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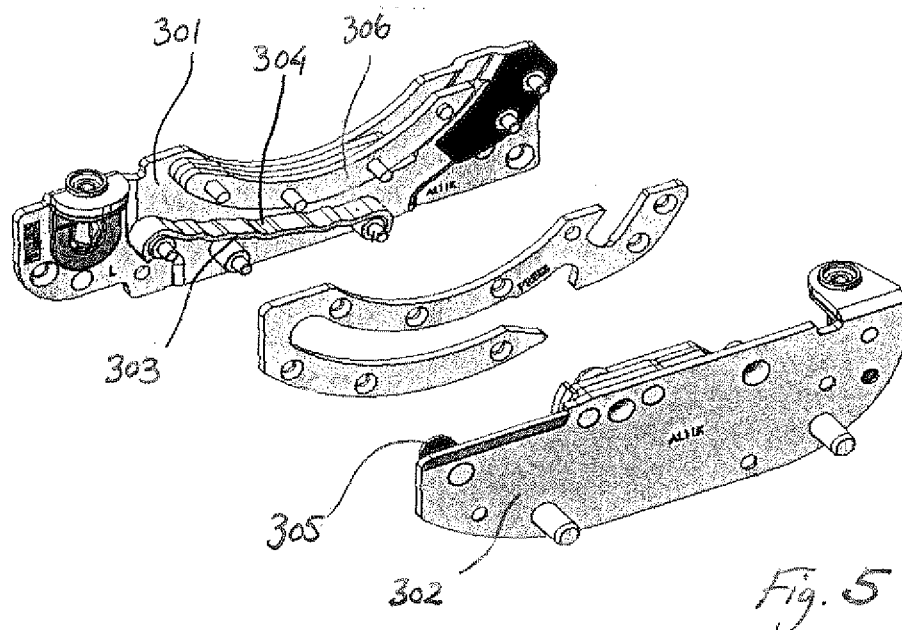
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(54) **An improved pivot window with at least one auxiliary opening device**

(57) The sash (2) of the window is connected with
the frame (1) by means of a hinge device including a set
of pivot hinges (12) defining a hinge axis of the window.
The hinges are mounted in such a position that the hinge

axis is situated between a centre line of the window and
the top or bottom of the window. The window is provided
with a least one auxiliary opening device comprising a
spring, preferably connected to the hinge device.



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Description

[0001] The invention relates to a window comprising a frame and a sash, said sash being connected with the frame by means of a hinge device defining a hinge axis of the window, the frame and the sash each including a first pair of mutually opposite members, and a second pair of mutually opposite members, said hinge device connecting a respective frame and sash member of the second pair of frame and sash members, and a centre line being defined substantially midway between the one and the other of the members of said first pair.

[0002] Windows of the pivoting or centre-hung type have found widespread acceptance, especially as roof windows, inter alia because this kind of window facilitates easy window cleaning, as the sash comprising the pane can be turned essentially 180° to allow cleaning of the outside surface of the pane from inside the building. A further advantage of this type of window is that it can be fully opened to a position where the sash is turned approximately 90° in which position air inlet is essentially unrestricted. Eventually, a pivoting window provides for an easy operation, partly due to the position of the operating means at the top member of the sash, partly because the weight of the sash is substantially balanced with the hinge axis situated close to the centre line of the window.

[0003] On the other hand, the opening area restricted by the frame bottom and side members and the intersection with the sash including the window pane at the hinge axis is, of course, substantially smaller than in a top-hung window of the same size. This entails, i.a., that pivoting windows are not or only rarely used when a large opening area as defined in the above is desired. Such desired applications may e.g. include the use of the window as an emergency escape or emergency access.

[0004] In the prior art, there are numerous examples of windows in which it has been sought to combine the advantages of top-hung and pivoting windows.

[0005] EP publications Nos. 679774, 679775, 679776 and 972885 each discloses a window, in which a sash is carried in an auxiliary frame or a set of arms. The auxiliary frame or each arm is at one end hingedly connected with the frame top member and at its other end with the sash. The sash is furthermore connected with the frame by means of cooperating sliding means. In this manner, the window may serve as a top-hung window, in which the arms move synchronically with the sash, which is thus rotated about the hinge connection at the frame top member, or as a tilting window. However, due to the desired multiple function of the window, the design is rather elaborate.

[0006] With this background it is the object of the present invention to provide a window, in which the advantages of a top-hung and a pivoting window are combined, but which at the same time is of a simple structure, which may be produced in a cost-effective manner and which is easy to operate.

[0007] This object is attained by the provision of a window of the kind mentioned in the introduction, which is furthermore **characterized in that** the hinge device comprises a set of pivot hinges mounted in such a position that the hinge axis is situated between said centre line and said one member of said first pair and that the window further comprises at least one auxiliary opening device as well as check means restricting the movement of the window during opening and/or closing thereof.

[0008] By moving the hinge axis towards one member of the frame and sash, respectively, i.e. towards the top or the bottom of the window, a substantially larger opening is obtained, while at the same time, the window is easy to operate. For instance, the same pivot hinge used in existing pivoting window may be placed in another position of the frame and sash side members. By the provision of a larger opening, it becomes possible to utilize the window as an emergency escape. In a traditional pivoting window, this would have required either choosing a larger model of the window, which is not always feasible or desirable, or a top-hung window with the disadvantages listed in the above.

[0009] A further advantage of moving the hinge axis to a position above the centre line is, that the upper part of the window standing out into the room behind the window becomes smaller. This entails that the risk of e.g. hitting ones head on the window is reduced. In addition it is an advantage when using screens and blinds since these may now be employed even when the window is open for airing or ventilation without having to be passed around the projecting top of the sash.

[0010] The displacement of the hinge axis, however, means that the weight of the two parts of the sash and pane lying on each side of the hinge axis, when the window is in its open position, is no longer the same, and due to gravitational forces the larger part of the sash and pane will be draw downwards. If the hinge axis is moved upwards in a traditional pivot window, the window will thus tend to fall back against the closed position. According to the invention the window is therefore further provided with an auxiliary opening device which helps to overcome the extra burden of having to lift a greater part of the weight of the window during operation thereof.

[0011] The auxiliary opening devices may, however, make it difficult or impossible to leave the window in a half-open position and the window according to the invention it therefore further provided with check means. The check means restricts the movement of the window, making it easier to control the window during operation thereof, but the braking effect should never be so, that the window seems to be locked or blocked.

[0012] On the face of it this use of an auxiliary opening device and check means counteracting each other seems disadvantageous, but has surprisingly shown to allow easy operation of the windows. Even if the window is in the fully open position, allowing the use as an emergency exit, it may be arrested without the use of additional means such as stays. Further, the window may even from

this fully open, arrested position be closed manually without overexertion on the part of the user.

[0013] As the need for both the aid of the auxiliary opening device and the braking effect of the check means may vary, they may have characteristics allowing each of them to e.g. work only in certain opening intervals.

[0014] In a preferred embodiment of the window according to the invention one end of said auxiliary opening device is connected with an upper or side face of one of the frame members of said second pair, and the other end of said auxiliary opening device is connected with a side or lower face of the corresponding sash member. Such an auxiliary opening device may include at least one pressure medium operated cylinder with an operating rod. This is a structurally simple and inexpensive opening device which may be connected with the frame and the sash in a simple manner.

[0015] In a preferred embodiment, the auxiliary openings device comprises two cylinders arranged one on each side of the window. This constitutes a well balanced construction and allows the use of two relatively cheap standard type cylinders instead of e.g. one more powerful cylinder. Further the use of two smaller cylinders gives the window a light and symmetrical appearance and may thus be preferable from an aesthetic point of view. This is particularly the case, when the two cylinders are substantially identical, but in special cases, where a very particular opening pattern is required, the two cylinders may also be provided to yield different forces and/or have different characteristics.

[0016] Other types of auxiliary opening devices such as chain openers may also be preferred. Especially when the window is provided with means for automatic or semi-automatic opening. In order to allow for the sash to be moved outside the range provided by the cylinder and operating rod, the connection between the cylinder and the frame may be releasable.

[0017] In a particularly preferred embodiment, at least one member of the second pair of frame and/or sash members is provided with a groove allowing the auxiliary openings device to move during operation of the window. The provision of such grooves further allows the auxiliary opening device to be at least partially hidden when seen from the room behind the window.

[0018] Alternatively, the auxiliary opening device may comprise a spring connected with the hinge device. This design makes it possible to position the auxiliary opening device virtually completely disguised.

[0019] The check means may be an integrated part of at least one of said hinges, whereby they may be completely disguised and protected from the weather. Preferably they comprise a spring member acting on one or more parts of the pivot hinge.

[0020] Check means providing a smooth resistance during operation of the window will be adequate for most purposes. However, if for example heavy winds are to be expected it is preferred that the check means allows the window to be arrested in one or more predetermined

positions. For instance an only slightly open ventilating position, a more open airing position and a fully open emergency escape position.

[0021] One way of achieving such arresting positions is by providing said spring member with one or more arresting points, where other parts of the hinge may come into a particularly tight contact therewith.

[0022] Alternatively, the check means may be a pressure medium operated cylinder or some other means restricting to opening of the window.

[0023] Preferably, the hinge axis is positioned in the interval between 1/3 and 2/3 of the distance between the centre line and said one member of said first pair. This provides for a good balance between a relatively large opening on the one hand and a satisfactory operability of the window on the other. An embodiment where the hinge axis is positioned at approximately 1/4 of the distance between the centre line and said one member of said first pair may be particularly preferable.

[0024] For aesthetical reasons as well as protection from the weather, the auxiliary opening device and/or said check means may be arranged in an at least partly concealed manner. One way of achieving this, is by arranging said auxiliary opening device and/or said check means between the frame and/or sash and at least one cladding protecting one or both of them from the weather. The cladding is a necessary part of any window and the concealment and protection of the auxiliary opening device and/or the check means is therefore achieved without the addition of extra parts to the window. Windows with spaces underneath such claddings are already known from the installation of e.g. screening devices.

[0025] The invention will be described in further detail with reference to the schematic drawings, in which

Fig. 1 shows a perspective view of a window according to the invention,

Fig. 2 shows a diagrammatic side view of a window according to the invention,

Fig. 3a and 3b shows a side view of an embodiment of the window according to the invention,

Fig. 4 shows a perspective view of a frame having grooves for holding two auxiliary opening devices, and

Fig. 5 shows a perspective view of an embodiment of a hinge with check means according to the invention.

[0026] The window shown in Fig. 1 comprises a frame 1 with a first and a second pair of mutually opposite frame members. The first pair consists of one member in the form of a top member 3 and another member in the form of a bottom member 4. The two members of the second pair constitutes side members 5 and 6, each extending between the top and bottom members 3 and 4 to form a substantially rectangular frame 1 intended to be built-in in e.g. an inclined roof (not shown). A sash generally designated 2 is constructed in a similar manner with a

top member 7, a bottom member 8 and side members 9, 10. In the sash 2 a window pane 11 of any type, e.g. an insulating unit, is enclashed.

[0027] The sash 2 is connected with the frame 1 by means of a hinge device, which in the embodiment shown comprises a set of hinges, of which one hinge 12 is shown in Fig. 1, at corresponding side members 5 and 9, and 6 and 10, respectively, of the frame 1 and sash 2. The set of hinges may be designed e.g. as disclosed in Applicant's European patent No. 1038083, the contents of which are incorporated herein by reference. Each hinge 12 thus includes a first member for connection with the frame side member 5, 6 and a second member for connection with the sash side 9, 10 member of the second pair, and the hinge 12 includes cooperating pins and guides as disclosed in further detail in the above-mentioned European patent. The use of a pivot hinge, in particular with cooperating pins and guides, makes it possible to establish an overlap between the sash and the frame in the closed position of the window, without the use of elaborate devices such as linkage mechanisms. This is a particularly important feature in windows installed in a roof. Several other parts of a traditional pivoting window may be simply transferred to the window according to the invention, possibly following a slight adaptation. This includes, i.a., some of the cladding parts that protect the frame and the sash, which are traditionally made of wood, from the weather.

[0028] As shown in Fig. 2, the set of hinges 12 define a hinge axis 13 extending substantially perpendicular to the plane of the Fig. 2. The hinges 12 are positioned between the top members 3 and 7 of the frame 1 and the sash 2, respectively, and a centre line 14 of the window. The centre line 14 is situated substantially midway between the top and bottom members 3 and 4 of the frame 1, corresponding in substance to the position midway between the top and bottom members 7 and 8 of the sash 2. The position of the hinge axis 13 is chosen in such a way that a suitable balance between ease of operation of the window and a suitable opening defined by the bottom member 4, the side members 5 and 6, and the intersection of the sash 2 including the pane 11 at the hinge axis 13. Preferably, the distance d between the hinge axis 13 and the centre line 14 of the window lies in the interval between $1/3$ and $2/3$ of the distance between the centre line 14 and the top member 3 of the frame 1.

[0029] In order to bring the window from the closed position to an open position, e.g. a ventilating position, operating means are provided. In the embodiment of Fig. 2, the operating means comprises a handle bar 15 on the sash top member 7. In a manner that is well known per se, the handle bar 15 includes engagement means for cooperation with engagement means on the frame top member 3.

[0030] As hinge axis 13 is displaced from the centre line 14, the sash 2 is not balanced in relation to the frame 1, as is the case in a traditional pivoting window. The force to be exerted by the user when opening the window

according to the invention is thus larger than in a traditional window. Therefore, as illustrated in Fig. 3a and 3b, an auxiliary opening device 120 is provided. In this embodiment, only differences with respect to the embodiment of Fig. 2 will be described in detail. Elements having the same or analogous function as in the Fig. 2 embodiment carry the same reference numerals to which 100 has been added. The auxiliary opening device 120 includes a pressure medium operated cylinder 124 with an operating rod 123.

[0031] In Fig. 3a the cylinder 124 is rotationally connected with the frame side member 106 at 122, and at 121 the operating rod 123 is rotationally connected with the sash side member 110. However, as shown in Fig. 3b, the cylinder 124' may also be connected with and upwards facing surface of the frame 101' or a groove 130' therein. Similarly the operating rod 123' may also be connected with a side surface of the sash 102'.

[0032] A opening device corresponding to the one in Fig. 3a and 3b may be provided at the opposite side members of the frame and sash, the two opening devices preferably but not necessarily having the same strength and characteristics. If for example aid is particularly needed at the beginning and the end of the opening movement, but not in the middle, two devices working primarily at the beginning and the end respectively may be employed.

[0033] The auxiliary opening device 120, 120' in Fig. 3a and 3b is shown arranged between side members 106, 110 of the frame and sash, respectively, but it is to be understood, that it may also be arranged between the top members 103, 107 or the bottom members 104, 108 of the frame and sash, respectively. Further, it is to be understood, that the auxiliary opening device might also be arranged at other positions in relation to the side members e.g. closer to the bottom of the window. The latter may be advantageous when using a pressure medium operated cylinder as a longer stroke allows the use of a less accurate and thus cheaper cylinder. The auxiliary opening device should, however, be arranged with due consideration of the type of device used, the aesthetics of the windows etc.

[0034] The operating means of this embodiment comprises a handle 115 placed on the sash bottom member 108. By operation of the handle 115 engagement means on the sash bottom member 108 are engaged and disengaged with corresponding engagement means on the frame bottom member 104. The cylinder 124 and the operating rod 123 provides a supplementary torque that helps to rotate the sash 102 with respect to the frame 101.

[0035] As may be seen more clearly in Fig. 4, each of the frame members 205, 206 of the second pair, to which the auxiliary opening devices are to be attached, is provided with a groove 230. This allows the opening device to be attached to the side surface 231 as indicated by the hole 222 or to an upwards facing surface 232 without necessitating a gap between the frame and sash (not shown). When the window is in the closed position, the

entire cylinder (not shown) will be held in the groove, and during opening of the window, it will be swung out of the groove as shown in Fig. 3a and 3b.

[0036] In Fig. 4 the groove 230 is arranged relatively close to the hinge 212. This entails that, when seen from the inside of the building in which the window is installed, the cylinder (not shown) will remain at least partly hidden during a relatively large portion of the opening. The view from the window will therefore not be considerably impaired by the arrangement of the auxiliary opening devices.

[0037] It should be noted that the cylinder of the auxiliary opening device might alternatively be connected with the sash member and the operating rod with the frame member, just as the precise position of the auxiliary opening device may vary.

[0038] As a further alternative, the auxiliary opening device may comprise a spring such as e.g. a torsion spring connected with the hinge device.

[0039] Fig. 5 shows a possible embodiment of a hinge for use in a window according to the invention. The hinge comprises two main hinge members 301 and 302 intended for mounting on the frame and sash, respectively. Mounted on the frame hinge member 301 is a leaf spring 303. In use, a pin 305 on the sash hinge member 302 will travel along the spring 303 and due to the limited space between the spring and the guide 306 lying above the spring in Fig. 5, the pin will be forced against the spring. The spring thus constantly exerts a pressure against the pin causing a checking of the window. The window may thus be left in any desired position and will stay there irrespective of the action of gravity.

[0040] The spring force should be strong enough to keep the window in a desired position. The action of the spring should thus correspond to the action of gravity on the part of the sash and pane not balanced by a corresponding part on the opposite side of the hinge axis, the action of the spring accordingly corresponding to the gravitational action on half the sash and pane when the hinge axis is positioned at 1/4 of the distance between the centre line and one of the sash members.

[0041] Preferably the spring should also be able to keep the window in position against wind forces. To achieve this, the spring force may be even stronger than mentioned above. Alternatively, as shown in the embodiment in Fig. 5, the spring 303 may also be provided with a number of depressions 304. When reaching one of these depressions the pin 305 will settle into the depression and an extra force therefore has to be exerted to move the window any further. The force needed to bring the pin out of the depression should be large enough to prevent the window from being moved by normal wind forces, but it should still be possible for the user of the window to overcome the force.

[0042] In Fig. 5 the shown depressions 304 are evenly spaced. They may, however, also be arranged corresponding to the window being kept in specially desired positions such as an only slightly open ventilating posi-

tion, a more open airing position and a fully open emergency escape position. Additionally a position where the top of the sash does not project into the room behind the window may be desirable where the window is to fitted with an insect screen, a roller blind or the like.

[0043] A similar hinge without a spring could also be used. In that case the guide 306 might be provided with one or more projecting resilient members. When opening the window the pin 305 would then travel along the guide meeting little or no resistance until reaching the projecting member. To travel further the pin would have to force aside the resilient member, the necessary force depending on the material and design of the latter.

[0044] The invention should not be regarded as being limited to the embodiments described in the above, but various modifications and combinations may be carried out. For instance, the check means may comprise more independent means such as e.g. the combination of a hinge spring and a stay arm or the like causing friction during opening of the window. Further, the window may be built-in in a facade, and the sash may be hingedly connected with the frame with the hinge axis extending in parallel with the side members of the frame and the sash.

Embodiments:

[0045]

1. A window comprising a frame and a sash, said sash being connected with the frame by means of a hinge device defining a hinge axis of the window, the frame and the sash each including a first pair of mutually opposite members, and a second pair of mutually opposite members, said hinge device connecting a respective frame and sash member of the second pair of frame and sash members, and a centre line being defined substantially midway between the one and the other of the members of said first pair, **characterized in that** the hinge device comprises a set of pivot hinges mounted in such a position that the hinge axis is situated between said centre line and said one member of said first pair and that the window further comprises at least one auxiliary opening device as well as check means restricting the movement of the window during opening and/or closing thereof.

2. A window as in embodiment 1, where one end of said auxiliary opening device is connected with an upper or side face of one of the frame members of said second pair, and the other end of said auxiliary opening device is connected with a side or lower face of the corresponding sash member.

3. A window as in embodiment 2, where one or more of the at least one auxiliary opening device comprises a pressure medium operated cylinder with an operating rod.

4. A window as in embodiment 3, where auxiliary

openings device comprises two cylinders arranged one on each side of the window.

5. A window as in embodiment 2, where the at least one auxiliary opening device comprises a chain opener.

6. A window as in any one of the preceding embodiments, in which the connection between the auxiliary opening device and the frame is releasable.

7. A window as in any one of the preceding embodiments, in which at least one member of the second pair of frame and/or sash members is provided with a groove allowing the auxiliary openings device to move during operation of the window.

8. A window as in any one of the preceding embodiments, in which the at least one auxiliary opening device comprises a spring, preferably connected with the hinge device.

9. A window as in any one of the preceding embodiments, where said check means is an integrated part of at least one of said hinges.

10. A window as in any one of the preceding embodiments, where said check means comprises a spring member acting on one or more parts of the pivot hinge.

11. A window as in any one of the preceding embodiments, where said check means allows the window to be arrested in one or more predetermined positions.

12. A window as in embodiment 10 and 11, where said spring member has one or more arresting points, where other parts of the hinge may come into a particularly tight contact therewith, thereby allowing the arresting of the window.

13. A window as in any one of the embodiments 1-8, where said check means is a pressure medium operated cylinder.

14. A window as in any one of the preceding embodiments, in which the hinge axis is positioned in the interval between 1/3 and 2/3 of the distance between the centre line and said one member of said first pair, preferably at approximately 1/4 of the distance between the centre line and said one member of said first pair.

15. A window as in embodiment 14, in which the action of the check means corresponds to the action of gravity on the part of the sash and pane not balanced by a corresponding part on the opposite side of the hinge axis, the action of the check means thus corresponding to the gravitational action on half the sash and pane when the hinge axis is positioned at 1/4 of the distance between the centre line and said one member of said first pair.

16. A window as in any one of the preceding embodiments, in which the one and the other member of said first pair constitutes the top and bottom member, respectively, of the frame and sash.

17. A window as in any of the preceding embodiments, where said auxiliary opening device and/or

said check means is arranged in an at least partly concealed manner.

18. A window as in embodiment 17, where said auxiliary opening device and/or said check means is arranged between the frame and/or sash and at least one cladding protecting one or both of them from the weather.

10 Claims

1. A window comprising a frame and a sash, said sash being connected with the frame by means of a hinge device defining a hinge axis of the window, the frame and the sash each including a first pair of mutually opposite members, and a second pair of mutually opposite members, said hinge device connecting a respective frame and sash member of the second pair of frame and sash members, and a centre line being defined substantially midway between the one and the other of the members of said first pair, **characterized in that** the hinge device comprises a set of pivot hinges mounted in such a position that the hinge axis is situated between said centre line and said one member of said first pair and that the window further comprises at least one auxiliary opening device comprising a spring connected with the hinge device.

2. A window as claimed in claim 1, wherein the spring is a torsion spring.

3. A window as claimed in claim 1 or 2, wherein one end of an auxiliary opening device is connected with an upper or side face of one of the frame members of said second pair, and the other end of the auxiliary opening device is connected with a side or lower face of the corresponding sash member.

4. A window as claimed in claim 3, wherein one auxiliary opening device comprises a pressure medium operated cylinder with an operating rod, preferably two cylinders arranged one on each side of the window.

5. A window as claimed in claim 3, wherein one auxiliary opening device comprises a chain opener.

6. A window as claimed in any one of the preceding claims, in which the connection between the auxiliary opening device and the frame is releasable.

7. A window as claimed in any one of the preceding claims, in which at least one member of the second pair of frame and/or sash members is provided with a groove allowing the auxiliary openings device to move during operation of the window.

8. A window as claimed in any one of the preceding

claims, wherein check means restricting the movement of the window during opening and/or closing thereof is provided.

9. A window as claimed in any one of the preceding claims, wherein said check means is an integrated part of at least one of said hinges, preferably comprising a spring member acting on one or more parts of the pivot hinge. 5
- 10
10. A window as claimed in any one of the preceding claims, wherein said check means allows the window to be arrested in one or more predetermined positions, wherein said spring member has one or more arresting points, and wherein other parts of the hinge may come into a particularly tight contact therewith, thereby allowing the arresting of the window. 15
11. A window as claimed in claim 8, wherein said check means is a pressure medium operated cylinder. 20
12. A window as claimed in any one of the preceding claims, in which the hinge axis is positioned in the interval between $1/3$ and $2/3$ of the distance between the centre line and said one member of said first pair, preferably at approximately $1/2$ of the distance between the centre line and said one member of said first pair. 25
13. A window as claimed in claim 12, wherein the action of the check means corresponds to the action of gravity on the part of the sash and pane not balanced by a corresponding part on the opposite side of the hinge axis, the action of the check means thus corresponding to the gravitational action on half the sash and pane when the hinge axis is positioned at $1/2$ of the distance between the centre line and said one member of said first pair. 30
35
14. A window as claimed in any one of the preceding claims, in which the one and the other member of said first pair constitutes the top and bottom member, respectively, of the frame and sash. 40
15. A window as claimed in any of the preceding claims, wherein said auxiliary opening device and/or said check means is arranged in an at least partly concealed manner, preferably between the frame and/or sash and at least one cladding protecting one or both of them from the weather. 45
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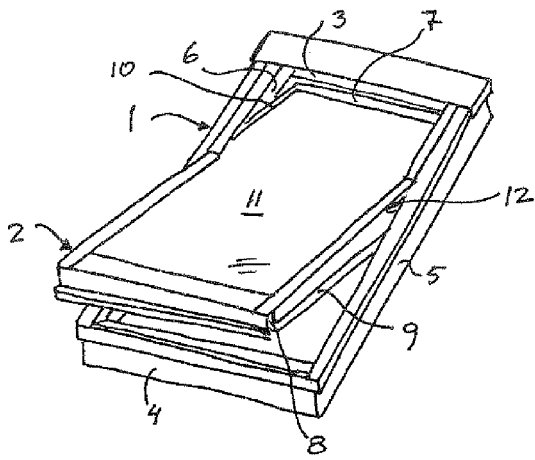


Fig. 1

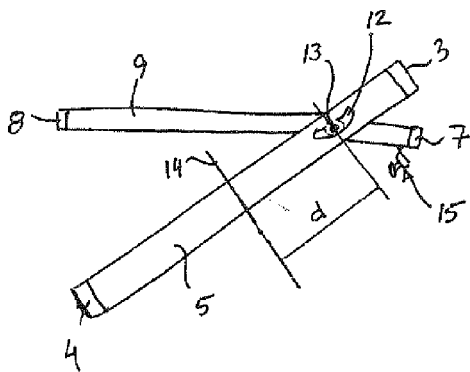


Fig. 2

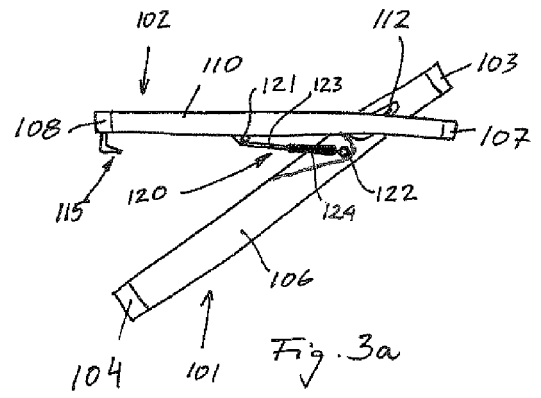


Fig. 3a

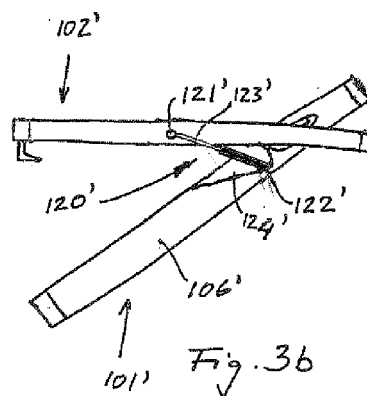
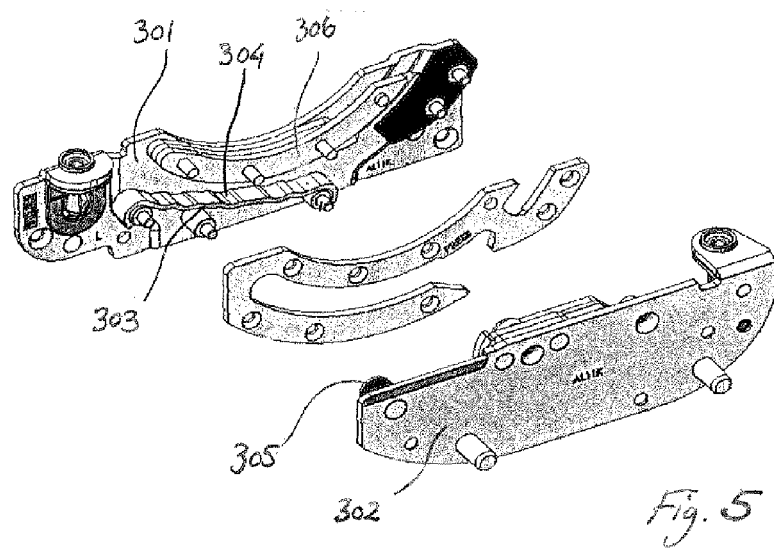
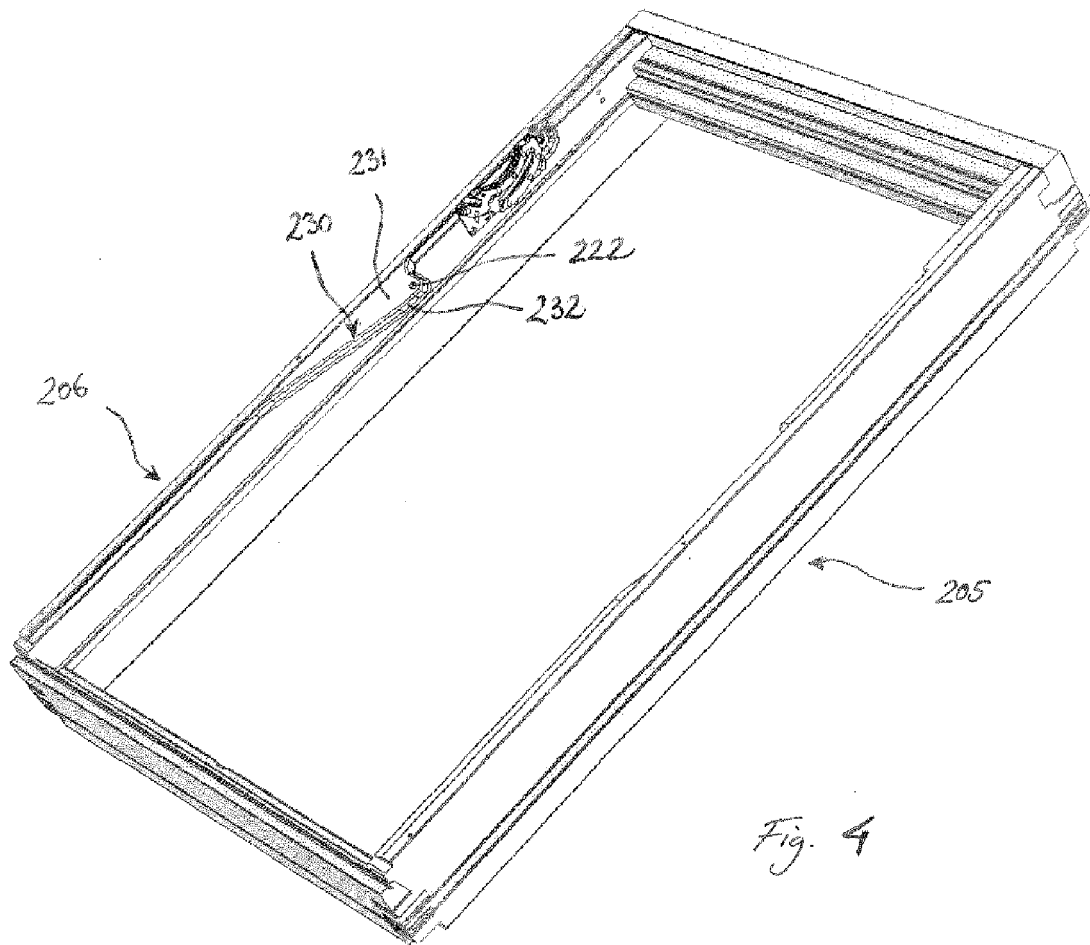


Fig. 3b



REFERENCES CITED IN THE DESCRIPTION

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