

(19)



Europäisches Patentamt
European Patent Office
Office européen des brevets



(11)

EP 0 702 122 A1

(12)

EUROPEAN PATENT APPLICATION

(43) Date of publication:
20.03.1996 Bulletin 1996/12

(51) Int Cl.⁶: **E05D 3/06, F24C 15/02,
E05D 3/02**

(21) Application number: **95114184.5**

(22) Date of filing: **09.09.1995**

(84) Designated Contracting States:
DE ES FR GB

(71) Applicant: **Merloni Elettrodomestici S.p.A.**
I-60044 Fabriano (AN) (IT)

(30) Priority: **13.09.1994 IT TO940720**

(72) Inventor: **Alberti, Carlo**
I-60044 Fabriano (AN) (IT)

(54) **Hinge with a moveable fulcrum for household appliances, in particular for cooking ovens**

(57) A hinge with a moveable fulcrum for doors having a horizontal rotational axis is described, in particular for doors of cooking ovens, essentially made up of a series of levers (2,4,7,11,19) and guides (13,14) assembled in a compact way, by balancing springs (22), return and blocking of the door in intermediate positions, by way of adjusting means of the said functions and by rapid fixing means (7,9,10) to the door (8).

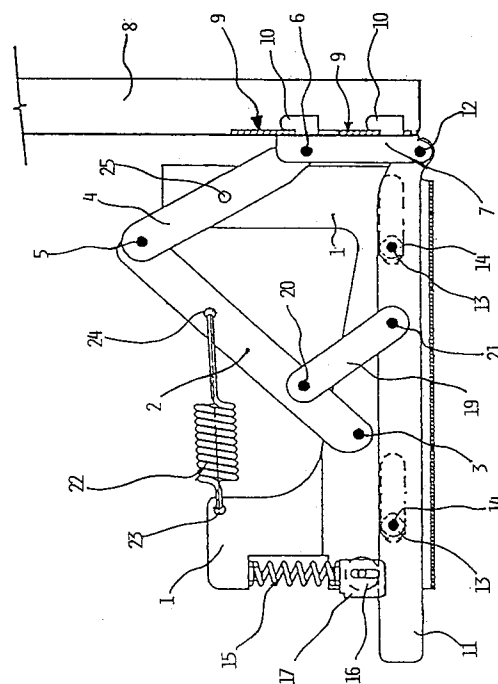


Fig. 1

EP 0 702 122 A1

Description

The present invention refers to a hinge with a moveable fulcrum for doors having a horizontal rotational axis, in particular for doors of cooking ovens, but generally adaptable to being assembled on any type of tipping door where it is useful or necessary that, in the opening phase, the door advances in such a way that, being downwardly rotated, the lower edge of the door can in no way interfere with the upper edge of eventual panels situated below.

As is known, in many practical applications the need arises for realising hinges that have to allow for rotary and translation movements of the doors and to undergo many years of strenuous conditions of use without becoming damaged or reducing the precision of closure; a particularly important application, in the case of electrical appliances, is that of tipping doors of cooking ovens and dishwashing machines.

Both the oven door, generally made up of steel plate supplied with an inspection window being of two or three plates of glass, and the doors of dishwashing machines, often covered by a wooden panel and having within the devices connected with the washing, are very heavy and moreover are often used as a temporary supportive element for pots or pans containing food to be cooked or for the baskets containing the dishes to be washed.

In both cases alignment of the door and a perfect sealed closure must be guaranteed, not only for reasons of aesthetics, but for avoiding the escape of hot fumes or washing water. Furthermore, due to the weight of the door, the hinge has to be supplied with balancing springs that allow for an easier and smoother opening, and that allow for, for instance in the case of an oven, maintaining the door in a half opened position and guarantee or contribute to guarantee the sealed closure of the door. Finally, as in the more general case below the door the frontal surface of the electrical appliance is not recessed, on the contrary it continues with the coplanar surface of the front of a heating drawer or of a panel of aesthetic functions, it has to be avoided that, in rotating the door forward, an interference exists between the lower edge of the door and the upper edge of the panel situated below.

With the actual state of the art two fundamental types of hinges are known, applied in the doors of ovens, one known as "mobile fulcrum" the other as "fixed fulcrum", both being characterised in that the greater part of the components of the mechanism have to be housed within the door with the following general inconveniences:

- considering the restriction of the available space, the mechanisms have to use lever linkages with arms being of very few millimetres in length and therefore the balancing of the weight is obtained by way of highly stressed springs, applied to the extremity of very disadvantageous levers, with consequent considerable stress on the rotational pins, rapid wear

and thus a loss of closure precision and ease of movement;

- the overall encumbrance of the mechanism, even though limited, causes restrictions of the minimum thickness of the door;
- in the case of doors for cooking ovens, the mechanism, necessarily being metal, constitutes a considerable thermal bridge transmitting to the external face the heat of the oven and thus causing problems of thermal dispersion, comfort and respect of the safety regulations that limit the maximum temperature allowed for surfaces accessible by the user;
- the restriction of space and the conception of the known mechanisms necessitate the rejection of a whole series of adjustments, such as the spring tension, the opening angle and, for hinges having a moveable fulcrum, the entity of movement of the fulcrum, so as that, different models of hinges are necessary even for slightly different applications;
- another typical limitation of the known hinges is that it is not always possible to meet the rotating and distancing needs with the necessity of obtaining that the door, in the completely open position, be positioned with the internal face being at an established level, whatever the thickness of the door; such a necessity is essential for instance in the case of dishwashing machines having along the internal wall of the door rails upon which the dish carrying basket is made to run.

In the particular case of hinges with "a moveable fulcrum", during the opening movement, the lower edge of the door is distanced from the frontal surface of the electrical appliance, the door being connected to the latter usually by way of an articulated quadrilateral constituting a kind of fulcrum; said articulated quadrilateral, due to its reduced dimensions, necessary as it is partially housed within the door, does not allow for adjusting the range of forward translation of the fulcrum.

The forward rotation of the door is generally determined by a tie rod having a hooking element at its extremity that, at the end of its movement, stops on an appropriate ledge laterally fixed on the chassis of the electrical appliance; the tie rod has a shoulder that, interfering with said ledge at a certain angle, allows for maintaining the door in a semi-open position; also such tie rod, due to the way in which it is made, does not allow for adjusting the opening angle or of the intermediate position; finally the weight of the door is usually balanced by a compressed spring, housed in a guide arranged within the door; an extremity of the spring stresses an extremity of the said tie rod with hooking element and knee; however even for such organ an adjustment is not possible: hinges with different balancing forces are

therefore only obtained by making available an assortment of springs.

Such hinge naturally has the advantage of having a kind of moveable fulcrum, which allows the door, apart from overcoming obstacles situated below during rotation, also to be closed with an even pressure along its entire edge.

A typical defect of the device, in addition to those mentioned above, is that, in the moving phase slight vibrations and transversal oscillations of the door are felt, being as that it is not hinged to an actual pintel but to a quadrilateral as mentioned above; such oscillations, even though normal and unavoidable, are interpreted by the user as a point of reference to a poor standard of mechanical quality.

In the case of a "fixed fulcrum" hinge, an effective fixed rotational axis exists that, being arranged within the door, in the most forward position possible, allows for rotation without its lower edge falling sufficiently thus interfering with obstacles arranged below.

The benefits of a fixed fulcrum hinge consist of a minor stress of the components, lower costs and a movement which is considered as being better than that of a moveable fulcrum; whereas to the general defects, as already mentioned, it is to be added that the simple rotary movement, without translation, does not guarantee a sealed pressure along the entire edge of the door being as uniform as that of the device having a moveable fulcrum; this takes place particularly in cases wherein the fixing block of the hinge to the structure of the electrical appliance is not perfectly positioned.

The aim of the present invention is that of overcoming the aforementioned drawbacks and in particular realising a hinge equipped with a kinematic system that, even though not housed within the door, allows for opening and closing said door with a rotary and translational movement, without interfering with eventual obstacles arranged below and that, in closing, allows for an evenly sealed pressure along the entire edge of the door, in virtue of an approaching movement being substantially translational.

Further aims of the present invention are also the realisation of important additional functions such as adjusting the balancing stress, the independent determination be it of the range of translational movement, and of the rotation and, finally, the height from the floor of the internal face of the door in the fully opened position, and the realisation of final and intermediate blocking points during the course of movement.

Such aims are reached according to the present invention by way of a hinge with a moveable fulcrum incorporating the characteristics of the annexed claims.

Further aims and advantages of the present invention shall result in being clear from the detailed description that follows and from the annexed drawings supplied purely as an explanatory and non limiting example, wherein:

- figure 1 illustrates a side view of the hinge according to the invention, in a closed position;
- figure 2 illustrates a side view of the hinge according to the invention, in an open position (continuous line) and semi-open (dotted line);
- figures 3 and 4 illustrate versions deriving from the hinge of figures 1 and 2, equipped with stress adjusting means of the balancing spring of the weight of the door.

In the following description, the invention shall be described with reference to a use being particularly advantageous, i.e. on domestic cooking ovens, however keeping in mind that it can also be applied to other electric appliances.

With reference to the mentioned figures, 1 indicates a supporting bracket of the hinge, that is rigidly fixed to the supporting structure of the oven, not illustrated in the figure; the oven naturally has two hinges of the type illustrated in the figures, arranged on the two sides of the opening of the cooking chamber.

Reference number 2 indicates a return rod, hinged to the supporting bracket 1 by way of a pin 3, while 4 indicates a connecting rod which controls the opening and rotation movement of the hinge. Such connecting rod 4 is hinged at an extremity, by way of a pin 5 to the return rod 2, while the other extremity of said connecting rod 4 is hinged, by way of a pin 6, to a fixing plate 7 to an oven door 8. The door 8 is equipped for such purpose with two slotted plates 9, for the hooking of fixing arms 10 of the plates 7; each of the slotted plates 9 may have if needed means for avoiding the undesired unhooking of the door 8, for instance a snapping or rotary pin, for simplicity not represented in the figure; on the other hand, upon hooking by way of the fixing arms 10 and the plates 9, the fixing plates 7 may have holes, for their fixing to the door 8 by way of appropriate screws.

A sliding rod is indicated with 11, blocked so as that it can only move horizontally, upon which a hole for housing a pin 12 is made, with which the plate 7 results in being hinged to the sliding rod 11: the pin 12 therefore constitutes the rotating fulcrum of the door 8.

13 indicates two rotating rollers, fixed to the sliding rod 11 by way of pin 14; such rollers 13, mobile within respective guides (illustrated with dotted lines) present on the supporting rod 1, guide and keep the sliding rod 11 to a horizontal movement.

A spiral spring is indicated with 15 that, hooked in an appropriate seat on the supporting rod 1, pushes a blocking roller 16, held in place by an appropriate bush 17, against the upper edge of the sliding rod 11; for this purpose, on the upper edge of the sliding rod 11, notches or projections are present, not represented, that, in virtue of the stress exercised by the roller 16, allow for blocking the door in various positions (final and intermediate).

Reference number 19 indicates a command rod of

the translation movement, hinged, respectively between pins 20 and 21, to the return rod 2 and to the sliding rod 11.

A pre-stressed spring is indicated with 22, hooked to the return rod 2 and to the supporting bracket 1 by way of holes 23 and 24.

Finally with 25 a hole is indicated on the control rod 4, that is used for blocking the hinge in a semi-open position, particularly useful for the assembly of the door 8; such blocking is obtained by inserting in such hole 25 a contrast pin against the chassis of the oven.

The functioning of the hinge according to the invention is the following. As is noted, in particular from figure 2, opening the door 8 in the sense indicated by the arrow A, a rotation is caused around the pin 12 and a lowering of the return rod 2 by way of the control rod 4 of the rotating movement; the return rod 2 further pulls the pre-stressed spring 22, that therefore functions as a contrast and counterweight upon lowering the door 8; the return rod 2 moreover presses against the pin 20 of the control rod 19 of the translation movement, which in turn presses forward the sliding rod 11 upon which it acts by way of the pin 21; the sliding rod 11 thus slides forward on the rollers 13; as a consequence the pin 12, or the fulcrum of the hinge, while the door 8 starts to rotate, moves forward, following the arrow B, rapidly distancing the door itself from the supporting structure of the oven.

From that described and illustrated it appears clear that the range of rotation and the sliding forward of the fulcrum are determined by the relative distances between the axis of the rotating pins arranged on two rods 19 and 4, on the return rod 2 and on the plate fixing 7 to the door 8; it also appears clear that, in virtue of the play of the levers, in the initial phase of opening the door 8, to a slight rotation of said door a notable forward translation of the sliding rod 11 corresponds; it is also clear that from the conception of the device according to the invention, the fixing plate 7 to the door 8 is in no way constrained in its form, if not for the position relative to the pins 6 and 12 in relation to the door and the kinematic motion, and can therefore be shaped and for the most appropriate fixing case by case. Continuing with the functional description, during the advancing phase of the rod 11, the roller 16, pushed by the spring 15 appropriately pre-stressed, meets the mentioned notches or protrusions present on the upper edge of the rod 11, guaranteeing door stops in predetermined positions, from which the door can be moved with muscular force, but not from the weight of the door alone.

It is clear that upon closing the door 8 the kinematic motion operates in the opposite manner from that described above.

For the easy fixing of the door 8 in the assembly phase, the hinge, already fixed to the supportive structure of the oven, is forced in a semi-open position and kept blocked by the said contrast pin, purposely inserted in the hole 25, which comes into contrast with the supportive structure.

From the given description the characteristics of the hinge with a moveable fulcrum subject of the present invention result in being clear, as do its advantages.

The fundamental characteristic of the invention is that the entire kinematic system is housed within the fixed structure of the electrical appliance upon which the door is arranged, thus allowing for constructing the latter of a thickness being the minimum necessary for its inherent structural, functional and aesthetic requirements, the overall dimensions of the hinge no longer being the decisive factor for its thickness; consequently the fixing means of the door can also be simplified.

Another characteristic of the hinge according to the invention is that of allowing in a simple manner the realisation of steps for blocking the door in intermediate or terminal positions.

Regarding the functioning of the hinge according to the invention, it is also to be noted how the rotation of the door smoothly takes place, without oscillations or sudden movements, which is not so with hinges of the known type; the hinges according to the invention also allow for the door to exercise a given force on the front of the appliance during the closing phase, in virtue for instance of the action of the spring 22, compensating any eventual misalignment and improving the closure of the door itself.

It is clear that numerous variants are possible by the man skilled in the art to the hinge subject of the present invention, without for this departing from the range of novelty inherent in the inventive idea.

For instance, in a first possible variant, apt for the cases in which the sliding rod 11 is not subject to severe stress, the rollers 13 upon which the rod slides can be substituted with fixed guides.

In the case in which the hinge according to the invention is used for different series of appliances, having doors of different dimensions and weights, it may be necessary to have a spring able to exercise different balancing stresses; however, in the greater part of the cases, it is possible to maintain a single model of the hinge adjusting from case to case the pre-stressing and lengthening of the spring; in such light, in a second possible variant of the present invention illustrated in figure 3, as an alternative to the single holes 23 and 24 for fixing the spring 22, two series of holes can be provided 23A and 24A on the bracket 1 and on the return rod 2, which allow for selecting the tension of the spring 22 for different applications; in a third possible variation illustrated in figure 4, instead of the two series of holes 23A and 24A, two series of slits 23B and 24B can be provided, having the same purpose, but allowing a greater adjusting range and a quicker hooking of the spring 22.

According to specific needs, it may also be necessary to have different values of the advancement of the fulcrum 12 and of the range of rotation; this can be obtained with a single hinge model by realising on the return rod 2, on the connecting rod 19 commanding the translation movement and on the connecting rod 4 controlling

the opening and rotating movement, more pairs of holes for the alternative housing of the pins 20 and 5, in appropriate positions and being of kinematic compatibility.

In the case in which a fine adjustment of the sliding quantity and the range of rotation is required, for instance even for adjustment needs that compensate small positional errors and dimensional tolerances, the connecting rods 4 and 19 can be substituted by tie rods, of the type known, adjustable in length by way of right-handed and left-handed threaded rods connected by threaded bushes, obviously considering the fact that the variations of the length carried out manually with such method have to be correlated for the two connecting rods (otherwise a distance between the axes being incompatible with a regular movement could be obtained).

For blocking the hinge in the required position for the assembly of the door 8, as an alternative to using a single hole 25 numerous holes of a similar function could be provided both on the return rod 2 and on the supporting bracket 1; in said holes, even in the constructive phase of the hinge itself, a blocking pin can be inserted which can be removed after assembling the door.

As an alternative to such system, the blocking of the hinge can be realised by way of a revolving plug, not represented, hinged to the rear 26 (fig. 2) of the supporting bracket 1, that can be rotated so as to block the upper edge of the return block 2.

As can be understood from the above description, the hinge according to the invention results in being essentially made up of a system of simple lever linkages, guides and springs assembled in a very compact form, with blocking means of the door in intermediate positions and rapid fixing means to the door; such hinge is made in such a way that the rotating angle and the fulcrum advancement can be different for a range of models, with simple variations of positioning the rotating pins of the levers or by adjusting the length of the levers themselves.

It is also clear that numerous other variants can be made to the hinge with a moveable fulcrum subject of the present invention, without for this departing from the novelty principles inherent in the innovative idea, as it is also clear that in the practical realisation of the invention the form of the illustrated details may be different, they may also be substituted with technically equivalent elements.

Claims

1. Household appliances door hinge, with a moveable fulcrum, in particular for cooking ovens, of the type comprising an anchoring element (1) to the appliance cabinet, a fixing element (7) to the door (8), and a kinematic system (2,4,11,19) that connects the anchoring element (1) to the fixing element (7), characterised in that the part of said kinematic system (2,4,22,19) that realises the translation of the

fulcrum (12) around which the door (8) rotates during opening or closing is housed in the cabinet of the appliance, in such a way that on the door (8) only said fixing element (7) is housed.

2. Hinge, according to claim 1, characterised in that the translation of the rotating fulcrum (12) takes place with movements being exclusively horizontal.
3. Hinge, according to claim 1, characterised in that said kinematic system (2,4,11,19) is realised so as that, in the initial phase of opening the door (8), a small rotation of the door corresponds to a notable forward translation of the rotating fulcrum (12).
4. Hinge, according to at least one of the previous claims, characterised in that said kinematic system comprises a cursor element (11), linearly mobile, to which said fixing element (7) is hinged, the hinging point (12) between said fixing element (7) and said cursor element (11) constituting said moveable fulcrum of the hinge.
5. Hinge, according to the previous claim, characterised in that said cursor element (11) is restricted to linear movement only, in particular by way of guiding means (13,14) interacting between said cursor element and said anchoring element (1).
6. Hinge, according to claim 4 or 5, characterised in that said kinematic system (2,4,11,19) comprises a lever linkage (2,4,19) articulated between said anchoring element (1), said fixing element (7) and said cursor element (11), said lever linkage (2,4,19) being able to transform a rotary movement (A) of said door (8), and therefore of said fixing element (7), in a linear movement (B) of said cursor element (11) that produces the translation of said fulcrum (12).
7. Hinge, according to the previous claim, characterised in that said lever linkage (2,4,19) comprises a first lever (4), hinged at one of its extremities to said fixing element (7), a second lever (2) hinged at one of its extremities to said anchorage element (1), said first and said second lever (4,2) having hinged between their other extremities a third lever (19) hinged at one of its extremities to said second lever (2), in particular in an intermediate point of the latter, and at its other extremity to said cursor element (11).
8. Hinge, according to at least one of the previous claims, characterised in that said kinematic system (2,4,11,19) comprises elastic means (22) of closing and/or balancing, in particular interacting between said anchoring element (1) and at least one lever (2) of said articulated lever linkage (2,4,19).

9. Hinge, according to the previous claim, characterised in that first tension adjusting means of said elastic means (22) are provided, said first means comprise in particular a plurality of seats (23A,24A;23B,24B) that can be selectively utilised for hooking the two extremities of a spring (22). 5
10. Hinge, according to at least one of the previous claims, characterised in that stopping means (15,17) of said cursor element (11) in one or more positions of its linear run are provided, for the purpose of stopping the door (8) in one or more positions of its rotary movement to which different grades of opening of the same correspond. 10 15
11. Hinge, according to the previous claim, characterised in that said stopping means comprise one or more cavities or protrusions obtained on a surface of said cursor element (11), within which a blocking element (16,17) is apt at engaging being subject to the action of an elastic element (15). 20
12. Hinge, according to at least one of the previous claims, characterised in that second means are provided for adjusting the run of said cursor element (11), and therefore for the adjustment of the range of translation (B) of said fulcrum (12) and of the range of rotary movement allowed to said door (8). 25
13. Hinge, according to at least one of the previous claims, characterised in that blocking means are provided of the kinematic system (2,4,11,19) in a fixed intermediate position, apt at favouring, in the assembly phase of the household appliance, the arrangement of the door (8). 30 35
14. Hinge, according to at least one of the previous claims, characterised in that the fixing element (7) and the door (8) have mutual rapid coupling means (9,10). 40
15. Household appliance, in particular a cooking oven, which utilises the hinge according to one or more of the previous claims. 45

50

55

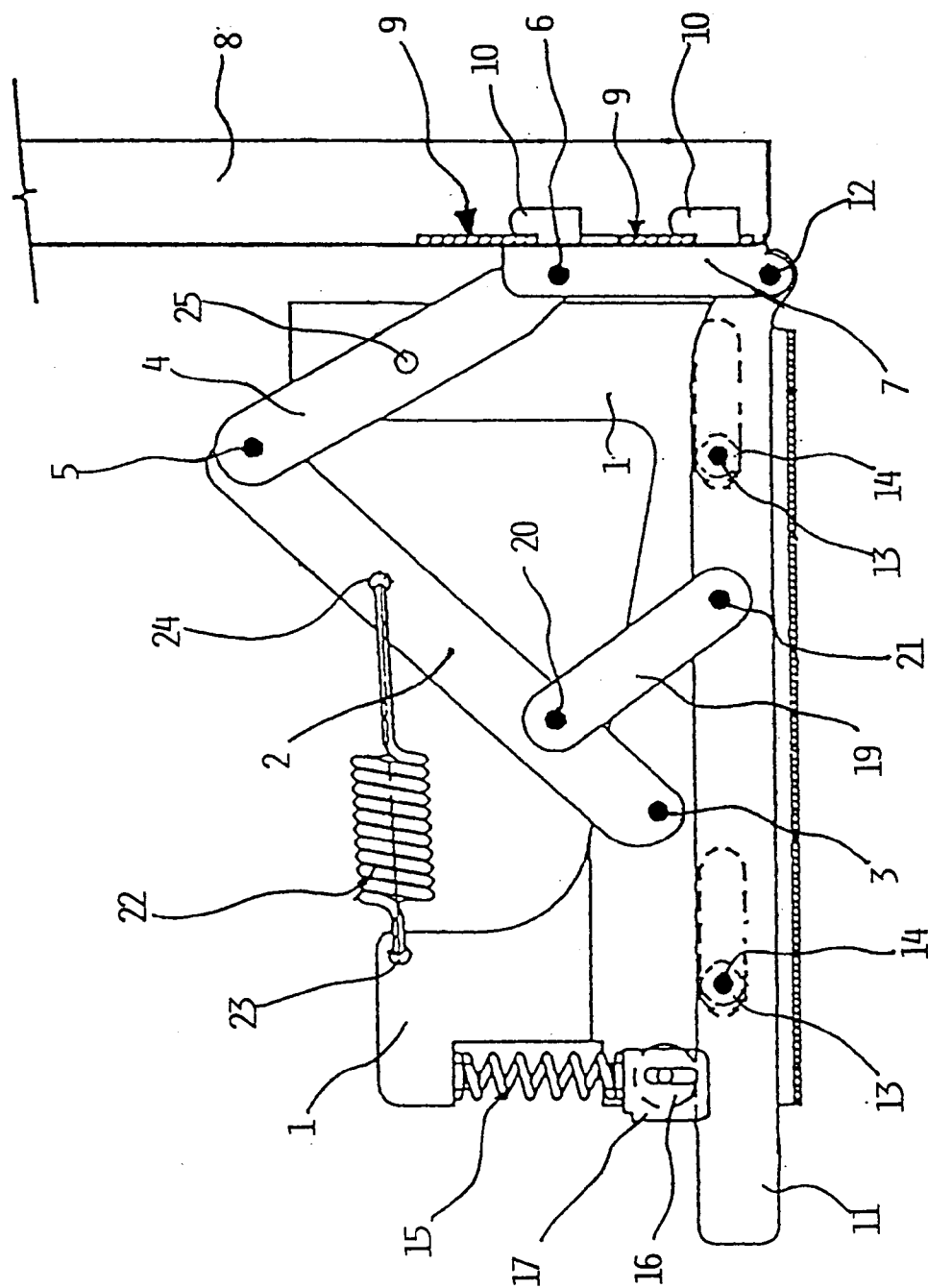


FIG. 1

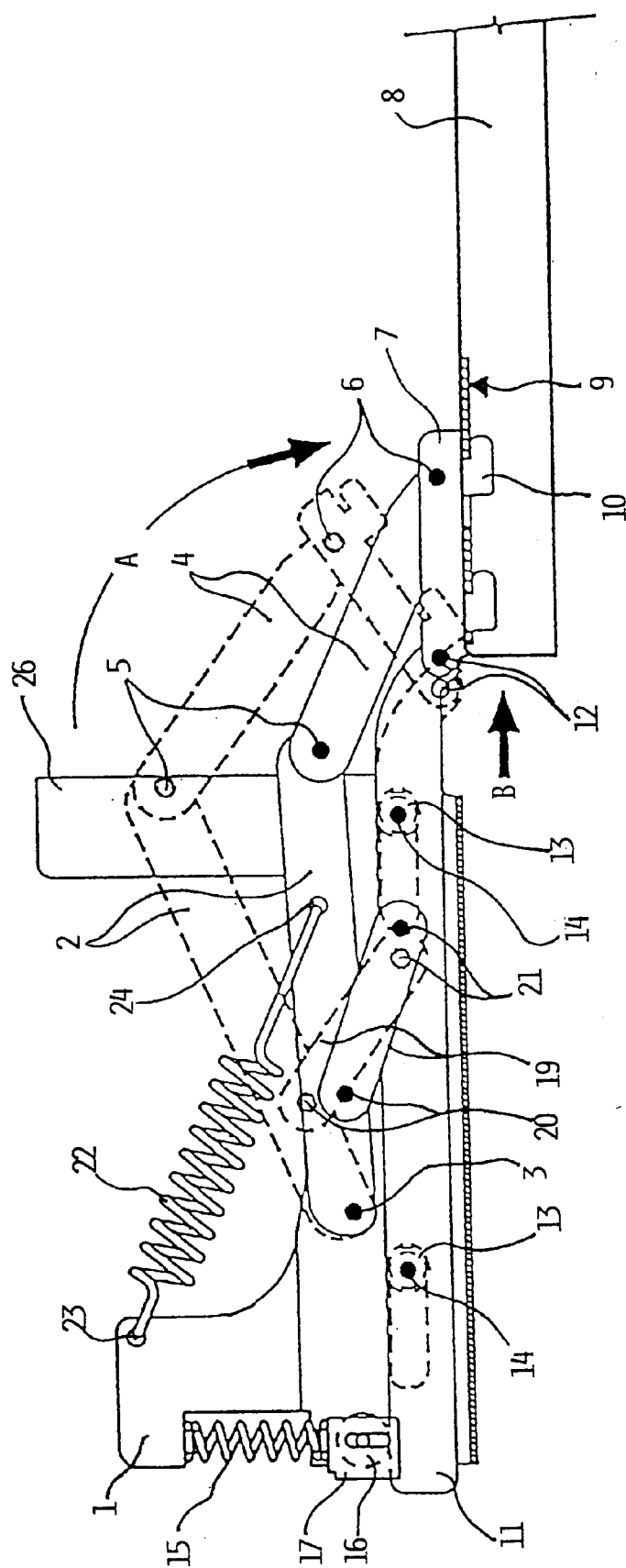


FIG. 2

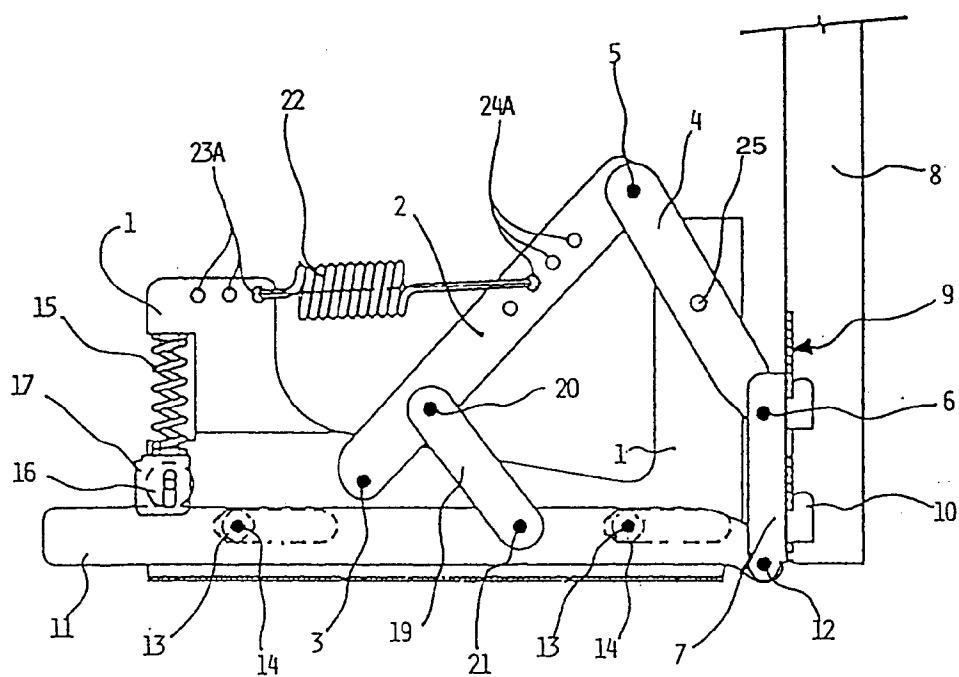


FIG. 3

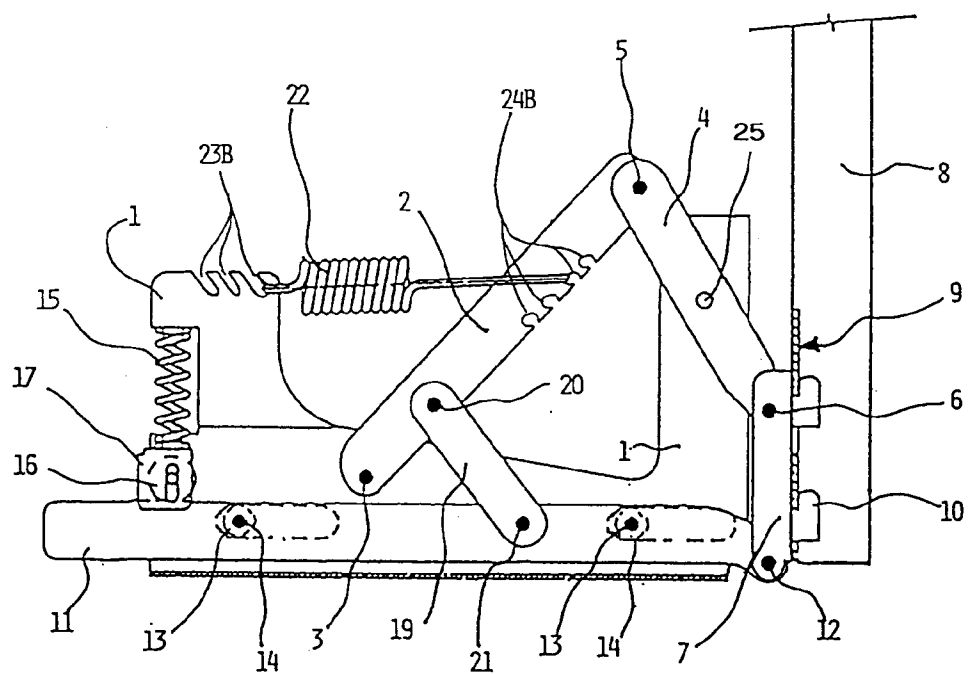


FIG. 4



European Patent
Office

EUROPEAN SEARCH REPORT

Application Number
EP 95 11 4184

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.6)
P,X	EP-A-0 628 686 (LIEBHERR-HAUSGERÄTE GMBH) * abstract *	1-7	E05D3/06 F24C15/02 E05D3/02
X	DE-A-22 04 828 (GROB)	1-7	
Y	* page 2, last paragraph - page 3; figures 1-4 *	8,10,11, 13-15	
Y	DE-A-24 22 132 (ROBERT KRAUSE KG) * page 11, last paragraph - page 12, line 4; figures 1,3 *	8	
Y	GB-A-2 262 601 (STOVES LTD) * page 7, line 19 - line 26 *	10,11 13,14	
A	* page 8, line 1 - line 9; figures 3,4 *		
Y	US-A-4 163 344 (SCHERER) * column 4, line 42 - line 48 * * column 6, line 9 - line 26; figures 1-4 *	13-15	
A	US-A-1 838 898 (ALDEEN) * column 2, line 51 - line 64; figure 1 *	8	TECHNICAL FIELDS SEARCHED (Int.Cl.6)
A	US-A-3 955 865 (WILSON) * column 4, line 4 - line 18; figure 2 *	8,9	E05D F24C
The present search report has been drawn up for all claims			
Place of search THE HAGUE		Date of completion of the search 12 December 1995	Examiner Van Kessel, J
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			

EPO FORM 1503 03.92 (P04C01)