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(54) Method and device for mounting a household appliance in a cupboard space

(57) A method and a device for mounting a household appliance in a cupboard space are described. The device comprises an operating head (8), which is operable from the outside of the household appliance and which is arranged at the end of a threaded operating bar (12), which is rotatable and non-displaceably fixed, for example, to the bottom wall (3) of the household appliance with the aid of a guiding means (13). A motion-transmitting means (14) is in threaded engagement with

the operating bar (12) to be moved along the same. A pair of connecting elements (15) are pivotally connected to the means (14) and to respective slidable rails (16) which have an engaging element (7) at their distal end. By inserting a tool into the operating head (8) and rotating the operating bar (12), the rails (16) are caused to project through openings in the household appliance and lockingly engage the vertical sides (9) of the cupboard space.

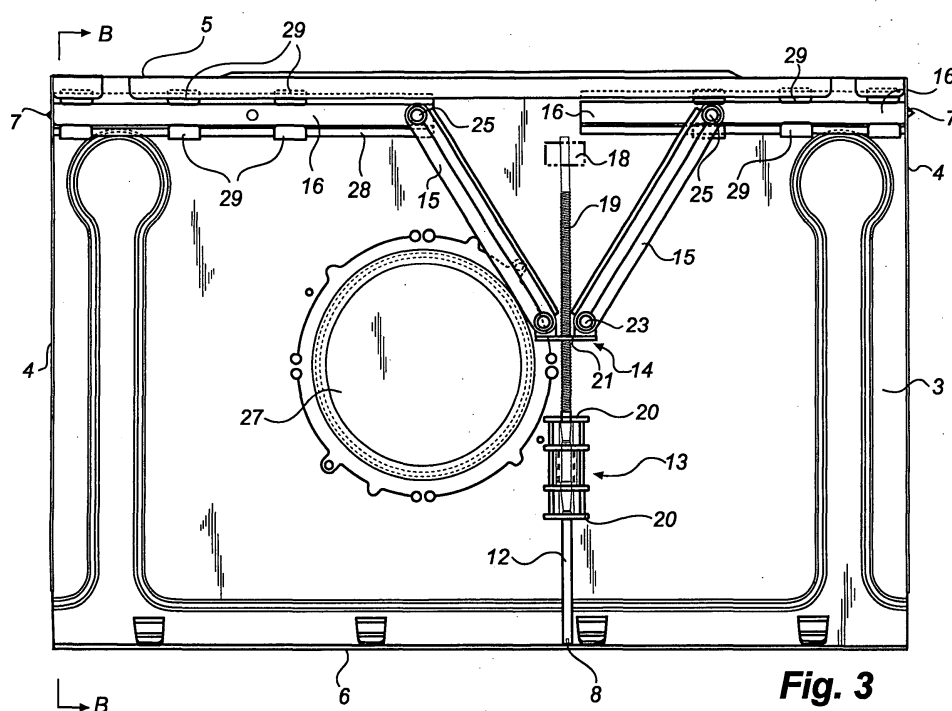


Fig. 3

Description

[0001] The present invention relates to a device for mounting a household appliance in a cupboard space which is defined by a pair of vertical sides and at least one horizontal shelf, which is intended to support the household appliance, said household appliance comprising a top wall, a bottom wall, two side walls, a front wall and a back wall, the device being intended to lockingly engage said vertical sides. The invention also relates to a method for mounting a household appliance in a cupboard space.

[0002] More specifically, the invention relates to a mounting device which is arranged in a household appliance, such as a microwave oven, for mounting thereof in a cupboard or a similar space.

[0003] It is becoming increasingly common to build in household appliances, such as microwave ovens, into specially designed cupboards. The mounting of a built-in appliance has to fulfil certain requirements on stability. This means that it should not, for example, be possible to displace the appliance from its position in the cupboard or to tip it over. Furthermore, the market places high demands on the aesthetic appearance of the mounting. Existing techniques for mounting appliances in cupboards are based on different kinds of fastening means, such as snap connections, screw joints, external connecting frames on the front of the appliance, etc.

[0004] The greatest disadvantage of prior-art technique for mounting household appliances in cupboards is that it is time-consuming (about 30 minutes or more). Devices for fastening the appliance have to be mounted in the cupboard as well as in or on the appliance. In addition, existing mounting techniques often produce an aesthetically unattractive mounting result,

[0005] The object of the present invention is to provide a device for mounting a household appliance which allows for quick and safe installation of the household appliance in a cupboard space and also easy removal of the same from the cupboard space for service or replacement.

[0006] Another object of the present invention is to provide a mounting device for a household appliance which is easy to handle and which is included in a household appliance of standard type.

[0007] It is a further object to provide a mounting device for a household appliance which automatically centres the household appliance in a cupboard space and which is aesthetically appealing since it does not have any effect, or has very little effect, on the appearance of the front of the household appliance.

[0008] These objects have been achieved according to the invention by means of a mounting device according to that stated by way of introduction, which is characterised in that the device comprises an operating bar which extends substantially from the front wall towards the back wall, a guiding means which is intended for the operating bar and which is fixedly mounted to the bottom

wall/top wall of the household appliance, a motion-transmitting means in engagement with the operating bar, a pair of rails which are movably arranged substantially parallel to the back wall of the household appliance, each rail having a distal end with an engaging element, which engaging elements, when mounting the household appliance in said cupboard space, are arranged to lockingly engage the respective vertical sides, and a pair of connecting elements which are fastened to said motion-transmitting means and which are in contact with the respective rails, the operating motion, when operating the operating bar, being transmitted via the motion-transmitting means to the respective connecting elements which each cause the associated rail to be moved in its longitudinal direction.

[0009] A method for mounting the household appliance according to that stated above is characterised by the following steps:

arranging a rotatable operating bar in the household appliance at an angle to the back wall, movably arranging in the household appliance a pair of rails substantially parallel to the back wall and, at least when performing said mounting, in contact with the operating bar, each rail having a distal end with an engaging element, and placing the household appliance on the shelf, when mounting the household appliance, and subsequently rotating the operating bar to move the rails in their respective longitudinal directions away from each other and out of openings in the side walls for locking engagement of the associated engaging elements with the respective vertical sides.

[0010] Further developments of the invention will be apparent from the features stated in the dependent claims.

[0011] According to the invention, a white goods item or household appliance (microwave oven) is equipped with a mounting device near its bottom or top inside the chassis. Instead of using mounting components that are to be fixed to the inside of the mounting space (the cupboard), as in prior-art technique, the mounting device according to the invention uses sharp points or the like which are forced into the internal walls of the cupboard. While being firmly fixed in the cupboard, the appliance is centred. The mounting device according to the invention provides an aesthetically appealing mounting, since one component only needs to be accessible from the (visible) front of the appliance, which is the actual turning means (the screw head), with the aid of which the points or the like are forced to move sideways and into the internal walls of the cupboard and into frictional engagement therewith.

[0012] The mounting device according to the invention is preferably provided by flat bars or rails which are mounted in the bottom or top portion of the appliance. As a result, the existing space in, for example, micro-

wave ovens can hold the entire device without necessitating an increase of the vertical dimension of the appliance. Thus, the outer dimensions of the appliance are unaltered when the appliance is equipped with a mounting device according to the invention.

[0013] A preferred embodiment of the invention will now be described for the purpose of exemplification and with reference to the accompanying drawings, in which:

Fig. 1 is a perspective view schematically illustrating a household appliance in the form of a microwave oven, which is equipped with the mounting device according to the invention;

Fig. 2 is a front view showing the household appliance according to Fig. 1 mounted in a cupboard space;

Fig. 3 is a top plan view of the mounting device in the household appliance according to Fig. 1, seen along the section line A-A in Fig. 2;

Fig. 4 is a side view of the mounting device in the household appliance according to Fig. 1, seen along the section line B-B in Fig. 3; and

Fig. 5 is a partial section front view of the household appliance according to Fig. 1 showing its mounting device.

[0014] With reference first to Fig. 1, a microwave oven 1 with an embodiment of the mounting device according to the invention is schematically illustrated. The microwave oven comprises a surrounding casing which consists of a top wall 2, a bottom wall 3, two side walls 4, a back wall 5 and a front wall 6 with an oven door. From the respective side walls 4, the two engaging elements 7 of the mounting device are caused to project from and be retracted into the casing, respectively, by an operating head 8 in the front wall 6 being turned clockwise and counterclockwise, respectively, as described below in more detail.

[0015] Fig. 2 shows the microwave oven when mounted in a cupboard space which is defined by a pair of vertical sides 9, with which the engaging elements 7 engage for locking mounting of the microwave oven, and a horizontal shelf 11 which supports the microwave oven.

[0016] Reference will now be made to Figs 3-5, which illustrate a preferred embodiment of the mounting device according to the invention.

[0017] Fig. 3 is a top plan view of the mounting device and it distinctly shows the different components, said components primarily constituting an operating bar 12, a guiding or fastening means 13 for the operating bar, a motion-transmitting means 14, connecting elements 15 and a pair of rails or bars 16 which are movable in their longitudinal direction.

[0018] The operating bar 12 extends substantially from the front wall 6 towards the back wall 5. An operating head 8 is fixed to or integrated with the end of the bar 12, located closest to the front wall 6. The head 8 is

preferably formed as a screw head, i.e. with a groove for a screwdriver, Allen key or the like, for rotating the operating bar when mounting the microwave oven in a cupboard space or for removing the microwave oven from the cupboard space. Furthermore, the operating bar 12 advantageously, but not necessarily, extends parallel to the bottom wall 3 of the casing as well as to its side walls 4.

[0019] A guiding or fastening means 13 is fixedly mounted to the bottom wall 3 of the casing (alternatively to its top wall 2 if the mounting device is arranged in the upper portion of the casing instead of in its lower portion, as illustrated herein). The operating bar 12 is rotatably mounted in the guiding means 13. The guiding means comprises two or more spaced-apart plate elements 20 with aligned through-bores (not shown), through which the operating bar 12 extends, cf. Fig. 4. A pair of stop elements 17 are fixedly mounted on the operating bar and cooperate with one or two of the plate elements 20 to prevent the operating bar from being displaced in its longitudinal direction during and after operation. If desired, one stop element only can be used if it extends between two plate elements. The end of the operating bar located opposite to the end with the operating head 8 is advantageously rotatably mounted in a bushing 18 (faintly outlined with a broken line in Fig. 3), which is fixedly mounted to the bottom wall 3. In this case, the guiding means 13 only has to have one single plate element 20, on each side of which the stop elements 17 are arranged. At least the portion 19 of the operating bar 12 projecting from the guiding means 13 in the direction of the back wall 5 of the casing is provided with an external thread.

[0020] The motion-transmitting means 14 has a central body 21 with a threaded through-hole, which is in threaded engagement with the operating bar 12 for moving the means 14 along the operating bar when the operating bar is being rotated. Preferably, the motion-transmitting means 14 has a supporting surface 22 with a friction-reducing coating for contact with the bottom wall 3, which prevents the means 14 from rotating along with the operating bar 12. The means 14 also comprises a pivot joint 23 on each side of the operating bar, said pivot joints being fixedly mounted on or integrated with the central body 21. In the shown embodiment of the invention, each pivot joint comprises a pin 24 which projects upwards, perpendicularly to the means 14, i.e. substantially perpendicularly to the bottom wall 3, as seen in Fig. 4. As an alternative, the pivot joint 23 can be a ball and socket joint, a hinge or the like.

[0021] In each joint, a connecting element or link 15 is pivotally mounted. The connecting elements 15 have a bore or a hole, preferably through-going, at each end, and in one of these bores a pin 24 each is inserted, thereby allowing the connecting elements 15 to pivot towards or away from the portion 19 of the operating bar 12, parallel to the bottom wall 3 of the casing. Preferably, the connecting elements 15 are formed as straight arms

of equal length, but if required they can also be bent. To provide the arms with increased strength against the compressive load applied thereto during mounting, they should be L-shaped or T-shaped in cross-section, see Fig. 5.

[0022] The other ends of the connecting elements 15 are pivotally mounted by means of pivot joints 25 to a pair of rails or bars 16, which are movably arranged parallel to the back wall 5 of the casing and which are located substantially in the same plane as the operating bar 12 and the connecting elements 15. The rails are formed as straight arms with substantially rectangular cross-section, the dimensions of which are preferably considerably smaller in the vertical direction of the casing, i.e. perpendicularly to the bottom wall 3, than in the horizontal direction thereof, see Fig. 3. The pivot joints 25 are advantageously formed in the same way as the pivot joints 23. A pin 26 projects upwards, perpendicularly to each rail 16, parallel to the pins 24, and the pins 26 are inserted into said bores at the free ends of the connecting elements 15. The pins 26 are further located in a suitable position between the distal and the proximal end of the respective rails. This position should be selected such that the angle between the operating bar 19 and one of the connecting elements 15 equals the angle between the operating bar and the other connecting element 15, when the rails are aligned with each other. This means that the pins 26 can be differently positioned on the two rails, as shown in Fig. 3, and consequently the operating bar 12 does not have to be symmetrically arranged in the casing but can be placed in a suitable position where there is no interfering component (cf. the component 27 in Fig. 3).

[0023] Thus, the pivot joints 25 are arranged at the proximal ends of the rails 16, or in the vicinity thereof. The distal ends of the rails are caused to project, by the rotation of the operating bar 12, from the casing through openings in the respective side walls 4 into locking engagement, by means of their engaging elements 7 which are fixed to or formed in one piece with the distal end surfaces of the rails, with the two vertical sides 9 of said cupboard space when the rails 16 are moved in their longitudinal direction away from each other. The engaging elements 7 are preferably sharp points which are forced into the vertical sides. Alternatively, the engaging elements are bodies made of an elastic material, such as rubber, which are pressed into frictional engagement with the vertical sides.

[0024] In the shown embodiment of the mounting device according to the invention, each rail 16 has a pair of externally open, parallel edge grooves 28 at the surface of the rail from which the pin 26 projects, see Fig. 4. Each rail runs in a guiding means in the form of opposite, L-shaped elements 29, the one leg 31 of which is fixedly mounted to the bottom wall 3 of the casing, perpendicularly to the same, and the other leg 32 of which extends into one edge groove 28 for sliding engagement with the same.

[0025] The mounting device functions as follows.

[0026] When the household appliance (the microwave oven) has been positioned on the shelf 11 in said cupboard space, the fitter inserts a tool (screwdriver) into the operating head 8 to turn the same, and thus also the operating bar 12. Since it must be considered that the most natural locking motion is a turning motion in a clockwise direction (cf. water taps and valves), the operating bar is suitably left-hand threaded. The operating bar moves the motion-transmitting means 14 towards the back wall 5 of the casing in the axial direction of the operating bar 12, thereby pressing the connecting elements 15 outwards and away from the operating bar in the direction of the respective side walls 4. In this connection, the distal ends of the rails 16 are pressed out of the openings in the side walls, which brings at least one of the engaging elements 7 into contact with a vertical side 9. Further turning of the operating bar causes the household appliance to be moved laterally due to said contact until also the other engaging element 7 is brought into contact with the associated vertical side 9. The final turning motion of the operating bar causes the engaging elements 7 to be pressed into the respective vertical sides 9, or into frictional engagement therewith, thereby securing the household appliance in the cupboard space.

[0027] When removing the household appliance from the cupboard space, the operating bar is turned in the other direction, in this case in a counterclockwise direction, which a person skilled in the art will easily understand.

[0028] Above a preferred embodiment of the invention has been described. There are of course a number of other embodiments falling within the scope of the appended claims. As an example, the motion-transmitting means and the connecting elements showed herein can be replaced by a cam, which is fixedly mounted to the free end of the operating bar and which applies a pressure against the proximal end surfaces of the rails when the operating bar is being rotated. Alternatively, a link arm can be fixedly mounted at the free end of the operating bar, transversely thereto, a link being pivotally fastened to each end of the link arm at each side of the operating bar and pivotally fastened to the respective rails. The guiding means 13 can also be replaced with an elongate nut means, which is in threaded engagement with the operating bar, the motion-transmitting means having a smooth hole instead of a threaded hole and being kept non-displaceable relative to the operating bar by means of a stop element arranged on the operating bar, i.e. such that the motion-transmitting means will not follow the axial motion of the operating bar. It is also conceivable to replace the motion-transmitting means and the connecting means with a conical or wedge-shaped body, which is fastened to the free end of the operating bar and which applies a pressure against the proximal end surfaces of the rails when the operating bar is being moved in the axial direction to-

wards the back wall. Instead of the threaded joints described above, use can be made of bayonet couplings in some applications of the invention.

[0029] Even though, in this description, the rails are arranged at the bottom wall of the casing adjacent to the back side wall, it is, of course, also possible to arrange them in some other place appropriate from considerations of space, for example, adjacent to the front wall or at the top wall.

[0030] Finally, the mounting device has been described and illustrated as orientated in one single, horizontal plane. It can, however, also be orientated in one vertical plane or in two planes, i.e. the operating bar, the motion-transmitting means and the connecting elements can be parallel to the back wall instead of to the bottom wall, in which case the pivot joints of the rails must naturally have some other design known per se.

Claims

1. A device for mounting a household appliance in a cupboard space which is defined by a pair of vertical sides (9) and at least one horizontal shelf (11), which is intended to support the household appliance, said household appliance comprising a top wall (2), a bottom wall (3), two side walls (4), a front wall (6) and a back wall (5), the device being intended to lockingly engage said vertical sides (9), **characterised in that** the device comprises an operating bar (12) which extends substantially from the front wall (6) towards the back wall (5), a guiding means (13) which is intended for the operating bar (12) and which is fixedly mounted to the bottom wall (3)/top wall (2) of the household appliance, a motion-transmitting means (14) in engagement with the operating bar (12), a pair of rails (16) which are movably arranged substantially parallel to the back wall (5) of the household appliance, each rail (16) having a distal end with an engaging element (7), which engaging elements, when mounting the household appliance in said cupboard space, are arranged to lockingly engage the respective vertical sides (9), and a pair of connecting elements (15) which are fastened to said motion-transmitting means (14) and which are in contact with the respective rails (16), the operating motion, when operating the operating bar (12), being transmitted via the motion-transmitting means (14) to the respective connecting elements (15) which each cause the associated rail (16) to be moved in its longitudinal direction.
2. A device as claimed in claim 1, **characterised in that** the motion-transmitting means (14) is movably arranged in the longitudinal direction of the operating bar (12) and comprises a pivot joint (23) on each side of the operating bar (12), that each rail (16) has

a pivot joint (25) between its distal and proximal ends, and that each connecting element (15) is formed as a link, which is pivotally connected with one of its ends to an associated pivot joint (23) on the motion-transmitting means (14) and which is connected with its other end to said pivot joint (25) on the associated rail (16).

3. A device as claimed in claim 2, **characterised in that** the rails (16) are aligned with each other, and that the connecting elements (15) are of the same length.
4. A device as claimed in any one of the preceding claims, **characterised in that** the connecting elements (15) are straight arms which are L-shaped in cross-section, and that the rails (16) are formed as straight arms with substantially rectangular cross-section, the dimensions of which are considerably smaller in the vertical direction than in the horizontal direction of the household appliance.
5. A device as claimed in any one of claims 2-4, **characterised in that** the pivot joint (25) of each rail (16) consists of a pin (26), which projects perpendicularly from the rail and which is inserted into a bore at one end of the connecting element (15), and that each pivot joint (23) of the motion-transmitting means (14) consists of a pin (24), which projects perpendicularly from the motion-transmitting means and which is inserted into a bore at the other end of the connecting element (15).
6. A device as claimed in claim 5, **characterised in that** each rail (16) has longitudinal, externally open edge grooves (28) at the surface of the rail (16) from which said pin (26) projects, that each rail (16) runs in a guiding means in the form of opposite, L-shaped elements (29), the one leg (31) of which is fixedly mounted to the bottom wall (3)/top wall (2) of the household appliance and the other leg (32) of which extends into said edge groove (28), and that the motion-transmitting means (14) has a supporting surface (22) which is arranged to slide along the bottom wall (3)/top wall (2) of the household appliance.
7. A device as claimed in any one of the preceding claims, **characterised in that** the operating bar (12), at its end closest to the front wall (6) of the household appliance, has an operating head (8), which is accessible through an opening in the front wall.
8. A device as claimed in any one of the preceding claims, **characterised in that** the guiding means (13) of the operating bar (12) comprises at least two spaced-apart plate elements (20) with aligned

through-bores, through which the operating bar (12) extends.

9. A device as claimed in claim 8, **characterised in that** the operating bar (12) supports a pair of spaced-apart stop elements (17) which are arranged to cooperate with at least one of said plate elements (20) to prevent the operating bar (12), when operated, from being displaced in the longitudinal direction, that at least the portion (19) of the operating bar (12) which projects from said guiding means (13) towards the back wall (5) of the household appliance has an external thread, and that the motion-transmitting means (14) comprises a central body (21) with a threaded through-hole, the internal thread of which is in threaded engagement with said external thread, the rotation of the operating bar (12) by means of its head (8) causing the motion-transmitting means (14) to be moved along the operating bar (12), and the rails (16) being moved via the connecting elements (15) towards or away from each other, depending on the direction of rotation of the operating bar (12).
10. A device as claimed in any one of the preceding claims, **characterised in that** the end of the operating bar (12) closest to the back wall (15) of the household appliance is mounted in a bushing (18), which is fixedly mounted to the bottom wall (3)/front wall (2).
11. A device as claimed in any one of the preceding claims, **characterised in that** the household appliance is a microwave oven.
12. A method for mounting a household appliance in a cupboard space which is defined by a pair of vertical sides (9) and at least one horizontal shelf (11), which is intended to support the household appliance, said household appliance comprising a top wall (2), a bottom wall (3), two side walls (4), a front wall (6) and a back wall (5), the household appliance being intended to be lockingly engaged with said vertical sides (9), **characterised by** the following steps:
 - arranging a rotatable operating bar (12) in the household appliance at an angle to the back wall (5),
 - movably arranging in the household appliance a pair of rails (16) substantially parallel to the back wall (5) and, at least when performing said mounting, in contact with the operating bar, each rail having a distal end with an engaging element (7), and
 - placing the household appliance on the shelf (11), when mounting the household appliance, and subsequently rotating the operating bar

(12) to move the rails (16) in their respective longitudinal directions away from each other and out of openings in the side walls (4) for locking engagement of the associated engaging elements (7) with the respective vertical sides (9).

13. A method as claimed in claim 12, **characterised in that**, for dismantling the household appliance, the rotary motion of the operating bar (12) is reversed, and that simultaneously the rails (16) are moved towards each other, thereby disengaging the engaging elements (7) from the respective vertical sides (9).

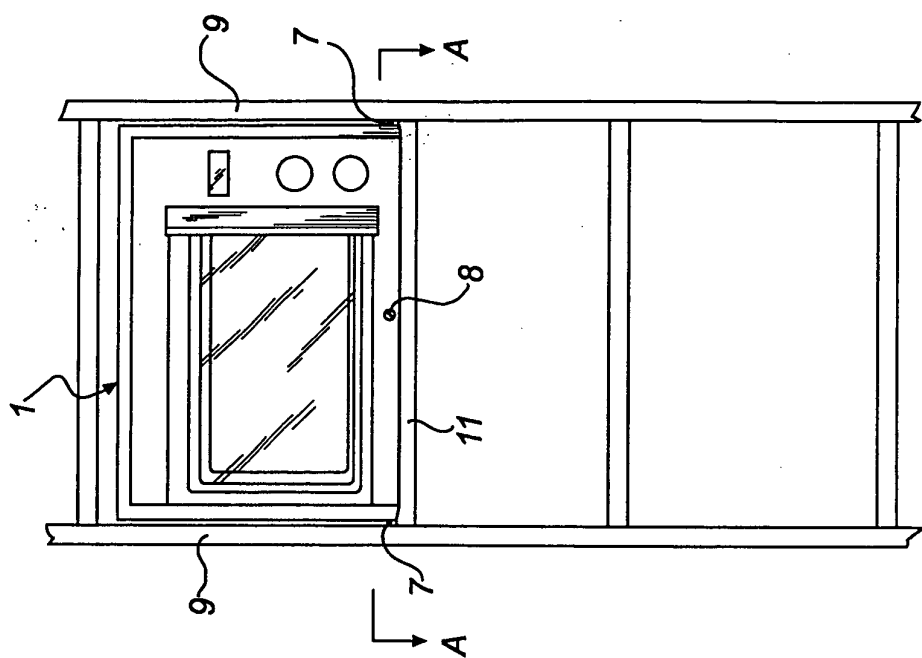


Fig. 2

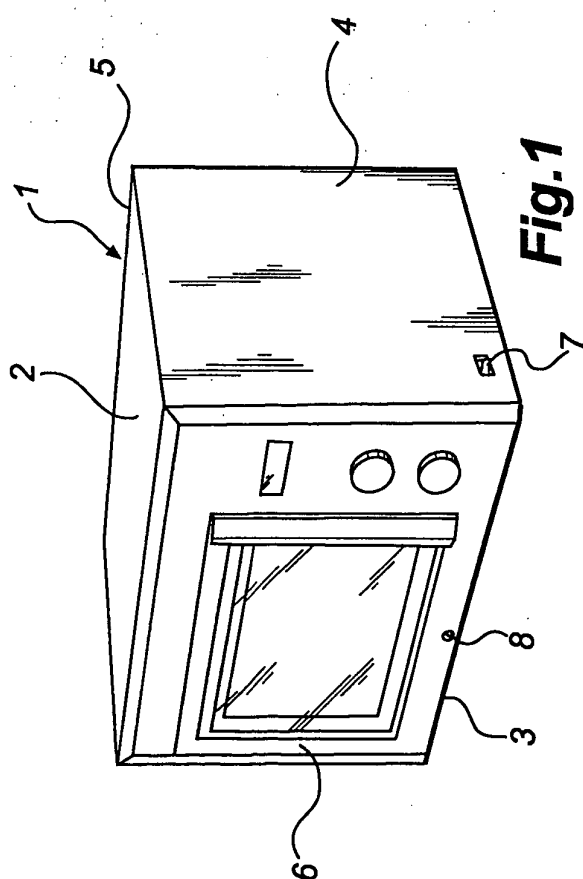


Fig. 1

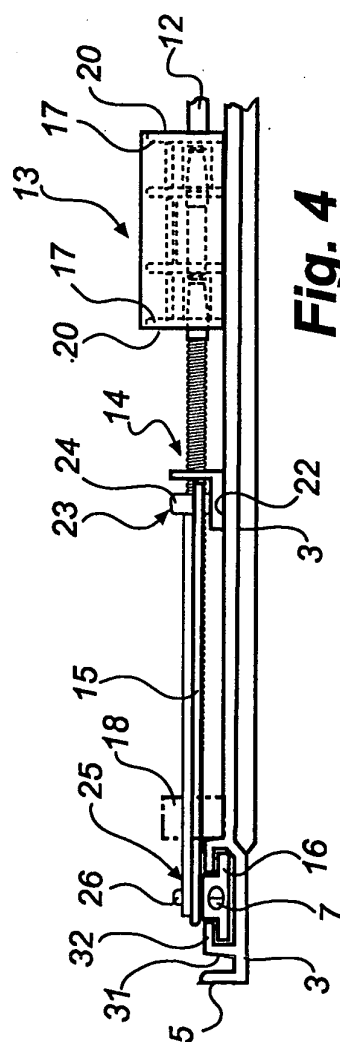
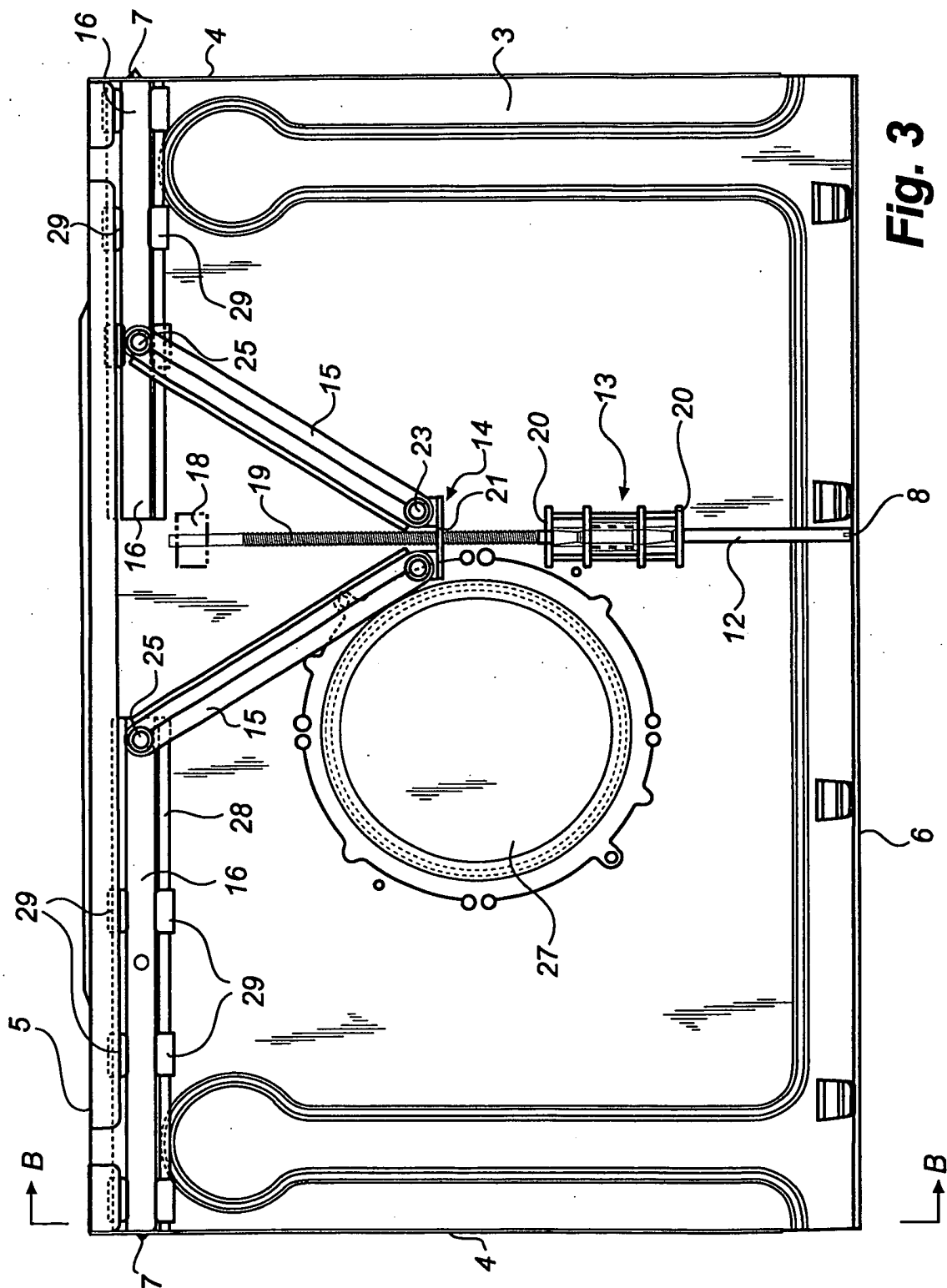


Fig. 4



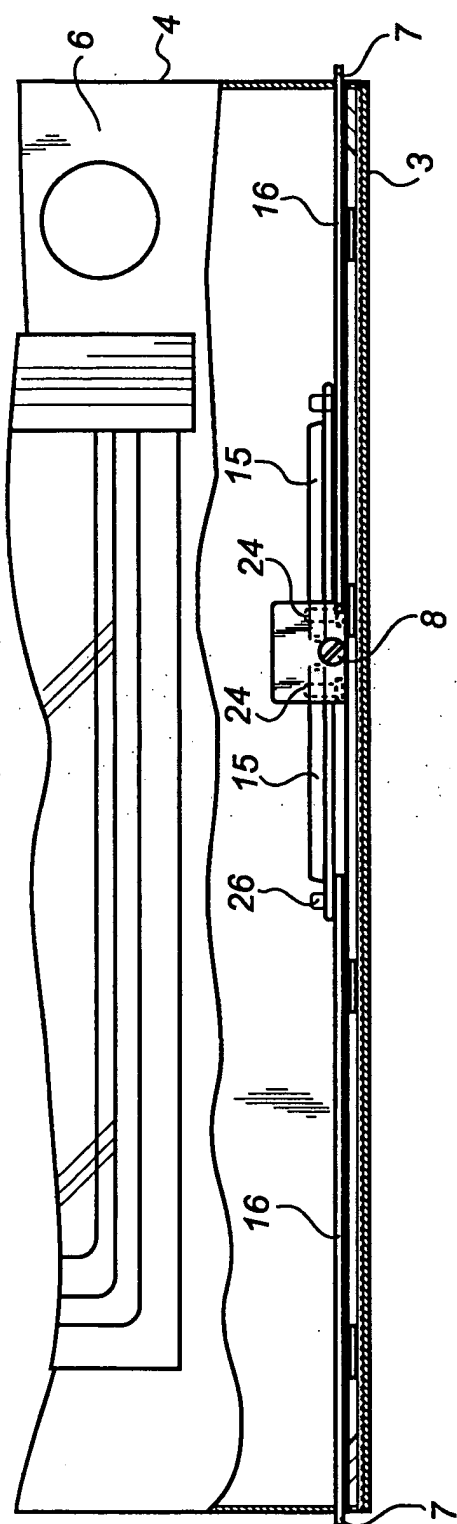


Fig. 5



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EUROPEAN SEARCH REPORT

Application Number
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Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.7)
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The present search report has been drawn up for all claims			TECHNICAL FIELDS SEARCHED (Int.Cl.7) A47B F16M F24C
Place of search MUNICH		Date of completion of the search 11 November 2003	Examiner MacCormick, D
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**ANNEX TO THE EUROPEAN SEARCH REPORT
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EP 03 01 2211

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