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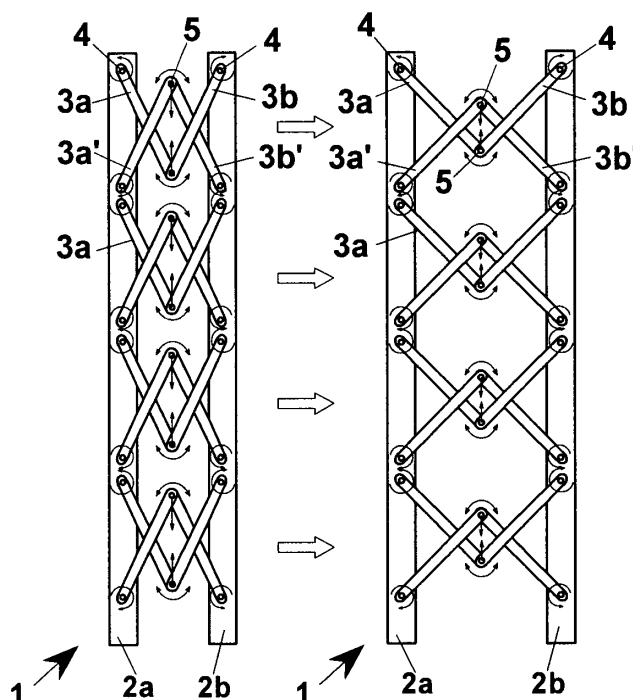
(54) **Collapsible grille shutter unit**

(57) Collapsible grille shutter unit comprising a first and a second bar (2a, 2b) interconnected by a first and a second plurality of rods (3a, 3b) hinged at an end by a movable pin (5). Each rod (3a) of the first series is hinged, moreover, to the first bar (2a) and each rod (3b) of the second series is hinged to the second bar (2b) by means of fixed pins (4). The fixed pins (4) can be located

at an end of the rods (3a and 3b) or at a midpoint thereof. The end of each rod (3a), hinged to the first bar (2a), may be shaped to mesh with the complementary end of a rod (3a') to it neighbouring. Such gearing allows, to operate in substantial synchronism all rods (3a, 3b) of each couple of bars (2a, 2b) and to provide a opening/closing mechanism with high precision.

Fig. 1

Fig. 2



DescriptionField of the invention

[0001] The present invention relates to a collapsible grille shutter unit to apply at a door or window opening to control the access in a desired way.

[0002] Furthermore, the invention relates to a method for the production of a such a grille shutter.

Description of the prior art

[0003] As known, a variety of types exist of grille shutters that are collapsible in a plane and are applied at a door or window opening of shops or houses as protective devices.

[0004] Such collapsible grille shutters comprise usually a plurality of metal vertical bars whose ends can slide by means of knobs in horizontal guides. The vertical bars are interconnected by metal rods in a crossing arrangement (lazy tongs grilles) hinged to each other in the crossing point, having at their ends pins that slide in grooves made in the vertical bars same.

[0005] When the window or the door at which the grille shutter is applied must be closed, the vertical bars are brought from a starting position, where they are approached to each other and the metal rods are arranged substantially vertical, to a position where they are distanced corresponding to an oblique arrangement of the metal rods. This is obtained because, when moving away from each other the vertical bars by sliding their ends in the horizontal guides, a rotation is induced of the metal rods about the respective pins, which slide in the grooves of the bars and move away from each other in a vertical direction, thus leaving wide empty spaces between them.

[0006] The manoeuvre is easy because between the pins and the grooves made in the vertical bars there is a certain play that allows the sliding and the rotation of each pin. However, the sum of all the backlash between the pins and the grooves makes the whole structure very instable and a location thereof is imprecise. This causes relevant difficulty at opening or closing the grille shutter because the vertical bars can be inclined blocking the rotation and the sliding of the pins in the respective grooves.

[0007] Furthermore, owing to the wide empty spaces left by the metal rods when the grille shutter is open the protection that is obtained of the window or of the door is partial and ineffective.

[0008] A further drawback is that the known methods for the production of the grille shutters provide many manual steps, and are expensive and complex because they require cutting many elements of different length.

Summary of the invention.

[0009] It is therefore a feature of the present invention

to provide a collapsible grille shutter unit that allows to cover homogeneously a building opening, for example a window or a door.

[0010] It is another feature of the present invention to provide a collapsible grille shutter unit that has an easy and precise operation when opening and closing.

[0011] It is a further feature of the present invention to provide a collapsible grille shutter unit that has not the drawbacks of the devices of prior art concerning the production and the assembling step.

[0012] It is a particular a feature of the present invention to provide a modular collapsible grille shutter that has the above described advantages.

[0013] These and other objects are accomplished by the collapsible grille shutter unit, according to the present invention, comprising at least a first and a second bar which can move parallel towards/away from each other, a first plurality of hinged rods at the first bar and a second plurality of hinged rods at the second bar, the rods of the first and of the second plurality being in pairs hinged to each other at a movable end that is located between said two bars at a mid point, whereby said bars can approach/move away from each other with a consequent movement of said end.

[0014] Advantageously, each rod is hinged to the respective bar at its other end.

[0015] Preferably, the ends hinged to the bar of at least two following rods along each bar have means for engaging with each other, suitable for causing a rotation of the two rods symmetric with respect to a plane perpendicular to the bar.

[0016] Preferably, said means for engaging comprises a shaped surface with recesses and protrusions suitable for engaging with the respective protrusions and recesses of the shaped surface of another rod, in order to transmit a mutual rotation about said fixed pin.

[0017] Advantageously, each couple of rods hinged to each other at a movable end is interlaced with another couple of rods to form substantially an "x" so that respective parallel rods lay in a same plane. This way, when said bars move away, at a certain point said two parallel rods contact each other and a self-blocking mechanism is obtained that limits a further opening movement of the bars. This mechanism allows, furthermore, the collapsible grille shutter unit to shrink to a position of minimum encumbrance with rods approached to each other.

[0018] According to another aspect of the invention a modular collapsible grille shutter comprises a plurality of grille shutter units arranged in series as above defined connected to each other by said rods.

[0019] Advantageously, the bars are formed by two parallel slats and the rods, in the collapsed position of the grille shutter, disappear between said slats whereby the collapsed grille shutter has the same width as the sum of the widths of said bars.

[0020] In particular, the ends of said rods are hinged on pins arranged in a midpoint between said bars, so

that when the grille shutter is collapsed said pins engage in a recess provided within said bars, or have height less than the distance between said slats.

[0021] Alternatively, the bars are formed by two profiles having longitudinal grooves that in use are opposite, said plurality of rods being hinged to said bars by means of support blocks that engage with said grooves.

[0022] In any preferred exemplary embodiment as above defined, a grille shutter comprises a plurality of units in succession that are arranged to form a plurality of intermediate bars set between a starting bar and an end bar, said rods hinged to said respective bars creating in a direction orthogonal to said rods at least two rows of rhombi such that said means for engaging with each other cause a symmetric opening movement of the rhombi.

[0023] Preferably, in addition to said at least two rows of symmetrically opening rhombi at least one third row of couples of rods is provided suitable for forming a corresponding series of rhombi like "lazy tongs", suitable for assuring a fixed distance between two successive bars.

[0024] Preferably, at least said starting bar or said end bar have said opposite grooved profiles united to each other in order to form a single profile, said starting bar allowing a snap-fit engagement with a starting profile anchorable to a wall, said end bar allowing a snap-fit engagement with a movable end profile suitable to house a lock.

Brief description of the drawings

[0025] The invention will now shown with the following description of an exemplary embodiment thereof, exemplifying but not limitative, with reference to the attached drawings wherein:

- figures from 1 to 3 show diagrammatically in an elevational front view a succession of positions of a first exemplary embodiment of the collapsible grille shutter unit, according to the invention, between a collapsed configuration and an open configuration;
- figures 4 and 5 show a top plan view of two possible configurations, respectively half-open and self-blocked, of an exemplary embodiment alternative to figures from 1 to 3;
- figures from 6 to 8 show diagrammatically in an elevational front view a succession of positions of an exemplary embodiment alternative to figures from 1 to 3 of the collapsible grille shutter unit between a collapsed configuration and an open configuration;
- figures 9 and 10 show a top plan view and a longitudinal sectional view according to arrows x-x of a possible exemplary embodiment of a rod used in the device of figures 6-8;
- figure 11 is a cross sectional view according to arrows XI-XI of the modular collapsible grille shutter

of figure 13;

- figure 12 shows in detail the mesh between the end of the rods of figures 9 and 11;
- figure 13 shows in an elevational front view a modular collapsible grille shutter obtained connecting to each other a plurality of the collapsible grille shutter units of figure 8;
- figure 14 is a cross sectional view of the end of two overlapped rods of the grille shutter of figure 13;
- figure 15 shows in detail the mechanism that allows the self-locking of a couple of hinged rods at a movable end;
- figures 16 and 17 show respectively in an elevational front view and in a rear view the modular collapsible grille shutter of figure 14 in closed configuration;
- figures 18 and 19 show the modular collapsible grille shutter of figure 14 applied to the inlet of a shop in extended configuration and completely closed configuration;
- figure 20 shows diagrammatically in an elevational front view a further exemplary embodiment of a collapsible grille shutter unit in open configuration alternative to figures from 1 to 3;
- figure 21 shows in a partially cross sectioned view an exemplary embodiment of the bars of the collapsible grille shutter unit alternative to that of figures from 1 to 17;
- figures 22 and 23 show partially cross sectioned views of an exemplary embodiment respectively of a starting bar and an end bar for the collapsible grille shutter of figure 21;
- figures 24 and 25 show front views of the collapsible grille shutter of figure 20 using the rods of figures 21-23 respectively in open and collapsed configuration.

Description of the preferred exemplary embodiment

[0026] With reference to figures from 1 to 3 a collapsible grille shutter unit, according to a first exemplary embodiment of the invention, comprises a first and a second bar 2a and 2b interconnected by a first and a second plurality of rods 3a and 3b hinged to each other at an end by a movable pin 5. Moreover, each rod 3a of the first series is hinged to the first bar 2a and each rod 3b of the second series is hinged to the second bar 2b by fixed pins 4. Fixed pins 4 can be located at an end of rods 3a and 3b (figures 1-3) or at a midpoint thereof (figures 4 and 5).

[0027] A couple of hinged rods 3a and 3b can be, moreover, interlaced with another couple of hinged rods 3a' and 3b' in order to form substantially an "x" where the parallel rods 3a, 3b' and 3a', 3b lay in a same plane.

[0028] The particular distribution of fixed pins 4 and of movable pins 5 allows to approach/move away from each other bars 2a and 2b in a parallel way. In fact, as diagrammatically shown in figures 2 and 3, when bars 2a and 2b are withdrawn rods 3a and 3b rotate about

the respective fixed pins 4 and movable pins 5; the latter, furthermore, translate along a line parallel to bars 2a and 2b reducing progressively the inclination of the rods.

[0029] The "x" arrangement of the couples of rods 3a, 3b and 3a', 3b' as above described determines, furthermore, a position of maximum opening for bars 2a and 2b, since when the parallel rods 3a, 3b' and 3a', 3b contact each other, a self-blocking is obtained at the movable pin 5 that prevents a further moving of bars 2a and 2b away from each other.

[0030] In the case shown in figures 6-8 the end of each rod 3a, hinged to the first bar 2a, is shaped in a way suitable to mesh with the complementary end of rod 3a' to it neighbouring.

[0031] In particular, as shown in figures 9, 10 and 12 the shaped end of each rod 3a, or 3b, has a plurality of protrusions 7a, or 7b, and a plurality of recesses 8a, or 8b, arranged along a circumference, or a portion of circumference, suitable for engaging with each other (figure 12).

[0032] Such gearing allows, therefore, to operate in substantial synchronism all rods 3a and 3b of each couple of bars 2a and 2b of the device 1 and to provide a opening/closing mechanism with high precision.

[0033] In figure 13 a possible exemplary embodiment is shown of a modular collapsible grille shutter 10 obtained coupling to rods 3a and 3b a plurality of collapsible units 1 as above described. In particular, all bars 2a and 2b of the grille shutter 10, with exclusion of the first and of the last, have at each fixed pin 4 two overlapped rods 3a and 3b that give continuity to the structure connecting two consecutive devices 1.

[0034] As shown in figures 11 and 14, bars 2a and 2b can comprise two parallel slats 2a', 2a" and 2b', 2b". In particular, rods 3a and 3b in the collapsed position of the grille shutter 10 can disappear between slats 2a', 2a" and 2b', 2b", since, both fixed pins 4 and the movable pins 5 have the same height as the sum of the thickness of the two rods to it hinged (figure 11). Alternatively, movable pins 5 engage in a recess 11 made within bars 2a and 2b (figure 17). In both cases the collapsed grille shutter 10 has the same width as the sum of the widths of the bars and then a minimum encumbrance.

[0035] In figures 18 and 19 a modular collapsible grille shutter 10 is shown applied to the inlet 51 of a shop 50 with bars 2a and 2b arranged horizontally and respectively in the extended configuration and in the collapsed configuration.

[0036] Always as shown in figures 18 and 19, on account of the uniformity of the grille shutter 10 in the collapsed configuration, for the features above described, it is possible to adorn it with advertisements 55, scripts, images, etc.

[0037] In figure 20 an exemplary embodiment is shown for grille shutter 10 alternative to that shown in figures from 1 to 13. In particular, two rows of rods 103a and 103b are provided hinged to the respective bars 102a or 102b in order to form in an orthogonal direction

to them at least two rows of rhombi 161. Rods 103a and 103b, forming each rhomb 161, have at the respective ends protrusions and recesses, already described with reference in particular to figure 12, which mesh with each other for causing each rhomb 161 to open symmetrically. In addition to the two rows of rhombi 161 that open symmetrically, at least a third row 162 is present of couples of rods 103a and 103b that form a corresponding series of rhombi like "lazy tongs", for assuring a same distance between successive bars.

[0038] In figure 21 an exemplary embodiment is shown for bars 102a and 102b. In this case, bars 102a and 102b are formed by profiles 102a'-102a" and 102b'-102b" respectively having longitudinal grooves 112 that in use are opposite. The series of rods 103a and 103b are hinged by means of pins 104 to bars 102a and 102b by means of support blocks 115 that engage with the grooves 112. This solution allows to conceal pin 104 in bar 102a, or 102b, in order to impede any forcing from the outside increasing the safety of the invention. Furthermore, as shown always in figure 20, movable pins 105 can comprise two halves 105' and 105" that fit with each other.

[0039] All the exemplary embodiments above described of the grille shutter 10 provide a succession of rods set between a starting bar and an end bar. In particular, in figures 22 and 23 exemplary embodiments are shown having respectively a starting bar and an end bar in case of profiled bar. They have the opposite grooved profiles united to each other in order to form a single profile 122. The starting profile 122 in operative conditions is fastened, for example snap-fitted, by a connection pin 130 to a starting profile 150 that in turn is fixed to a wall, for example by means of bolts, screws etc. Similarly, the end bar 122 can be snap-fitted to an end profile 155 suitable to house a lock 160 (figures 24 and 25). In particular, as shown in figure 23 (and in a similar way in figure 22), a snap engagement is possible between a starting bar 122 and starting profile 150 by the pins 130 that have bevelled ends to make easier the introduction. In this way the assembling steps are quite easy and allow maximum safety owing to the non-reversibility of the SNAP connection.

[0040] The foregoing description of a specific embodiment will so fully reveal the invention according to the conceptual point of view, so that others, by applying current knowledge, will be able to modify and/or adapt for various applications such an embodiment without further research and without parting from the invention, and it is therefore to be understood that such adaptations and modifications will have to be considered as equivalent to the specific embodiment. The means and the materials to realise the different functions described herein could have a different nature without, for this reason, departing from the field of the invention. It is to be understood that the phraseology or terminology employed herein is for the purpose of description and not of limitation.

Claims

1. Collapsible grille shutter **characterised in that** it comprises

at least a first and a second bar which can move parallel towards/away from each other, a first plurality of hinged rods at the first bar and a second plurality of hinged rods at the second bar, the rods of the first and of the second plurality being in pairs hinged to each other at a movable end that is located between said two bars at a mid point, whereby said bars can approach/move away from each other with a consequent movement of said end.
2. Collapsible grille shutter, according to claim 1, wherein each rod is hinged to the respective bar at its other end.
3. Collapsible grille shutter, according to claim 1, wherein at least two following rods along each bar have the ends hinged to said rod provided with means for engaging with each other, suitable for causing a rotation of the two rods symmetric with respect to a plane orthogonal to said bar.
4. Collapsible grille shutter, according to claim 3, wherein said means for engaging comprises a shaped surface with recesses and protrusions suitable for engaging with the respective protrusions and recesses of the shaped surface of another rod in order to transmit a mutual rotation about said fixed pin.
5. Collapsible grille shutter, according to claim 1, wherein each couple of rods hinged to each other at said common end is interlaced with another couple of rods to form substantially an "x" so that respective parallel rods lay in a same plane.
6. Collapsible grille shutter **characterised in that** it comprises a plurality of grille shutter units according to the previous claims arranged in series connected to each other by said rods.
7. Collapsible grille shutter, according to claim 6, wherein each rod comprises two parallel slats and said rods, in the collapsed position of the grille shutter, disappear between said slats whereby the collapsed grille shutter has the same width as the sum of the widths of said bars.
8. Collapsible grille shutter, according to claim 7, where the ends of said rods are hinged on pins arranged in a midpoint between said bars, so that in the collapsed grille shutter said pins engage in a recess provided within said bars.
9. Collapsible grille shutter, according to claim 7, wherein said pins have height less than the distance between said slats.
10. Collapsible grille shutter, according to claim 6, wherein said rods are formed by two profiles having longitudinal grooves that in use are opposite, said plurality of rods being hinged to said bars by means of support blocks that engage with said grooves.
11. Collapsible grille shutter, according to claim 6, **characterised in that** it comprises a plurality of units in succession that are arranged to form a plurality of intermediate bars set between a starting bar and an end bar, said rods hinged to said respective bars creating, in a direction orthogonal to said rods, at least two rows of rhombi such that said means for engaging with each other cause a symmetric opening movement of each rhomb.
12. Collapsible grille shutter, according to claim 11, comprising furthermore at least one third row of couples of rods suitable for forming a corresponding series of rhombi like "lazy tongs", suitable for assuring a same distance between successive bars.
13. Collapsible grille shutter, according to claim 11, wherein at least said starting bar or said end bar have said opposite grooved profiles united to each other in order to form a single profile, said starting bar allowing a snap-fit engagement with a starting profile anchorable to a wall, said end bar allowing a snap-fit engagement with an end profile suitable to house a lock.

Fig. 1

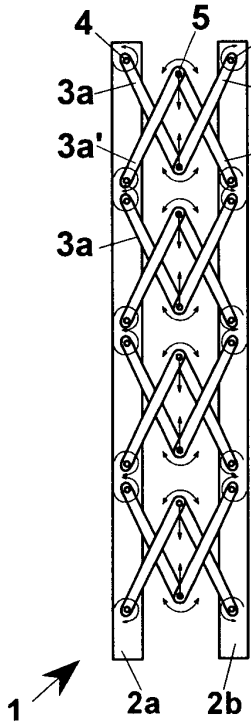


Fig. 2

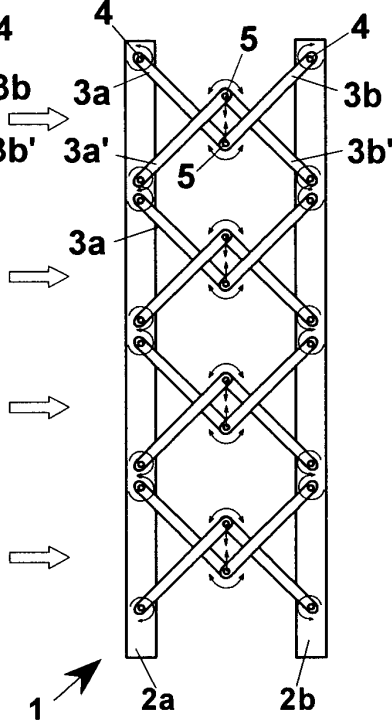


Fig. 3

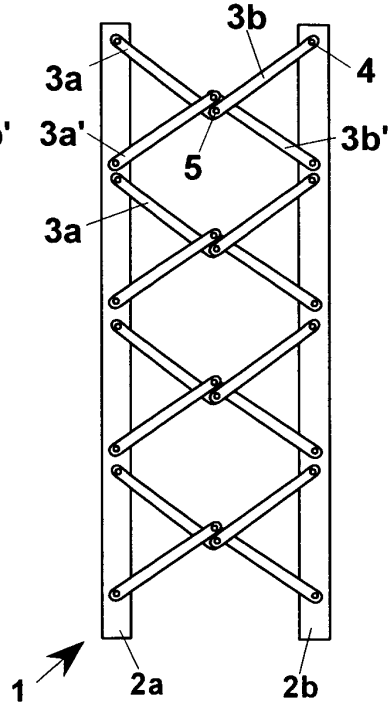


Fig. 4

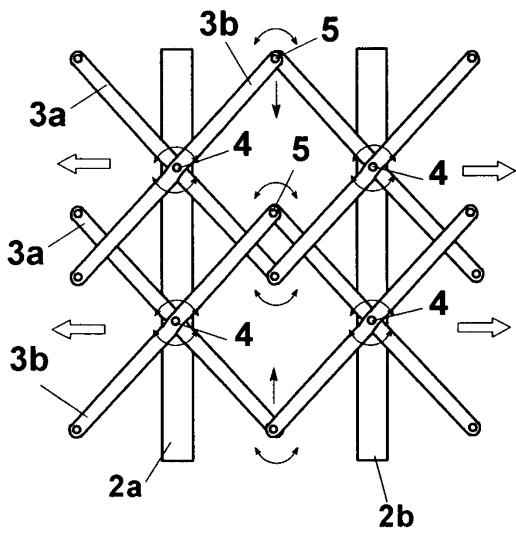


Fig. 5

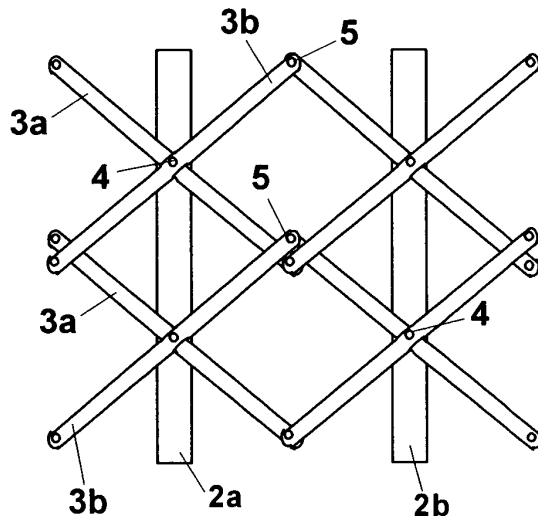


Fig. 6

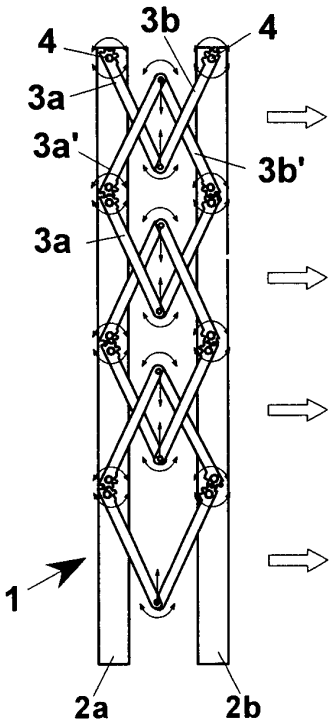


Fig. 7

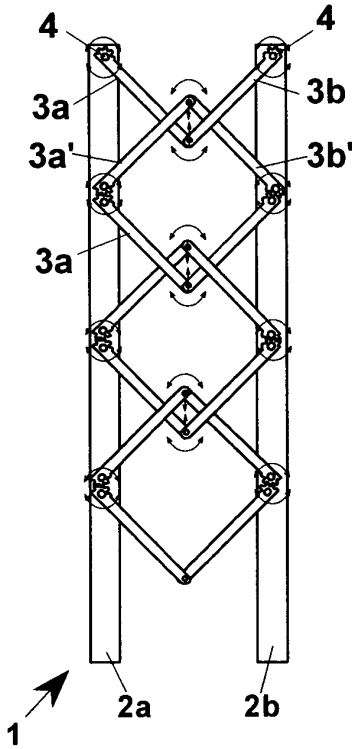


Fig. 8

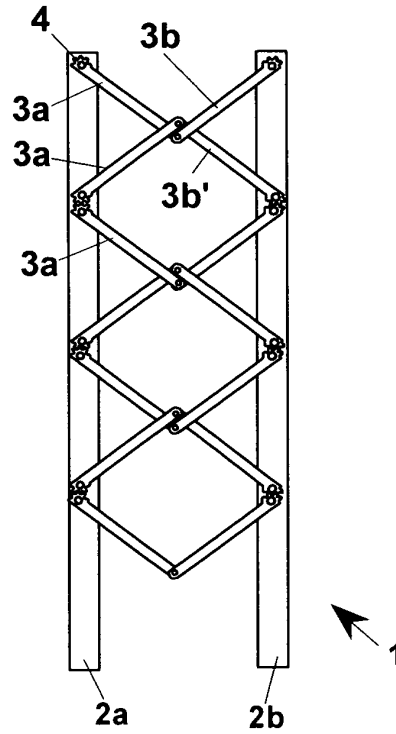


Fig. 9

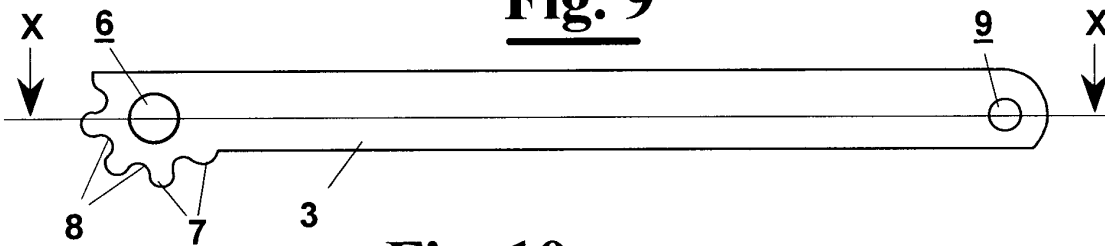


Fig. 10

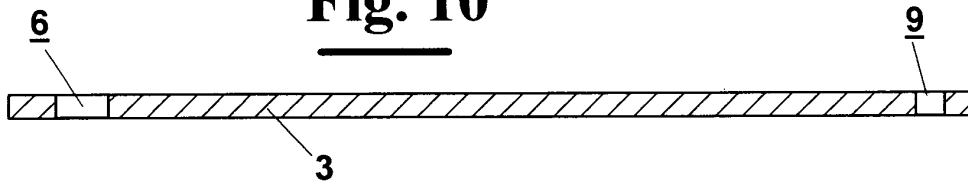


Fig. 11

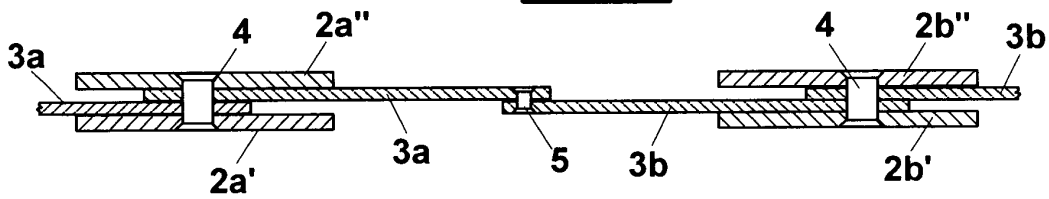


Fig. 12

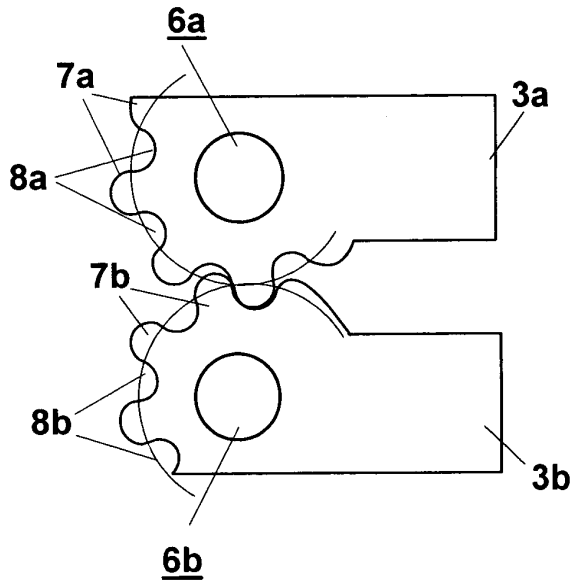


Fig. 13

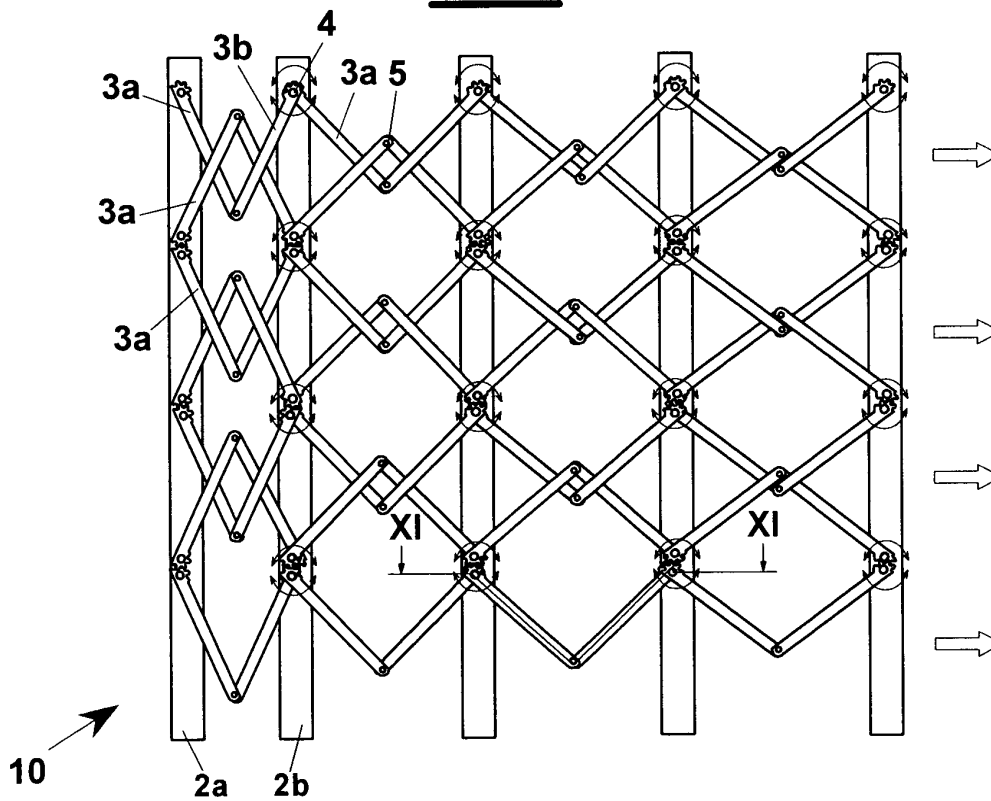


Fig. 14

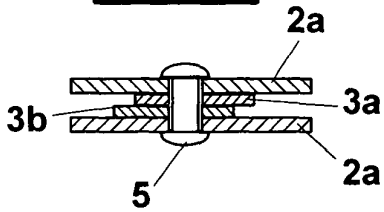


Fig. 15

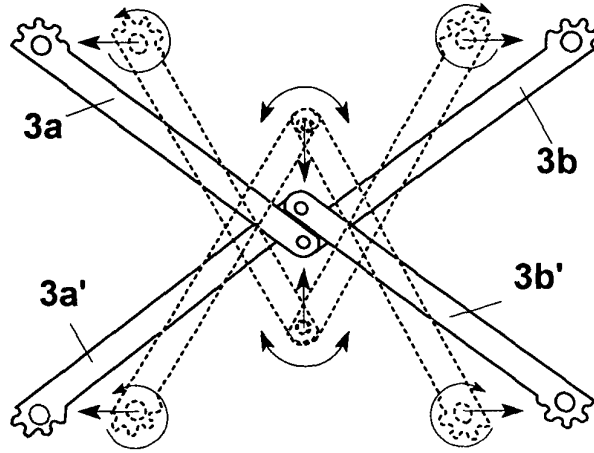


Fig. 16

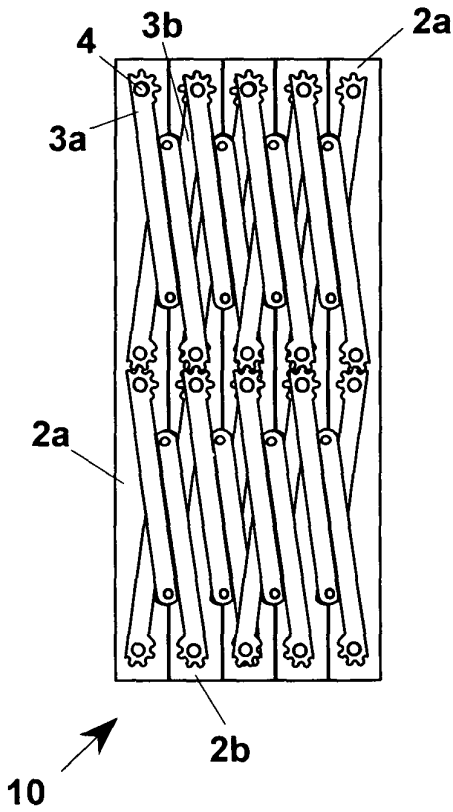


Fig. 17

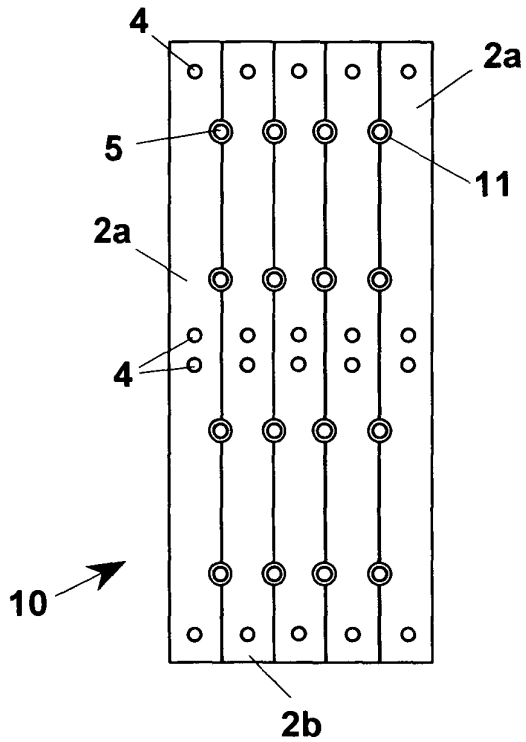


Fig. 18

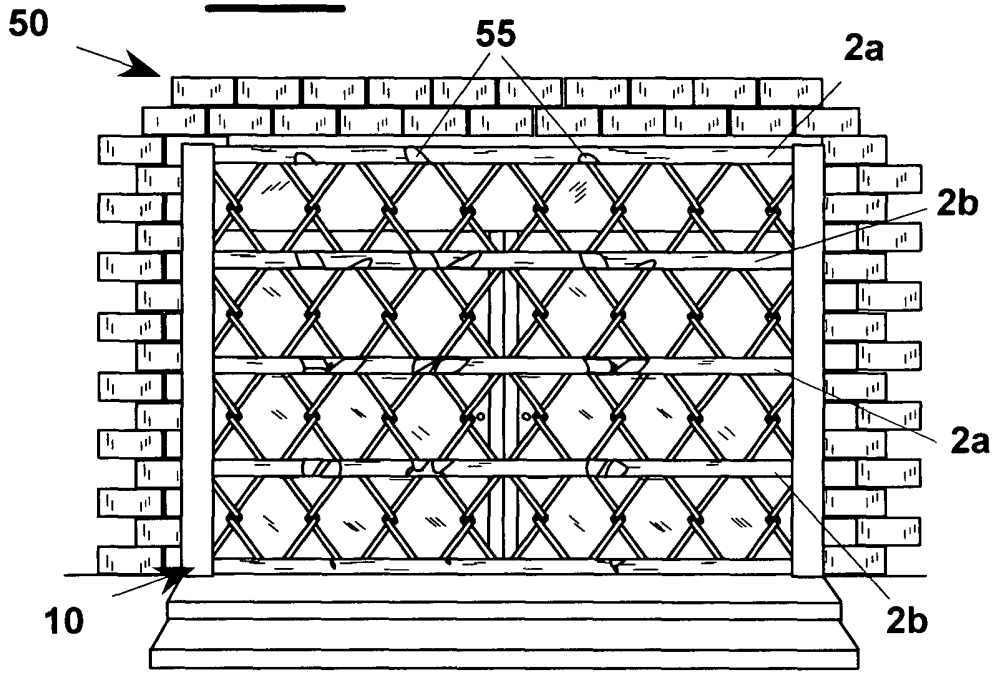
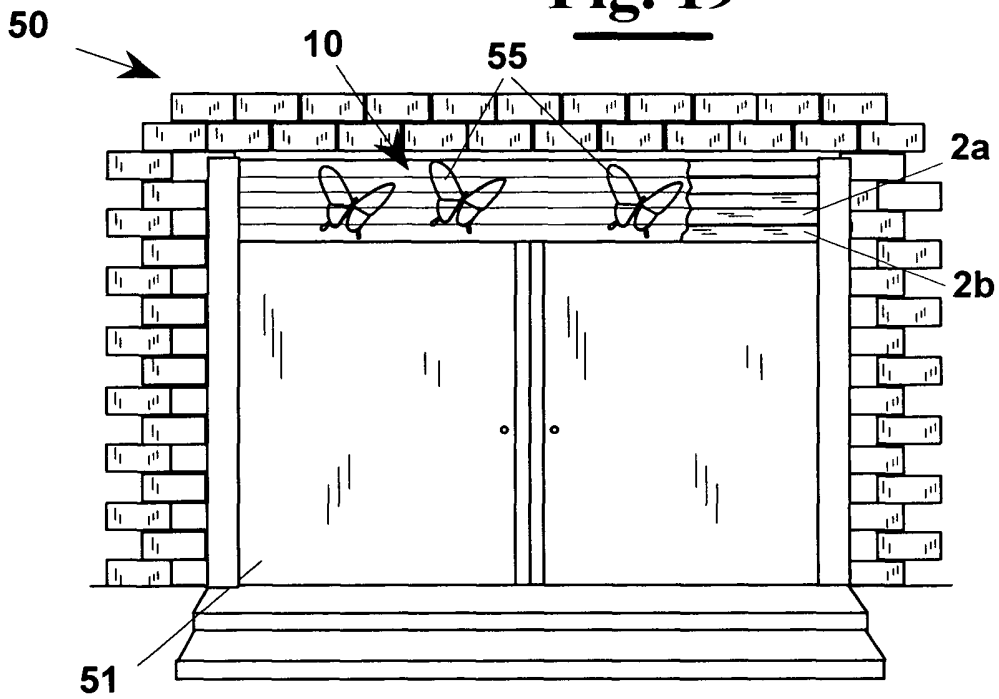


Fig. 19



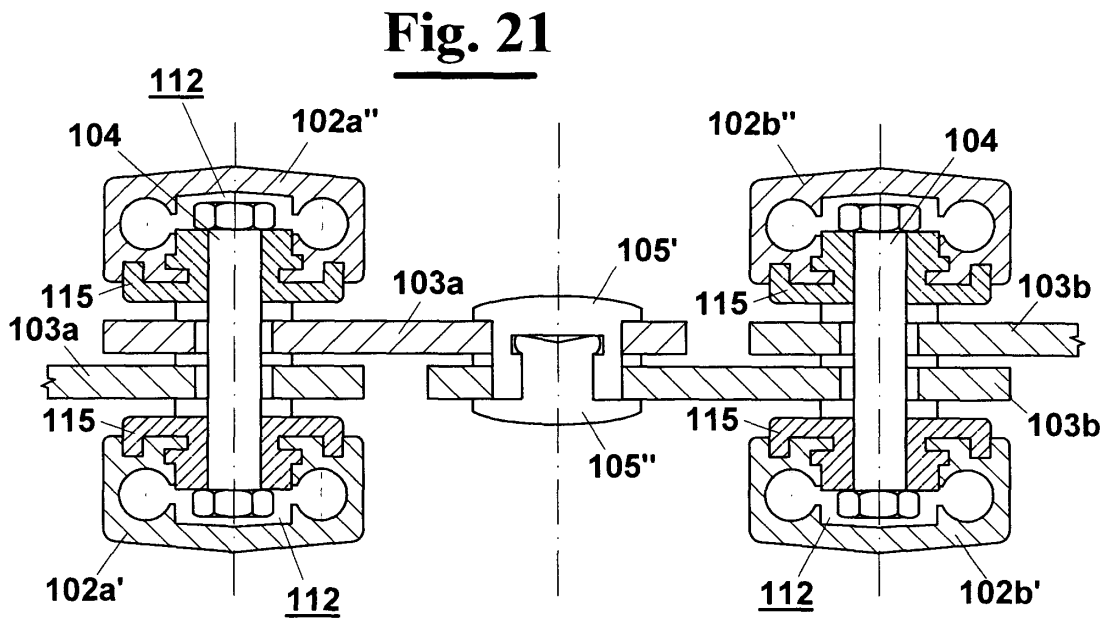
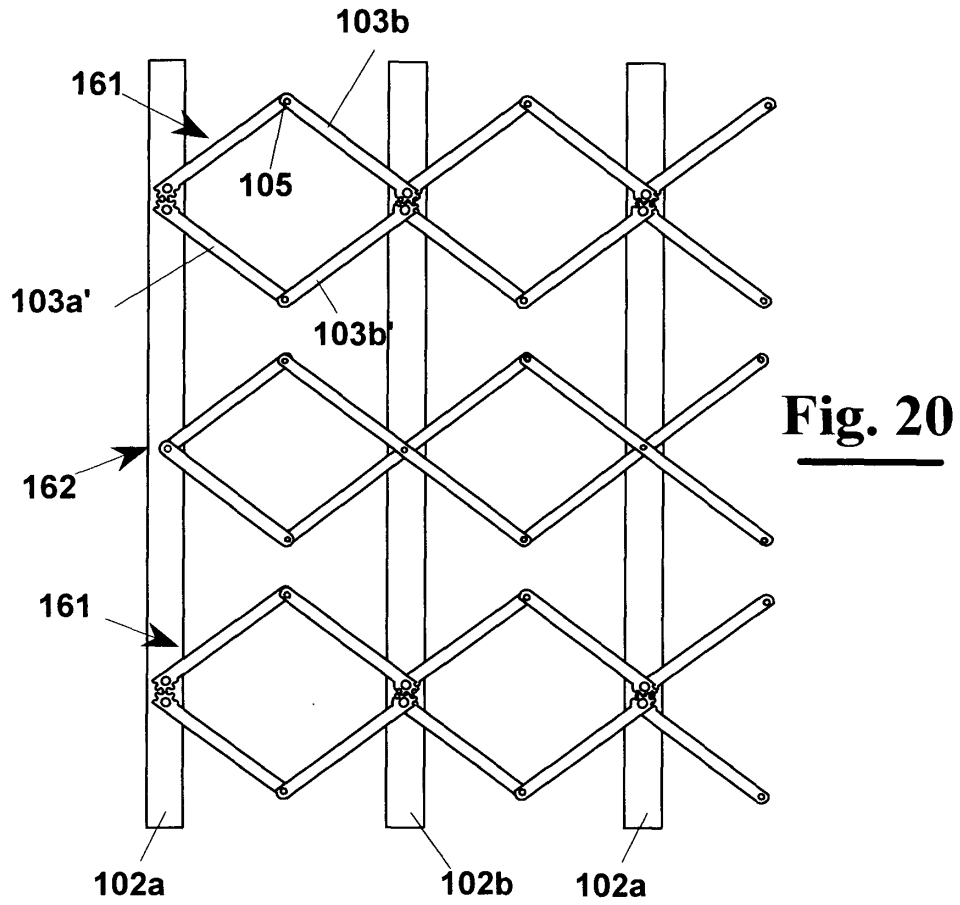


Fig. 22

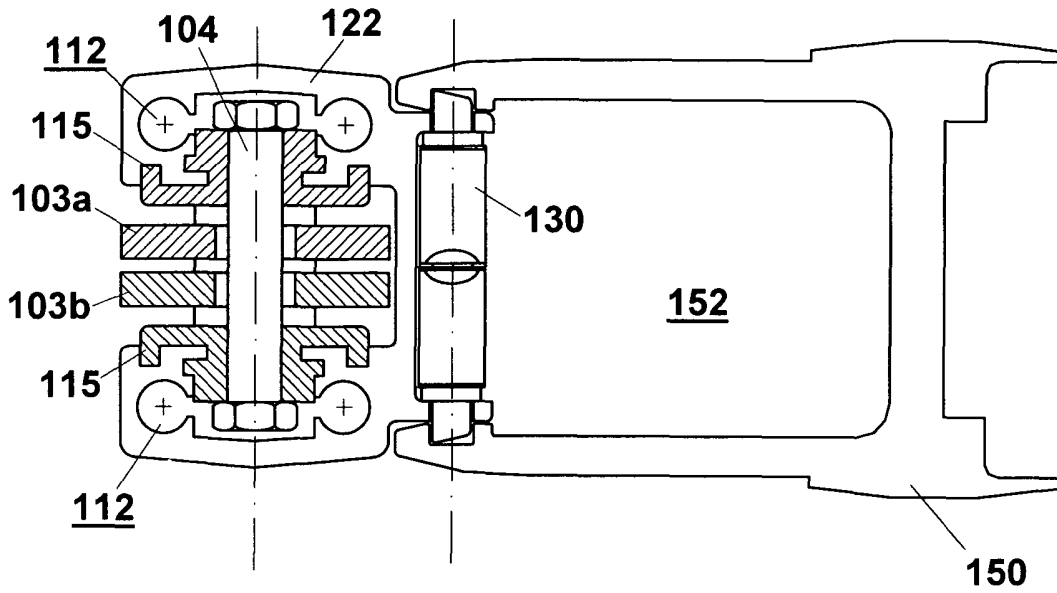


Fig. 23

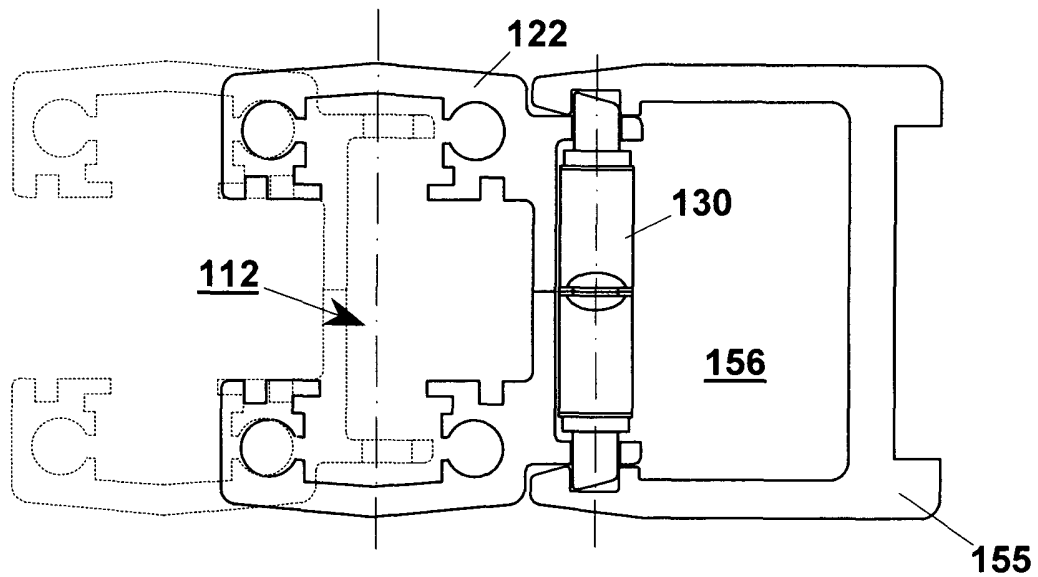


Fig. 24

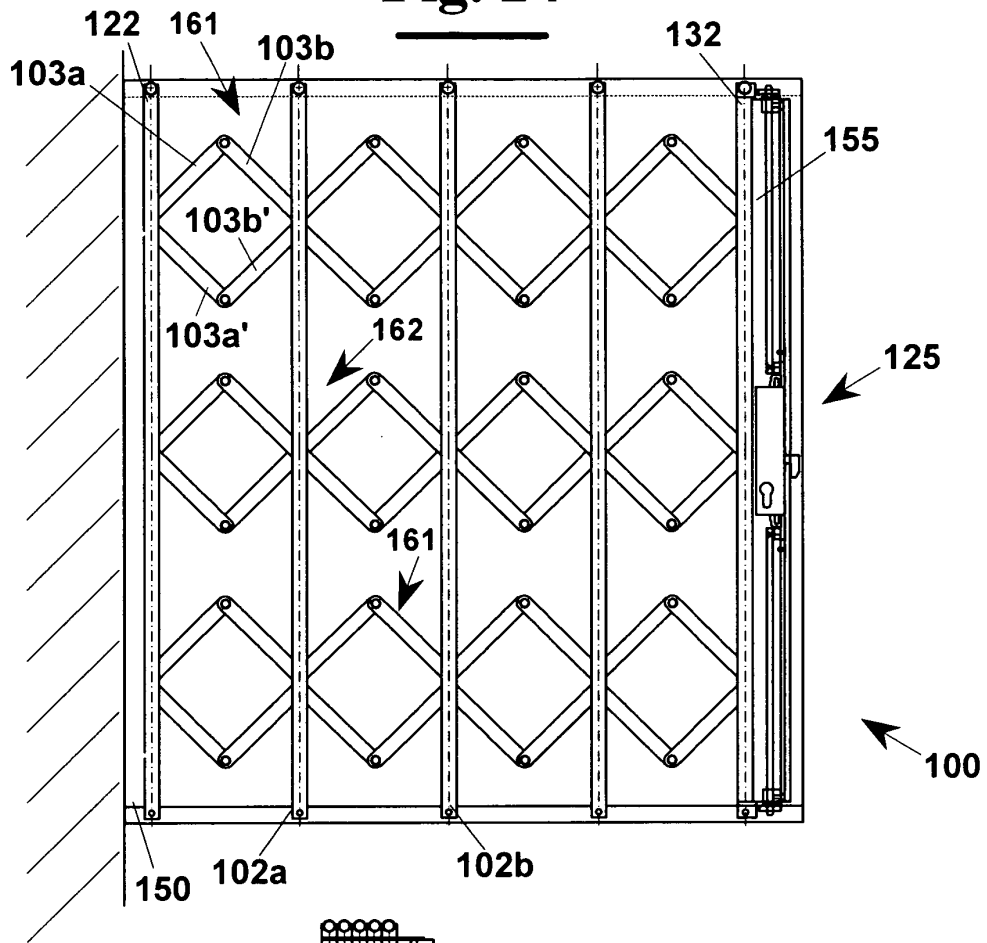


Fig. 25

