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(71) Applicant: **Aldoor Oy**
15520 Lahti (FI)

(72) Inventor: **Kuokkanen, Osmo**
15240 Lahti (FI)

(74) Representative: **Levlin, Jan Markus**
Berggren Oy Ab
P.O. Box 16
00101 Helsinki (FI)

(54) Smoke outlet window and mechanism for opening and closing the same

(57) The invention relates to a smoke outlet window and its opening and closing mechanism. The smoke outlet window is arranged to open with respect to its vertical axis, so that each window element (10a, 10b) is attached, at the top and bottom sash, to the window frame by means of axle stubs (11a, 11b). Advantageously the axle stubs (11a, 11b) are arranged in an intermeshed fashion, so that the window unit can be opened completely. The opening and closing mechanism is based on a process where the power generated by a manually operated actuator, such as a hand crank (18), is transmitted to the lever arms (12, 14, 15) for example by means of a wire rope (31) and a slide (17), said lever arms (12, 14, 15) being arranged to move so that the window can be opened and closed. The movements of the window elements (10a, 10b) can be synchronized for instance by interconnecting said window elements (10a, 10b) by means of a rod (19).

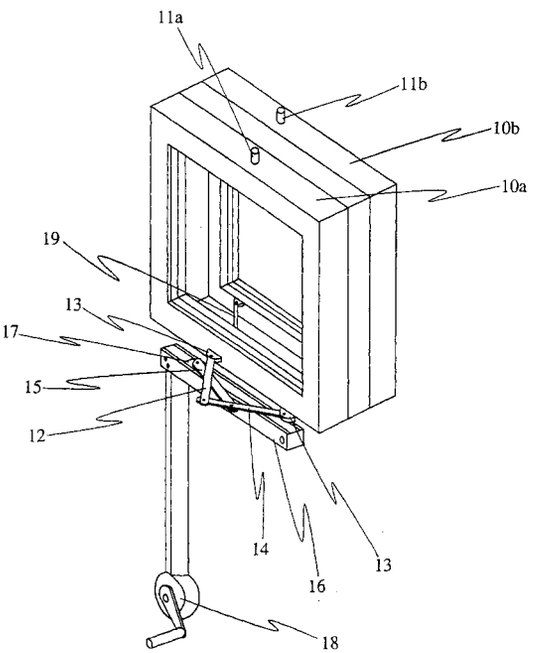

Fig. 1

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Description

[0001] The invention relates to a smoke outlet window and a mechanism for opening and closing the same. In particular, the invention relates to a window that opens with respect to the vertical axis, and an opening mechanism meant for opening and closing said window, which mechanism can be controlled by means of an actuator.

[0002] The Finnish Ministry of Environment has issued regulations, according to which for instance apartment houses and industrial properties must be provided with a system for exhausting smoke accumulated in said facilities. The simplest way to remove smoke is traditional airing through a hatch, advantageously a window. The size of the smoke outlet window is proportional to the volume of the space to be aired. The smoke outlet window can for example be a window hatch located somewhere in the top area of an apartment house stairwell, or possibly a skylight or a trap door.

[0003] Because the smoke outlet window is located, for instance in the case of apartment houses, in the top area of the stairwell, it is fairly difficult for the user to find access to the window so as to open it. This is the case with other high-positioned windows, too. One solution for avoiding said problem is introduced in the GB patent 1,046,918. Said publication specifies a vertically fitted window and a system for opening the same, which is controlled by means of a manual hand crank. The opening system is a fairly complicated mechanism based on bevel gears and composed of several elements, whereby the window is opened and closed.

[0004] The object of the present invention is to realize a window suited for exhausting smoke, which window can be opened and closed by remote control, by intermediation of a simple actuator. Another object of the present invention is to realize a mechanism for opening and closing the window.

[0005] Said objects are achieved by means of a window structure, where the window is attached to the frame by means of vertical axle stubs, around which stubs the opening and closing procedure takes place. The objects of the opening and closing mechanism are achieved by means of a system attached to the window frame and sash and based on lever arms, which system can be can be operated by means of remote control, for instance by means of a hand crank.

[0006] The smoke outlet window according to the invention is characterized by what is stated in the independent claim 1. Other preferred embodiments of the invention are enlisted in the dependent claims.

[0007] The operation of the invention is based on the fact that the lever arms attached to the window frame and sash are connected to each other. Moreover, one of said lever arms is attached to a third lever arm, which at one end is fastened to a slide movable along a bar, said slide being controlled for example by means of a crank. As the slide moves along the guide bar, the lever arms are shifted with respect to each other and open the window as a consequence of the motional effect caused by the crank, so that the window is turned around the axle stubs parallel to the vertical axis, said stubs being placed in the window frame advantageously so that the window can be opened completely.

[0008] Several advantages are gained by means of the arrangement according to the invention. First of all, the window can be opened completely, in which case smoke exhaustion is speeded up. Secondly, by means of the arrangement according to the invention, the window can be opened and closed from a distance, in which case it is excellently suited for instance to apartment house stairwells, where the windows are often located very high in the wall. Moreover, the arrangement according to the invention can be applied to a system composed of several separate windows. In that case, for instance in the conditions prevailing in Finland, the heat insulation of houses is improved. In addition to this, the arrangement according to the invention can be installed in already existing buildings.

[0009] The invention is described in more detail below, with reference to the appended drawings, wherein

figure 1	illustrates an embodiment of the invention,
figure 2	illustrates an opening mechanism of an embodiment of the invention,
figure 3	illustrates an example of an opening mechanism based on wire rope and a hand crank, and
figure 4a and 4b	illustrate the operation of an opening mechanism of an embodiment of the invention.

[0010] Like numbers for like parts are used in the drawings.

[0011] Figure 1 shows a preferred embodiment of the invention in an overall view, where all components of said embodiment are visible. In this exemplary embodiment, the window is advantageously a unity composed of several window elements and rotatable around the vertical axis. The window illustrated here is composed of two window elements 10a, 10b, but it may also include more than two elements. In the top and bottom part of the sash of both window elements 10a, 10b, there are installed axle stubs 11a, 11b, which fasten the window sash to the frame, and around which the window is opened. In a window unit composed of several window elements 10a, 10b, the axle stubs 11a, 11b are advantageously fitted to be fastened in an intermeshed fashion, so that the window can be opened wide without interference by the axle stubs 11a, 11b. In that case the mutual distance between the window normals, passing via the axle stubs 11a, 11b, is advantageously equal to the thickness of the window unit formed by the window elements 10a, 10b. The axle stubs 11a, 11b can also be

positioned in the window sashes in some other fashion than what is illustrated in the drawing, according to the needs of the situation at hand. For example, the axle stubs 11a, 11b can be placed in identical positions in the window sashes, but in that case the window cannot be opened completely.

[0012] The window opening mechanism is illustrated both in figure 1 and in an enlarged view in figure 2. In the window sash, for instance in the bottom sash, there is attached a first lever arm 12 by means of conventional technique. Here the fastening is realized so that said lever arm 12 can freely turn around the pin that fastens the lever arm to the sash counterpart 13, as is illustrated in figure 2. Another lever arm 14 is attached to the window frame, for example to be turnable in the same way as the first lever arm 12. Said first and second lever arm 12, 14 are turnably attached to each other, so that the first lever arm 12 can turn with respect to the second lever arm 14, and vice versa. Advantageously the fastening is realized by means of a pin, around which the lever arms 12, 14 can turn. In this exemplary embodiment, the fastening of the lever arms 12, 14 to each other is realized at the ends of said lever arms, but the fastening can also be realized for instance at the middle of the other lever arm 14. Advantageously the fastening of the lever arms to the sash of the first window element 10a and to the window frame is realized so that the normal of the window frame passing via the axle stub 11a passes in between the fastening members 13 of the first lever arm 12 and the second lever arm 14. For a man skilled in the art, it is obvious that the fastening of the lever arms to the window sash and frame may, within the scope of the inventive idea of the present invention, be realized in some other fashion than what is described by way of example in the above specification. Also, the fastening may be realized at some other point than the bottom sash.

[0013] To the lever arm 14 fastened to said window frame, there is attached a third lever arm 15 of the opening mechanism, said lever arm 15 serving as the power arm proper for opening the smoke outlet window. The fastening can be realized for example in similar fashion as the mutual fastening of the first lever arm 12 and the second lever arm 14. At the other end, said third lever arm 15 is attached to the slide 17 moving along the guide bar 16 according to figure 2. Advantageously the slide guide bar 16 is attached to the window frame so that all elements of the smoke outlet window opening mechanism are freely turnable without interference by the slide guide bar 16.

[0014] The slide 17 is fitted to slide along the guide bar 16. The moving of the slide 17 along the guide bar 16 can be realized for instance by means of a hand crank 18 illustrated in figure 1. The rotary motion created by the hand crank 18 makes the slide 17 move along the guide bar 16, because the power of the hand crank 18 is geared to the slide 17 for example by means of a wire rope. Figure 3 shows, by way of example, how a preferred embodiment of the invention is arranged in order to move the slide 17 along the guide bar 16. In this exemplary embodiment, both ends of the wire rope 31 are provided with locking members that are fitted to be locked in the notches provided in the hand crank 18. The wire rope 31 is arranged in the window opening mechanism so that the first locking member of the wire rope 31 is placed in a notch provided in the first wire rope gorge of the hand crank 18, whereafter a suitable amount of wire rope is coiled in the first gorge of the hand crank. To the guide bar 16 of the slide 17, the wire rope 31 is brought so that from the hand crank 18, the wire rope is reeled out so that it circles the runner wheel 32, which is located immediately above the hand crank 18 and guides the wire rope 31. After the runner wheel 32, the wire rope 31 is brought, via the slide 17 and a first wire rope folding axis 21, to a second wire rope folding axis 22, which in this exemplary embodiment is located at the other end of the guide bar 16. After the second folding axis 22, the wire rope 31 is brought, via the slide 17, to a third wire rope folding axis 23, and further via the runner wheel 32 to a second wire rope gorge of the hand crank, in which there is advantageously coiled an equal length of wire rope 31 as in the first gorge. In the first and second wire rope gorges of the hand crank 18, the wire rope is advantageously coiled in opposite directions, in order to be able both open and close the window. The wire rope 31 is attached, by means of the locking member provided therein, in a notch provided in the second wire rope gorge. The slide 17 is attached to the wire rope 31 by means of some prior art technique. By means of the method according to the above description, the wire rope 31 does not slip while opening or closing the window. The wire rope 31 can be replaced by some other corresponding structure, such as chain or rope. For a man skilled in the art, it is obvious that the slide 17 can also be moved by some other means than the hand crank 18. The operation of these means can for example be based on an electric motor or a gas spring. The member designed for moving the slide 17 can always be placed further from the guide bar 16, the longer the wire rope 31 or the corresponding member is. The length of the wire rope 31 can advantageously be chosen according to the needs, i.e. depending for example on how high the smoke outlet window is located.

[0015] Let us now observe the operation of the smoke outlet window opening mechanism with reference to figures 4a and 4b. By rotating the hand crank 18 according to a preferred embodiment of the invention, the slide 17 moving along the guide bar 16 can be moved. When the window is opened, the slide 17 in this exemplary embodiment moves from the position illustrated in figure 4a to the position illustrated in figure 4b, i.e. from one end of the guide bar 16 towards the other end of said guide bar 16. The rigid lever arm 15 attached to the slide 17 pushes the lever arm 14, attached to the window frame, at the fastening point of said lever arms 14, 15, so that

the lever arm 14 attached to the frame pulls along the lever arm 12 attached to the lever arm 14 and to the window sash. Thus the lever arm 12 attached to the window sash begins to turn open the window in the way illustrated in figure 4b. Hence, the power moving the slide 17 turns open the window around the axle stubs 11a, 11b. The window is closed by pulling the slide 17 back along the guide bar 16, in which case the lever arms 12, 14, 15 move, with respect to each other, in the opposite order as compared to the process described above, whereby the window is closed. For a man skilled in the art, it is obvious that the slide 17 and the lever arms 12, 14, 15 can also be arranged so that in the initial position, i.e. when the window is closed, the slide 17 is located in the middle of the guide bar 16, and the window is opened by moving the slide 17 towards the other end of the guide bar 16.

[0016] As was already mentioned above, the window illustrated here comprises two window elements 10a, 10b, both of which are at the sashes attached to the window frame by individual axle stubs 11a, 11b. From figure 4a, it can be easily observed how the axle stubs 11a, 11b are in this exemplary embodiment placed on both sides of the center of the window sash, so that the window can be opened wide. For a man skilled in the art it is obvious that the opening of the window is easier, if the window elements 10a, 10b of the window unit composed of more than one window are somehow connected, in order to make the opening strength affect all windows simultaneously, and the opening of the window elements 10a, 10b is synchronized. In this exemplary embodiment, the windows are linked at the sashes by means of a rod 19, which is turnably installed in between the windows as is illustrated in figure 2. In case the window unit includes more than two windows, each window can be linked to with the adjacent windows in the fashion described above. For a man skilled in the art it is obvious that the fastening of several window elements 10a, 10b to the window frame must be carried out so that the axle stubs 11a, 11b of each window element 10a, 10b are placed, in relation to the rest of the axle stubs 11a, 11b in a mutually intermeshed fashion, so that the window can be opened completely.

[0017] In the specification above, we have described a window structure and opening mechanism particularly designed for smoke exhaustion. For a man skilled in the art it is obvious, that the arrangement described above can also be applied to a window meant for ordinary use. The opening mechanism in particular is suited to be used in many different connections within the scope of the inventive idea defined in the appended claims. The scale and proportions in the accompanying drawings are not exact, but their sole purpose is to illustrate the structure and operation of the present invention.

Claims

1. A smoke outlet window composed of two or more window elements (10a; 10b), being arranged to be opened and closed by means of an opening and closing mechanism realized by lever arms (12, 14, 15), **characterized in that**

   - the axle stubs (11a; 11b) for attaching the window elements (10a; 10b) to the window frame are attached to the top and bottom sashes of each window element (10a; 10b), in an intermeshed fashion with respect to the axle stubs (11a, 11b) of the rest of the window elements (10a; 10b), so that the window is made turnable around said axle stubs (11a, 11b);

   - the opening and closing mechanism includes a slide (17) and a slide guide bar (16) for transmitting power to the lever arms (12, 14, 15) and for focusing said power in order to turn the window around the axle stubs (11a, 11b).

2. A smoke outlet window according to claim 1, **characterized in that** each window element (10a, 10b) is arranged to be fastened by a rod (19) to the window elements (10a, 10b) adjacent to said window element (10a, 10b) in order to synchronize the opening and closing of the window unit formed by said window elements.

3. A smoke outlet window according to claim 1 or 2, **characterized in that** to the slide (17) and the second lever arm (14), there is attached a third lever arm (15), which turns said second lever arm (14) attached to the window frame, so that the generated power effect is transmitted to the window frame and to the first lever arm (12) fastened to the window sash and to said second lever arm (14), in order to open or close the window.

4. A smoke outlet window according to any of the preceding claims, **characterized in that** the window opening and closing power is arranged to be transmitted to the slide (17) by means of a hand crank (18).

5. A smoke outlet window according to any of the preceding claims, **characterized in that** the window opening and closing power is arranged to be transmitted to the slide (17) by means of a wire rope (31).

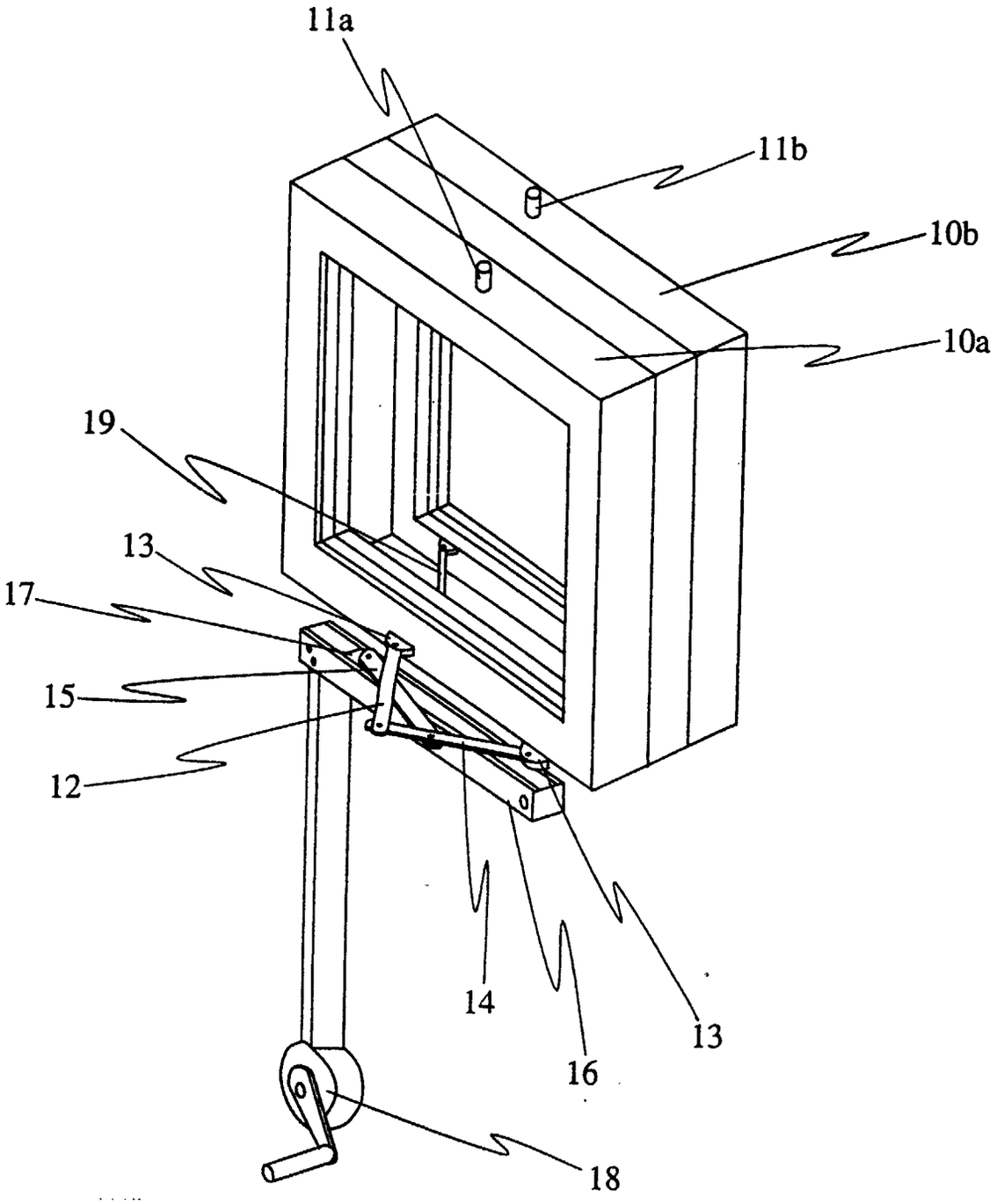

Fig. 1

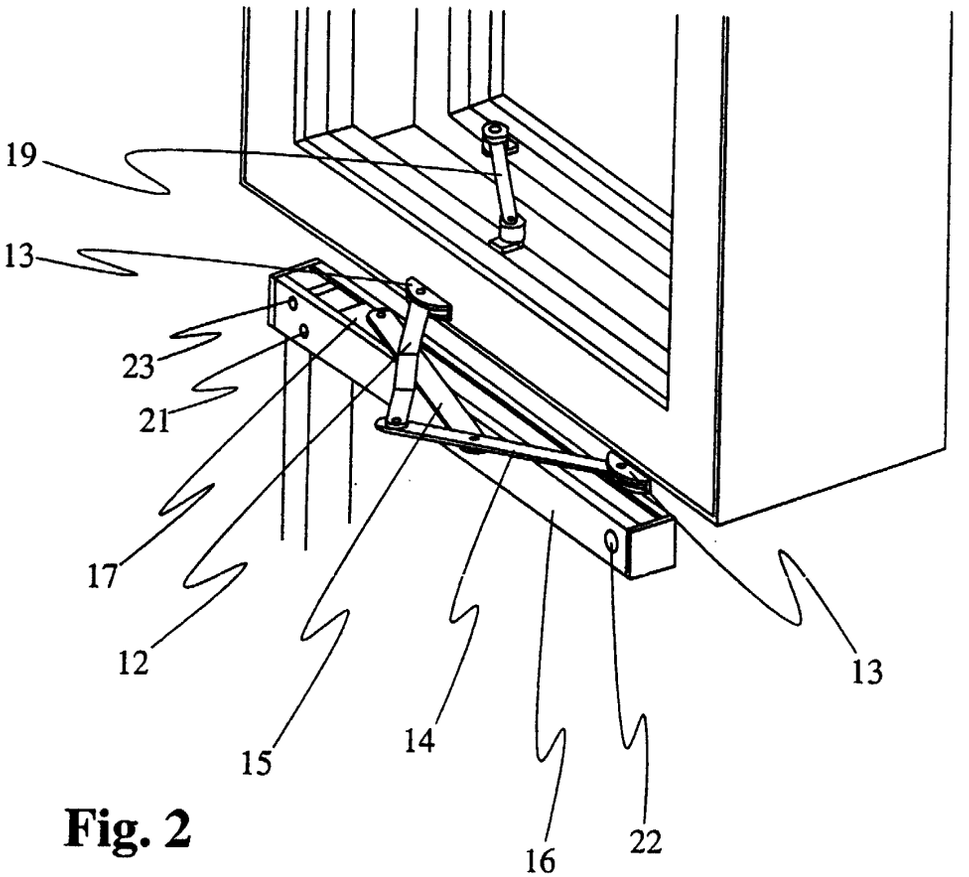

Fig. 2

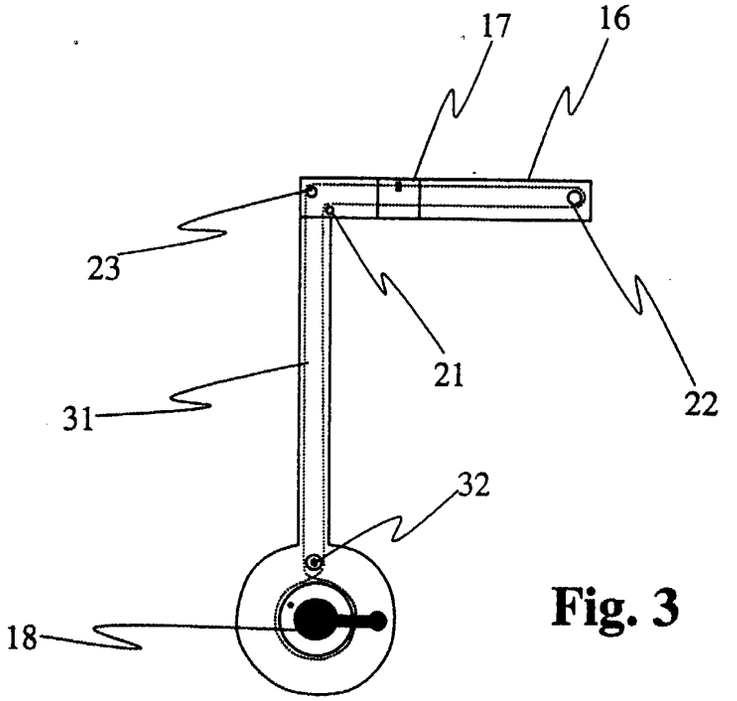

Fig. 3

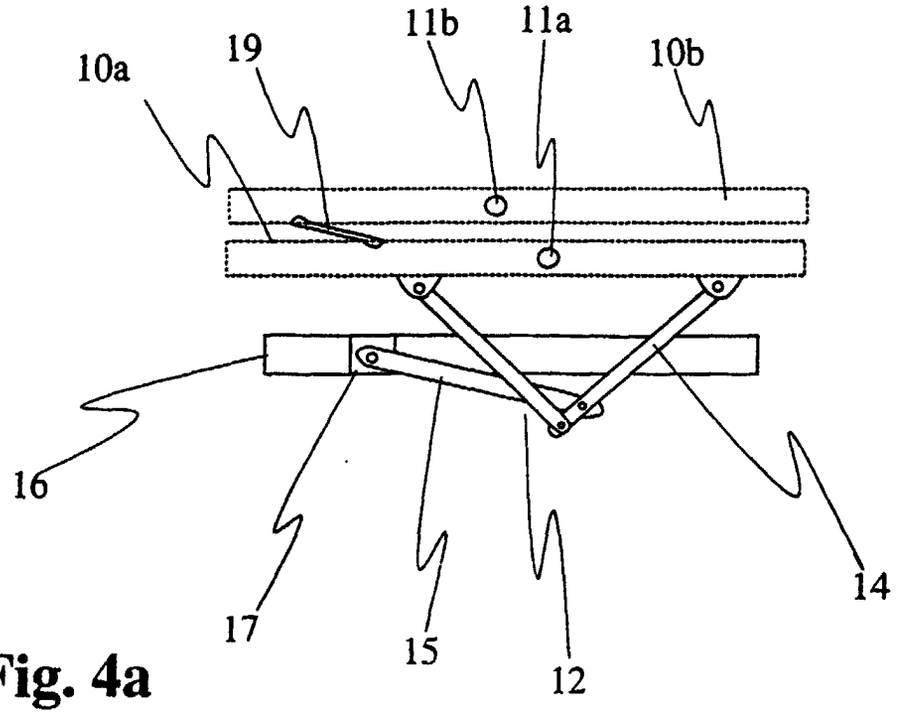

Fig. 4a

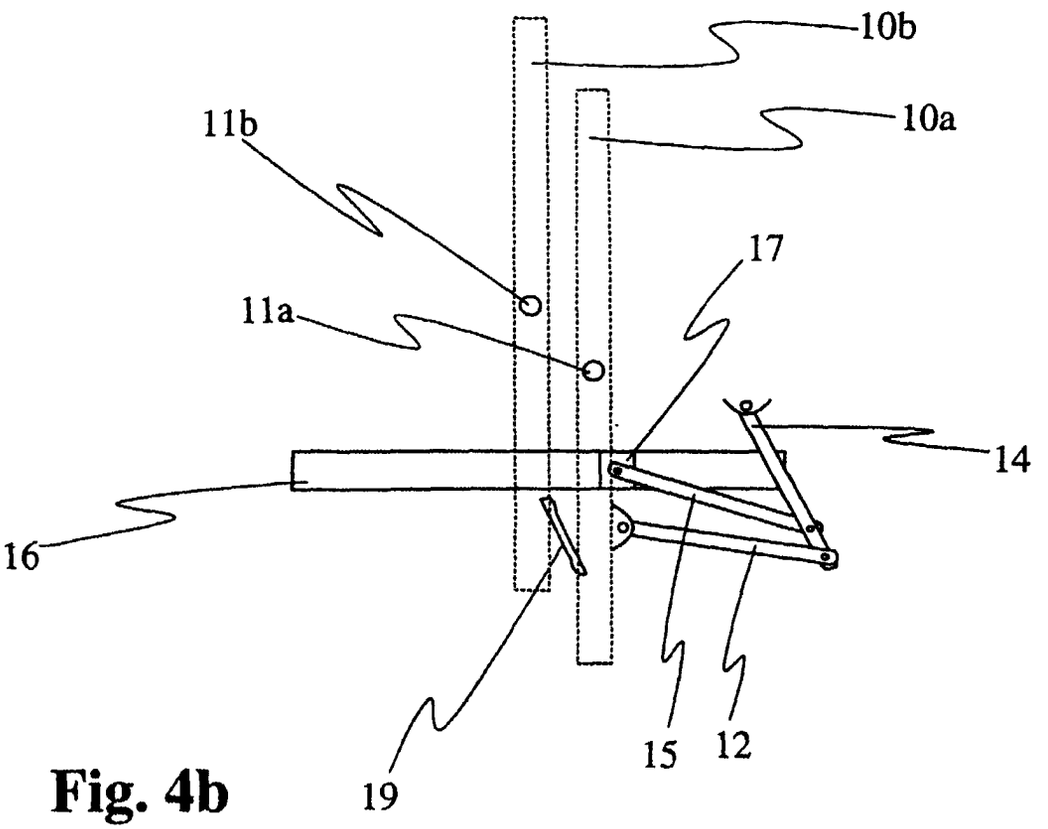

Fig. 4b