



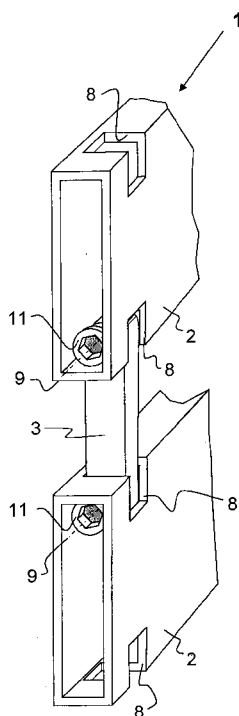
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(54) Title: A ROLLING SHUTTER COMPRISING METAL STAVES AND A SYSTEM FOR CONNECTING METAL STAVES, OF SLIDING OR FIXED, AS WELL AS ARTICULATED TYPE, FOR THE REALIZATION OF MANTLES AGAINST BURGLARY FOR CIVIL AND INDUSTRIAL ROLLING SHUTTERS



**Fig.1**

(57) Abstract: The present invention relates to an innovative simplified system (1) for slide-able and articulated connection of metal slats (2) for providing anti-burglary roller-shutter curtains for residential, commercial, and industrial roller shutters with variable gap (Lv) or fixed gap (Lf) for passage of light between slats. In the first case - variable gap (Lv) - the mutual connection of each pair of slats (2) is obtained via connecting rods (3), hinging means (10, 11, 12), and slots (8) made strictly adjacent to the ends of the slats (2), namely, in the part of the slat (2) that can slide along the rails of the lateral guides. These means (3, 10, 11, 12) and the corresponding slots (8) are designed both to enable articulation of the slats (2) during rolling of the roller-shutter curtain and to space the slats (2) themselves apart from one another. In the second case - fixed gap (Lf) - the mutual connection of each pair of slats (2) is obtained via brackets (5) which constrain said connecting rods (3) with pins (7).

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A ROLLING SHUTTER COMPRISING METAL STAVES AND A SYSTEM  
FOR CONNECTING METAL STAVES, OF SLIDING OR FIXED, AS WELL  
AS ARTICULATED TYPE, FOR THE REALIZATION OF MANTLES  
AGAINST BURGLARY FOR CIVIL AND INDUSTRIAL ROLLING  
SHUTTERS

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The present invention relates to an innovative system for slideable/fixed and articulated connection of metal slats for providing anti-burglary roller-shutter curtains for residential, commercial, and industrial  
5 roller shutters via connecting rods that space apart the slats themselves and that modulate the gap for passage of light between them in a fixed and/or variable way.

The present system is completely innovative in so far as today there do not exist similar systems, and is  
10 moreover inventive, in so far as it has been devised to solve in a unique way the following problems of the known art:

- the problem of connecting together a plurality of slats enabling a mutual sliding thereof both during  
15 opening and during closing in order to be able to modulate easily the gap between each pair of slats and simultaneously reduce the cost of the component elements and simplify assembly thereof, without moreover weakening the curtain obtained;
- 20 ➤ the problem of enabling rolling of the roller-shutter curtain, without allowing it to be raised from outside; and
- the problem of providing in a simple way a valid anti-burglary curtain, even though considerable  
25 thicknesses of the slats are used.

The main purpose of the present invention is precisely to provide a roller-shutter curtain for residential, commercial, and industrial roller shutters that:

- 5 - will be made up of slats obtained using semifinished elements and/or sectional elements made of metal or even not of metal that are readily available on the market and require simple machining operations, moreover involving minimized  
10 times and costs;
- will be provided with slats that can moreover be assembled together in short times with an extremely small number of component elements;
- will be fast to close and open even in the case  
15 where it is heavy, such as the anti-burglary ones made of steel;
- will be provided with an extremely long service life, in terms of number of cycles of use, in order not to require any long-term extraordinary  
20 maintenance at all;
- will be sturdy in order to constitute a valid anti-burglary solution like the one afforded by a metal grating; and
- will be not raisable in the case where it is forced  
25 from outside.

The above purposes are achieved by providing a simplified innovative system for slideable and articulated connection of metal slats for providing anti-burglary roller-shutter curtains for residential,  
30 commercial, and industrial roller shutters as in the claims annexed at the end of the description.

The above purposes and the consequent advantages, as well as the characteristics of the invention according to the present disclosure will emerge more clearly from the ensuing detailed description of some preferred solutions and variants thereof, which are provided by way of non-limiting example, with reference to the attached drawings, wherein:

- Figure 1 is a schematic representation in three-dimensional view of a pair of slats 2 (of which only the portion corresponding to just one end that can slide in the rails that are constituted by the lateral guides of the roller shutter is represented) connected according to the present connection system 1, i.e., via connecting rods 3, which are hinged and can be inserted through purposely provided slots 8 made in the slats 2 themselves in the form of sliding-block linkages;

- Figure 2 is the same schematic representation as that of Figure 1, where the slats have undergone a mutual rotation, which is possible precisely owing to the presence of said connecting rod 3;

- Figure 3 is a schematic representation identical to that of Figure 1, to enable a comparison with the subsequent Figure 4;

- Figure 4 is the same schematic representation as that of Figure 3, where the slats 2 have undergone a mutual translation, which is also possible once again owing to the presence of said connecting rod 3;

- Figure 5 is an exploded three-dimensional schematic representation of the elements that make up the system 1 according to the present invention, which is constituted for each pair of slats 2 by a means for

mutual connection 3 of the slats 2 that can be inserted in the slats themselves through purposely provided slots 8 made on the inner side of the ends of the slats 2 themselves, said means 3 being designed for mutual sliding of the slats 2 to enable a variable gap  $L_v$  and/or a fixed gap  $L_f$  for passage of light between the slats to be obtained, as well as for their mutual rotation to enable moreover rolling of the curtain constituted by said slats 2;

10 - Figure 6 is a cross-sectional view of a portion of the curtain constituted by a plurality of slats 2 connected by the system 1 according to the present invention obtained, in a preferred but non-limiting solution, by a connecting rod 3 and a plurality of connection means constituted by pins 11, sleeves 10, 15 and counterpins 12 that constrain said connecting rods 3, which are inserted through said slots 8 made on the inner side of the ends of the slats 2 themselves;

20 - Figure 7 is the same cross-sectional view as that of Figure 6 of a portion of the curtain constituted by said slats 2, where said slats 2 have now undergone a mutual sliding that provides the total closing of the roller shutter;

25 - Figure 8 is a schematic representation in three-dimensional view of another further simplified solution of said system 1 according to the present invention, where the system 1 provides a gap between slats of a fixed type  $L_f$ ;

30 - Figure 9 is an exploded view of the scheme of Figure 8 that shows the elements making up the system 1 in the solution with fixed gap  $L_f$  between the slats, it

now being impossible for the connecting rods 3 to slide within the slats 2 owing to the presence of brackets 5 with partially threaded holes 6, said brackets 5 being blocked with a pair of pins 7 and, in the solution with fixed gap  $L_f$ , replacing said slidable-connection means 3, constituted by said pins 11, sleeves 10, and counterpins 12;

- Figure 10 is a cross-sectional view of a portion of the curtain constituted by a plurality of slats 2 connected according to the scheme of Figure 8, said vertical section being thus constituted by said slats 2 connected so as to provide a fixed gap  $L_f$  between slats;

- Figure 11 is a schematic representation in front view of a variant of said second preferred, though non-limiting, solution of a device 21 for articulated connection and mutual hinging of a pair of slats 22A-22B, designed to provide an elastic hinging in a plurality of residential, commercial, and industrial applications according to the present invention, basically constituted by an elastic means 25, an inextensible connection means 24, and a pair of means for constraint 23 of said pair of slats 22A-22B on said inextensible connection means 24, said means of constraint 23 thus fixed on said inextensible connection means 24 preventing lengthening in extension of said elastic means 25;

- Figure 12 is the same schematic illustration as that of Figure 11 represented in longitudinal section in order to highlight the shape of said parts that constitute said preferred solution of the device 21; in

particular, there may be appreciated from the drawing the elastic means 25 constituted by a tension spring that connects two slats 22A-22B through said inextensible connection means 24 constituted by a steel  
5 cable, which constrains the spring 25 to said slats 22A-22B, via the pair of means of constraint or clamps 23 that clamp the cable 4 via a pair of clamping screws 26;

- Figure 13 is a schematic illustration of a preferred but non-limiting solution of an example of  
10 application of the above device 21, applied as means for connection of a pair of elements or slats 22A-22B of a roller shutter, where said devices 21 solve the problem of the connection and of the elastic hinging of  
15 the slats 22A-22B themselves; and

- Figure 14 is the same schematic illustration as that of Figure 13, where the slats 22A-2B have undergone a mutual rotation, which is possible owing to the presence of said device 21, especially when they  
20 are rolled around a roller identical to the one illustrated in Figure 11, to enable a comparison with Figure 13.

From the first ten attached figures, a person skilled in the branch will readily appreciate how the  
25 system 1 is constituted for slideable and articulated connection of metal slats 2 for providing anti-burglary roller-shutter curtains for residential, commercial, and industrial roller shutters, which in two preferred embodiments envisages connecting rods 3 that space the  
30 slats 2 themselves apart and modulate the gap for passage of light between them in a fixed  $L_f$  and/or

variable Lv way.

With reference to Figures 1 to 7, which show a first embodiment of the invention, the system 1 for slideable and articulated connection of metal slats 2, for providing anti-burglary roller-shutter curtains for residential, commercial, and industrial roller shutters is obtained via slidable-connection means or connecting rods 3, hinging means 10-11-12, and slots 8 made strictly adjacent to the ends of the slats 2, on the side of the inner surface of the roller-shutter curtain that can slide along the rails of the lateral guides. The means 3-10-11-12 and the corresponding slots 8 are designed both to enable articulation of the slats 2, as emerges from Figures 1 and 2 when the curtain is being rolled up, and to space the slats 2 apart, moving them away from one another or bringing them up closer to one another, respectively during opening and closing of the roller shutter, with said system 1 modulating the gap for passage of light between the slats 2 in a variable way Lv, as emerges from Figures 3 and 4.

Figures 5, 6 and 7 show the details of a first preferred but non-limiting embodiment of the system 1, with said hinging means 10-11-12 constituted by a threaded pin with hexagonal head 11 first passing along an axis 9 through a hole 4 of the connecting rod 3 and then screwing into a completely internally threaded sleeve 10, into which, on the opposite side, a counterpin 12 is screwed.

Said hinging means 10-11-12 can be replaced during assembly of the roller-shutter curtain by hinging rivets or by other equivalent hinging means that are

easy and fast to install.

A second embodiment of the invention, shown in Figures 8, 9 and 10, envisages that the articulated connection of the slats 2, as an alternative to that with variable gap  $L_v$ , is at a pre-set fixed distance  $L_f$ . According to the invention, this can be obtained by constraining said slidable-connection means or connecting rods 3 to purposely provided fixed-connection means 5-7. In this case, the means 3-5-7 and the slots 8 are designed both to enable articulation of the slats 2 during rolling of the curtain and to space the slats 2 of the roller shutter themselves in a fixed way, i.e., with a fixed gap  $L_f$  for passage of light between the slats, during opening and closing. The fixed-connection means 5-7, in a preferred but non-limiting solution, are constituted by rigid elements or brackets 5 provided with partially threaded holes 6, constrained by threaded pins 7.

When the roller-shutter curtain is completely closed, the system 1 prevents raising of the curtain itself, thus providing a valid anti-lift blocking means, also thanks to the particular box-like conformation of the slats 2.

Prevention of raising is due to the fact that, when the curtain is raised from beneath, the slats of the curtain itself are subjected, in the area of the roller, to a thrust that imparts a rotation, opposite to the rotation of rolling, on the curtain itself, thus creating within the box an obstacle to rolling of the curtain, and hence constituting a hindrance to raising of the latter.

The slats 2 will preferably be obtained starting from commercially available sectional elements, usually made of steel or aluminium with rectangular box section. It is moreover envisaged that said slats 2, when they are not made of metal, will preferably be made of rigid plastic materials, such as the sectional elements made of extruded PVC with high thermal insulation.

A variant of the second embodiment, shown in Figures 11 to 14, envisages a system for articulated connection, together with a mutual hinging of an elastic type, of at least one pair of rigid elements or slats, this system being designed to solve in an innovative way the following problems of the known art:

- the problem of connecting together a pair of rigid elements or slats, enabling a mutual elastic rotation thereof, both during opening and during closing;
- the problem of providing a functionally valid hinge that at the same time will enable reduction of the cost of the component elements, without minimizing the corresponding effectiveness and efficiency;
- the problem of simplifying assembly of the hinge and the corresponding installation, given that is constitutes a sturdy and valid hinging means, without at the same time weakening either the elements that are to be coupled together or the hinging and coupling constraint itself; and
- the problem of enabling rolling on a roller of a plurality of elements that can be coupled via said hinging means, preventing undesirable friction and

creation of undesirable spaces that increase the volume of rolling of the elements themselves.

The above problems have been overcome with this variant of the invention by providing an innovative articulated connection, together with a mutual elastic hinging, of at least one pair of rigid elements or slats, which is designed to provide an alternative elastic hinging in a plurality of residential, commercial, and industrial applications as specified in the attached claims.

From Figures 11, 12, 13 and 14, which regard a variant of the second embodiment of the present invention, it emerges that in this case the connection is substantially constituted by a device 21 comprising an elastic means 25, an inextensible connection means 24, and a pair of means of constraint 23 of at least one pair of slats 22A-22B on one and the same inextensible connection means 24, with said means of constraint 23 rigidly fixed on said inextensible connection means 24 so as to prevent lengthening in extension of said elastic means 25, only enabling elastic bending of the latter, thus providing a valid device 21 for connection and articulated elastic hinging.

In the preferred but non-limiting solution that is described, said device 21 is constituted by a tension spring 25 with helical development having a cylindrical shape, with a length ranging from a few millimetres to some tens of centimetres, provided at its two ends with tapered sections 27, designed to be inserted in said rigid elements 22A-22B (which, in the example shown,

are a pair of slats of a plurality of slats that constitute the roller-shutter curtain) that are to be hinged together and elastically articulated and are thus obtained to prevent any wear of the elements that make up the device 21. Inserted into said tension spring 25 as inextensible connection means is a cable 24, which, by passing alternately in said tension springs 25 and in the lateral ends of said plurality of slats 22A-22B of the roller-shutter curtain, unites the entire curtain itself. The latter can be raised by winding or unwinding the cables 24 connected to the last slat or bottom slat of the roller shutter and to pulleys connected to the roller of the roller shutter itself.

The means of constraint 23 have been represented in a preferred but non-limiting solution by clamps 23 provided with clamping screws 26, which are constrained on the cable 24 and within said elements or slats 22A-22B in such a way as to prevent tensile lengthening of the spring 15. The latter, thus constrained, can undergo only elastic bending during rolling/unrolling of the roller-shutter curtain onto/from the roller, at the same time providing a valid means for hinged connection and articulation of each individual pair of slats 22A-22B of the curtain.

Shown in Figures 13 and 14 is the above preferred but non-limiting embodiment of said device 21 described above, applied to a pair of slats 22A-22B of a roller shutter, where said devices 21 constitute, not only a valid means for hinging and articulation of the slats, especially when they are rolled on the roller, thus

enabling the advantage of minimizing the volume of packing of the curtain constituted by the plurality of slats, but also a valid means for spacing the slats 22A-22B themselves apart with a fixed gap.

5           The advantages of the present invention basically derive from the simplicity of construction of the roller-shutter curtain starting from said box-type elements and/or sectional elements and accessories, and are moreover represented by the low manufacturing costs  
10 and the ease of machining and assembly in the workshop and installation of the end product thus obtained.

          It is also evident that numerous modifications, adaptations, integrations, variants, and replacements of elements with other functionally equivalent ones may  
15 be made to the embodiment described herein by way of illustrative and non-limiting example, without thereby departing from the sphere of protection of the ensuing claims.

#### LEGEND

- 20 1. Simplified system for slideable and articulated connection of metal slats for providing anti-burglary roller-shutter curtains for residential, commercial, and industrial roller shutters with variable gap (Lv) or fixed gap (Lf) for passage of  
25 light between slats;
2. Slat
3. Slidable-connection means or connecting rod
4. Non-threaded holes of the connecting rod 3
5. Fixed-connection means or bracket
- 30 6. Partially threaded holes of the bracket 5
7. Pins of the bracket 5

8. Slots present adjacent to the ends of the slat 2
9. Screwing axes of the pins 7 and 11
10. Internally threaded sleeve
11. Threaded pin with hexagonal head of the embodiment  
5 with variable gap Lv
12. Threaded counterpin with hexagonal head of the  
embodiment with variable gap Lv
21. System for articulated connection and mutual  
hinging of at least one pair of rigid elements or  
10 slats 22A-22B
- 22A-22B. Pair of slats to be connected with said  
connection system 21
23. Means of constraint or clamp provided with clamping  
screw 26
- 15 24. Inextensible connection means or cable
25. Flexible or elastic connection means or tension  
spring
26. Clamping screw of the clamp 23
27. Tapered ends of the tension spring 25  
20

CLAIMS

1) A roller shutter comprising slats and a simplified system (1) for slideable and articulated connection of metal slats (2) for providing anti-burglary roller-shutter curtains for residential, commercial, and industrial roller shutters with variable gap (Lv) for passage of light between slats, characterized in that the mutual connection of each pair of slats (2) is obtained via slidable-connection means or connecting rods (3), hinging means (10, 11, 12), and slots (8) made strictly adjacent to the ends of the slats (2), on the side of the inner surface of the roller-shutter curtain that can slide along the rails of the lateral guides, said means (3, 10, 11, 12) and the corresponding slots (8) being designed both to enable articulation of the slats (2) during rolling of the roller-shutter curtain and to space the slats (2) themselves apart, moving them away from one another and bringing them up closer, respectively during opening and closing of the roller shutter.

2) The roller shutter according to Claim 1, characterized in that said slidable-connection means or connecting rod (3) constrains the ends of the slats (2) that can slide along the guide rails of the curtain, owing to the presence of slots (8) adjacent to the ends of the slats (2) themselves, said slots (8) being designed to provide articulation for rolling of the roller-shutter curtain, as well as to cause the connecting rods (3) to slide through the slots (8), said connecting rods (3) connecting in pairs each slat (2) to the next one via said hinging means (10, 11,

12), said connection system (1) thus constituted completely preventing passage of the light between each pair of slats (2) during complete closing of the curtain, and moreover being designed to space apart the  
5 slats (2) themselves with a variable gap (Lv), thus enabling passage of light during opening of the roller-shutter curtain.

3) The roller shutter according to the preceding claims, characterized in that said hinging means (10,  
10 11, 12) are constituted by an internally threaded sleeve (10), a threaded pin with hexagonal head (11) and a counterpin (12), said pin (11) first passing along an axis (9) through a hole (4) of the connecting rod (3) and subsequently screwing into the sleeve (10),  
15 into which, on the opposite side, a counterpin (12) is screwed.

4) The roller shutter according to the preceding claims, characterized in that said hinging means (10,  
11, 12) can be replaced by hinging rivets or by other  
20 equivalent hinging means.

5) The roller shutter according to the preceding claims, characterized in that said slots (8) present on the slats (2) are obtained so as to enable easy rolling of the shutter curtain, in any case preventing it from  
25 being raised in the event of attempt at burglary; said hindrance being due to the fact that as said curtain is raised from beneath the slats making it up undergo, in the area of the roller, a thrust that imparts on the curtain a rotation opposite to the rotation of rolling  
30 on the roller, thus creating within the box an obstacle to rolling of the curtain, and hence constituting a

hindrance to raising of the latter.

6) A roller shutter comprising slats and a simplified system (1) for slideable and articulated connection of metal slats (2) for providing anti-burglary roller-shutter curtains for residential, commercial, and industrial roller shutters with fixed gap (Lf) for passage of light between slats, said roller shutter being characterized in that the mutual connection of each pair of slats (2) is obtained with slidable-connection means or connecting rods (3), constrained via fixed-connection means (5, 7), and with slots (8) made strictly adjacent to the end of the slats (2), on the inner surface of the roller-shutter curtain that can slide along the rails of the lateral guides, said means (3, 5, 7) and said slots (8) being designed both to enable articulation of the slats (2) during rolling of the curtain and to space the slats (2) of the roller shutter apart with a fixed gap (Lf), during opening and closing of the shutter.

7) The roller shutter according to Claim 6, characterized in that said fixed-connection means (5, 7) are constituted by rigid elements or brackets (5) with partially threaded holes (6) and threaded pins (7).

8) The roller shutter according to Claim 6 or Claim 7, characterized in that said system (1), when the roller-shutter curtain is completely closed, prevents raising of the curtain itself, thus providing a valid anti-lift blocking means; said anti-lift blocking being due to the fact that during raising of the curtain from beneath, the slats making up said

curtain undergo, in the area of the roller, a thrust that imparts a rotation on the curtain opposite to the rotation of rolling on the roller shutter, thus creating within the box an obstacle to rolling of the curtain, and hence constituting a hindrance to raising of the latter.

9) The roller shutter according to one or more of Claims 6 onwards, characterized in that said slats (2) are obtained with rectangular box section, using commercially available sectional elements preferably made of steel and aluminium.

10) The roller shutter according to Claim 6, characterized in that, as an alternative to said connecting rods (3), said fixed-connection means (5-7), and said slots (8), mutual connection of each pair of slats (2A-2B) is substantially constituted by an elastic means (25) internally reinforced by an inextensible connection means (24) and firmly constrained to said pair of elements (2A-2B) via a plurality of means of constraint (23), said means of constraint (23) being firmly constrained on said inextensible connection means (24) so as to prevent lengthening in extension of said elastic means (25), enabling only elastic bending of the latter and thus providing a valid elastic hinging device (21) that can be conveniently installed in a plurality of residential, commercial, and industrial applications.

11) The roller shutter according to Claim 10, characterized in that said device (21) thus constituted is designed to provide a valid means of spacing of the elements or slats (22A-22B) to be constrained with a

fixed gap, in addition to a valid means for hinging and articulation thereof.

12) The roller shutter according to any one of Claims 11 onwards, characterized in that said elastic  
5 means (5) is constituted by a cylindrical tension spring having a length that may range from a few millimetres to some tens of centimetres, provided at its two ends with tapered sections (27).

13) The roller shutter according to any one of  
10 Claims 11 onwards, characterized in that said inextensible connection means (24) is constituted, in a preferred but non-limiting solution, by a steel cable with high shear strength and high tensile strength having a length that may range from a few decimetres to  
15 some metres.

14) The roller shutter according to any one of Claims 11 onwards, characterized in that said elements (22A-22B) are constituted by slats that make up, in a plurality of pairs, a roller-shutter curtain.

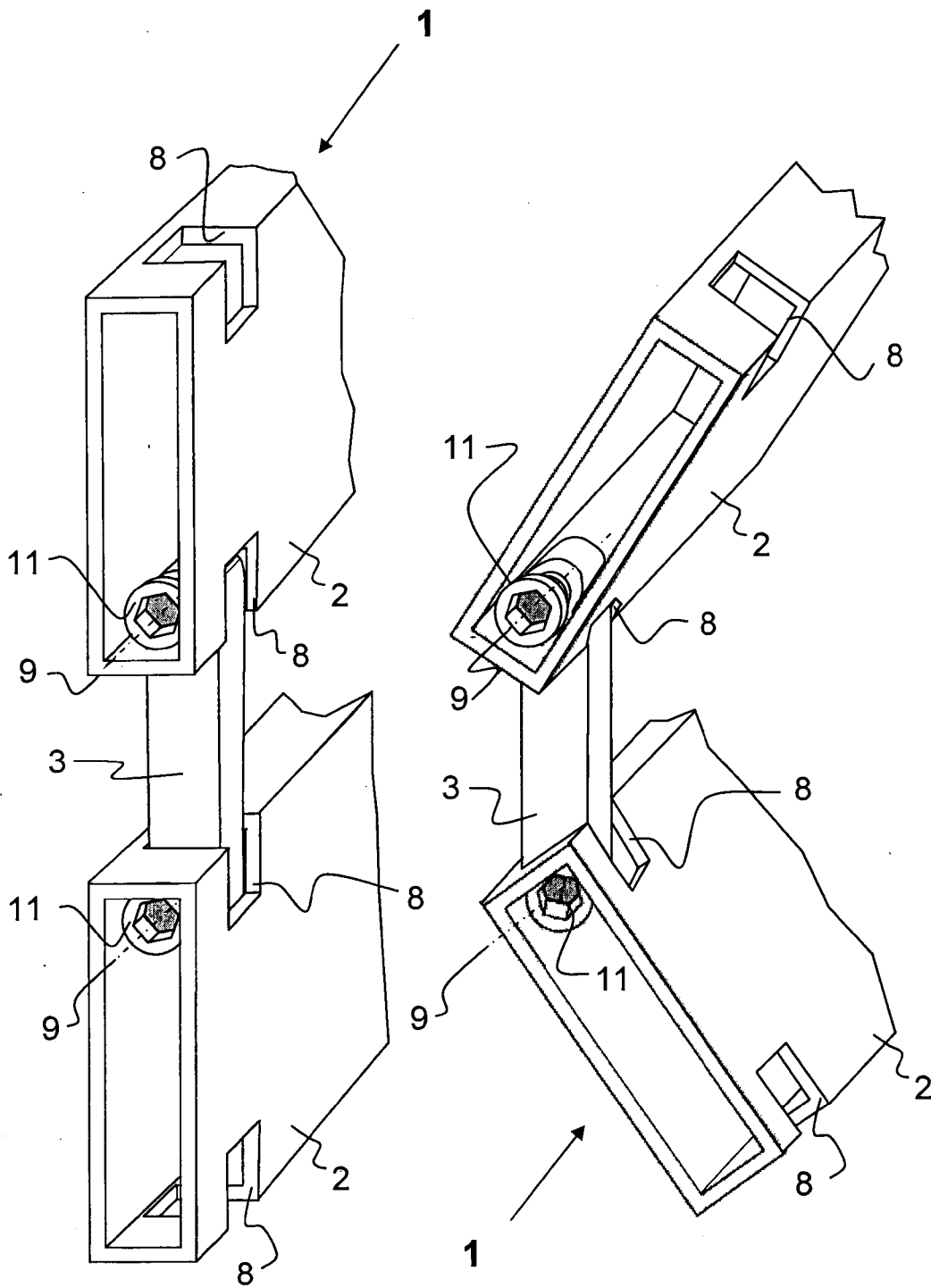
15) The roller shutter according to any one of  
20 Claims 11 onwards, characterized in that said device (21), in the particular multiple application to a roller-shutter curtain, provides, in addition to a valid means for connection and hinging of the slats of  
25 the curtain, also a means for easy closing and opening of the curtain itself via said inextensible connection means (24), the latter being windable on pulleys connected to the shutter roller and being present at least in pairs at the ends of the slats, which are  
30 protected while they slide within the lateral guides of the roller shutter.

16) The roller shutter according to any one of Claims 11 onwards, characterized in that said elastic means (25) enable easy rolling of the shutter curtain, especially when they are wound on the roller, wherein  
5 they enable minimization of the volume of packing of the curtain constituted by the plurality of slats making up said curtain, moreover preventing raising thereof in the event of burglary.

17) The roller shutter according to any one of  
10 Claims 11 onwards, characterized in that said elements (23, 24, 25, 26) making up the device (21) may be made in various shapes and of various materials to meet the aesthetic and functional needs of the sector of application.

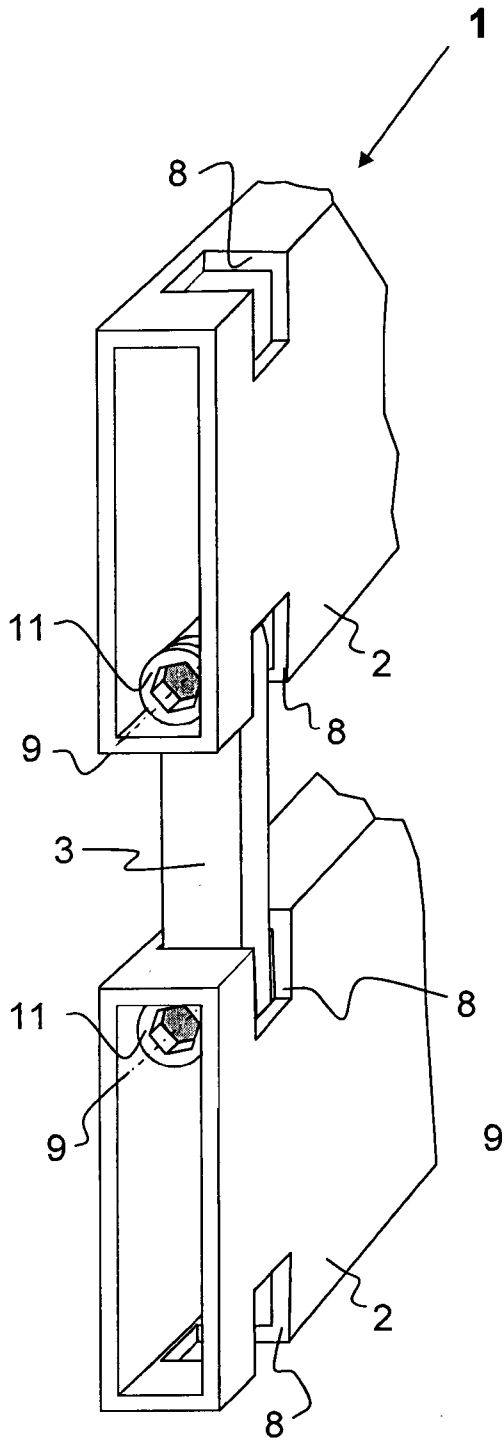
15 18) The roller shutter according to any one of Claims 11 onwards, characterized in that said connection device (21) is designed to be insertable as elastic hinge in a plurality of residential, commercial, and industrial applications.

20 19) The roller shutter according to one or more of the preceding claims, characterized in that said slats (2), when they are not made of metal, are preferably made of rigid plastic materials, such as sectional elements made of extruded PVC with high  
25 thermal insulation.

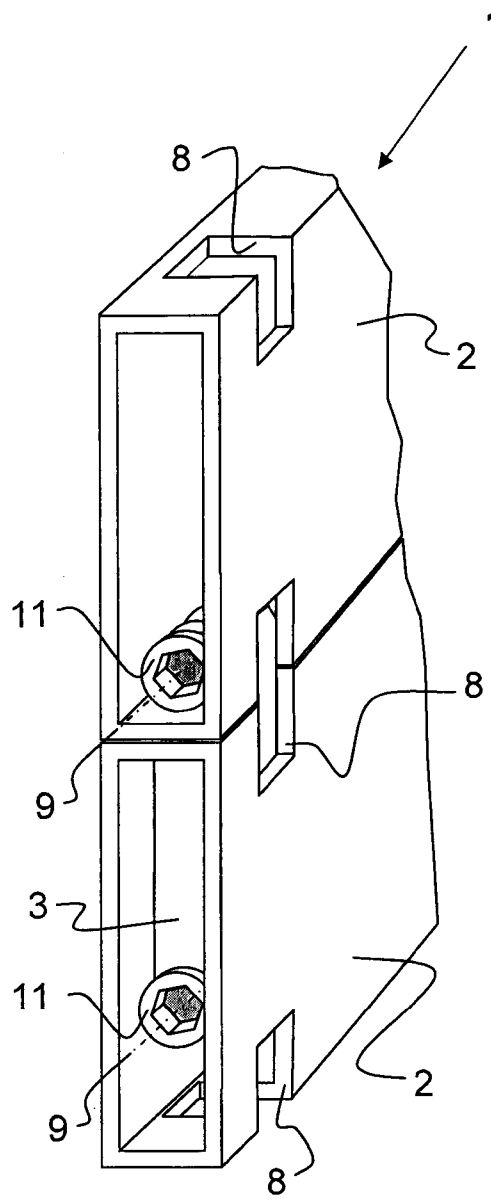


**Fig.1**

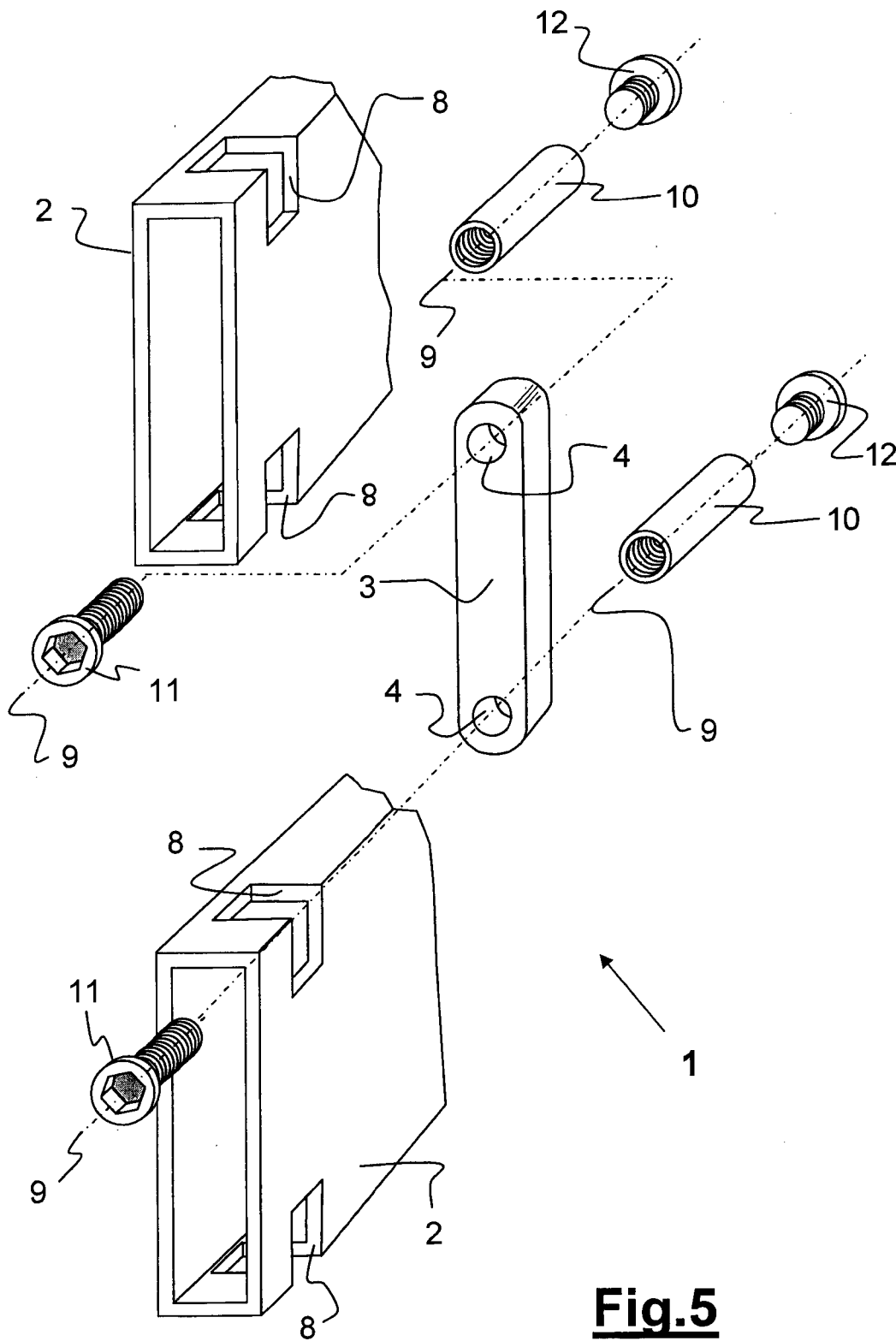
**Fig.2**



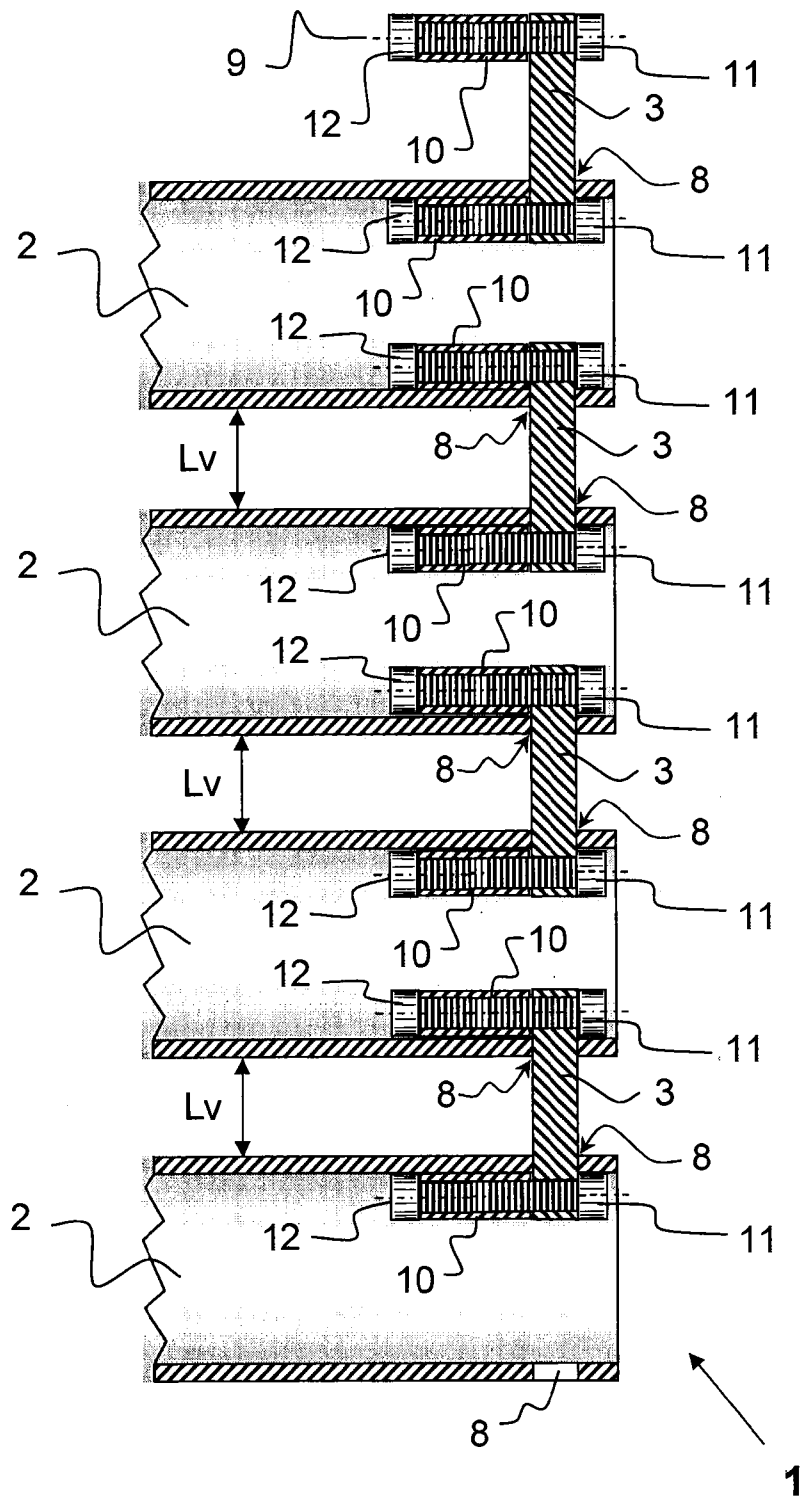
**Fig.3**



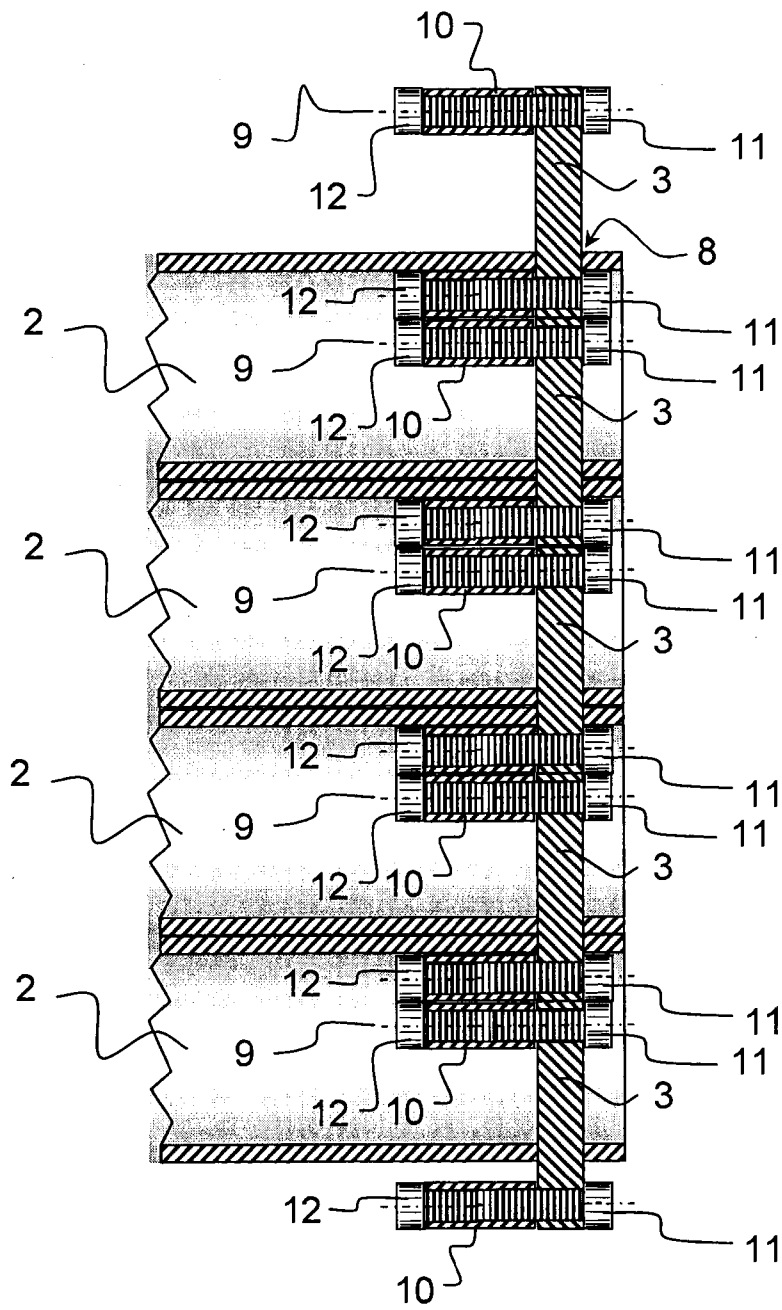
**Fig.4**



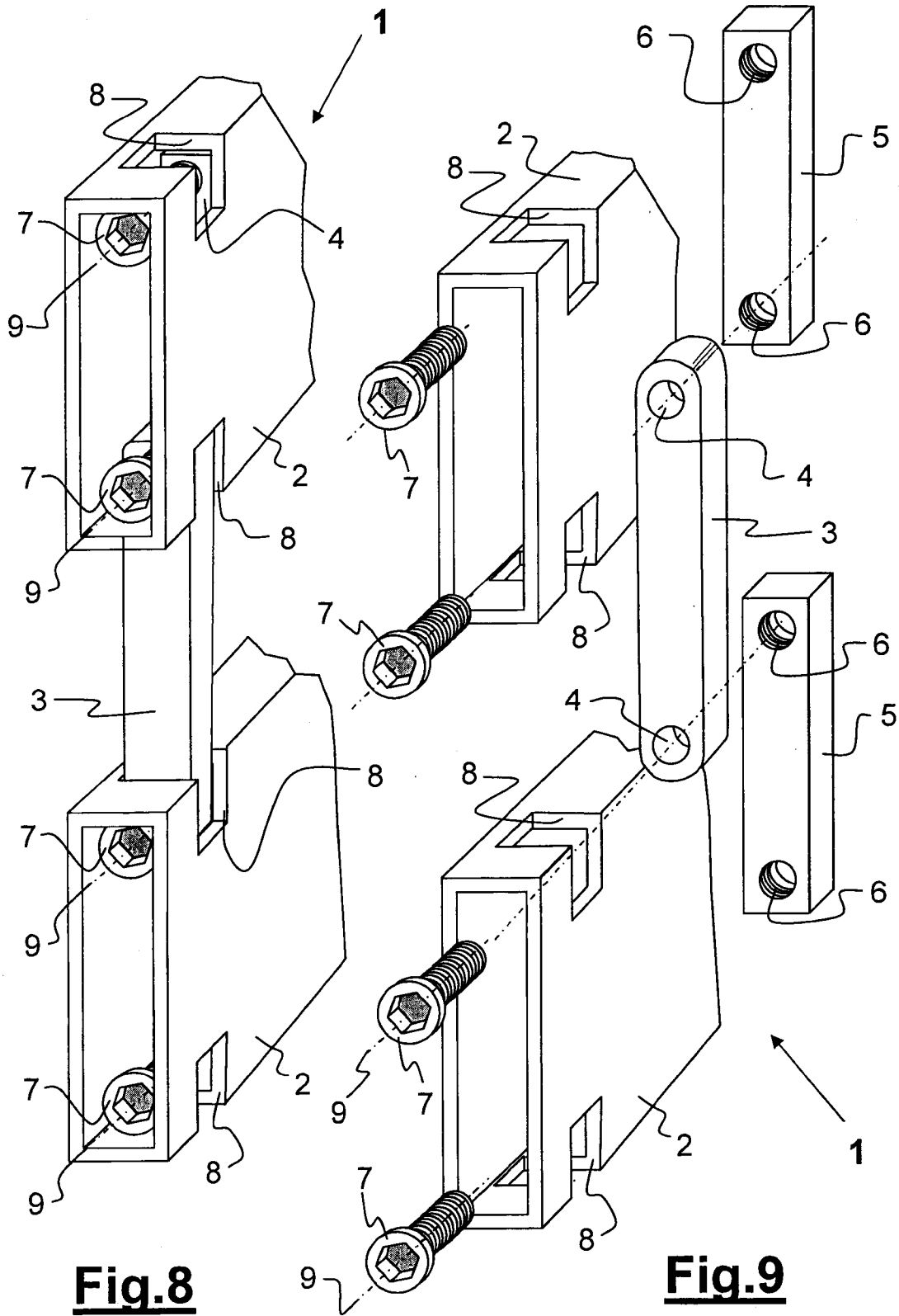
**Fig.5**



**Fig.6**

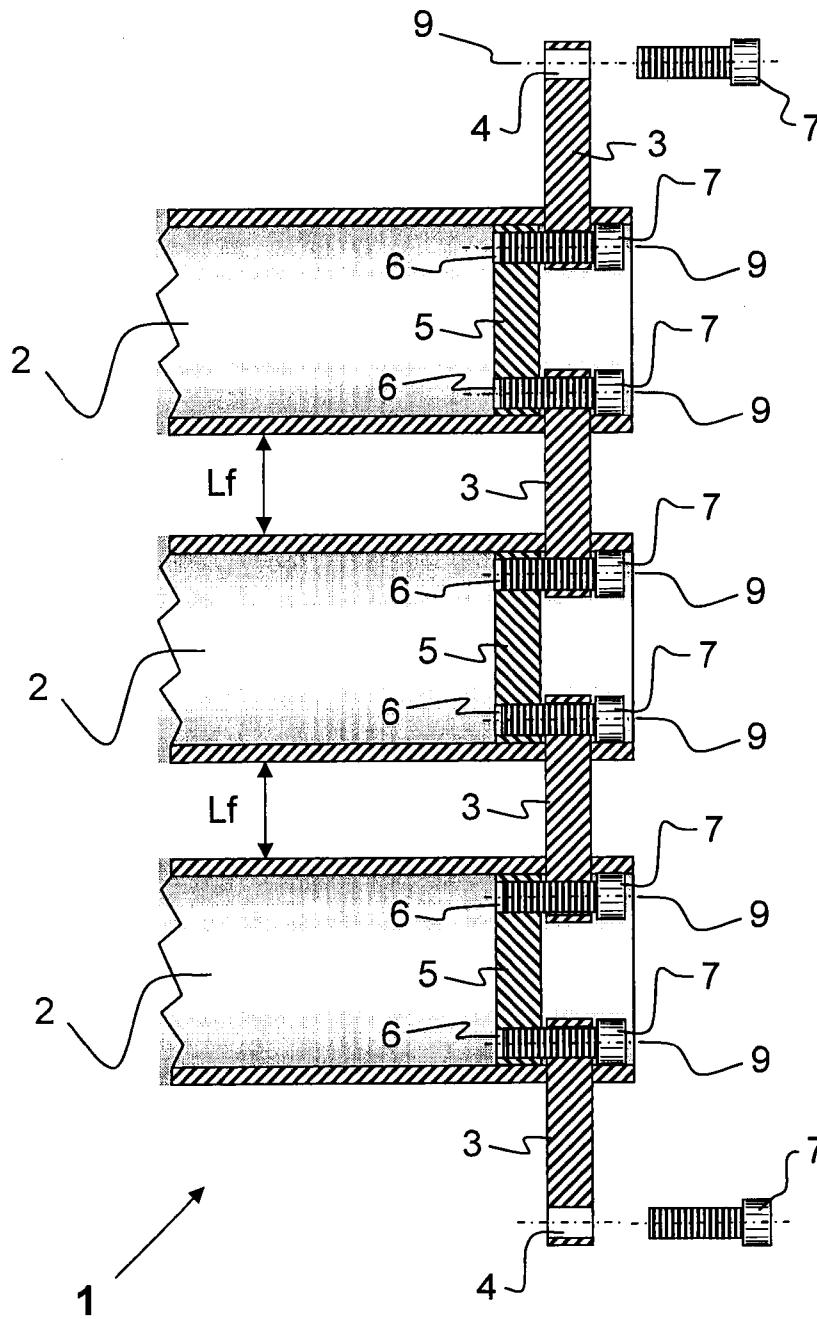


**Fig.7**

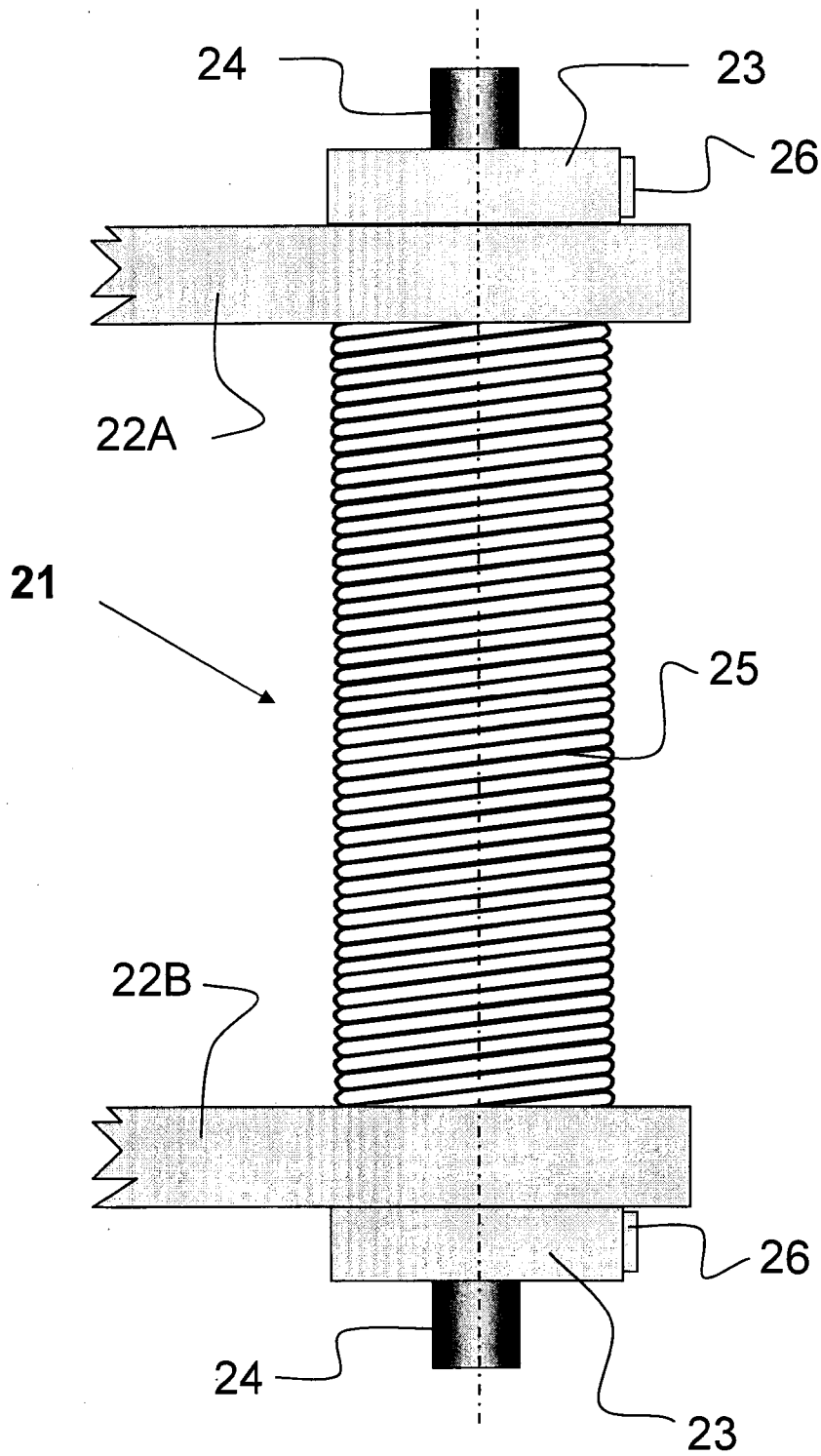


**Fig.8**

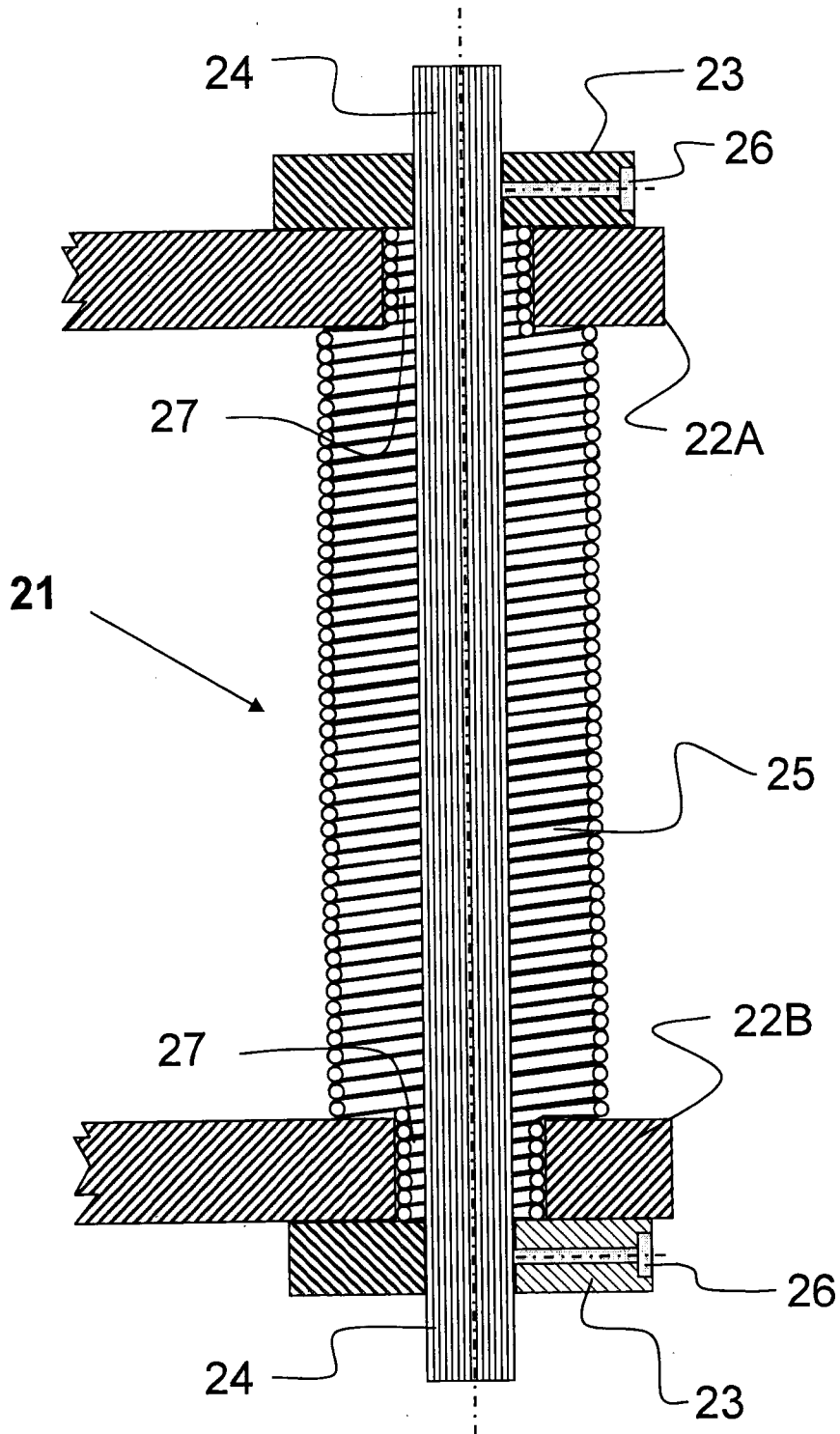
**Fig.9**



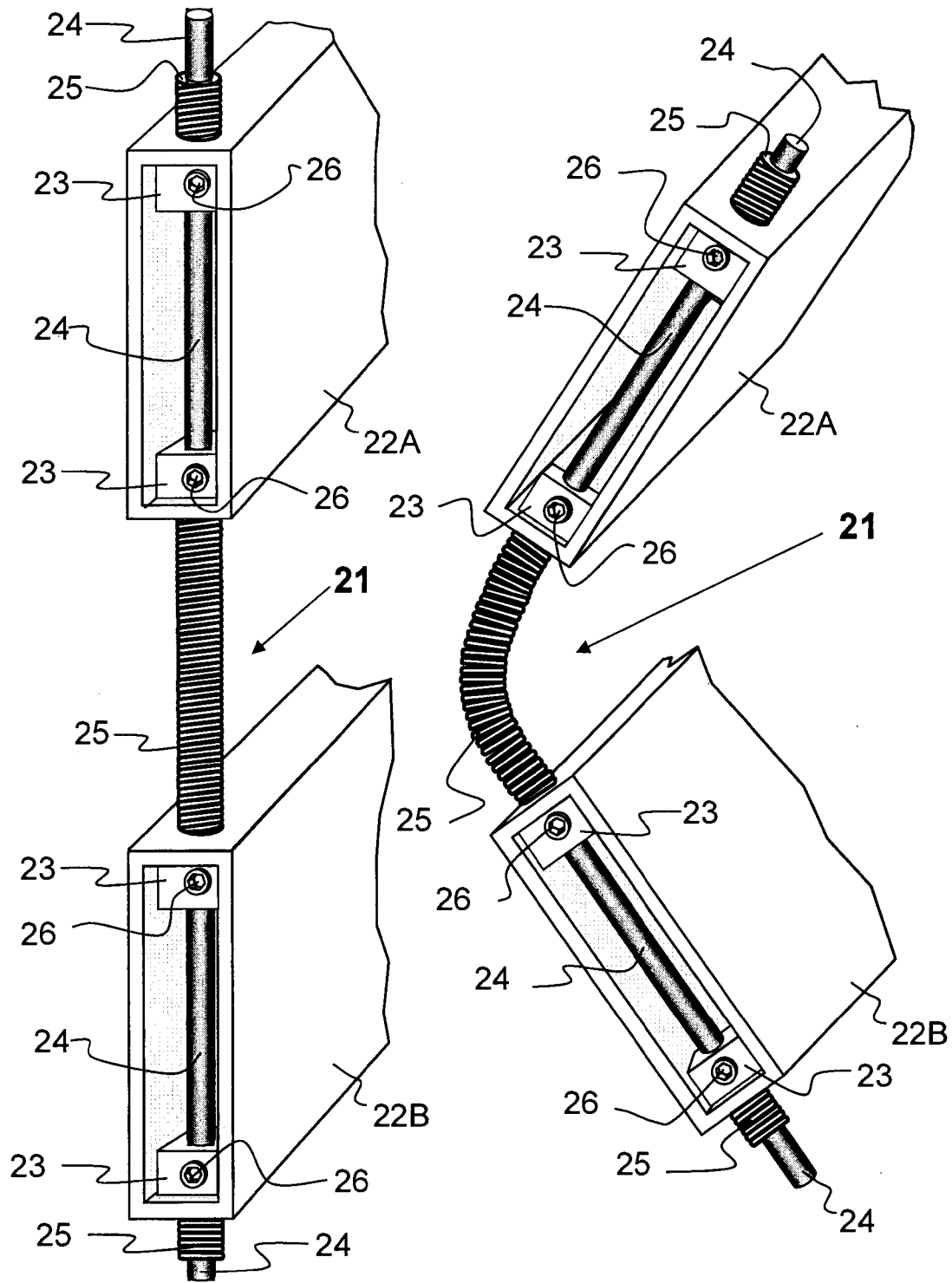
**Fig.10**



**Fig. 11**



**Fig. 12**



**Fig. 13**

**Fig. 14**