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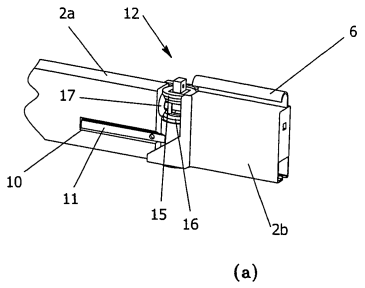
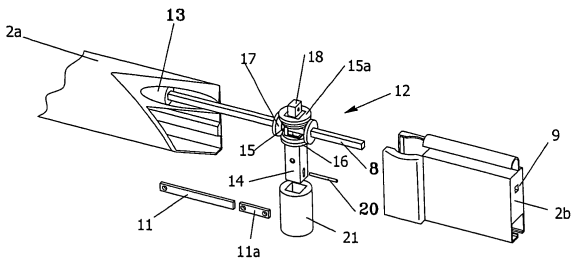
(54) Roller shutters with swivelling slats

(57) This invention relates to a roller shutter with slats that open so that air and light can pass through them even when said shutter is fully lowered.

Said shutter, suitable for windows and French windows, is of the type comprising a plurality of slats jointed together in such a way that said shutter can be wound onto a roller (7) so that it can be raised and lowered, said slats being designed to be inserted into a pair of U-shaped guides (5), installed along the jambs of said windows, characterised in that it includes one or more opening slats (2), which said slats (2) comprise a central part (2a) and two ends (2b), said central part (2a) being articulated in relation to said two ends (2b) and said two ends (2b) remaining inserted in said U-shaped guides, said slats (2) being opened by means of rotation of said central part (2a) in relation to said two ends (2b), first means being fitted for each slat (2) which articulate said central part (2a) in relation to said ends (2b) of said opening slat (2), and second means being fitted to cause said rotation between said central part (2a) and said two ends (2b) of said opening slat (2).



(a)



(b)

Fig. 3

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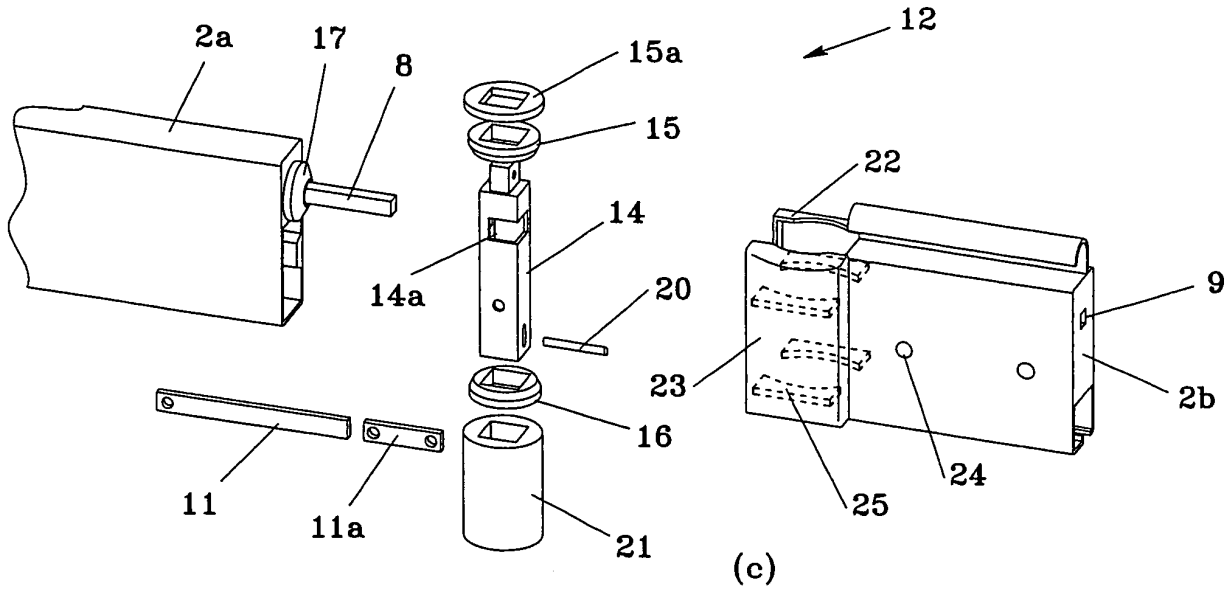


Fig. 3

Description

[0001] This invention relates to a roller shutter with slats that open so that air and light can pass through them even when said shutter is fully lowered.

[0002] Numerous types of roller shutters currently exist, which consist of slats made with various cross-sectional areas and measurements and with different materials, such as wood, PVC, steel, aluminium etc., connected to one another so that they can be wound onto a roller installed above the window, which said slats run on U-shaped lateral guides.

[0003] As the various slats are connected to one another and the guides prevent them from rotating, no light or air can pass through the shutter when the slats are closed. When the shutters are closed, the only possibility is not to lower the slats completely, to allow a little light and air to filter through the narrow slit between one slat and another.

[0004] This situation has some justification, because a closed roller shutter constitutes an effective barrier against light and wind, which is impossible with other closing devices, such as louvred shutters; however, in some circumstances it is useful to allow some light to pass through or a significant air change, but without raising the shutter for reasons of privacy or security, especially in the case of ground floor apartments.

[0005] This invention eliminates said drawback by means of a device, as claimed in claim 1, which enables the slats to rotate around their longitudinal axis, the end of the slats being inserted into the common U-shaped guides.

[0006] To eliminate the need to modify the contour of the slats at the edges, ie. to modify the existing guides, the slats of the shutter according to the invention are designed to rotate in relation to their ends, which remain stationary.

[0007] This means that they can be used instead of existing roller shutters, with no need to modify the fixed parts of the device, thus facilitating their use.

[0008] The result is a shutter with slats which can be opened by causing the slats to rotate around their axis, so that a significant amount of air and light can pass through even when the shutter is fully lowered. Said rotation is gradual and adjustable, so the passage of air and light can also be adjusted as required.

[0009] The swivelling slats can be placed all over the surface of the shutter, which remains flat when it is fully extended, or only on part of said surface. However, the lower part of the shutter, especially in the case of French windows, should preferably have fixed slats to prevent the entry of dust and/or animals from the ground outside.

[0010] The slats are rotated manually, by means of a regulating lever housed in a recess on the inside wall of the shutter, at a suitable height, which controls the rotation of a chain of cylinders which, in turn, transmit the rotation motion to the slats via cogwheels. Said regulation can also be performed electrically in a wholly similar way.

[0011] Before the shutter is rewound, the slats must obviously be rotated to the vertical position, to restore the correct articulation between the slats. For this reason, the system of articulation between the cylinders must be specially designed to allow correct transmission of the rotary motion and to provide the articulation required to rewind the shutter.

[0012] The invention will now be described according to a preferred embodiment, by way of example but not of limitation, with reference to the annexed figures, wherein:

- figure 1 shows a shutter according to the invention;
- figures 2 (a, b) show a slat in the closed and open configurations;
- figures 3 (a, b, c) and 4 show the slat opening/closing mechanism;
- figures 5 (a, b) show the slat opening procedure;
- figure 6 shows a detail of the slat opening/closing mechanism;
- figure 7 shows a possible articulation of the opening parts of the slats.

[0013] In fig. 1, no. (1) indicates a shutter according to the invention.

[0014] According to a preferred form of embodiment, said shutter comprises a plurality of opening slats (2), together with some fixed lower slats (3) and upper slats (4).

[0015] Opening slats (2) comprise an opening central part (2a) and two ends (2b), which are connected to said central part (2a) in the way specified below. Said two ends (2b), each of which is inserted into a U-shaped guide (5), are sections of conventional slats, which are connected to one another via hooks (6) designed to allow reciprocal rotation, which is necessary so that shutter (1) can be wound onto a roller (7).

[0016] Shutter (1) according to the invention can be installed in place of a shutter of known type, without any modification of the guides or the raising system; as ends (2b) of slats (2) are segments of slats of known type, they can be inserted in U-shaped guides (5) without any difficulty. Moreover, as slats (2) have exactly the same geometry as slats of known type when they are in the closing position, and hooks (6) which connect ends (2b) of slats (2) to one another allow sufficient reciprocal rotation, the shutter can be wound onto said roller (7).

[0017] According to one possible form of embodiment, ends 2b can be slightly curved, to facilitate their insertion into guides (5).

[0018] Slats (2) open as a result of the rotation of the central part (2a) in relation to ends (2b), which remain stationary in the guides, as shown in fig. 2. Fig. 2a shows a slat (2) in the closed configuration, and fig. 2b shows said slat (2) in the open configuration, illustrating the rotation around a longitudinal axis or shaft (8) of the central part (2a) of slat (2) in relation to ends (2b) of said slat, which remain stationary in guides (5). Said longitudinal

shaft (8) is preferably made from a steel rod with a polygonal (preferably square) cross-sectional area, so that when it is inserted into seatings (9) in ends (2b) of slats (2), said ends (2b) are better aligned, as will be shown below.

[0019] Fig. 3a shows an opening slat (2), seen from the inner part, where a lever (11) which activates an opening/closing mechanism (12) is housed in a slot or seating (10) formed in central part (2a).

[0020] Said opening/closing mechanism (12) is shown in a first exploded view in fig. 3b, which illustrates the rotation shaft (8) that rigidly connects the two end elements (2b) of slat (2).

[0021] To form said rigid connection, rotation shaft (8), which has a square cross-sectional area, is rendered integral with end elements (2b) by forced, or in any event locked, insertion, using means of known type, into said square seating (9) made in end elements (2b) of slats (2). The fact that shaft (8) is rendered integral with end elements (2b) creates a rigid barrier which is resistant even to attempts at breaking and entering.

[0022] Central part (2a) of the slat is mounted on shaft (8) via bushings (13) made, for example, of teflon, which have a square hole into which shaft (8) is inserted, said bushings (13) being externally round, so that central part (2a) of slat (2) can rotate on them.

[0023] Opening/closing mechanism (12), shown in a second exploded view in fig. 3c, comprises a pivot (14), which could have a square cross-sectional area, for example, to which is keyed a first bevel gear (15) that meshes with a second bevel gear (17) mounted idle on shaft (8), but integral with central part (2a) of slat (2). A third bevel gear (16), which meshes with second bevel gear (17), is mounted idle on pivot (14). Both of said bevel gears (15) and (16) mesh with said second bevel gear (17), and the function of the idle gear (16) is only to act as contrast, ensuring correct engagement between the first (15) and second (17) bevel gears, which is achieved by setting the correct axial distance between said first and third gears (15) and (16).

[0024] Rotation shaft (8) of central part (2a) of slat (2) intersects with pivot (14), an opening (14a) being made in said pivot (14). Said opening (14a) will be described below in detail, to demonstrate how it enables the pivot to rotate through approximately 60° around its own vertical axis, despite the intersection with shaft (8).

[0025] As will be seen in fig. 3b, pivot (14) terminates at the top with a tenon (18) and at the bottom with a mortice (19). In this way a chain connection can be formed, as shown in fig. 4, with the opening/closing mechanisms (12) of the slats above and the slats below. The connection is preferably made with the use of pins (20), which are inserted into suitable holes in said mortices and tenons and ensure the correct reciprocal position between pivots (14) of the chain, said pins (20) forming a joint between two successive pivots (14), said mortice-and-tenon joint being loose.

[0026] As shutter (1) according to the invention can be wound onto roller (7), pivots (14) must be jointed in such a way as to allow reciprocal rotation between consecutive slats (2); this is only possible when pin (20) which connects two consecutive pivots (14) is parallel to shaft (8) of slat (2). The opening/closing mechanisms (12) must therefore be assembled in such a way that shaft (8) and pin (20) are parallel when slats (2) are closed.

[0027] A bushing (21), for example made of teflon, is inserted on the outside of pivot (14), below third bevel gear (16). The upper part of said bushing (21) presses against second bevel gear (16), and the lower part against first bevel gear (15), of opening/closing mechanism (12) of the slat below, preferably with the insertion of a washer (15a). The action of bushing (21) is made possible by the fact that the correct distance between two consecutive pivots (14) is ensured by pin (20) which connects them. Basically, the function of bushing (21) is to ensure the correct axial distance between said first and third bevel gears (15) and (16) and consequently correct meshing between first bevel gear (15) and second bevel gear which is integral with central part (2a) of slat (2).

[0028] In practice, the pivots (14) of the various opening/closing mechanisms, being connected with mortice and tenon joints and secured with pins (20), form a chain with a length equal to the sum of the heights of all the opening slats (2). Bushings (21) consequently act as spacers, ensuring the correct axial distance between first and third bevel gears (15) and (16).

[0029] As an alternative to the creation of a chain whose length is determined by the connections via pins (20), bushing (21) can axially lock third bevel gear (16), also locking bushing (21), for example with a pin, in the correct position in relation to pivot (14).

[0030] Central part (2a) of slat (2) is caused to open by the rotation of pivot (14) which, via first bevel gear (15) and second bevel gear (17), causes the rotation of central part (2a) of slat (2). As the pivots (14) of all the opening slats (2) are connected together, when one pivot (14) in the chain of pivots is rotated, all the opening slats open simultaneously (2).

[0031] Pivot (14) is operated by said lever (11) which, via a bevel gear pair not illustrated, causes the rotation of a pivot integral with bevel gear (17), which in turn causes pivot (14) to rotate. In the rest position, ie. with the slats closed, lever (11) is housed in seating (10) formed in central part (2a) of one of slats (2). When it is activated, said lever (11) exits from said seating and rotates through approximately 60°. To prevent it from constituting an obstacle, lever (11) is mounted via a joint (11 a) which allows said lever to be folded into a vertical position, flush with the shutter.

[0032] Figs. 5 show the operation of opening/closing mechanism (12).

[0033] When lever (11) is rotated, pivot (14) of the slat that houses lever (11) is caused to rotate, and this transmits the rotation to the pivots of the upper slats. As bevel gear (15) is keyed to pivot (14) at each slat, it rotates and

causes the rotation of second bevel gear (17) which is integral with central part (2a) of the corresponding slat (2), which therefore opens.

[0034] To close the slats, it is therefore sufficient to turn lever (11) in the opposite direction. As third bevel gear (16) is idle, it does not have any movement transmission function, and merely ensures correct engagement between first and second bevel gears (15) and (17), which said correct engagement is guaranteed by the fact that the axial distance between first and third bevel gears (15) and (16) is ensured by bushing (21) as described above. Fig. 5a shows lever (11) when it has just been extracted from seating (10), and part (2a) of slat (2) beginning to rotate. In fig. 5b the rotation is complete, and lever (11) has been folded downwards out of the way.

[0035] In order to raise the shutter and wind it round roller (7), the slats must obviously be closed. In this way lever (11) will also be retracted into its seating (10), and consequently will not constitute a obstacle. Pin (20) will also be returned to the position parallel to shaft (8), and consequently allow reciprocal rotation between consecutive opening slats (2).

[0036] Fig. 6 shows the detail of the point at which shaft (8) intersects with pivot (14). As will be seen from the drawing, pivot (14) has a sufficiently large diameter to form an inner opening (14a) with such a shape as to allow the passage of shaft (8), and the rotation of pivot (14) through 60°. The lower and upper parts of pivot (14) are connected via parts (14b).

[0037] According to a preferred embodiment of the invention, end (2b) of opening slat (2) consists of two parts on the side of opening/closing mechanism (12). The first, outer part (22) extends straight until it covers opening/closing mechanism (12), in order to protect it against atmospheric agents. The second, inner part (23) is shaped in such a way as to be a few millimetres thicker than the part inserted in U-shaped guide (5), in order to cover the inside and outside of opening/closing mechanism (12). Said first and second parts (22) and (23) are connected to one another with screws (24), preferably screwable from the inside of shutter (1).

[0038] Shapes (25) can be stamped inside said first and second parts (22) and (23) of end (2b) of opening slat (2); said shapes have the function of supporting said first and third bevel gears (15) and (16) in the correct position so as to maintain the correct engagement with second bevel gear (17), replacing bushing (21) and washer (15a) in that function.

[0039] Finally, if the anti-burglary function guaranteed by steel shaft (8) is not required, said shaft (8) could be eliminated and opening part (2a) of slat (2) could be supported only at the two ends (fig. 8).

[0040] On the side of opening/closing mechanism (12), said opening part (2a) of slat (2) can be supported by second bevel gear (17), which in turn is effectively supported by shaped parts (24) of said first and second part (22) and (23), while on the opposite side it could be supported by a bushing (26) hinged to a pivot (27) formed in the adjacent fixed end (2b) of slat (2). Alternatively, pivot (27) could be fixed in relation to opening part (2a), and bushing (25) could be connected to fixed part (2b) of slat (2). In practice, central part (2a) of slats (2) rotates on a pair of pivots, because second bevel gear (17) in practice acts as a fixed pivot on opening part (2a) of slat (2), which rotates on a bushing constituted by the shaped seating (24) of fixed end (2a), according to the variation consisting of said two parts (22) and (23).

[0041] As will appear clearly from the above description, the shutter according to the invention enables part of the slats to be opened with a very simple operation, allowing light and air to pass through the slats, with no need to raise the shutter.

[0042] The invention has been described by way of example but not of limitation, according to a preferred form of embodiment. One skilled in the art could devise numerous other embodiments, all of which fall into the ambit of protection of the following claims.

Claims

1. Shutter for windows and French windows, of the type comprising a plurality of slats jointed together in such a way that said shutter can be wound onto a roller (7) so that it can be raised and lowered, said slats being designed to be inserted into a pair of U-shaped guides (5), installed along the jambs of said windows, **characterised in that** it includes one or more opening slats (2), which said slats (2) comprise a central part (2a) and two ends (2b), said central part (2a) being articulated in relation to said two ends (2b) and said two ends (2b) remaining inserted in said U-shaped guides, said slats (2) being opened by means of rotation of said central part (2a) in relation to said two ends (2b), first means being fitted for each slat (2) which articulate said central part (2a) in relation to said ends (2b) of said opening slat (2), and second means being fitted to cause said rotation between said central part (2a) and said two ends (2b) of said opening slat (2).

2. Shutter as claimed in claim 1, **characterised in that** said first means designed to articulate central part (2a) to ends (2b) of opening slat (2) comprise a shaft (8) that connects said ends (2b) together, on which central part (2a) of opening slat (2) rotates.

3. Shutter as claimed in claim 2, **characterised in that** said shaft (8) which connects ends (2b) of opening slat (2) is integral with said ends (2b) of opening slat (2).

4. Shutter as claimed in claim 2, **characterised in that** said shaft (8) which connects said ends (2b) has a polygonal cross-sectional area, bushings (13) which are fixed in relation to said shaft (8) being inserted,

on which said bushings central part (2a) of opening slat (2) rotates in relation to shaft (8).

5. Shutter as claimed in claim 1, **characterised in that** said first means designed to articulate central part (2a) to ends (2b) of opening slat (2) comprise a pair of pivots (27) and (17), fixed in relation to said central part (2a) of slat (2), which rotate on bushings (26) and (24) positioned on said ends (2b) of slat (2).

6. Shutter as claimed in claim 5, **characterised in that** said pivot (27) is fixed in relation to said end (2b) of slat (2) and said bushing (26) is housed on said central part (2a) of slat (2).

7. Shutter as claimed in claim 1, **characterised in that** said second means designed to cause said rotation between the central part (2a) and the two ends (2b) of opening slat (2) comprise a pivot (14), with a vertical axis, positioned on opening slat (2), the rotation of said pivot around said vertical axis causing said rotation of central part (2a) in relation to ends (2b) of opening slat (2), third means designed to transmit the rotary motion of said pivot (14) to central part (2a) of opening slat (2) being installed.

8. Shutter as claimed in claim 7, **characterised in that** said third means designed to transmit the rotary motion of said pivot (14) to central part (2a) of opening slat (2) comprise a first and second gear (15) and (17) integral with said pivot (14) and said central part (2a) of opening slat (2) respectively.

9. Shutter as claimed in claim 8, **characterised in that** said first and second gears (15) and (17) are conical gears.

10. Shutter as claimed in claim 9, **characterised in that** said first and second gears (15) and (17) are kept meshed with one another by a third bevel gear (16), coaxial with said first bevel gear (15) integral with pivot (14), said third bevel gear (16) being idle in relation to pivot (14), fourth means being installed to maintain a constant axial distance between said first and third bevel gears (15) and (16).

11. Shutter as claimed in claim 10, **characterised in that** said fourth means, designed to maintain a constant axial distance between said first and third bevel gears (15) and (16), comprise a bushing (21) installed under said third bevel gear, which said bushing (21) presses with its upper part against said third bevel gear (16), axial slide of said bushing (21) in relation to said pivot (14) being prevented.

12. Shutter as claimed in claim 7, **characterised in that** it includes a plurality of pivots (14), each situated on an opening slat (2), said pivots (14) being connected together to form a chain, and fifth means being provided to transmit the rotary motion between said pivots (14) and allow said chain to bend in such a way that shutter (1) can be wound on said roller (7).

13. Shutter as claimed in claim 12, **characterised in that** said fifth means designed to transmit the rotary motion of said pivots (14) and to allow said chain to bend in such a way that shutter (1) can be wound on said roller (7) comprise tenons (18), formed in a first end of each of said pivots (14), which are inserted loosely into mortice (19), formed on a second end of each of said pivots (14), said mortice-and-tenon joints being orientated in such a way as to allow reciprocal rotation between consecutive pivots (14) around axes parallel to the opening slats (2), when said pivots (14) are in a position that corresponds to the closing of central part (2a) of opening slats (2).

14. Shutter as claimed in at least one of claims 1 to 4 and 7 to 13, **characterised in that** said axes (8) intersect with said pivots (14), an opening (14a) being made in said pivots with such a shape as to allow the passage of said shaft (8), and the rotation of said pivot (14), the lower and upper parts of said pivots (14) being connected through parts (14b).

15. Shutter as claimed in at least one of claims 1 to 14, **characterised in that** said ends (2b) of slats (2), situated on the side where said second means designed to cause said rotation between central part (2a) and the two ends (2b) of opening slat (2) are installed, comprise a first outer part (22) and a second inner part (23), which extend until they cover said means which activate the rotation of the slats.

16. Shutter as claimed in claims 10 and 15, **characterised in that** said fourth means designed to maintain a constant axial distance between said first and third bevel gears (15) and (16) comprises shaped parts (24), made in said parts (22) and (23) which compose said ends (2b), which said shaped parts (24) are designed to support said first and third gears (15) and (16) so as to maintain correct engagement with said second gear.

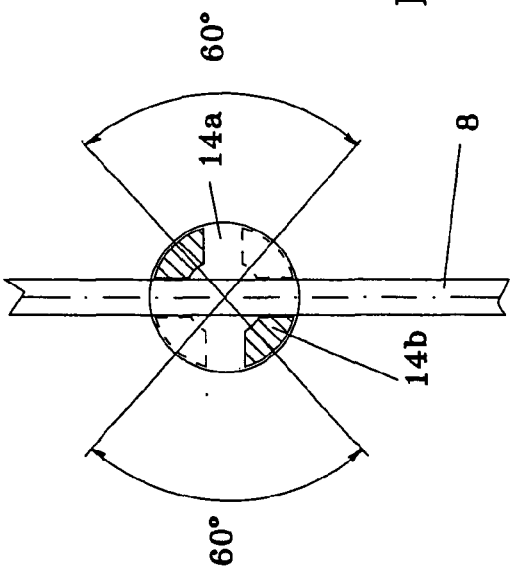


Fig. 6

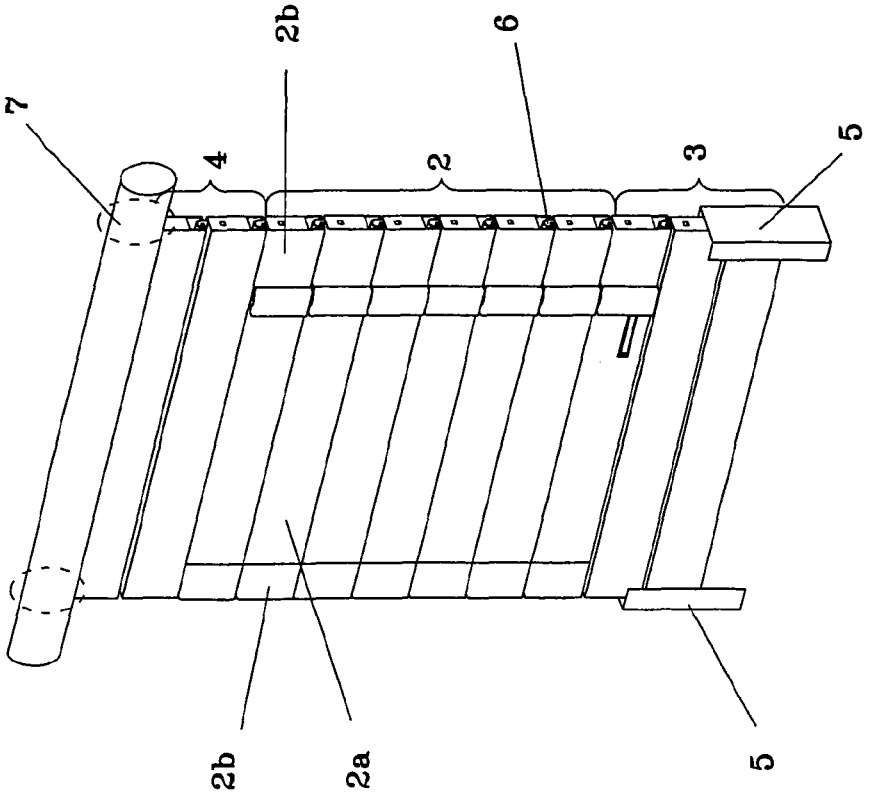


Fig. 1

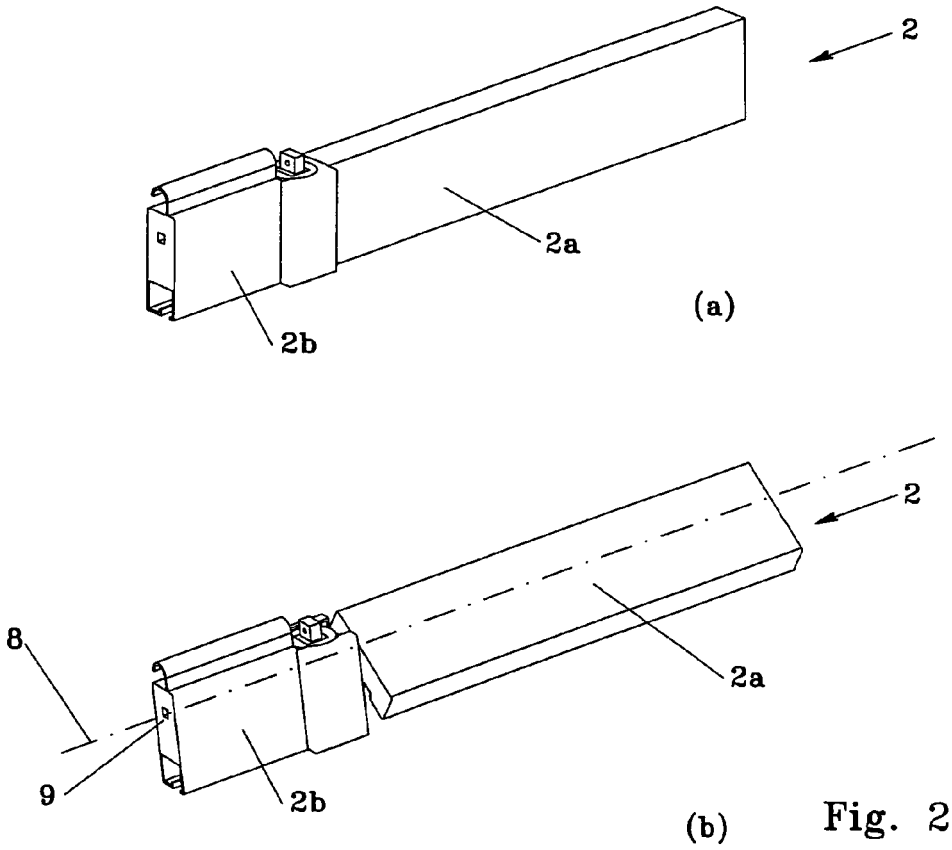


Fig. 2

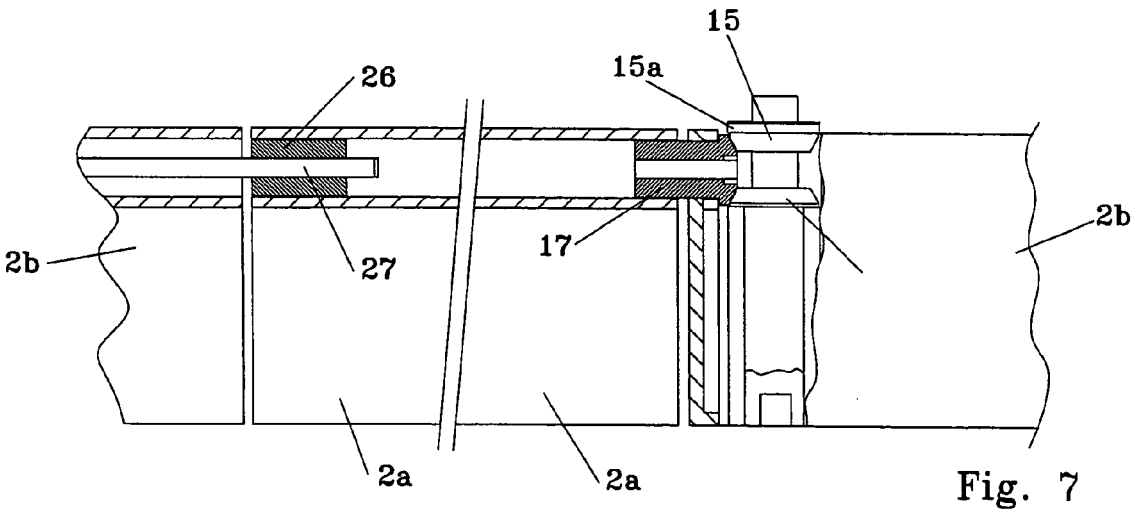
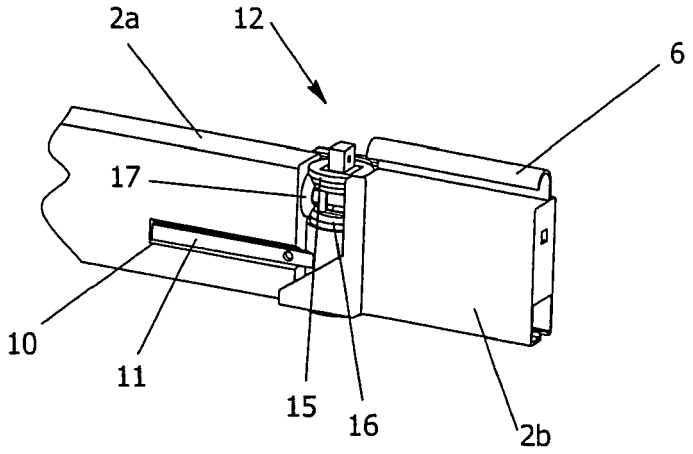


Fig. 7



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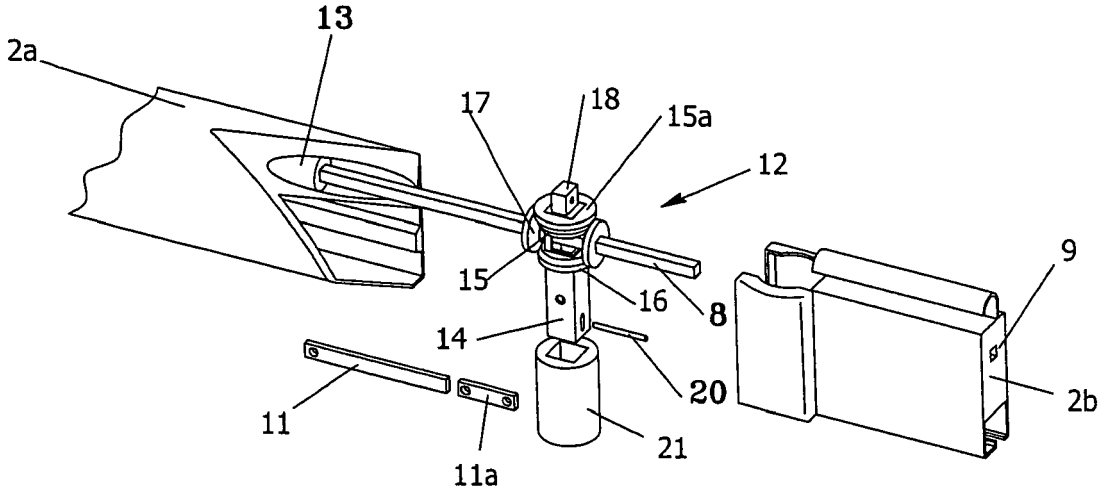
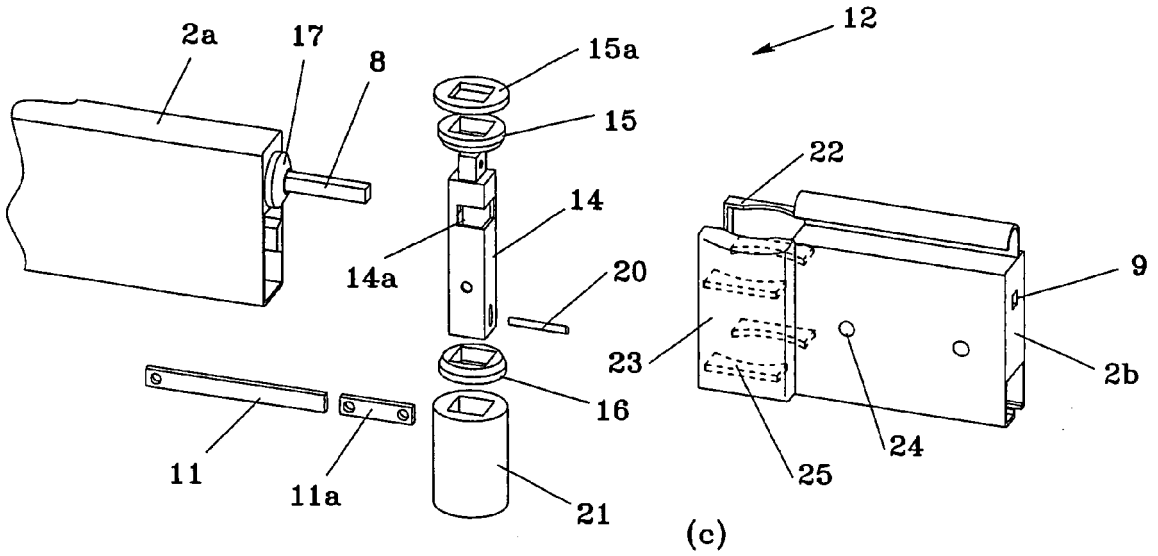


(b)

Fig. 3


2a
17
8
15a
12
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22
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14a
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9
23
2b
16
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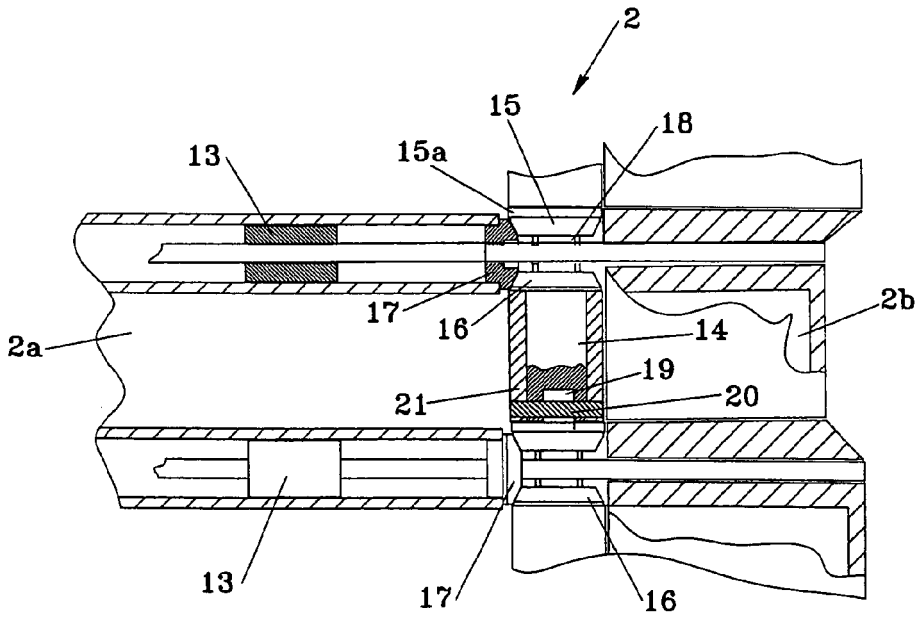
(c)

Fig. 3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15a
2b
17
16
14
2a
19
21
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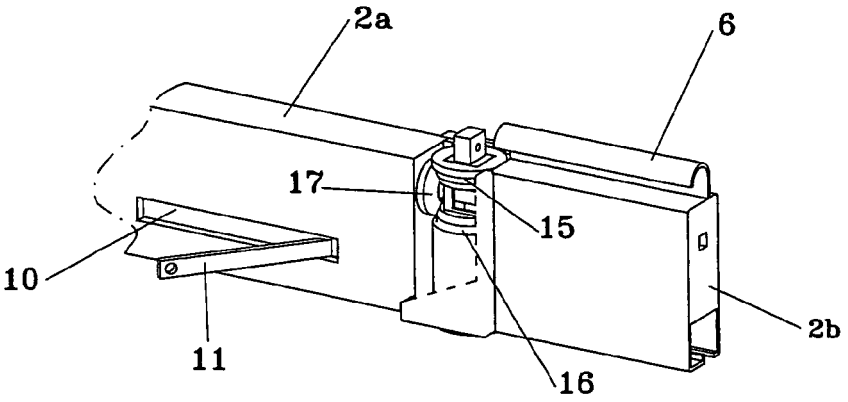
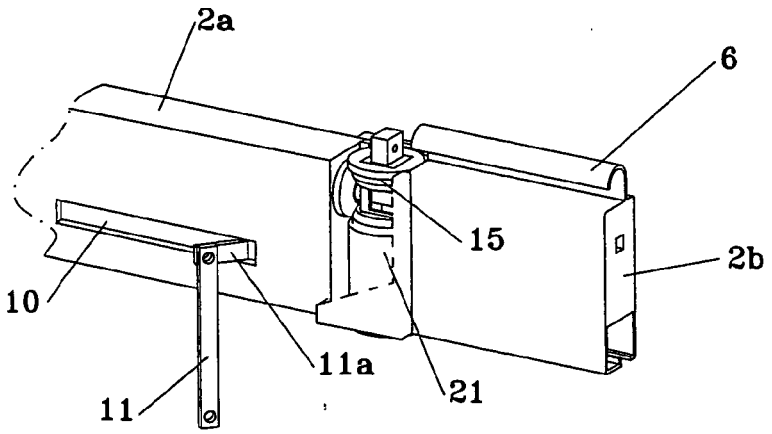
13
17
16

Fig. 4



(a)



(b)

Fig. 5