

[54] ANTI-TIP MECHANISM FOR APPLIANCE

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[58] Field of Search 312/271, 273, 275, 276, 312/317 R, 317 A; 5/133, 145, 146, 39, 41; 182/13, 15; 108/48; 134/115; 126/191

[56] References Cited

UNITED STATES PATENTS

3,137,868	6/1964	Hoffsis et al.	5/39
3,150,904	9/1964	Kendt et al.	312/276
3,150,905	9/1964	Payton et al.	312/276
3,393,950	7/1968	Dutcher et al.	312/317 R

Primary Examiner—Robert L. Wolfe

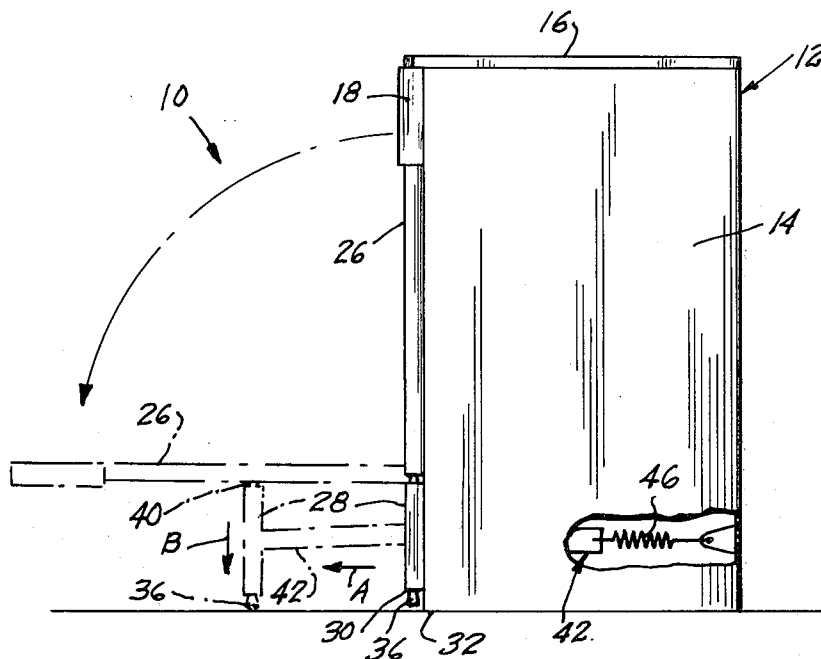
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[57] ABSTRACT

An anti-tip mechanism for a free-standing cabinet, in particular for an appliance, especially a portable appliance, which has a front access door hinged at the bottom and which incorporates a panel, normally coplanar with the door, which is mounted for horizontal linear movement forwardly of the cabinet to support the door in its fully open position. The panel moves linearly forward from a position at the front of the cabinet on a pair of spaced arms mounted in respective bearings and the door is counterbalanced by a pair of springs each having one end fixed to the cabinet and the other end fixed to a respective arm and by a linkage including a pair of cables entrained about respective pulleys and connected to the ends of the arms and respective ones of a pair of levers which extend rearwardly from opposite ends of the access door.

12 Claims, 6 Drawing Figures



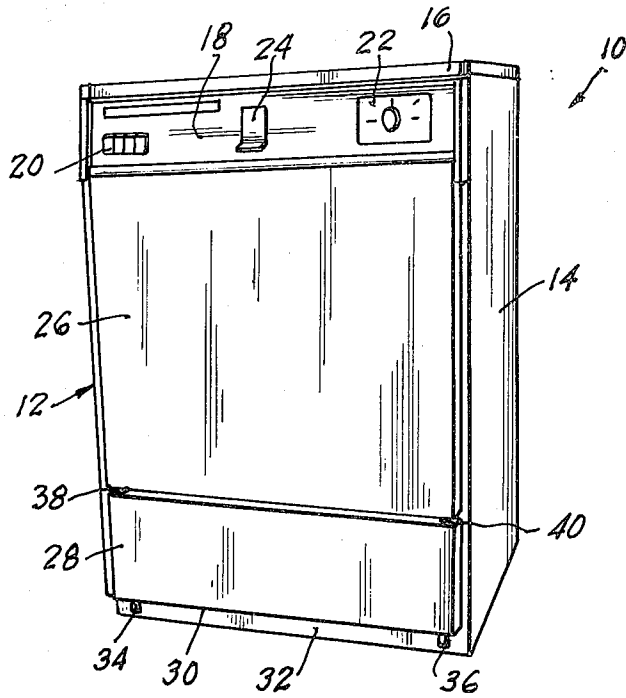


Fig-1

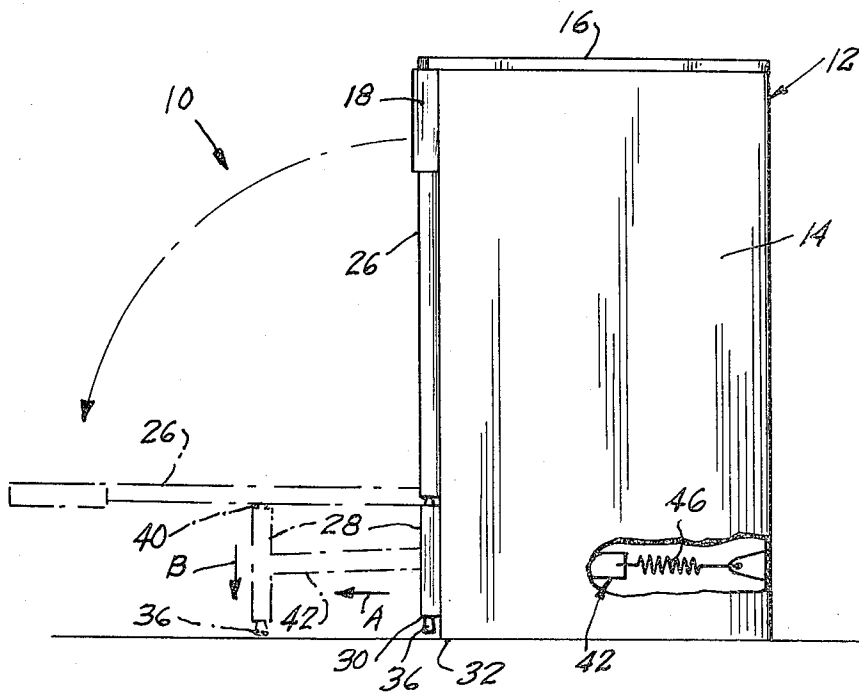
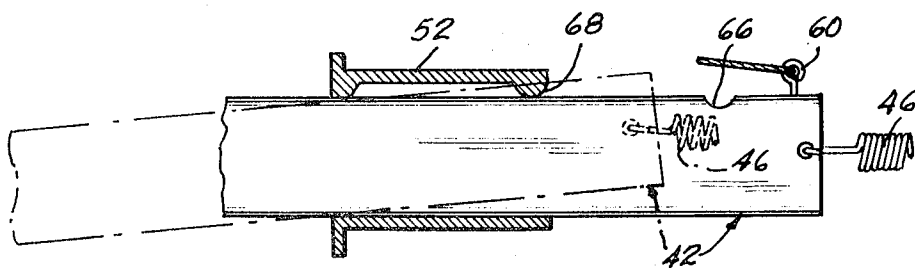
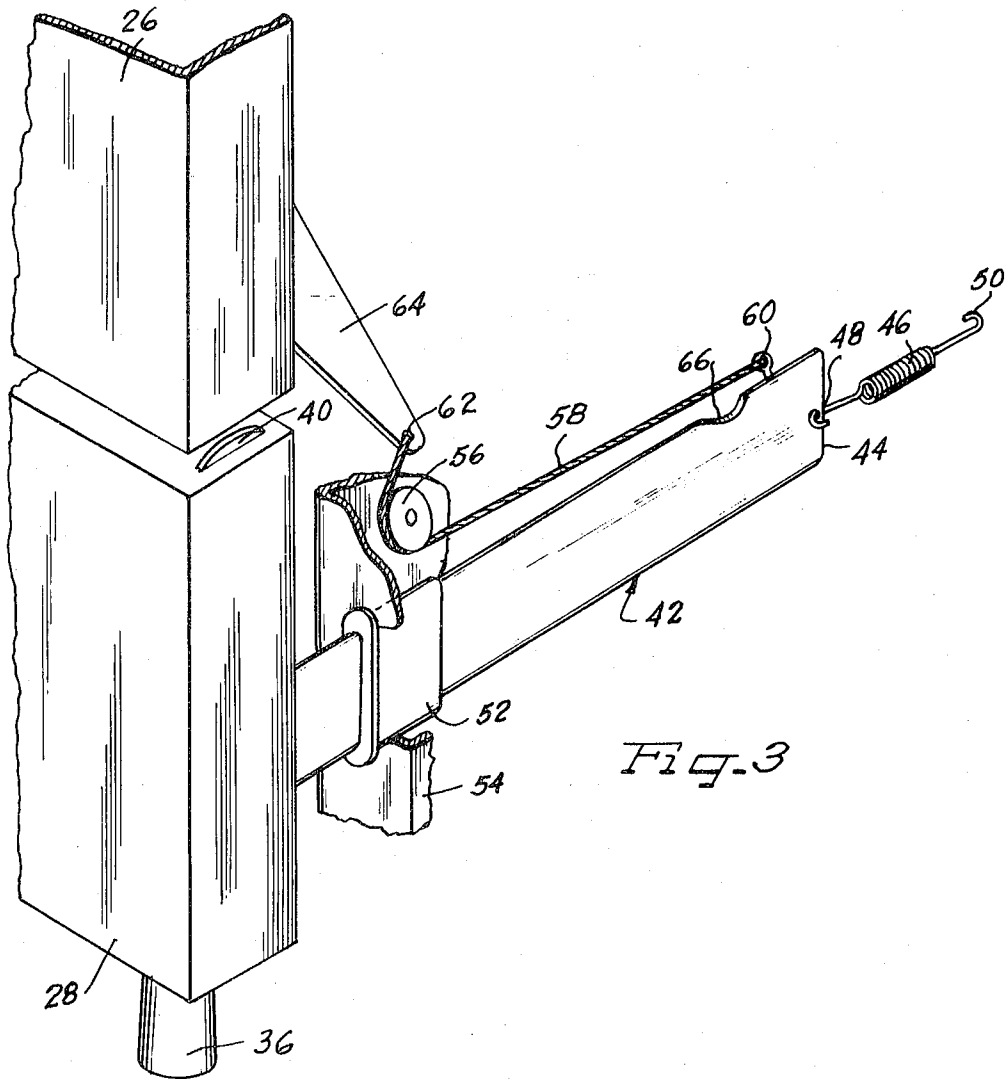


Fig-2



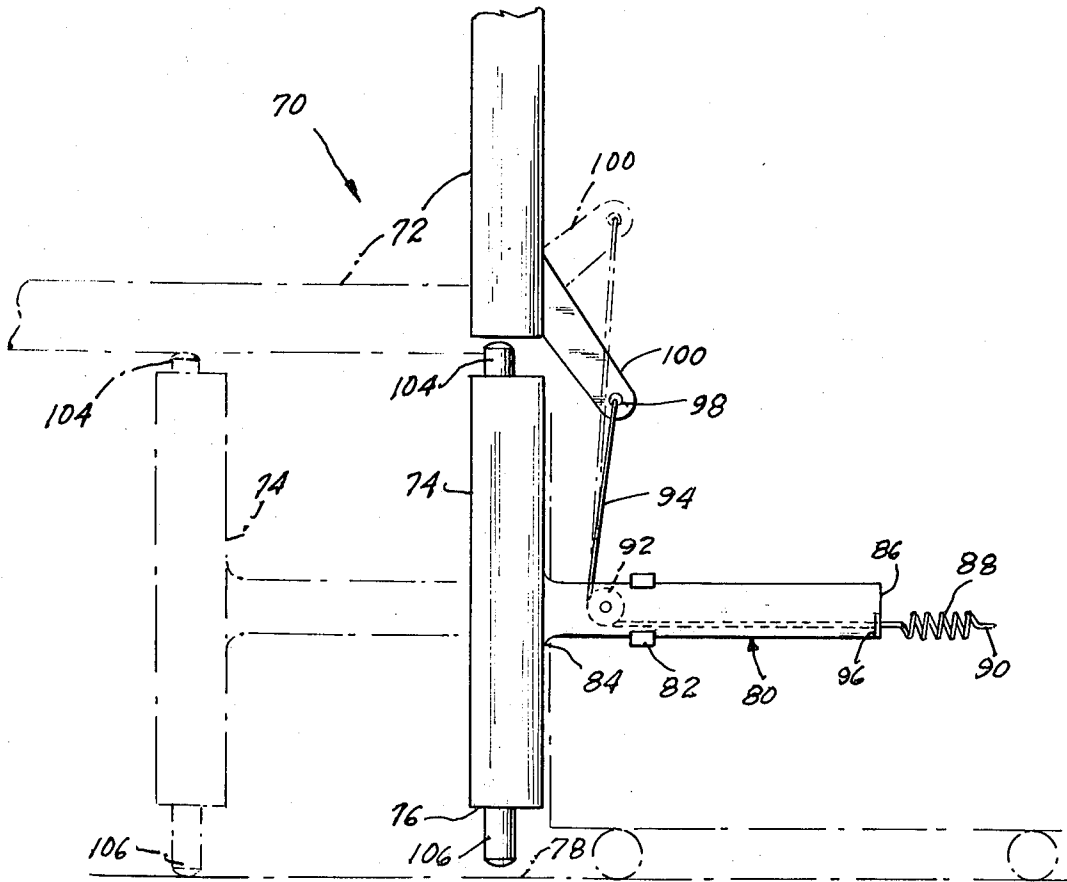


Fig. 5

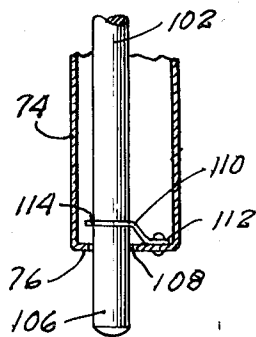


Fig. 6

ANTI-TIP MECHANISM FOR APPLIANCE

BACKGROUND OF THE INVENTION

1. Field of the Invention

This invention relates to an anti-tip mechanism for a freestanding cabinet, and more particularly to an anti-tip mechanism for an appliance, especially a portable appliance, in which the access door of the appliance is supported forwardly of its hinged connection to the cabinet by a support member which stabilizes the appliance to substantially prevent rocking or tipping.

2. Description of the Prior Art

The art of support structures generally recognizes the provision of members which move in a forward direction out of structures to support a hinged member of the structure. For example, in the furniture art a hinged door of a secretary has been provided with a linkage and forwardly moving arms to support the door so that the inside surface thereof may be used as a writing surface when the door is fully open. This type of support structure, however, increases the lever arm from the front of the desk to an undefined point and actually increases the possibility of tipping. The same is true for drop-leaf tables which have an unsupported horizontally pivoting leaf supporting member.

In the appliance art, Norman L. Kendt and Geroge T. Sholtes, in their U.S. letters Pat. No. 3,150,904 disclose the provision of a pair of forwardly and downwardly directed outboard arms which are extensible to a point forward of an appliance when the door of the appliance is open to prevent tipping of the appliance. This structure requires openings in the front of the appliance to permit the anti-tip arms to pass therethrough.

In U.S. letters Pat. No. 3,393,950, assigned to Whirlpool Corporation, Ival G. Dutcher and Vernon R. Sjodin disclose the utilization of an access panel normally closing the front of an appliance between the access door and the bottom of the appliance for supporting the access door of the appliance. In this structure, the panel is pivoted forwardly and downwardly on a hinged parallelogram principle, a portion of the access door forming one side of the parallelogram, to stand vertically on the floor and support the door in its fully open position.

Of course, the art recognizes a multitude of anti-tip structures which vary from those provided for particular applications, such as the ironing board support of W. Gay in U.S. Pat. No. 1,849,184, to more complicated support and counterbalance structures. For a variety of such art, the reader is referred to in U.S. letters Pat. Nos. 3,150,905; 3,322,480; 3,339,969; 3,345,776; and 3,738,727.

SUMMARY OF THE INVENTION

It is the primary object of the present invention to provide an anti-tip mechanism for a free-standing cabinet, such as the cabinet for a portable appliance.

A more specific object of the invention is to provide a portable appliance with an anti-tip mechanism which, for all practical purposes, is completely concealed and unobtrusive at the front of the appliance when the access door of the appliance is closed.

Another object of the invention is to utilize a panel which is normally coplanar with the access door of an appliance and generally employed as a decorator panel, as a major element of an anti-tip mechanism for the appliance.

According to the present invention, an anti-tip mechanism for a free-standing cabinet having an access door hinged at its bottom edge and a panel coplanar with the door comprises a pair of arms mounted near the outboard ends of the panel and extending rearwardly from the panel through respective bearings which mount the arms for linear movement between a first position where the panel is coplanar with the access door and a second position forward of the first position where the panel stands vertically on the floor and supports the access door in its fully open position. A pair of levers which extend rearwardly from the access door are linked to the respective arms via respective cable and pulley systems which are effective to move the arms from the first position to the second position as the access door is opened.

The access door is counterbalanced by way of the cable and pulley systems together with a pair of springs which are connected to the cabinet and to respective ones of the linearly movable arms.

In a preferred embodiment of the invention each of the linearly movable arms includes a detent on the upper edge thereof to receive a respective projecting portion within the associated bearing so that the panel clears the floor during its forward travel and pivots somewhat downwardly when reaching the second position in response to the detenting action.

In another embodiment of the invention, the panel carries a pair of spaced rods which extend through the upper and lower edges of the panel near the outboard ends thereof and which, in turn, carry upper and lower resilient portions for contacting the access door and the floor respectively. The rods are mounted for vertical movement with respect to the panel, are biased upwardly to clear the floor during movement of the panel, and are forced downwardly into contact with the floor in response to engagement and depression by the access door in its fully open position.

BRIEF DESCRIPTION OF THE DRAWINGS

Other objects, features and advantages of the invention, its organization, construction and operation will be best understood from the following detailed description of particular embodiments of the invention, taken in conjunction with the accompanying drawings, of which:

FIG. 1 is a perspective view of a free-standing appliance having an anti-tip mechanism constructed in accordance with the principles of the present invention;

FIG. 2 is a side elevation of the appliance of FIG. 1 illustrating the anti-tip principle of the present invention with an access door for the appliance shown in phantom line in one position of the door, and with a portion of the appliance cabinet broken away to illustrate internal structure;

FIG. 3 is a detailed perspective view of the anti-tip mechanism of the appliance illustrated in FIGS. 1 and 2;

FIG. 4 illustrates the bearing and detent structure of FIG. 3 with the bearing illustrated in section;

FIG. 5 is a detailed illustration of another embodiment of the invention; and

FIG. 6 is a partial sectional view of the linearly moving panel of the apparatus illustrated in FIG. 5.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring to FIG. 1, a free-standing cabinet is generally illustrated at 10 in the form of an appliance, in particular a dishwasher which comprises a cabinet 12 having a pair of sidewalls 14 (only one being shown), a top 16, a rear wall, and a front wall including a control panel 18 carried on an access door 26. The control panel 18 may include a variety of control elements, such as a plurality of push buttons 20 and a timer mechanism 22. Mounted in the control panel 18 is also a door latch 24, as is conventional in the dishwasher art.

The access door 26 covers only a portion of the front of the appliance, the remainder being closed by a panel 28 having a bottom edge 30 which is spaced above the floor line or bottom edge 32 of the appliance. Of course, if the appliance is a portable appliance and mounted on wheels, the front wheels of the appliance actually form the tipping pivot point with which the invention is primarily concerned. For purpose of illustration, however, the front edge of the machine at the reference 32 will suffice for this discussion.

Referring for a moment to FIG. 2, with the access door 26 pivoted downwardly approximately 90° as shown in phantom line, the appliance may have a tendency to tip towards the door if a sufficient downward force is applied to the inside surface of the door. This can happen, of course, when articles are placed on the door in loading or unloading the appliance. The effective lever arm, in this case, extends from the lower front edge of the machine to the point of application of the force, and must be counterbalanced by the weight of the machine at some defined point for the particular machine, said point depending on the placement of such components as drive motors, pumps, etc. As is readily apparent from FIG. 2, the utilization of the panel 28 to support the access door 26 at a point substantially forward of the cabinet 12 reduces the lever arm of the door and increases the lever arm of the mass of the machine about the point of support.

The panel 28 carries a pair of feet 34 and 36 near the outboard ends thereof which contact the floor when the anti-tip mechanism is effective, i.e. when the panel 28 is at its forward position with the door 26 in the fully open position shown in phantom line in FIG. 2. The panel 28 also carries a pair of resilient mar-proof pads or bumpers 38 and 40 on its upper edge near the outboard ends thereof to contact and support the access door 26.

As indicated by the arrows A and B in FIG. 2, the panel 28 first moves linearly outwardly to its forward position with the elements 34 and 36 traveling above the floor, and then moves downwardly, as indicated by the arrow B, so that the elements 34 and 36 contact the floor, this action being explained hereinbelow with reference to FIG. 3. Referring now to FIG. 3, a portion of the access door 26 is illustrated above and coplanar with the panel 28. As illustrated in the drawing, sufficient space is provided between the top of the panel 28 and the bottom of the access door 26 so that fingers, clothing, etc. will not be pinched therebetween.

In FIG. 3 the apparatus of the anti-tip mechanism on only one side of the appliance is illustrated; however, it should be understood that a similar structure will be provided at the opposite side of the machine. As shown in the drawing, an arm member or arm 42 is connected

to and extends rearwardly from the outer end portion of panel 28. The panel 28 is biased towards a position coplanar with the access door 26 by a spring 46 which has a first hooked end attached to the rear end 44 of the arm 42 through a hole 48, and an opposite hooked end 50 which is secured to the cabinet as indicated in FIG. 2.

The arm 42 is slidably supported by a bearing member or bearing 52 mounted in a fixed bracket 54 which, in turn, is connected to the cabinet. In order to move the panel 28 to its forward, access-door-supporting position, the bracket 54 mounts a pulley 56 having a cable 58 carried thereabout and attached at one end thereof at 60 to the arm 42 and at the other end thereof at 62 to a lever arm 64 which extends rearwardly from the access door 26. As the access door 26 pivots downwardly, the arm 42 is pulled linearly through in sliding relationship with the bearing 52.

In order to define the forward supporting position of the panel 28 and to slightly lower the panel so that the feet 34 and 36 contact the floor, the arm 42 is provided with a notch or detent 66 in the upper edge thereof which receives a downwardly extending projection or inwardly extending boss 68 of the bearing 52 (FIG. 4). As the boss 68 enters the detent 66 the panel 28 pivots downwardly somewhat (arrow B in FIG. 2); at this time, the access door 26 has pivoted downwardly to its fully open position and is supported on the mar-resistant pads 38 and 40 as shown in phantom line in FIG. 2. In closing the access door 26, the spring 46 attached to the end of arm 42 provides a counterbalancing force which acts through the linkage (including the cable 58 and the pulley 56) connected to the lever arm 64 to assist in moving the access door back to its closed position. At the same time, the spring 46 acting on the arm 42 pulls the panel 28 back in against the front of cabinet as the access door closes. It should be noted that the force from the spring 46 acts in a direction tending to pull the detent 66, and thus the arm 42 (see FIG. 4), out of engagement with the boss 68 in returning the front panel 28 from its second or forward or fully extended to its first or coplanar or fully retracted position.

ALTERNATIVE EMBODIMENT

Referring now to FIGS. 5 and 6, an anti-tip mechanism is generally illustrated at 70 as comprising an access door 72, a linearly movable panel 74 having a lower edge 76 carried above the floor 78. The panel 74 has, on each side of the machine, a rearwardly-extending arm 80 which slidably extends through a bearing 82 and includes an end 86 which is connected to a spring 88 having an end 90 connected to the cabinet in much the same manner as that illustrated in FIGS. 2 and 3.

A mounting bracket (not shown) carries the bearing 82 and a pulley 92, also in much the same manner as that illustrated in FIG. 3. The pulley 92 has a cable 94 entrained thereabout and connected at 96 to the arm 80 and at 98 to a lever arm 100 which extends rearwardly from the access door 72.

As is apparent from the structure illustrated in FIG. 5, the panel 74 is moved out to its supporting position and back to its coplanar position in the same manner as the apparatus illustrated in FIG. 3; however, the movement of the panel 74 is strictly linear in that no detent structure is provided. During its outward travel,

the foot 106 is carried above the floor as will be described hereinbelow.

Referring to FIGS. 5 and 6, the panel 74 is shown as including at each opposite side portion a rod 102 having an upper end 104, which may carry a mar-resistant covering, and a lower or foot end 106 and is mounted for vertical movement within the panel 74. More specifically, each rod 102 extends through a hole 108 in the bottom 76 of the panel 74 and through a like hole (not shown) in the top of the panel 74. Biasing means, here shown as a spring 110, is secured to the panel 74 at 112 and to the rod 102 at 114 to normally urge the rod 102 upwardly so that the foot 106 clears the floor during horizontal movement of the panel 74. When the panel reaches its supporting position forward of the cabinet, the access door has pivoted downwardly to a fully open position to engage the upper end 104 of the rod 102 and depress the rod 102, moving it downwardly with respect to the panel 74, so that the foot 106 contacts the floor. In this embodiment of the invention the access door 72 is closed and the panel 74 correspondingly retracted to the front of the cabinet with the assistance of the spring 88 in substantially the same manner as with the earlier-described embodiment. In this version, however, as the weight of the access door is removed from the upper end 104 of rod 102 the spring 110 moves the rod upwardly so that the foot end 106 of the rod clears the floor allowing the panel to move horizontally back to its fully retracted position.

The springs 110 have a sufficiently low spring force to permit easy deflection so that if, for example, an object is between the upper end 104 of the rod 102 and the lower edge of the access door 72 the rod 102 will be depressed as the door closes and the object will not be pinched. Again, this prevents injury to fingers, clothing, etc.

In each of the embodiments of the invention disclosed herein, the rearwardly-extending arms may be releasably attached to the movable panel by any suitable means so that upon partial opening of the access door and partial extension of the panel, the panel may be removed for maintenance of components mounted in the lower part of the cabinet.

Although I have described my invention by reference to particular illustrative embodiments thereof, many changes and modifications of the invention may become apparent to those skilled in the art without departing from the spirit and scope of the invention. I, therefore, intend to include within the patent warranted hereon all such changes and modifications as may reasonably and properly be included within the scope of my contribution to the art.

The embodiments of the invention in which an exclusive property or privilege is claimed are defined as follows:

1. In an appliance having an access door including a front surface and a lower edge and pivotally mounted on a lower portion of one side of said appliance along a horizontal axis so as to be movable between a fully open generally horizontal position and a closed generally vertical position, and anti-tip means for preventing the tipping of said appliance with respect to the floor, comprising:

a single generally vertical panel centered below the access door and in a parallel plane with the closed access door, the panel including an upper portion and a lower portion and having a first position adja-

cent the lower edge of said access door in its closed position and a second position in a plane substantially parallel to the plane of said first position and interposed substantially perpendicularly between the front surface of the access door and the floor in the open position of the door with said upper portion of said panel having means thereon which are out of contact with the door in the closed position of the door and which receive the front surface of said access door in contacting balanced load supporting engagement in the open position of the door and the lower portion of said panel having means engaging the floor; and

means for moving said panel linearly between its first and second positions in response to the movement of the access door between its closed position and its open position, said first position of said panel corresponding to the closed position of said access door and said second position of said panel corresponding to the fully open position of said access door;

whereby the panel is unobtrusive with the access door in its closed position and furnishes a support for the access door when the access door is in its fully open position.

2. In an appliance as claimed in claim 1, wherein said means for moving said panel comprises:

a pair of substantially horizontal linearly movable arm members respectively extending rearwardly from opposite outboard end portions of said panel; a pair of bearing members for slidably receiving respective ones of said arm members;

a pair of lever arm members extending rearwardly from opposite lower outboard end portions of said access door;

a pair of linkage means connecting a respective lever arm member to a respective horizontal arm member; and a pair of spring means each having one end thereof fixed to the appliance and the other end thereof connected to the distal end of a respective horizontal arm member to urge said panel toward its first position.

3. In an appliance as claimed in claim 1, wherein said means for moving said panel comprises:

a rigid linearly movable arm connected to and extending rearwardly from said panel; bearing means slidably mounting said arm;

linkage means connecting said arm and said access door and operable to move said panel to said second position upon opening of said access door; and biasing means connected to said arm to move said panel toward said first position as said access door is closed.

4. In an appliance as claimed in claim 3, wherein said linkage means comprises:

a lever arm extending rearwardly from said access door,

a pulley mounted for rotation about an axis below said lever arm, and

a cable carried about said pulley and connected between said lever arm and a point on said linearly movable arm rearwardly of said pulley.

5. In an appliance as claimed in claim 1 wherein the panel is substantially coextensive with the access door and wherein opposite end portions of said panel carry foot members at the bottom thereof for contacting the

floor and bumpers at the top thereof for contacting the access door.

6. In an appliance as claimed in claim 1, wherein said panel comprises:

an upper edge and a lower edge; and
upper and lower contact means extending beyond
said upper and lower edges for respectively contacting the access door and the floor.

7. In an appliance having an access door including a front surface and a lower edge with a fully open and a closed position and pivotally mounted on a lower portion of one side of said appliance along a horizontal axis, anti-tip means for preventing the tipping of said appliance with respect to the floor comprising:

a panel below the access door and having a first position adjacent the lower edge of said access door and a second position in a plane substantially parallel to the plane of said first position interposed between the front surface of the access door and the floor with the upper portion of said panel adjacent the front surface of said access door, and means for moving said panel between its first and second positions in response to the movement of the access door,

said first position of said panel corresponding to the closed position of said access door and said second position of said panel corresponding to the fully open position of said access door, whereby the panel is unobtrusive with the access door in its closed position and furnishes a support for the access door when the access door is in its fully open position,

wherein the means for moving the panel comprises:

a pair of substantially horizontal arm members, said arm members extending from respective opposite outer end portions of the panel, and each of said arm members defining a notch in corresponding upper portions thereof;

a pair of bearing members for slidably engaging the respective arm members, each of said bearing members having a downwardly extending projection at the top portion thereof for engaging the notches in the respective arm members;

a pair of lever arm members, said lever arm members extending rearwardly from respective opposite lower end portions of the access door;

linkage means for connecting each of the lever arm members to a respective horizontal arm member; and

spring means connected to each of said horizontal arm members for biasing the panel toward its first position and, through the linkage means, counterbalancing the access door.

8. In an appliance having an access door including a front surface and a lower edge with a fully open and a closed position and pivotally mounted on a lower portion of one side of said appliance along a horizontal axis, anti-tip means for preventing the tipping of said appliance with respect to the floor comprising:

a panel below the access door including an upper portion and having a first position adjacent the lower edge of said access door and a second position in a plane substantially parallel to the plane of said first position and interposed between the front surface of the access door and the floor with said upper portion of said panel adjacent and receiving

the front surface of said access door in contacting engagement;

means for moving said panel between its first and second positions in response to the movement of the access door, said first position of said panel corresponding to the closed position of said access door and said second position of said panel corresponding to the fully open position of said access door; whereby the panel is unobtrusive with the access door in its closed position and furnishes a support for the access door when the access door is in its fully open position;

wherein said panel comprises:

an upper edge and a lower edge;

upper and lower contact means extending beyond said upper and lower edges for respectively contacting the access door and the floor;

rod means mounted for vertical movement and carrying said contact means; and

biasing means urging said rod means upwardly to prevent interference with the floor as said panel moves between said first and second positions.

9. An anti-tip device for an appliance having a front access door hingedly mounted on a horizontal axis with respect to the floor, said anti-tip device comprising:

a movable front panel located below the access door; means for moving the panel linearly between a first and a second position in response to movement of the access door from a closed to a fully open position;

means on the upper portion of the panel out of contact with the door in the closed position of the door and receiving a front portion of the access door in supported contact therewith when said panel is in the second position and said access door is in the fully open position; and

means associated with the lower portion of the panel engaging the floor when said panel is in the second position and said access door is in the fully open position;

whereby the panel is unobtrusive in the first position with the access door in the closed position and is interposed, in its second position, between the front surface of the access door and the floor to furnish support for said access door in the fully open position.

10. An anti-tip device according to claim 9, wherein said means for moving the panel linearly comprise linkage connecting the door and the panel.

11. In a free-standing cabinet having an access opening and an access door hinged about a horizontal axis for movement between a closed position and a fully open position where it is supported on the floor by a movable cabinet panel which is coplanar with the door in the closed position and positioned forwardly of the coplanar position in the open position of the door, the improvement comprising:

mounting means mounting the panel for linear movement between its positions; and

linkage means connecting the door and the panel for moving the panel in response to movement of the door,

wherein said panel comprises:

rod means vertically mounted in said panel for vertical movement and including an upper portion for contacting the access door and a lower portion for contacting the floor; and

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spring means connected to said rod means for urging said rod means upwardly, the weight of the door forcing said rod means downwardly to contact the floor as the door moves to its fully open position.

12. In a free-standing cabinet having an access opening and an access door hinged about a horizontal axis for movement between a closed position and a fully open position where it is supported on the floor by a movable cabinet panel which is coplanar with the door in the closed position and positioned forwardly of the coplanar position in the open position of the door, the improvement comprising:

mounting means mounting the panel for linear movement between its positions to receive the access door thereon in contacting engagement in the open

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position of the door;

linkage means connecting the door and the panel for moving the panel in response to movement of the door;

wherein said mounting means comprises:

means operable when said panel reaches its forward position to cause said panel to contact the floor, including:

an arm extending rearwardly from said panel;

means defining a detent in the upper edge of said arm; and

a member adjacent the arm and fixed to the cabinet and received in the detent when said panel reaches its forward position.

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