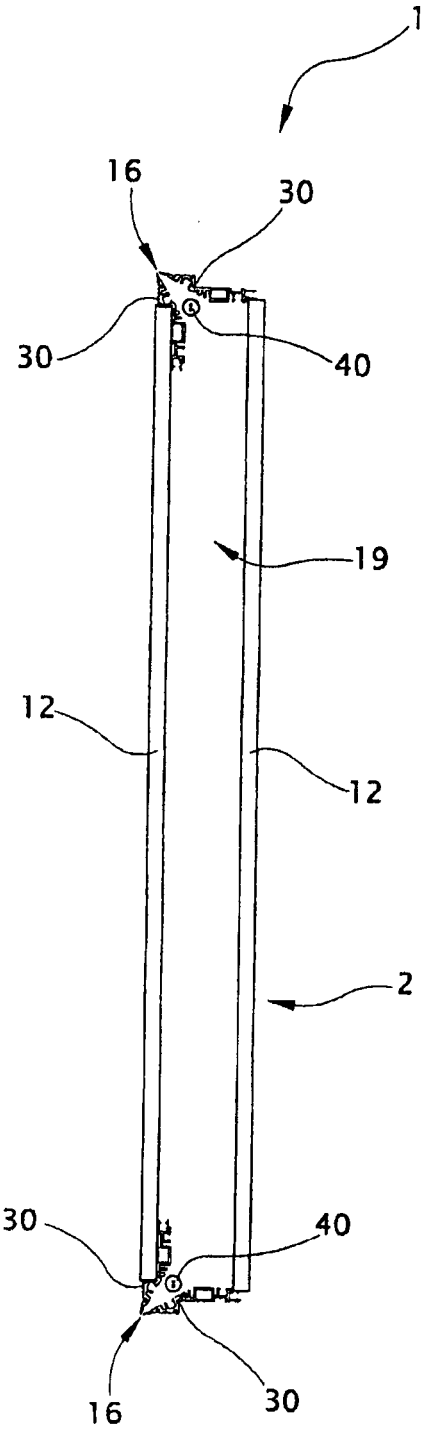

Fig.7

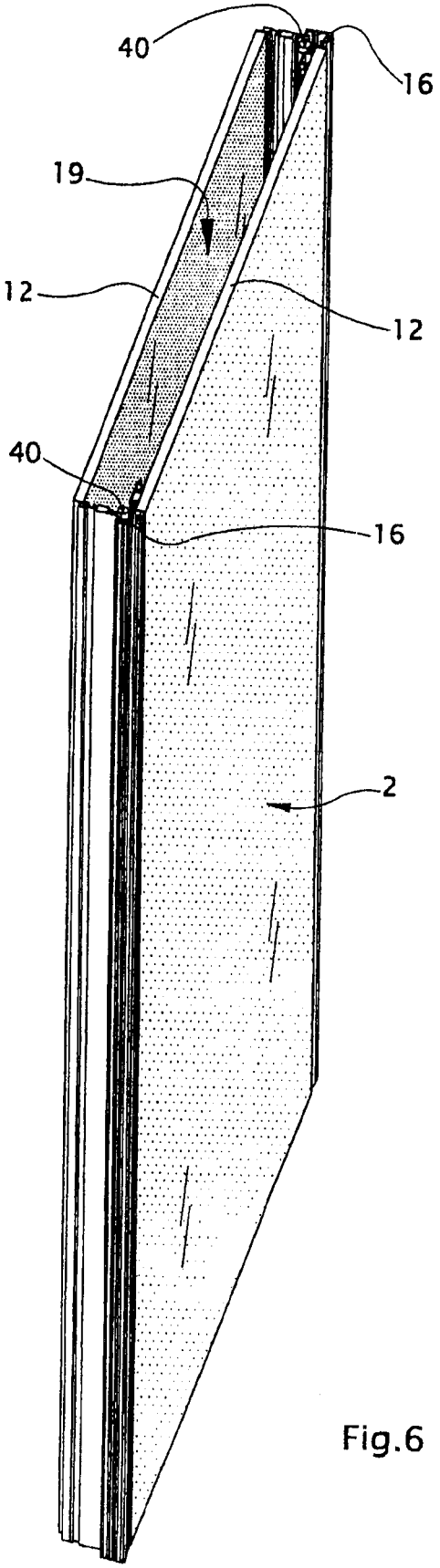

Fig.6

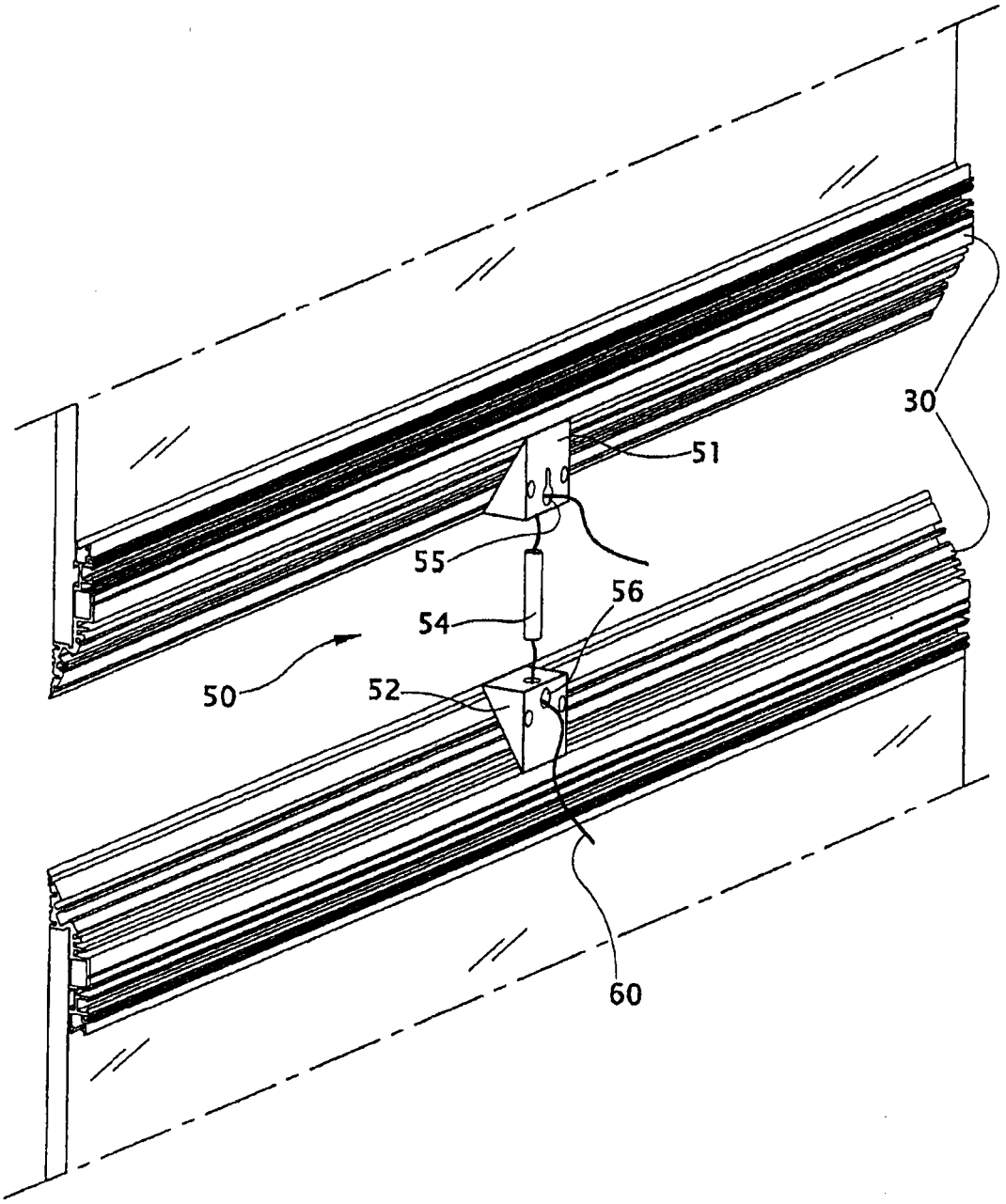

Fig.8

REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- IT 2003 A **[0003]**
- IT 0000100 A **[0003]**
- IT 200300016 A **[0003]**