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(54) **Domestic appliance comprising pullout door carriage and traction-assisting mechanism**

(57) An electric household appliance, particularly a baking oven, comprises a front-opened compartment (3) with a housing (1) and a pull-out door carriage (6) slidable in opposite direction into and out of the housing into a fully inserted rear or an extracted front position. A traction-assisting mechanism (8) is provided that assists the move of the carriage to a front or a rear position, comprising a tilting member (82), comprising a plate-shaped horizontal catch body with at least one catch (84), being mounted on a first horizontal face, pivotable on a vertical pivotal axis (83), a spring member, for acting on said tilting member (82) for tilting displacement relative to the traction direction of the pull-out door carriage and a vertical pin member (81) fixedly mounted on a second horizontal face, being adapted to engage into the catch (84) of the catch body.

This softly slows down the carriage (with the door) shortly before arriving in the closed position. Further, the carriage (and the door) is held in the closed position with a certain closing force.

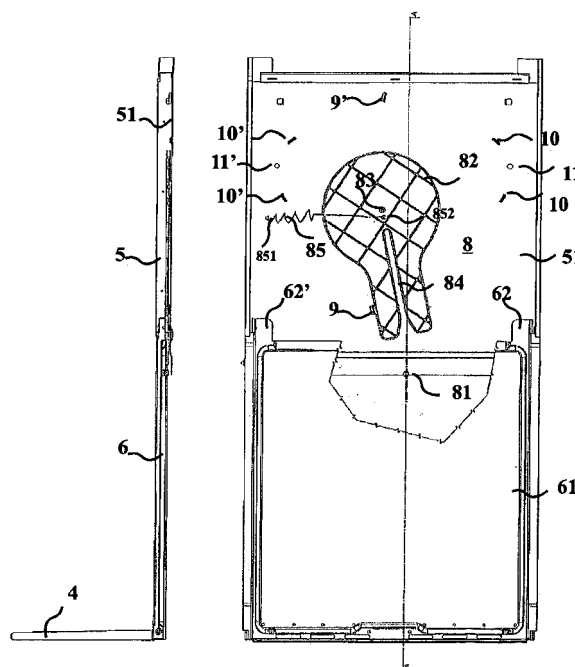


Fig. 2

Description

TECHNICAL FIELD OF THE INVENTION

[0001] The present invention relates to a domestic or household appliance, such as for example, but not exclusively, a baking or cooking oven, a refrigerator or a dishwasher, comprising a front-opened compartment within a housing, comprising also a pull-out door carriage, slidable in opposite direction into and out of the housing into a fully inserted rear or an extracted front position, and a traction-assisting mechanism that assists the movement of the carriage to the front or rear position.

BACKGROUND OF THE INVENTION

[0002] Domestic appliances are known which comprise a front-opened compartment within a housing, the compartment being, equipped with trays for food or other goods and being closeable by a front door. It is desired to keep such front doors completely closed under operation. Otherwise unpleasant odors and/or waste of energy may occur.

[0003] Therefore, it has long been customary to provide such front doors with loading springs, which counterbalance, or substantially counterbalance their weight and, when closed, influence them to remain closed.

[0004] More recently, it has been proposed to render such front doors completely removable from the compartment and to mount the door together with the trays on a separate carriage. Charging and discharging is facilitated by providing the appliance with such a pull-out door carriage that allows the trays to slide out with the door. Particularly, this gives safer access to the trays of a baking oven without reaching into the hot oven compartment.

[0005] However, as pull-out door carriages typically comprise a frame, a bottom plate, a door and also trays for food, they are relatively heavy, and many expedient technical solutions have been proposed to facilitate their use.

[0006] Example given, pull-out guide assemblies may be provided on each of the opposite sides of the carriage, designed to ensure that the movement of the carriage into and out of the housing will be easy and as smooth as possible. However, conventional guide assemblies still have a problem in that force must be continuously applied to the drawer until the drawer is completely closed. Also the pull-out carriage sometimes will not stay in its fully closed rear position, i.e. fully inserted into the housing. Such situation may occur when the carriage has been pushed into the housing without care or not to the full extent.

[0007] In order to solve these problems, a proposal has been made in which slides of a guide assembly are mounted such that they are slightly downwardly inclined as they extend inwardly in the housing, thereby causing the door carriage to be self-closed without being unin-

tentionally opened. In this case, however, the carriage may slam against the housing due to the weights of the carriage and goods received in the trays generating a high impact force.

[0008] In addition, there is inconvenience in that, when the carriage has been pushed with excessive force, the carriage may rebound and be unintentionally re-opened due to the resultant repulsive force.

[0009] Therefore, there has been a need to construct household appliances with a mechanism such that as the carriage approaches the rear position it will positively draw it into the fully closed position and hold it there with a closing force in order to prevent unintended opening of the compartment.

[0010] From EP1258685 a domestic appliance, particularly baking oven, is known, with a carriage and a door as well as a spring device, which carriage can be moved out and run back driven by the force of the spring device. The oven door is held closed by the force of the spring device. To open the door, an actuating unit has to operate to reduce the spring device in power.

SUMMARY OF THE INVENTION

[0011] It is an object of the present invention to provide a domestic appliance of the type described above, comprising a traction-assisting mechanism that ensures safe or tight closing of the pull-out door carriage or of the door it comprises without requiring the user's special attention.

[0012] According to the present invention a domestic appliance is provided, having components including a housing, enclosing a front-opened compartment, and a pull-out door carriage, comprising a door for opening and closing the front opening of the compartment, slidable in opposite directions along a traction direction into and out of said housing to an inserted rear position or an extracted front position, preferably said components comprising pairs of first and second mutual opposing horizontal faces of a carriage part and a housing part. The appliance comprises also a traction-assisting mechanism comprising a tilting member, comprising a preferably plate-shaped horizontal, catch body with at least one catch recess, preferably being mounted on a first of said horizontal faces, which tilting member is pivotable about a vertical pivoting or pivotal axis, and a vertical pin member, preferably fixedly mounted on a second of said horizontal faces, being adapted to engage into the catch recess of the catch body.

[0013] The traction-assisting mechanism of the kind described here is of greatest structural simplicity and can be easily mounted, has a small overall volume and nevertheless is highly reliable in operation.

[0014] Preferably a resilient member, in particular spring member, for acting on said tilting member for tilting displacement relative to the traction direction is provided. It particularly serves to cushion a pull-out door carriage to be inserted during the last insertion stage and to hold the carriage in a front end or rear end position such that

it can only be moved by overcoming the resilient force of the spring-loaded tilting member, albeit small.

[0015] The horizontal arrangement according to the invention allows for ample leverage of the tilting member. Thereby it is possible to provide that the carriage is subjected to a pull-in/pull-out movement over a substantial distance and such distance may be readily adjusted and/or selected. Furthermore, the movement of the carriage will be substantially uniform.

BRIEF DESCRIPTION OF THE DRAWINGS

[0016]

Fig. 1 is an elevation side view of a household appliance illustrating a baking oven according to the invention.

FIGS. 2-4 are plan views and corresponding side views of the pull-out door carriage according to the invention in different working positions

FIG. 2 shows the pull-out door carriage in an extracted position.

Fig. 3 shows the pull-out door carriage at a breakover point.

Fig. 4 shows the pull-out door carriage in a fully retracted position.

DETAILED DESCRIPTION OF THE INVENTION

[0017] An domestic or household appliance according to the invention comprises various components including inter alia a stationary housing (1) having formed therein a front-opened compartment (3) and a movable pull-out door carriage (6).

[0018] Fig. 1 schematically illustrates a baking oven of this type. The baking oven has a heat-insulating housing (1), in which is provided a casing (2), enclosing a baking compartment (3). The casing (2) is formed by a cover wall, a bottom wall, lateral walls and a rear wall. Typically within the region of the cover and the bottom wall heating elements are arranged.

[0019] The baking compartment is accessible via a front opening that is closable by a door (4). Said door (4) is attached to a pull-out door carriage structure, designed in a known way.

[0020] The carriage of the embodiment illustrated in Fig. 2 to 4 comprises a bottom plate (61), supported by a frame having flanges at its ends. These flanges carry stub axles for rollers able to run freely within guide rails of the partition. Also an adjustable food rack with trays (7) for receiving the food to be cooked is attached to the door.

[0021] In the illustrated embodiment, the front door (4) of the oven is linked to the carriage in a fixed angle, so that movement of the carriage in a forward direction will result in opening the front door (4).

[0022] Alternatively, the front door (4) can be mounted to the carriage in a hinged arrangement so that a

movement of the carriage in a forward direction will result in opening the front door (4) and a correspondingly pivotal movement of the front door (4) in a door opening direction will result in a forward movement of the carriage including the food rack.

[0023] Generally, the pull-out door carriage (6) is adapted to be slidable in opposite traction directions into or out of the housing to a fully inserted rear or an extracted front position relative to said housing. In the illustrated embodiment the carriage adapted to be moved within a separate partition (5) of the housing (1).

[0024] Such sliding movement is enabled by conventional means, for example guide assemblies mounted on each side of the carriage and including supporting rails mounted inside the compartment (3) or in a separate partition (5) below the compartment and a pull-out rail mounted on the carriage. Various rollers and /or balls may be provided between the rails to facilitate smooth movement of the carriage and providing the function of bearing the load of the carriage.

[0025] In an electric household appliance of this type the pullout door carriage (6) and the housing (1) comprises pairs of mutually opposing horizontal faces. Such pairs comprise at least one movable face, such as a downward face of a frame or a bottom plate (61) of the carriage, that is opposed to a stationary face of the housing (1), such as an upward face of floor plate of the housing (1), of a separate partition (5) or of the compartment. When opening or closing the door (4) the movable horizontal face moves relative to the stationary horizontal face along a traction direction.

[0026] According to the invention the household appliance comprises a traction-assisting mechanism (8) that operates to ensure that the pull-out door carriage (6) is moved backward to a fully inserted closed rear position and forward to a fully or partially opened front position.

[0027] Essential elements of the traction-assisting mechanism (8) are a tilting member (82), a pin member (81) and a spring member (85). The tilting member (82) comprises a plateshaped horizontal catch body, mounted on a first of said pairs of horizontal faces on a first component. For example, in the illustrated embodiment of Fig. 2 to 4, the catch body is mounted on the upward horizontal face of a floor plate (51) of a partition (5). The catch body is mounted pivotable around a pivotal axis (83) that extend vertically.

[0028] Said catch body comprises a catch (84), preferably an openended catch (84) such as slot or notch, for engaging a pin member (81) projecting from the second component.

[0029] Preferably, the catch body is a circular catch body with a single catch recess (84).

[0030] Alternatively, the catch body may comprise a plurality of catches in the periphery of a circular body.

[0031] According to a preferred embodiment, the catch recess (84) is an elongate slot. Preferably, the slot is arranged radially and has an open-mouthed recess. Preferably, such catch slot is arranged in a fork-type ex-

tension of a circular catch body as shown in, the illustrated embodiments. Said fork-type extension defines a slot with side edges and an inner stop near the pivotal axis (83) of the tilting member (82).

[0032] As will be best seen in Fig. 4, the pivotable catch body is formed with a catch recess (84), configured to be closely engageable with a pin member (81).

[0033] Particularly; when the catch recess (84) is an elongated slot, the catch recess to receive the pin is preferably formed having a width slightly larger than the diameter of the pin, so as to provide a certain amount of clearance between the pin and the vertical edges defining the slot.

[0034] Said pin member is mounted on a second of said pairs of opposing horizontal faces on a second component of the appliance. In the embodiment illustrated in Fig. 2 to 4 the pin member (81) is fastened to the frame of the pull-out door carriage (6) and extends vertically downwardly from the carriage.

[0035] The pin member (81) is preferably a rounded pin, a rotatable stud or a lug. According to one embodiment, the pin member is formed as a lug from the bottom plate (61) of the carriage.

[0036] Alternatively, it may be a separate member fastened to the carriage.

[0037] According to the invention, the tilting member (82) is spring-loaded by a spring member, for acting on said tilting member (82) for tilting displacement relative to the traction direction.

[0038] The spring member preferably is a helical coil spring, a gas piston or a solenoid.

[0039] The spring member (85) is arranged such that it is first expanded upon movement of the catch (84) in a rearward and frontward direction and that then retracts to impart an urging force to the tilting member (82).

[0040] Accordingly, the spring has a first end fixed to an anchor point (851) on the same component as the pivotal axis (83) of the tilting member. The second end of the spring is fastened to the tilting member by a fastener (852). For smooth and hassle-free operation, the second end maybe fastened within a circle area around the pivotal axis (83), within the radius of the inner stop of the slot, and in line with the slot axis or nearer to the anchor point (851) of attachment.

[0041] Further spring properties, particular its resilient force, can be selected in view of desired comfort, weight of door and distance to be covered, to ensure slow and gentle closing and opening of the door to the end of the travel. The resilient force is selected strong enough to hold the carriage and the door fixed to it in a closed position, but weak enough to permit the door to be readily opened manually against the spring force.

[0042] For improved tilting action of the traction-assisting mechanism (8) the position of axis of the tilting member (82) and the corresponding position of the pin member should be displaced laterally relative to the traction direction.

[0043] As indicated in Fig. 2 and 4 the pin member (81)

is mounted at a lateral distance from the pivotal axis (83) of the tilting member (82), relative to the direction of traction A-A, resp. C-C.

[0044] The magnitude of the pull-in movement is dependent on the distance of the lever arm between the pivoting axis of the catch body and the pin member (81). It is apparent that the length of the lever arm depends essentially on the widths of the carriage and cannot be greater, i.e., although it is decidedly greater than in the known catch devices wherein the effective pull-in distance is limited.

[0045] To make sure that the pin still meets the recess of the catch (84), measurements are provided that keep the recess of the catch in a rest position opposite to the pin member, wherein the axis of the catch (84) is inclined relative to the direction of traction, when the pin member is disengaged in a fully extracted position of the pull-out door carriage.

[0046] Said rest position may be achieved due to a relaxed position of the spring member. However, according to a preferred embodiment of the invention, the traction-assisting mechanism (8) comprises stoppers (9) to limit the pivotal movement of the tilting member (82). The stoppers (9) hold the tilting member (82) in a forward rest position, wherein the catch (84) is inclined to the direction of traction. Thus, unintentional displacement of the pin member (81) in an extracted position is prevented.

[0047] The front end rest position of the tilting member (82) is preferably characterized by a tilting angle of the axis of the catch relative to the direction of traction. The angle between the axis of the catch and the traction direction may preferably range between 5 to 75 degree. A preferred angle is between 5 to 20 degree. A wider angle may help to reduce the amount of force necessary to move the catch (84) over the breakover position.

[0048] According to one preferred embodiment of the invention, the tilting member is configured to retain the pin in the rearward position and to release the pin in a front position.

[0049] The pin is retained in an end position when the fork-type extension of the catch body is sufficiently large to be stopped by the rear wall of the compartment.

[0050] Otherwise, as in the illustrated embodiment, the backward pivotal movement may be stopped by stoppers (9) to keep the catch (84) inclined to the direction of traction on the rearward position and the pin member (81) engaged in the catch (84).

[0051] This makes it possible to avoid a situation whereby the pin member (81) and the tilting member (82) become disengaged at a position at the rearward end of the housing.

[0052] Furthermore, arcuate protrusions (10, 10') that guide the catch body along its pivotal movement may be provided.

[0053] It should be noted here that it is necessary to the spacing between the corresponding sides of the carriage and the sidewalls of the partition (5) or the guide rail assembly to be relatively precisely with small lateral

play and upper play. Otherwise, there will be malfunctions, i.e., the pin will be either unable to engage the catch (84) altogether or will cant over the carriage with the result that operation is impeded.

[0054] To absorb lateral forces as always arise upon movement of the carriage, preferably further guides may be provided to direct the carriage in the predetermined straight movement in a forward or rearward direction. Such means may comprise noses (62, 62') attached to the carriage and corresponding vertical studs (11, 11') attached to the floor plate (51) of the partition (5) or the housing.

[0055] In the above-described embodiments of the present invention, the pin member (81) is mounted on the bottom plate (61) of the carriage and the tilting member (82) is mounted on the floor plate of the housing. It is however possible in accordance with the present invention to reverse this arrangement. In other word, it is possible for the pin member (81) to be mounted on the housing body and for the tilting member (82) to be mounted on the carriage.

[0056] Furthermore, as the housing (1) of a domestic household appliance is typically symmetrical with regard to the taxis of traction the traction-assisting mechanism (8) can be installed on both sides of the appliance or in the middle section of it. Two mirror-inverted arrangement may be arranged on both sides of the appliance. This may prevent too large a force from acting at the start of the traction motion and also prevent the motion from being jerky.

[0057] According to one embodiment the pivotal axis (83) of the tilting member (82) is mounted on the midline of the appliance. Alternatively, the pin member (81) may be mounted midline of the appliance, particularly if mounted to the carriage, to reduce lateral displacement of the carriage.

[0058] The operation of the traction-assisting mechanism (8) will now be described in more detail with particular reference to Fig. 2 to 4.

[0059] In Fig. 2 to 4, the pull-out door carriage (6) is schematically illustrated in a front position, a rear position and in a breakover position at a turning point of the tractionassisting mechanism (8).

[0060] Fig. 2 illustrates the position, at which the baking oven is open and the pull-out door carriage (6) in a frontward position, the tilting member (82) being in a rest position characterized in that the spring member (85) is in a neutral rest position. The axis of the catch (84) is inclined to the traction direction and the mouth of the catch faces the pin member (81).

[0061] The pin member (81) is withdrawn from the catch (84) and thereby releases engagement between the pin member (81) and the tilting member (82). From this position the carriage 6 can as a whole be moved out of the housing, can be separated from the baking oven and can be interchanged against an other carriage.

[0062] When the door (4) is manually moved against the housing it is pressed against the opposing force of

the preloaded spring so that the pin is urged into the catch (84) and the tilting member (82) is caused to turn about the pivotal pin counterclockwise.

[0063] When the carriage is pulled inwardly, the pin member (81) moves in traction direction, then slides into the catch (84) and the trailing surface of the pin member (81) acts on the trailing side edge of the catch (84). As the axis of the catch (84) is offset with regard to the axis of traction, a tilting moment about the axis of the catch body is imparted to the tilting member (82), i.e. in a counter-clockwise direction. Also the fastener (852) of the spring member (85) moves in a pivoting movement around the pivotal axis-(83) of the catch body and the spring member (85) is expanded. As a result, when the carriage reaches the position as shown in Fig. 3 a breakover point is reached. When the fastener (8-52) moves beyond the breakover position, the tensile force, of the spring tilts the tilting member(82) in a counter-clockwise rotation and urges the tilting member (82) into the rearward position. Thereby the caught pin member (81) pulls the carriage is into the final rearward rest position as shown in Fig. 4.

[0064] In the rearward position as illustrated in Fig. 4 the caught pin member (81) remains under the tension of the spring, since the catch body already lies against stopper (9'), whereas the catch body has not completed a maximum possible pivot movement. This assures that, even with tolerances, the carriage will keep in the closed position.

[0065] The traction -assisting mechanism works in the opposite way, when the pull-out carriage is pulled out.

[0066] Although the present invention has been described and illustrated with respect to preferred embodiments thereof, it is to be understood that various modifications and changes may be made to the specifically described and illustrated features without departing from the scope of the present invention. Furthermore, it is to be understood that various specific features described and illustrated with respect to one or more embodiments may be employed in all illustrated embodiments, unless otherwise so indicated.

Reference Numerals

[0067]

1	housing
2	casing
3	compartment
4	door
5	partition
6	pull-out door carriage

7	tray		and/or horizontal.
8	traction-assisting mechanism		4. Domestic appliance according to one of claims 1 to 3, wherein the catch (84) is arranged in a fork-type extension of the catch body.
9, 9'	stoppers	5	
10, 10'	arcuate protrusions		5. Domestic appliance according to one of claims 1 to 4, comprising stoppers (9,9') to define at least one end position of the tilting member (82).
11, 11'	vertical studs	10	
51	floor plate of partition		6. Domestic appliance according to one of claims 1 to 5, wherein the pivotal axis (83) and/or the pin member (81) is mounted on a midline of the appliance.
61	bottom plate of pull-out door carriage		
62, 62'	noses	15	7. Domestic appliance, the components of which comprising pairs of first and second mutual opposing horizontal faces of a carriage part and a housing part, wherein preferably the catch body is mounted on a first of said horizontal faces and the pin member (81) is fixedly mounted on a second of said horizontal faces.
81	pin member		
82	tilting member	20	
83	pivotal axis		
84	catch		8. Domestic appliance according to one of claims 1 to 7, comprising a resilient member, in particular spring member, for acting on said tilting member (82) for tilting displacement, relative to the traction direction wherein the resilient for spring member (85) preferably comprises a first end attached to an anchor point (851) and a second end attached to the tilting member 82 within a circle area around the pivotal axis (83) and within the radius of an inner stop of the catch (84).
85	spring member	25	
851	anchor point of spring member		
852	fastener of spring member	30	

Claims

1. Domestic appliance, in particular domestic cooking oven, having components including a housing (1), enclosing a front-opened compartment (3), and a pull-out door carriage (6), comprising a door (4) for opening and closing the front opening of the compartment (3), slidable in opposite directions along a traction direction into and out of said housing (1) to an inserted rear position or an extracted front position, comprising also a traction-assisting mechanism (8) comprising a tilting member (82), pivotable about a vertical pivotal axis (83) and comprising a catch body with at least one catch recess (84) and a vertical pin member (81) being adapted to engage into the catch recess (84) of the catch body.
 2. Domestic appliance according to claim 1, wherein the pin member (81) mounted at a lateral distance from the pivotal axis (83) of the tilting member (82), relative to the direction of traction.
 3. Domestic appliance according to claim 1 or claim 2, wherein the catch recess (84) is an elongate, radial arranged slot and/or the catch body is plate shaped
9. Domestic appliance according to one of claims to 8, wherein the carriage and the housing (1) comprise noses (62,62') and projections to guide the carriage along the, traction direction.
10. Domestic appliance according to one of claims 1 to 9, comprising arcuate protrusions (10,10') that guide the catch body along its pivotal movement.

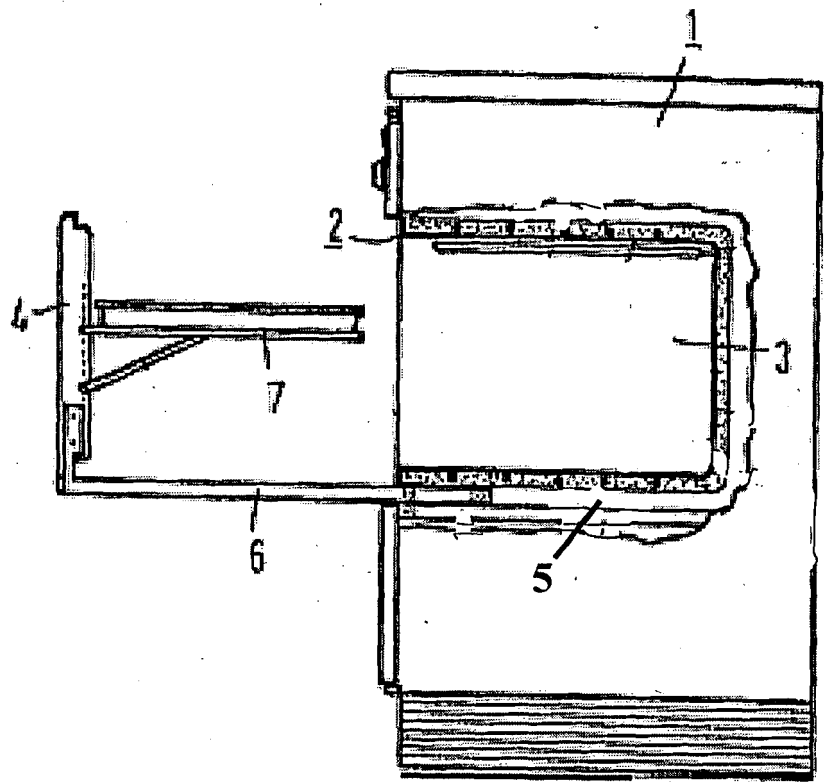


Fig. 1

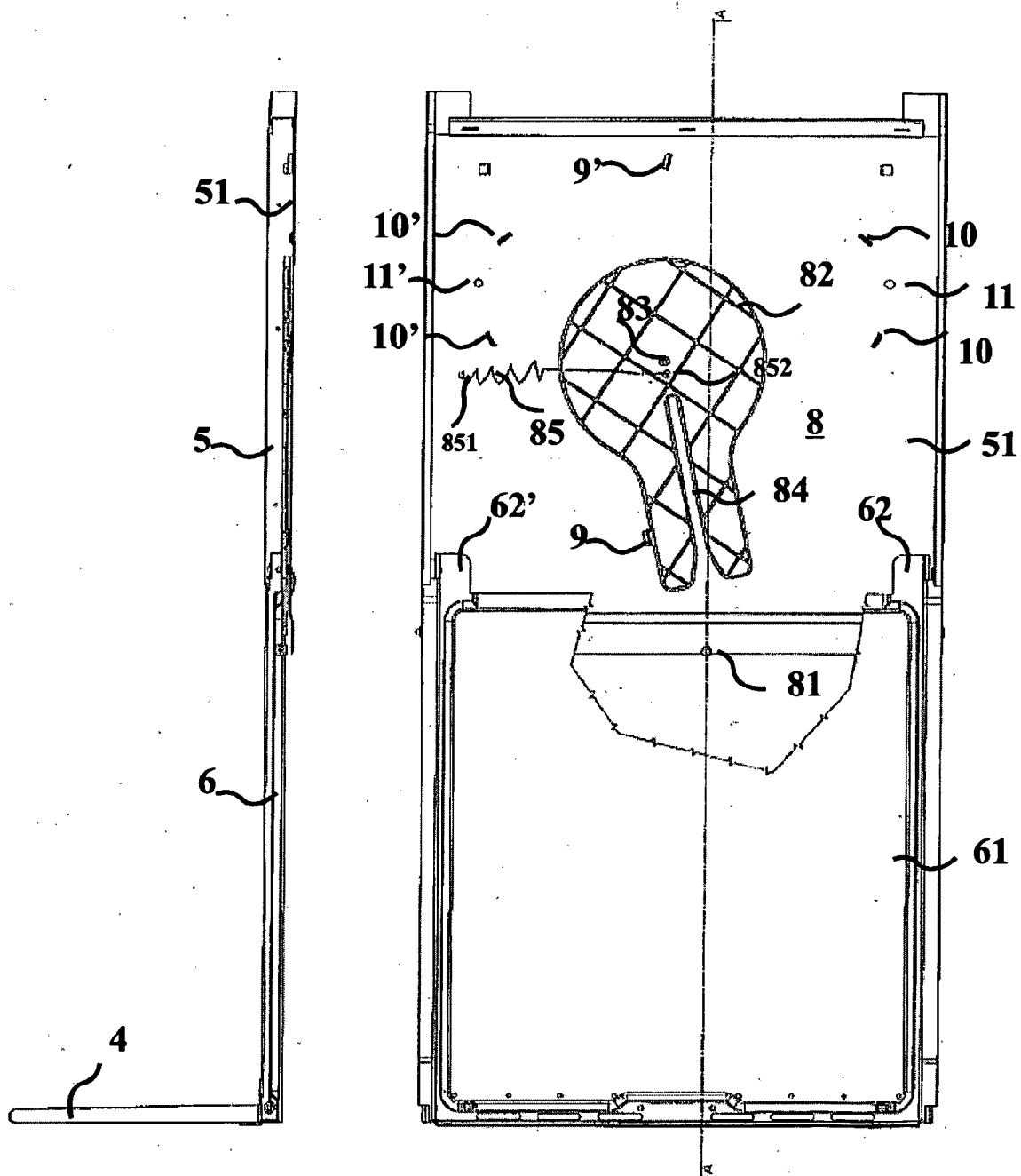


Fig. 2

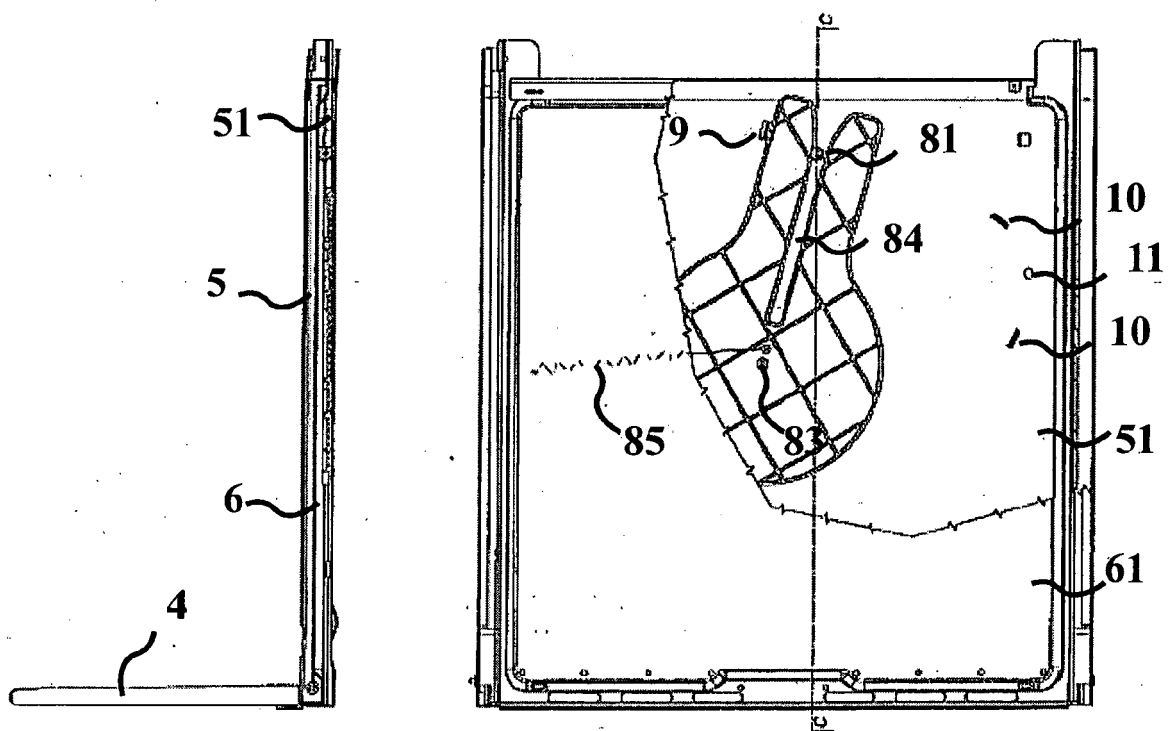


Fig. 3

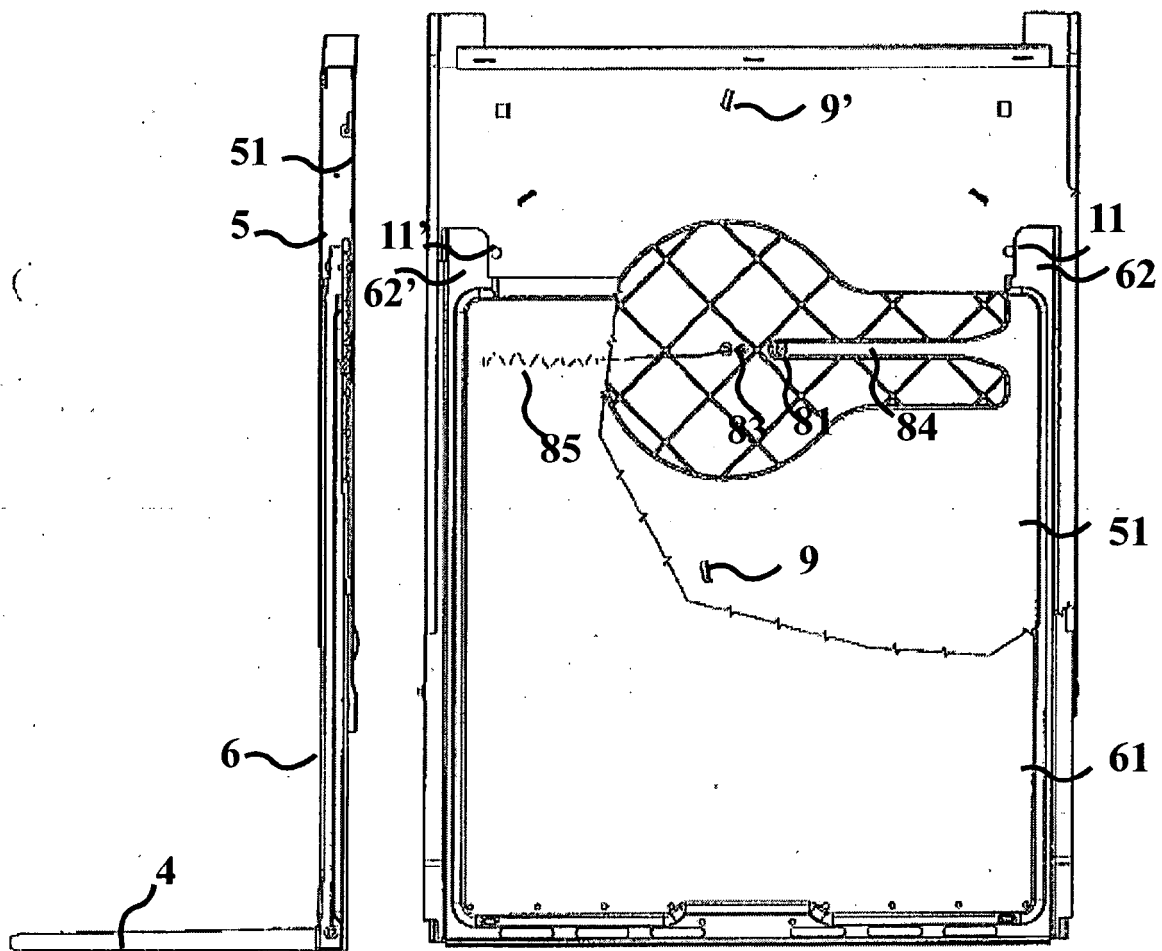


Fig. 4



European Patent
Office

EUROPEAN SEARCH REPORT

Application Number
EP 07 01 6146

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
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The present search report has been drawn up for all claims			
Place of search Munich		Date of completion of the search 8 April 2008	Examiner von Mittelstaedt, A
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document			

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EPO FORM 1503 03.02 (P04C01)

**ANNEX TO THE EUROPEAN SEARCH REPORT
ON EUROPEAN PATENT APPLICATION NO.**

EP 07 01 6146

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.
The members are as contained in the European Patent Office EDP file on
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