



(12) **EUROPEAN PATENT APPLICATION**

(43) Date of publication:
09.01.2019 Bulletin 2019/02

(51) Int Cl.:
E05D 15/06^(2006.01) E06B 7/14^(2006.01)

(21) Application number: **18181495.5**

(22) Date of filing: **03.07.2018**

(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

- **ASSIS TEIXEIRA PEREIRA BRANCO,
FRANCISCO
4150-243 PORTO (PT)**
- **TIMÓTEO VIEIRA, NUNO JOSÉ
4465-143 São Mamede Infesta (PT)**
- **DA SILVA PETIZ, JOÃO ANDRÉ
4200-935 PORTO (PT)**
- **DE SOUSA LIMA E SÁ RIBEIRO, RUI MIGUEL
4465-229 S. MAMEDE (PT)**

(30) Priority: **03.07.2017 PT 2017110179**

(71) Applicant: **FWD - LDA
4470-605 Moreira da Maia (PT)**

(74) Representative: **Ferreira, Maria Silvina
Clarke, Modet & Co
Av. Casal Ribeiro, N°50-3° andar
1000-93 Lisboa (PT)**

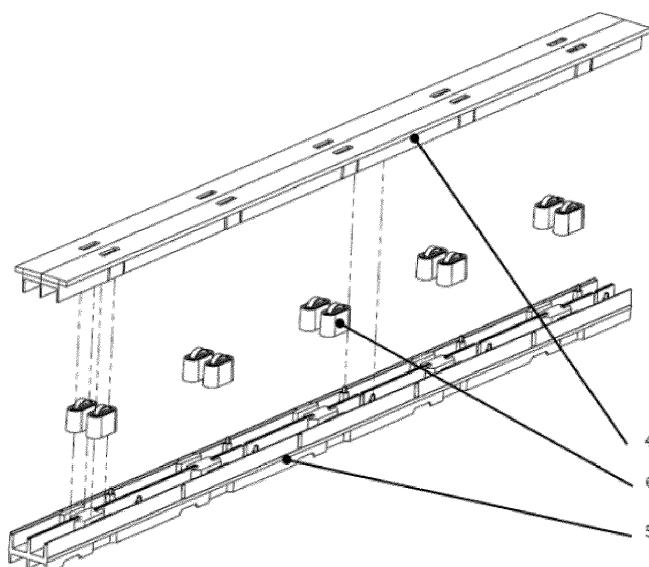
(72) Inventors:
• **BRANCO TEIXEIRA, RUI FERNANDO
4050-031 PORTO (PT)**

(54) **MODULAR SLIDING SYSTEM**

(57) The present application is related to a sliding system applicable both in the horizontal plane and in the vertical plane, of doors or windows, manufactured in non-metallic composite materials of a polymer matrix.

The sliding system consists of at least one sliding module, which module comprises a lower base structure (5) making the contact between the module and the door

or window lower rim, an upper structure (4) fitting in the lower structure (5) and which is the visible part of the module, and a set of rollers (6) fitting in the upper structure (4) and resting on the lower structure (5), positioned in a spaced manner and having the rotation axis perpendicular to their length.



Description

Technical Domain

[0001] The present application is related to a sliding system, horizontal or vertical, of doors or windows.

Background

[0002] Doors and windows sliding (running) systems are based, from their initial development, on the same operating principle which involves the support of a sliding panel on a set of rollers, which on their turn slide on a rail that is attached to the lower profile of the door or window rim whereto they are applied.

[0003] It is a system which use is warranted by the ability to produce doors and windows of great dimensions that, by sliding over a line parallel to the rim, require no space assigned to their opening, as it is the case of doors and windows using hinged systems.

[0004] It is, however, a principle that results in a bigger effort to displace the door or window due to the high frictional force produced by these systems. In fact, the structural requirements to achieve, particularly in what concerns the reduced diameter of the rollers employed, result in applying higher frictional force to the system, and therefore in higher inertia against the displacement thereof. This force increases as the dimensions of the door or window to be displaced are larger.

[0005] On the other hand, systems of the state of the art require permanent mechanical contact between metallic parts of different types, i. e., between the door or window and the supporting-guiding rail through the rollers. Being these metallic parts in contact with the exterior, subject to wear, both by rain chemical action and by oxidation, deterioration of the elements occurs, which causes a cyclic need for system maintenance, associated with a limited lifetime. Furthermore, because of the mechanical contact between the various components of different metallic alloys, an associated sound is further generated, which will increase as the operating conditions deteriorate by natural wear.

[0006] With the purpose of improving the performance of the state of the art systems described, new solutions have been emerged addressing the rollers' transfer to the fixed part of the rim, that is, in the rail's place of previous systems, a metallic rail whereto the rollers are applied emerges. Such change in the rollers' location allows to reduce both friction and inertia upon the door or window displacement, thereby making better use of the force exerted by the user. An increasing number of rollers is proportional to a reduced exerted force and to an increased size of the sliding panels.

[0007] However, such new aspect of doors and windows sliding systems does not solve, in fact it aggravates, a basic problem associated to the durability of the same, as also here rails with rollers are of different types of metallic alloys and materials, being subjected to deteri-

oration. This is more severe as the medium where doors and windows are assembled is more aggressive, since also in these systems both the rollers and the rail are exposed to all environmental aggressions.

[0008] In addition, there is the fact that the manufacture of these bearing-carrier rails is manually made, wherein a bearing and two retractors are assembled in an axis, which in turn is inserted in two open holes on an aluminium rail. Such handmade process, besides needing much manpower, also includes in its assembling process procedures that require the application of a force which, when excessive, deteriorates this sliding system's components right from the start, being the most obvious one the wear by friction, which the bearing-supporting axis (replacing the rollers of former windows and doors systems) causes on the aluminium supporting profile brackets. By lack of protection, the profile will immediately start undergoing an oxidation process.

[0009] Yet there is a tendency on the frame systems market for a window or door evaluation parameters performance better than that introduced by the European products certification (i. e., CE Mark) . The system of bearings applied to a rim rail brought little improvement to the Air Permeability (the lower the better) and Water Tightness (the higher the better) parameters and it introduced an aggravating factor, the aluminium rail becomes a sound and temperature-conducting element, which causes the thermal and acoustic performance of the window or door to considerably worse.

[0010] The acoustic performance of a window or door, evaluated by the airborne sound insulation index R_w , mainly depends on the acoustic performance characteristics of the glass and frame profile (currently controllable by the various types of glasses with acoustic attenuation characteristics commercially available) and on the frame rim profile (and it is here that problems with the final acoustic of the set - glass + profiles arise in all current solutions for sliding frames that are identical to each other). Nevertheless, the permeability of all components, as a consequence of complementary mechanisms (e.g.: sliding opening of the panels) and systems (e.g.: water drainage), will condition the final acoustic performance.

[0011] Thereby, one observes that, in practice, known solutions present well-known problems of deterioration and thus the need for maintenance and cyclic replacement of components increases.

[0012] The system exposition to the exterior and to natural elements combined with damage caused by manual assembling, considerably reduces its durability forcing it to cyclic maintenance which may include the complete replacement of the sliding system.

[0013] The new behaviour evaluation parameters have introduced new requirements for doors and windows which increasingly must be barriers between the interior and the exterior in residential areas, and the capacity of sliding systems is closely related to the improvement of the performance thereof.

[0014] One concludes that prior art systems address

the solution for the above-mentioned problems in an isolated way without thinking of a single, integrated solution.

Summary

[0015] The present application describes a modular sliding system characterized in that it consists of at least one sliding module, made of non-metallic composite material of a polymer matrix, said module comprising:

- a lower structure (5) consisting of at least two vertical walls, intercepted by an intermediate horizontal blade, which divides said structure in two levels, upper level and lower level;
- an upper structure (4) consisting of at least two vertical walls, and of a horizontal top blade comprising rectangular grooves parallel along its length;
- at least two rollers (6) being the rotational axis perpendicular to the module length,

wherein the horizontal blades of the lower and upper structures each comprise at least one channel for water circulation, defined along the module length; and wherein the vertical walls of both structures comprise at least two grooves along the module length.

[0016] In a particular embodiment of the developed system, the intermediate horizontal blade of the lower structure comprises at least two grooves on its surface.

[0017] In another particular embodiment of the developed system, the intermediate horizontal blade of the lower structure does not include any grooves on its surface.

[0018] In a particular embodiment of the developed system, the lower structure of a sliding module is built with spaced recesses, caused by an increase in the neighbouring lateral walls' thickness, as a support base for the rollers.

[0019] In a particular embodiment of the developed system, the top horizontal blade of a sliding module upper structure is wider than the distance between neighbouring lateral walls of said structure.

[0020] In a particular embodiment of the developed system, the lateral tops of a sliding module comprise fitting flaps at each of the upper and lower structures.

General Description

[0021] The application emerges from the need for developing a new sliding system to apply to doors and windows, which offers in an embodiment - a modular element consisting of several components - one solution for the various problems affecting sliding systems, in particular in what concerns the behaviour towards the exterior, in terms of water tightness, air permeability, thermal transmission and acoustic attenuation, without compromising a smooth and reduced-effort sliding.

[0022] For that, the developed doors and windows sliding system consists of at least one sliding module, made

of non-metallic composite materials of a polymer matrix. The system constituent modules are attachable to one another, through a fitting mechanism located at the lateral tops of each one of them, which favours proper coupling and attachment between modules, thereby minimizing the gaps between them. Each module consists of a lower base structure which makes the contact between the module and the door or window lower rim, an upper structure which fits in the lower structure and which is the visible part of the module, and a set of rollers that fit in the upper structure and rest on the lower structure, positioned in a spaced manner and having the rotation axis perpendicular to their length.

[0023] The module may be made from a single piece, or it may consist of two or more parts which, when properly connected to one another, enable the two-structure configuration, the upper and the lower one, thereby providing shape to the complex network of channels and grooves, in order to optimize water, air/wind, and sound circulation. Channels represent deformations on the inner surface of said structures, favouring water circulation and its ulterior flow through the grooves - perforations - placed in a spaced manner along the lateral walls of both structures and along the upper structure's top, where pulleys emerge. The combination of grooves and inner channels is no trivial solution, as it relates the module physical and behaviour parameters with the exterior in a conflicting way - the higher the number of grooves the better the water drainage, but the worse will be the acoustic attenuation, for example - thus requiring the necessary balance between such characteristics.

[0024] For that, grooves with different dimensions and purposes are designed at both module levels which, in combination with the channels network provided in each one of them, favour the proper flow operation, without affecting the remaining behaviour characteristics of the module. Grooves are provided at the module upper and lower structures in order to promote the flowing from the respective levels towards the exterior, and further grooves are provided to establish communication between both levels.

[0025] In fact, the dimension of the channels forming the paths, as well as the dimension, spacing and number of grooves provided in the module, configure an air and water circulation scheme which provides the desired balance between the needs for water flow, air tightness and sound permeability.

[0026] Choosing for polymeric materials for the different components of the developed sliding module, in contrast with the currently commercialized modules making use of metallic structures and bearings, results in a conceptual philosophy which has a direct impact on the operation/behaviour of said module. In fact, using exclusively non-metallic materials reflects on the behaviour of the module at the thermal and acoustic levels, as polymeric matrix materials have thermal and acoustic low conductivity properties which are optimal for the application to windows and doors, favouring parameters such

as Thermal Conductivity, which should be low, and Acoustic Attenuation, which should be high.

Brief description of the figures

[0027] For an easier understanding of the present application figures are appended, which depict preferred implementations that are not meant, however, to limit the art disclosed herein.

Figure 1 illustrates an embodiment of a window or door with two sliding panels (or sheets) wherein reference numerals represent:

- 1- Fixed rim of the window or door;
- 2- Sliding panel;
- 3- Sliding module.

Figure 2 illustrates the sliding module as well as all its components and their relative position, wherein reference numerals represent:

- 1- Fixed rim of the window or door;
- 3- Sliding module.

Figure 3 illustrates the sliding module as well as all its components and their relative position, wherein reference numerals represent:

- 4- Upper structure;
- 5- Lower structure;
- 6- Rollers.

Figure 4 illustrates the roller with its components, their relative position and assembling lines, wherein reference numerals represent:

- 7- Cap;
- 8- Support;
- 9- Bushing;
- 10- Pulley;
- 11- Assembled set formed by the supports, bushings and pulley.

Figure 5 illustrates the upper structure of the sliding module.

Figure 6 illustrates the lower structure of the sliding module.

Figure 7 illustrates the top-to-top fitting between modules of the modular sliding system, wherein reference numerals represent:

- 4- Upper structure;
- 5- Lower structure;
- 12- Fitting flap of the upper module;
- 13- Fitting flap of the lower module.

Figure 8 illustrates the type A groove position in bi-rail-type doors or windows, wherein reference numerals represent:

- 1- Fixed rim of the window or door;
- 14- External sliding module;
- 15- Internal sliding module;
- 16- Type A groove.

Figure 9 illustrates the type B groove position in bi-rail-type doors or windows, wherein reference numerals represent:

- 1- Fixed rim of the window or door;
- 14- External sliding module;
- 15- Internal sliding module;
- 17- Type B groove.

Figure 10 illustrates the type C groove position in bi-rail-type doors or windows, wherein reference numerals represent:

- 1- Fixed rim of the window or door;
- 14- External sliding module;
- 15- Internal sliding module;
- 18- Type C groove.

Figure 11 illustrates the type D groove position in bi-rail-type doors or windows, wherein reference numerals represent:

- 1- Fixed rim of the window or door;
- 14- External sliding module;
- 15- Internal sliding module;
- 19- Type D groove.

Figure 12 illustrates the type E groove position in bi-rail-type doors or windows, wherein reference numerals represent:

- 1- Fixed rim of the window or door;
- 14- External sliding module;
- 15- Internal sliding module;
- 20- Type E groove.

Figure 13 illustrates the type F groove position in bi-rail-type doors or windows, wherein reference numerals represent:

- 1- Fixed rim of the window or door;
- 14- External sliding module;
- 15- Internal sliding module;
- 21- Type F groove.

Description of embodiments

[0028] Referring to the figures, in the following is a detailed description of each component defining the sliding

module (3), and which is the sliding system proposed.

[0029] The lower structure (5) is the module element that rests on the window or door lower rim (1), being responsible for the transmission of the roller (6) radial load to said rim. It is formed by at least two walls vertical to the module (3) length which form sinuous paths formed by the channels and grooves network, and by an intermediate horizontal blade dividing the lower structure (5) into two levels, upper level and lower level, for flowing purposes. The walls and the blade have spaced grooves on their surfaces which together with the channels network form paths for the water, air - in the form of wind - and sound circulation, allowing to improve the water tightness, air permeability and acoustic attenuation abilities of the window or door.

[0030] Along the lower structure (5) length, and in a spaced manner, there are recesses caused by the walls thickness increase, serving as a support base for the rollers. In fact, the lower structure (5) serves as a support base for the rollers (6) and for the upper structure (4) whereby the walls thickness increase is warranted by the need for this structure to withstand the load transmitted by the upper elements.

[0031] When a module is made of an aggregate of parts and not as a single piece, the lower structure (5) fits into the upper one (4) through a protuberance along the vertical walls and by means of spaced pins along the lateral walls which line up with concavities placed at the upper structure (4). They also serve to support the starting load between the two structures.

[0032] The module upper structure (4) has, as main functions, to define the position of the rollers (6) and to absorb small lateral loads. It is formed by at least two vertical walls and by one horizontal blade representing the top of the structure, which is wider than the lateral walls. In this way, the air passage between the upper structure (4) and the window or door rim (1) is reduced, improving acoustic performance, while preventing air bubbles from entering (formed by wind coming into a circulation/flow system filled with water), which cause water to splash into the interior room where the window is installed, a recurring situation in sliding windows using state of the art sliding systems.

[0033] The horizontal blade of the upper structure (4) is the most visible part of the module (3) with the possibility of having different finishing or aesthetic coatings, having a slight slope perpendicular to the structure length and presenting parallel rectangular grooves along its length, where rollers (6) emerge.

[0034] The module may be repeated longitudinally such that to create the sliding rail which theoretically can have an infinite length, keeping the performance of each set individually. In order to ensure stability, and to contribute for the sealing of gaps through which water and sound pass, the module has a fitting mechanism at the two lateral tops, consisting of flaps (12, 13) that favour the connection and the alignment with the next module.

[0035] During the development of the solutions, spe-

cial attention has been given to the clearances reduction and careful positioning of the channels and grooves network, which are of special importance in windows or doors sliding systems as they play a main role in the acoustic, and water and air tightness behaviour.

[0036] Both upper (4) and lower (5) module structures create a circuit for water, air/wind and sound improving the barrier interior/exterior, a prime function of a window or door. In fact, in said circuit, the element that is to be controlled, being either water, air or sound, enters the module (3) via the upper structure (4) through the lateral walls grooves or through the roller (6) clearances, travels the channels circuit defined at the lower structure upper level, runs to the lower level through holes provided on the horizontal blade, travels the circuit formed by the lower level walls and leaves the module (3) through the grooves provided on the lateral walls.

In a particular embodiment, wherein the window or door presents two panels which slide over separate planes - the most common sliding window system, usually called bi-rail because each of the panels slides on a different rail or chute - the module (14) closer to the exterior presents a circuit identical to that above described, with the exception that the lower structure (5) has a horizontal blade without grooves on its surface, not providing a passage between levels. This way, the outer module circuit (14) is made exclusively via the upper level of its lower structure (5), being directly conducted to the exterior of the module (14). On its turn, the inner module (15) circuit runs via its lower level, thus avoiding the intersection of both modules (14, 15) circuits which improves the general behaviour of the system, as it was proven by a test ran on a prototype.

[0037] There are six types of grooves with different sizes and spacings. Groove A (16) serves for the flow from the outer module upper level, has a size of 31mm x 5,5mm and spacings of 250mm. Groove B (17) serves for the flow from the lower level, has a size of 31mm x 5,5mm and spacings of 500mm. Groove C (18) serves for the communication between channels of the same level, has a size of 15mm x 5,5mm and spacings of 500mm. Groove D (19) serves for the communication between the inner module and the outer module, has 15mm x 5,5mm and spacings of 500mm. Groove E (20) serves for the communication between the inner module's upper and lower levels, has a size of 25mm x 5,5mm and spacings of 400mm. Groove F (21) serves for the opening of the upper module's circuit to the exterior, has 25mm x 5,5mm and spacings of 400mm. Each module has two upper channels and two lower channels.

[0038] The rollers (6) are also modular components consisting of various elements, having been developed with the same purpose of favouring the module behaviour towards the exterior in what concerns water tightness, air permeability, thermal transmission and acoustic attenuation, without compromising a smooth and reduced-effort sliding.

[0039] The roller (6) consists of, from outside to inside,

a cap (7) maintaining the assembly united, two symmetrical support bodies (8) capped by the cap where the bushings (9) fit, allowing the rotation of the pulley over which there is provided a thermoplastic elastomer cover (i. e., rubber) establishing contact with the door or window sliding panel. All roller components are made of composite materials optimized for the respective function they perform. Characteristics like low friction coefficient, durability, resistance to the ultraviolet radiation from the sun, the positioning of material injection points, injection orientation of carbon fibres, fitting elements and mounting processes of the assembly have influenced the materials design and selection of each component.

[0040] The cap (7) is a hollow part having an elliptical top view with a conical shape, and which caps all the other roller (6) parts holding them together. The placement thereof is the last step of the roller assembling (6).

[0041] The support bodies (8) have an elliptical shape sectioned along their major axis and are conical. Fitting both bodies in a symmetrical position is performed by means of protruding pins which ensure alignment and form an irreversible mechanical connection. In each one of the support bodies (8) a bushing (9) is placed. These elements transmit a radial load from the roller (6) to the base of the assembly.

[0042] The bushing (9) is an annular part having two flaps symmetrical to each other, made in a low-friction-coefficient polymeric material in order to reduce the global friction of the roller (6). It is placed on the support part and maintains its position thanks to the symmetrical flaps which prevent the bushing (9) from rotating by direct action of the pulley.

[0043] The pulley is a cylindrical part made of high resistance and low friction polymeric material. It presents geometric embossing along the external diameter and has three holes closer to the centre where a lubricant is provided, which is to be released over the lifetime of the roller (6). The external diameter embossing improves the physical connection between the pulley and its coating, a thermoplastic elastomer which is the contact surface of the roller (6) with the sliding panel and has elastomer properties which act as a cushion to the sliding panel's weight, dissipating the load applied to the roller (6) and, at the same time, increasing the tangential friction promoting the rotation of the roller whenever the sliding panel moves (otherwise, there could be the risk for the panel to slide without causing the rotation of the pulley, which is made of a low friction material).

[0044] The fact that the roller (6) components are made of polymeric matrix composites contributes to lower the module's thermal conductivity and acoustic attenuation.

[0045] In a particular embodiment of the sliding module, the production of 1-m-sized elements is planned, whereby, in most practical applications, there is the need to consider more than one element for the construction of the frame. Therefore, the introduction to each element's top of an edge to fit and seal the joint between profiles was considered, both at the upper and lower el-

ements.

[0046] The result of the proposed design and development allows, in an integrated and industrial manner, to fulfil the different requirements a component of this nature demands, thereby being assumed as a distinguishing characteristic relative to the other current solutions.

[0047] The present description is not, naturally, in any way restricted to the embodiments presented herein and a person with average knowledge in the area may foresee many possibilities for modification thereof without departing from the main idea, as per defined in the claims. The preferred embodiments above described are obviously combinable with one another. The following claims further define preferred embodiments.

Claims

1. Modular sliding system **characterized in that** it consists of at least one sliding module, made of non-metallic composite material of a polymer matrix, said module comprising:

- a lower structure (5) consisting of at least two vertical walls, intercepted by an intermediate horizontal blade, which divides said structure in two levels, upper level and lower level;
- an upper structure (4) consisting of at least two vertical walls, and of a horizontal top blade which comprises rectangular grooves parallel along its length;
- at least two rollers (6) being the rotational axis perpendicular to the module length, wherein the horizontal blades of the lower and upper structures each comprise at least one channel for water circulation, defined along the module length; and wherein the vertical walls of both structures comprise at least two grooves along the module length.

2. System according to claim 1, **characterized in that** the intermediate horizontal blade of the lower structure comprises at least two grooves on its surface.

3. System according to claim 1, **characterized in that** the intermediate horizontal blade of the lower structure does not include any grooves on its surface.

4. System according to any one of the precedent claims, **characterized in that** the lower structure of a sliding module is built with spaced recesses, caused by an increase in the neighbouring lateral walls' thickness, as a support base for the rollers.

5. System according to claim 1, **characterized in that** the top horizontal blade of a sliding module upper structure is wider than the distance between neighbouring lateral walls of said structure.

6. System according to claim 1, **characterized in that** the lateral tops of a sliding module comprise fitting flaps at each one of the upper and lower structures.

5

10

15

20

25

30

35

40

45

50

55

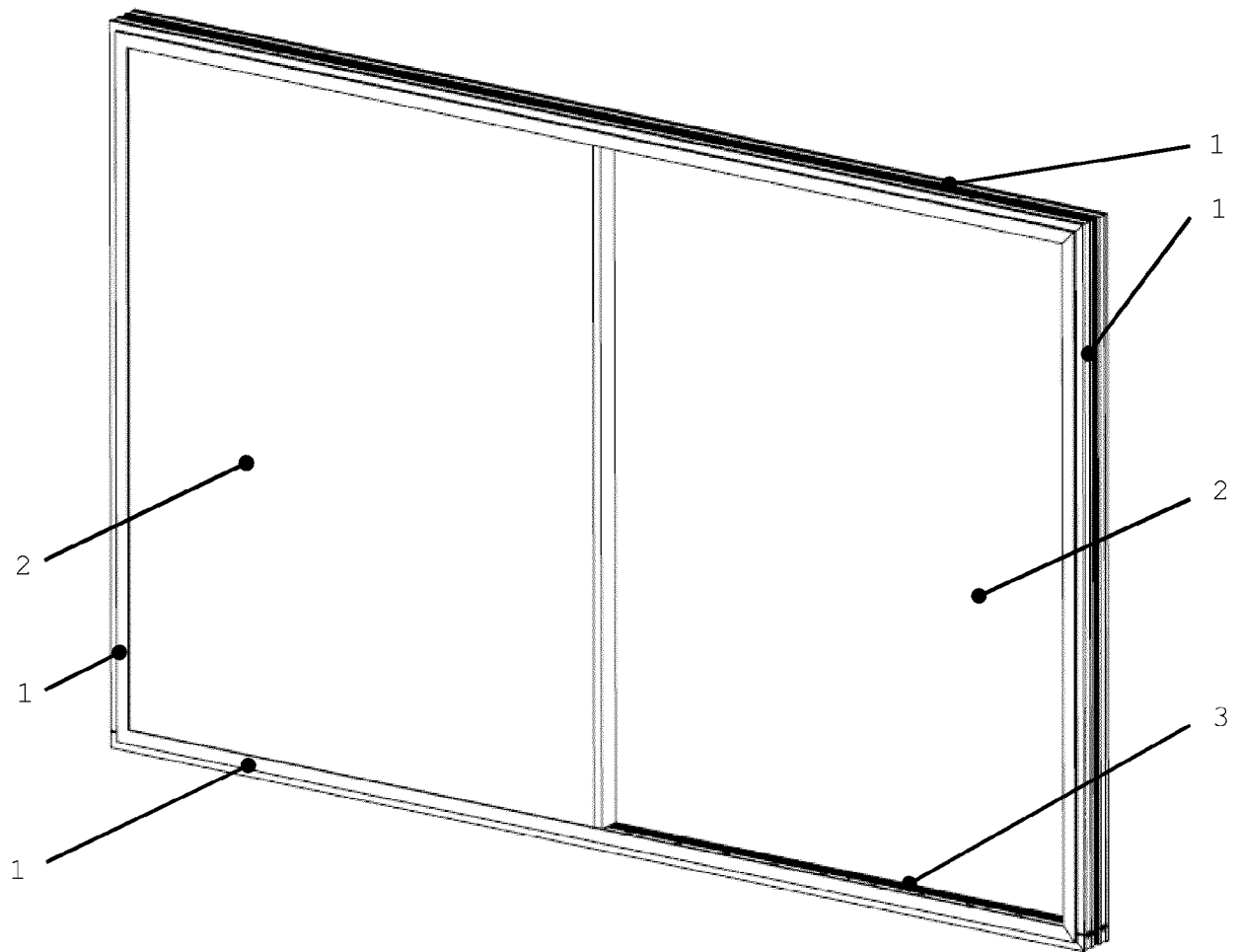


Fig. 1

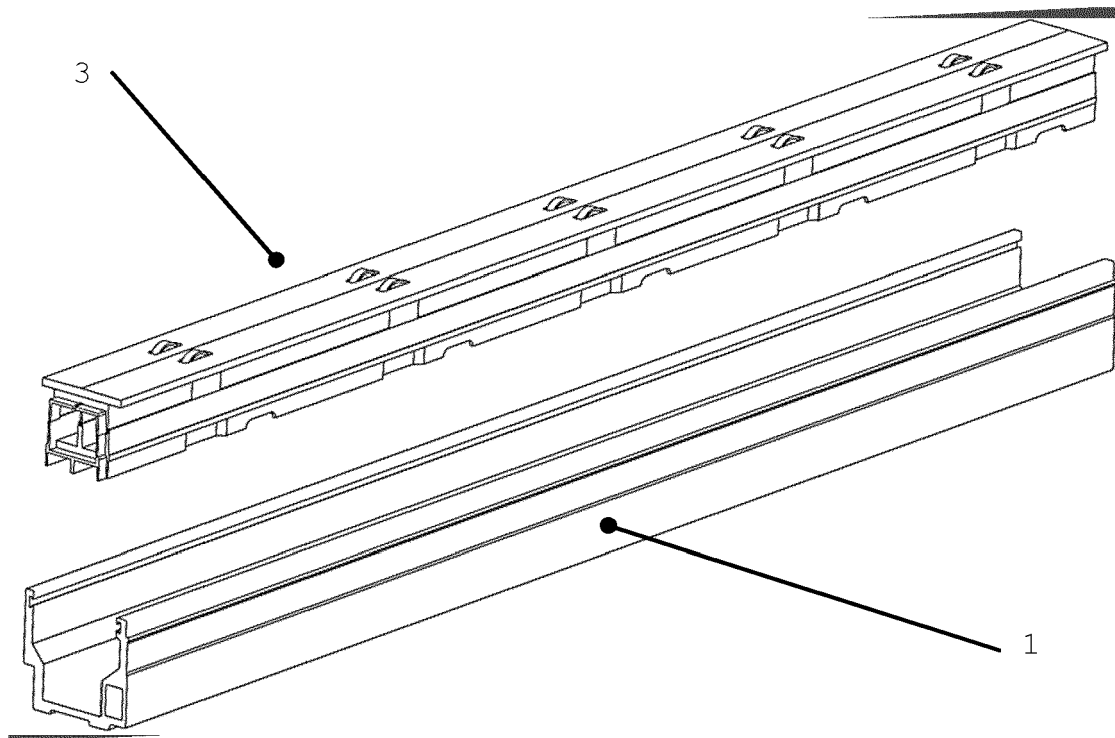


Fig. 2

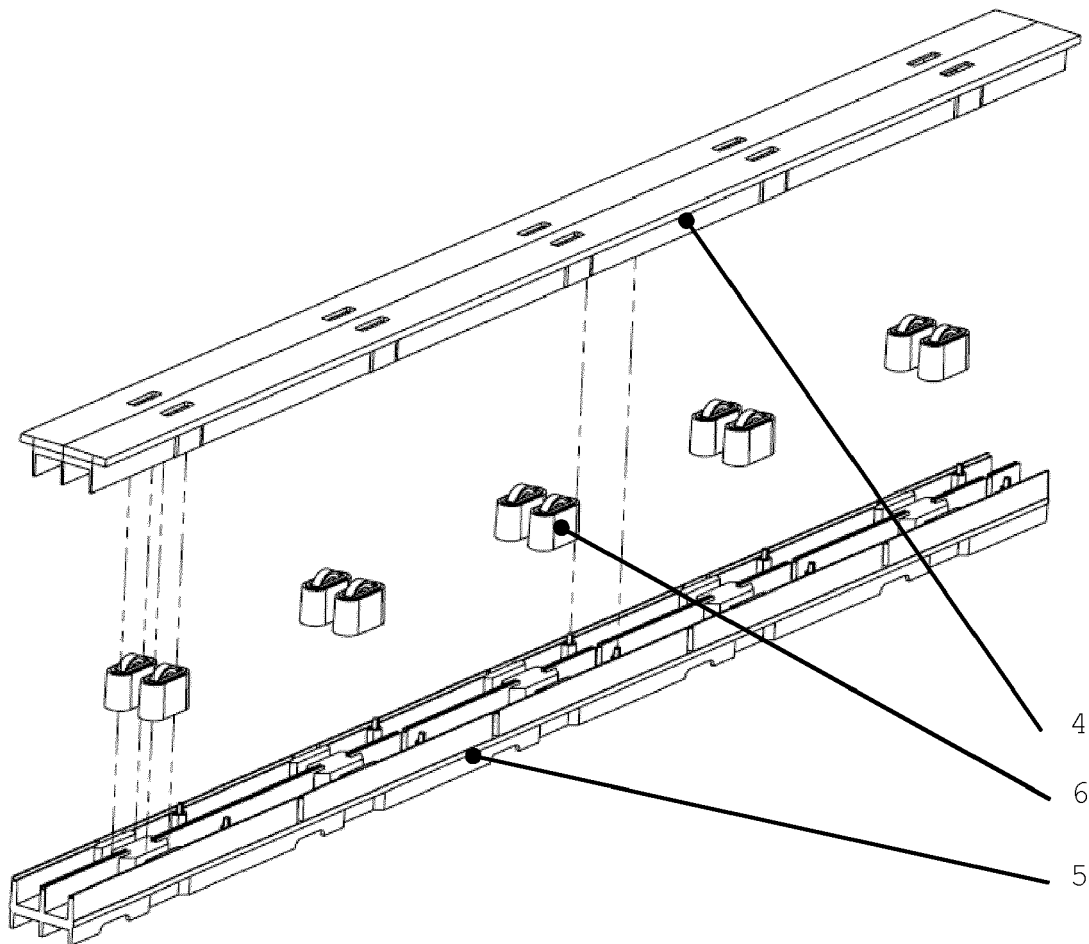


Fig. 3

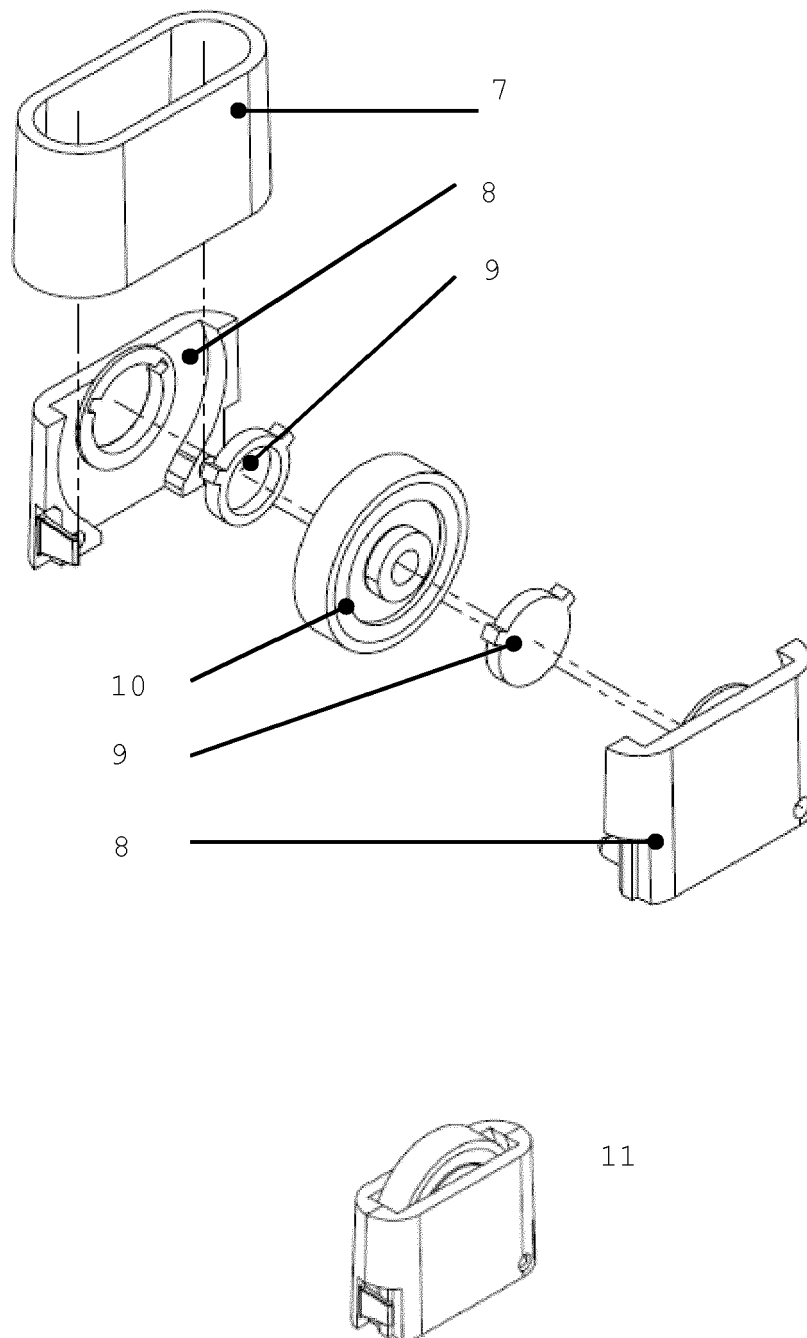


Fig. 4

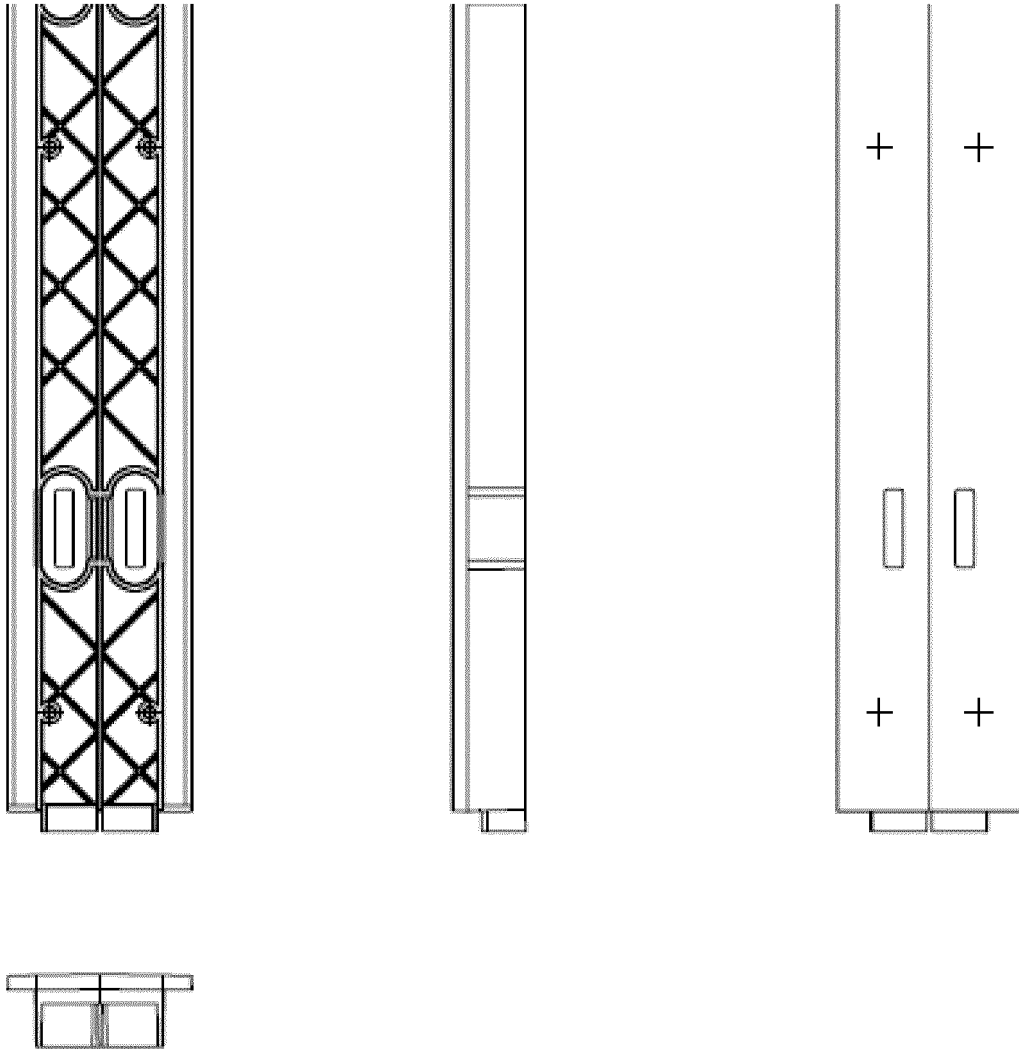


Fig. 5

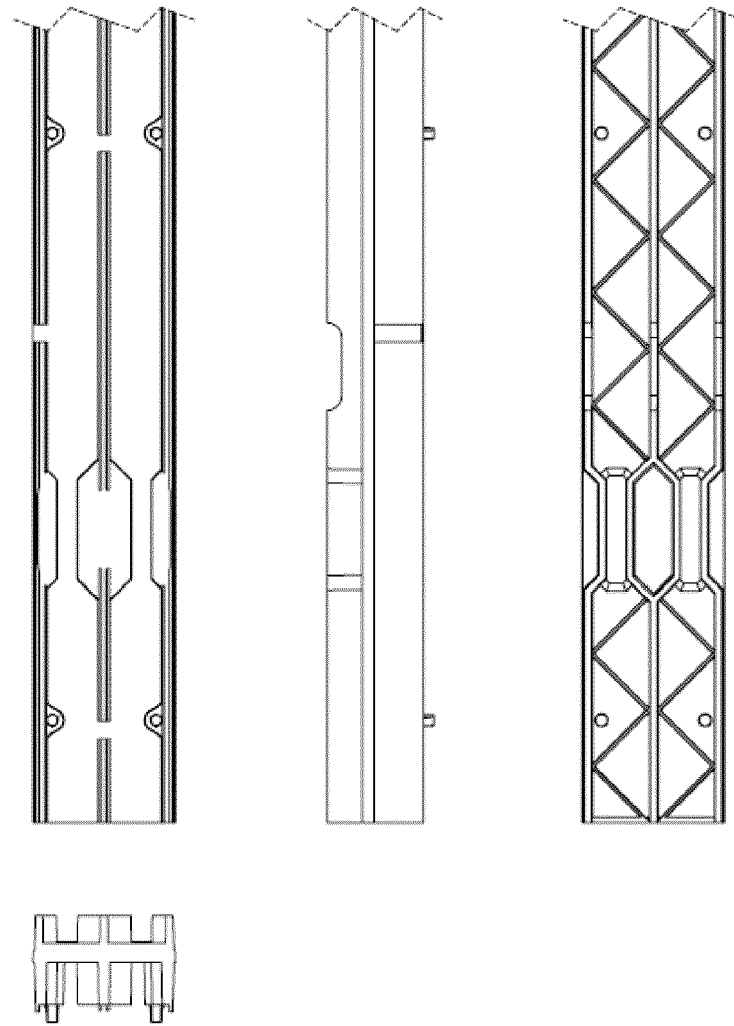


Fig. 6

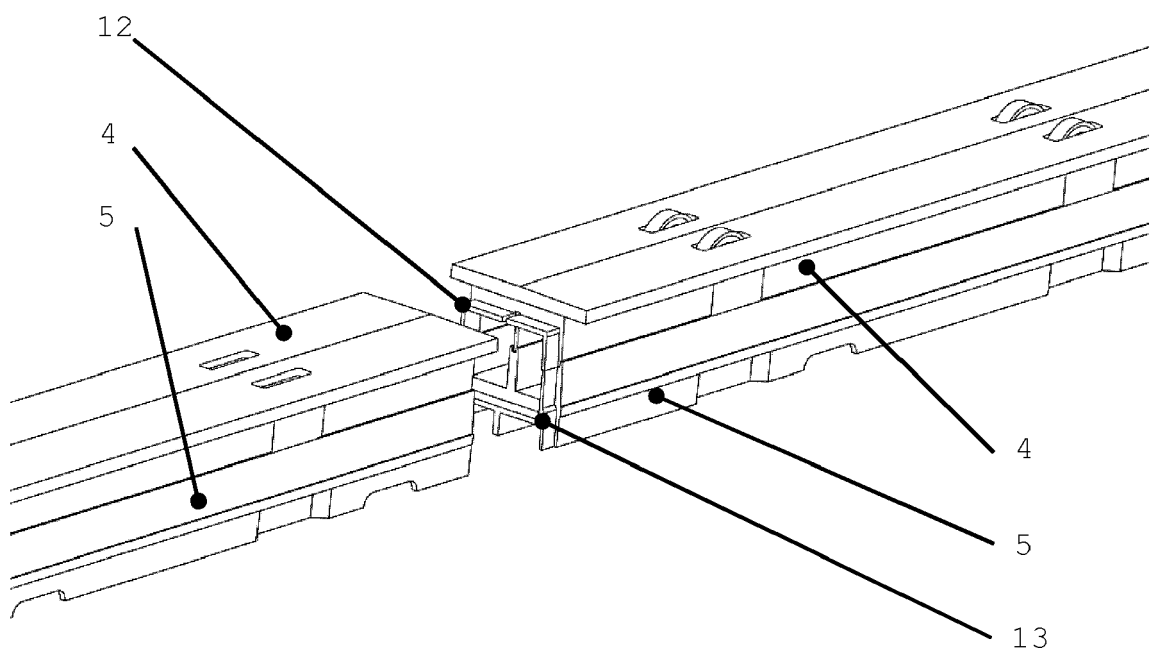


Fig. 7

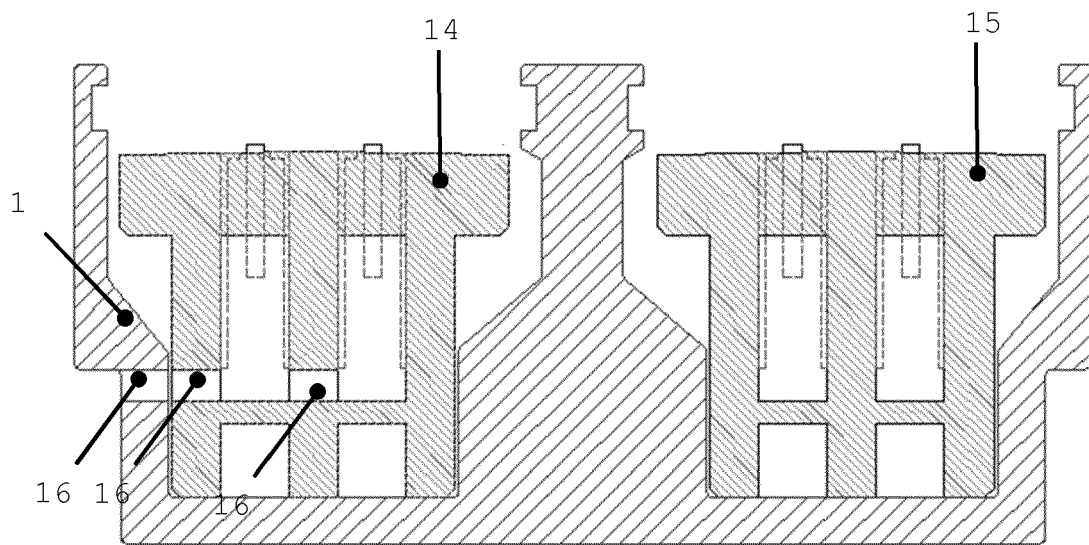


Fig. 8

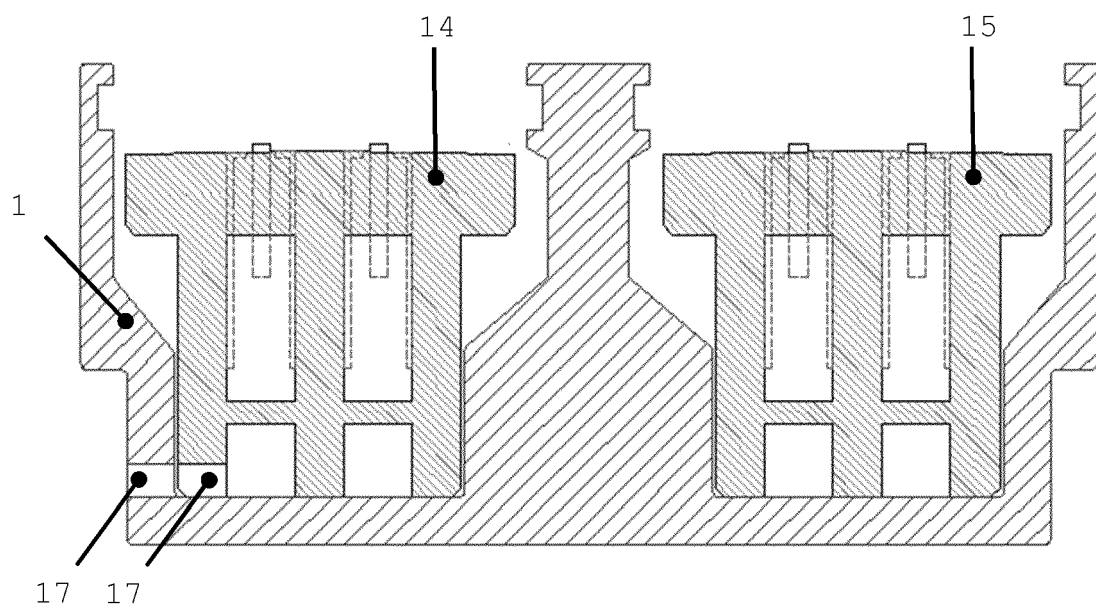


Fig. 9

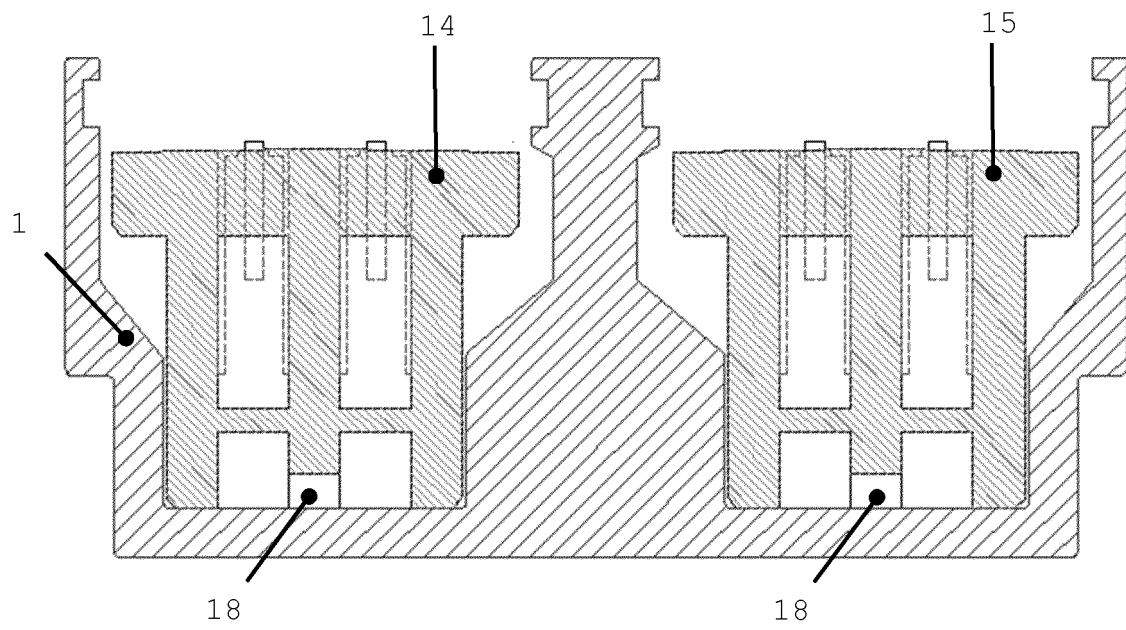


Fig. 10

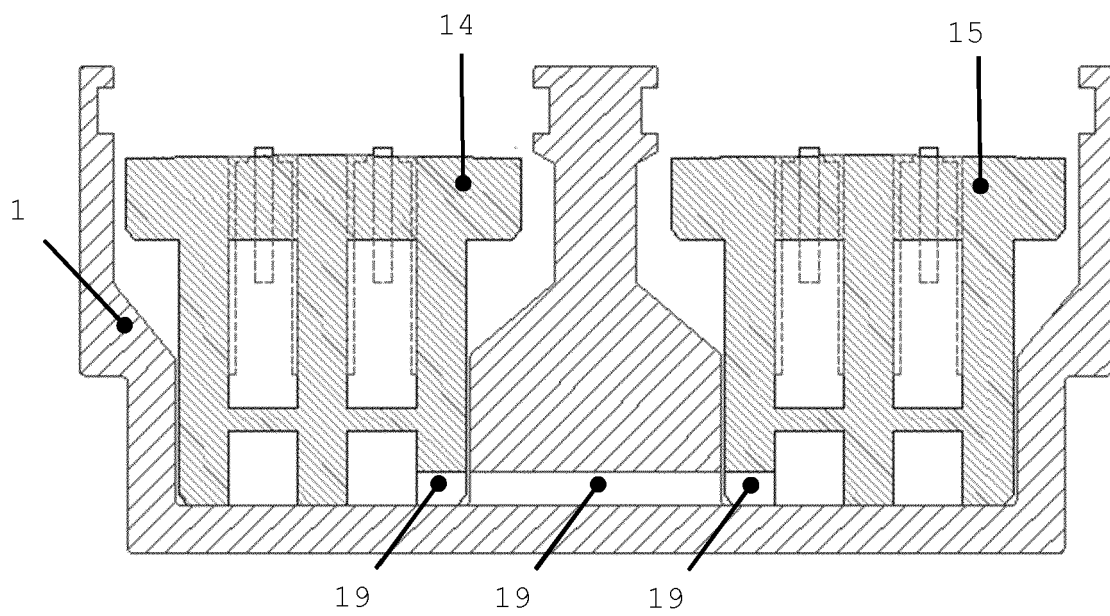


Fig. 11

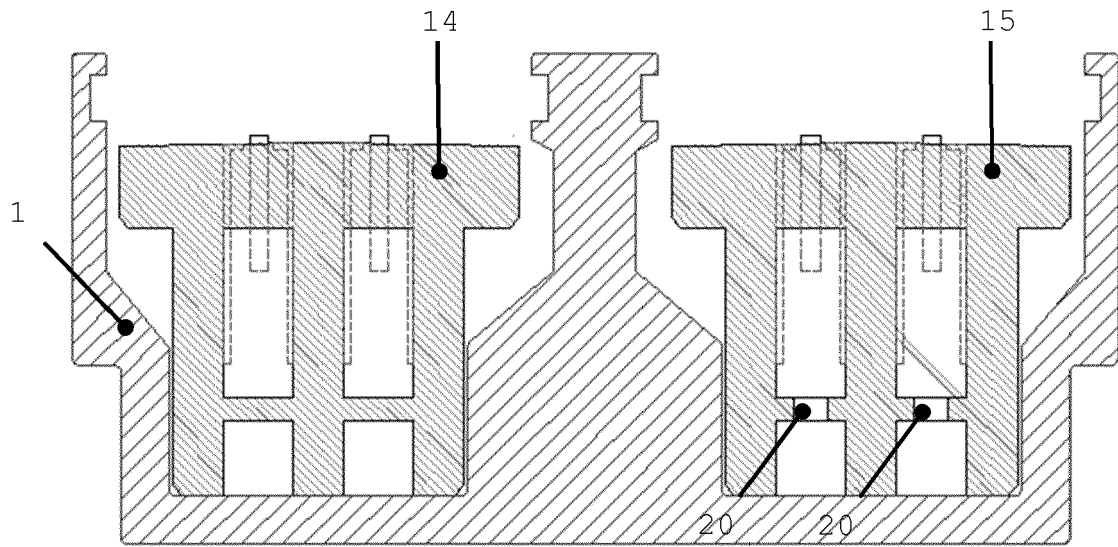


Fig. 12

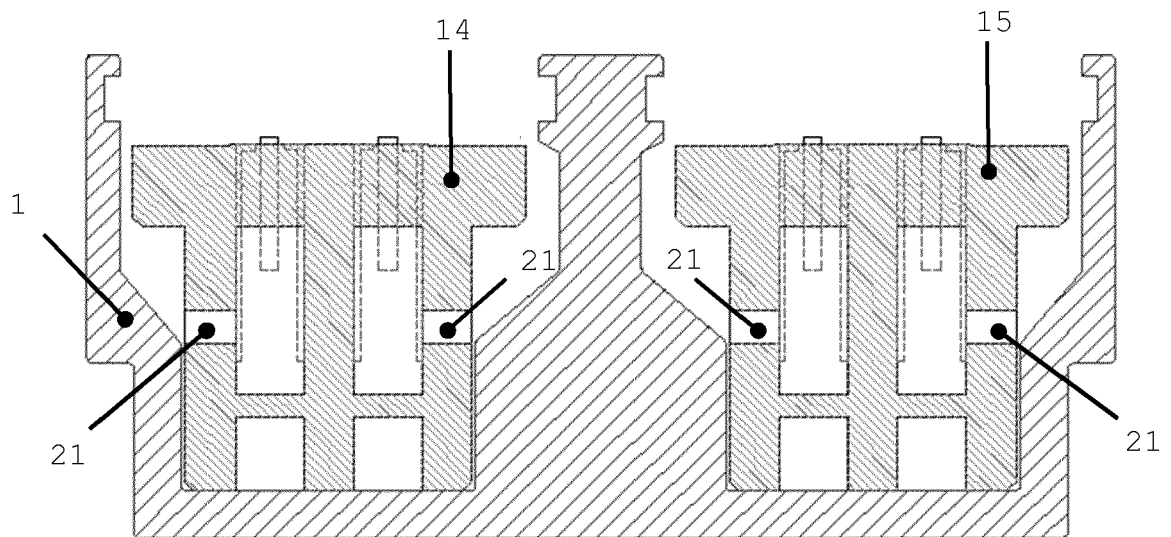


Fig. 13



EUROPEAN SEARCH REPORT

 Application Number
 EP 18 18 1495

5

10

15

20

25

30

35

40

45

50

55

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	WO 2010/024703 A1 (UNLTD PERSPECTIVE SA [CH]; PINTO PEREIRA BRANCO ROBERTO M [PT]; MACHAD) 4 March 2010 (2010-03-04) * page 4, line 17 - page 7, line 9; claim 15; figures 1-7 *	1-6	INV. E05D15/06 E06B7/14
X	WO 2017/110473 A1 (WATAHAN SOLUTIONS CO LTD [JP]) 29 June 2017 (2017-06-29) * paragraph [0038]; figures 1,2,8,9,18,19 *	1-6	
A	GB 2 526 574 A (LINEAR BUILDING INNOVATIONS LTD [GB]) 2 December 2015 (2015-12-02) * page 21, line 16 - line 21; figure 13 *	1	
			TECHNICAL FIELDS SEARCHED (IPC)
			E05D E06B
The present search report has been drawn up for all claims			
Place of search The Hague		Date of completion of the search 26 November 2018	Examiner Rémondot, Xavier
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document		T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document	

 1
 EPO FORM 1503 03.82 (P04C01)

**ANNEX TO THE EUROPEAN SEARCH REPORT
ON EUROPEAN PATENT APPLICATION NO.**

EP 18 18 1495

5

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
The European Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

26-11-2018

10

15

20

25

30

35

40

45

50

55

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
WO 2010024703 A1	04-03-2010	CN 102203371 A	28-09-2011
		DK 2361339 T3	16-09-2013
		EP 2361339 A1	31-08-2011
		ES 2427251 T3	30-10-2013
		PT 2361339 E	10-09-2013
		WO 2010024703 A1	04-03-2010

WO 2017110473 A1	29-06-2017	KR 20180099653 A	05-09-2018
		SG 11201805027T A	30-07-2018
		TW 201723298 A	01-07-2017
		WO 2017110473 A1	29-06-2017

GB 2526574 A	02-12-2015	EP 3149264 A1	05-04-2017
		GB 2526574 A	02-12-2015
		US 2017191303 A1	06-07-2017
		WO 2015181530 A1	03-12-2015
