Oct. 27, 1959 B. E. MUSTEE 2,910,336

DOOR BALANCE AND LIMIT DEVICE

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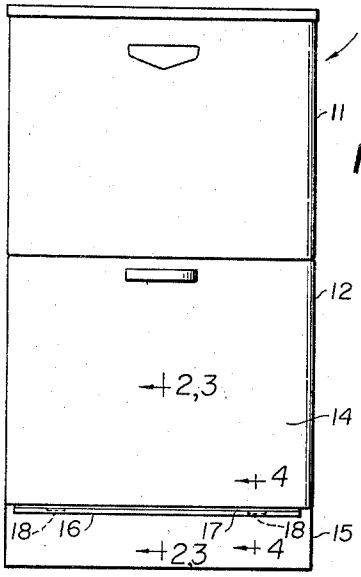


Fig. 1

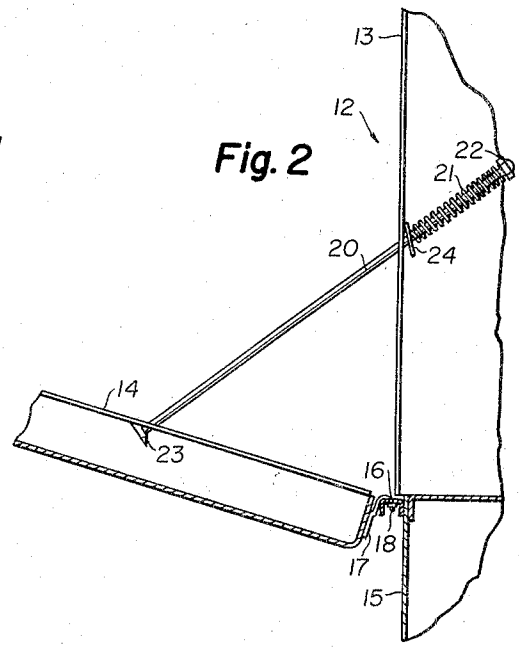


Fig. 2

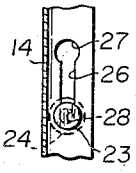


Fig. 5

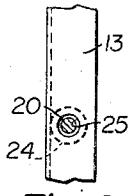


Fig. 6

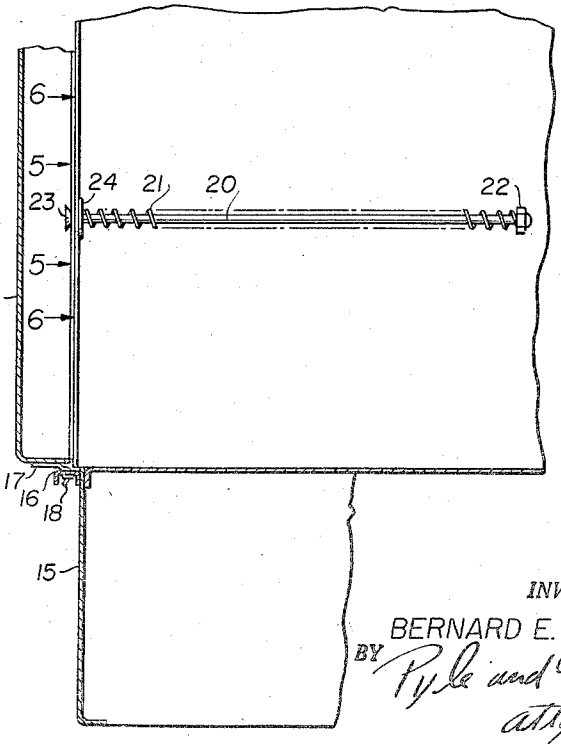


Fig. 3

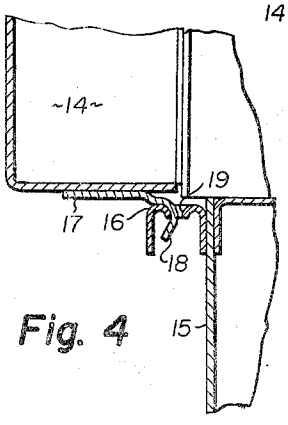


Fig. 4

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DOOR BALANCE AND LIMIT DEVICE

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3 Claims. (Cl. 312—328)

This invention relates in general to door balancing and retaining devices.

Oven doors are a well known example of balanced door structures having limiting means to prevent overswing of the door and to support the door and a load on the door when open. The complicated nature of these balancing devices and retainers will be best appreciated by those who repair such doors. The springing and mounting of these devices is buried deep within the cabinet structure and requires considerable time and effort to install or remove.

Therefore, an object of this invention is to provide an improved spring balancing and holding structure, together with limiting and support means.

Another object of this invention is to provide such structure in a readily accessible location and adapted to be installed or removed in a moment's time.

And another object of this invention is to provide such apparatus of simplified construction which is not readily subject to mechanical failure.

Other objects and a fuller understanding of the invention may be had by referring to the following description and claims, taken in conjunction with the accompanying drawing, in which:

Figure 1 is a front view of a laundry tub cabinet of modern design, having a water holding tub in the upper portion opening from the top, and having a storage compartment below, with a front entrance opening into the compartment closed by a door, the door being balanced and limited in opening extent and supported in its maximum open position by the improved device of this invention;

Figure 2 is a section view taken along the line 2—2 of Figure 1, but with the door in an open position;

Figure 3 is a true section view taken along line 3—3 of Figure 1;

Figure 4 is an enlarged detail view of the improved door hinge structure;

Figure 5 is a detail view taken as indicated by the line 5—5 of Figure 3; and

Figure 6 is a detail view taken as indicated by the line 6—6 of Figure 3.

To illustrate the invention in an environment where such device is exceptionally useful, a laundry tub cabinet 10 of modern design has been selected. It will readily be understood that this device may be applied to any similar cabinet construction having an entrance opening closable by a pivotally mounted door. Oven doors are examples of another useful environment for this invention.

In the drawing, a modern laundry tub cabinet 10 having an upper tub portion 11 and a lower cabinet portion 12 is set forth by way of example. This particular cabinet 10 has a glass fibre reinforced water holding tub in the top portion and opens from the top of the cabinet. The area below the tub is suitable for storage of laundry products such as soap. Accordingly, the bottom portion 12 of the cabinet is provided with a front entrance opening and is closed by a pivotally swung door 14. No particular effort has been made to illustrate the front opening into the cabinet, because such structures are well known and understood. As in usual constructions of this type, there is a peripheral edge 13 outlining the cabinet entrance opening. The edge 13 amounts to a small flange extending around the cabinet opening.

The cabinet 10 is mounted upon a base 15 having a ledge 16 to support and swingably mount the door 14. A longitudinal anchor strip 17 is attached to the bottom of the door and has a tab 18 extending through a suitable opening 19 in the ledge 16. Therefore, a very simple and readily detachable pivotal mount is provided for door 14. The door may then swing forward in this particular embodiment around the tab 18 as a pivot point.

The construction of the strip 17, tab 18 and ledge 16 is unique in door hinging structures. The ledge 16 is an elongated member of a more or less arbitrary length, as seen in Figure 1, and has a cross section substantially as seen in Figure 4. Preferably, just two slotted openings 19 are provided, and are laterally spaced near the extremities of ledge 16. As shown best in Figure 4, the edges of slot 19 are rolled downwardly into the slot. Tab 18 of strip 17 is provided in a rounded hook form to fit in a slidable manner with the rolled edge of slot 19. By comparing Figures 2 and 4, the smooth hinge movement of the tab 18 over the edge of slot 19 will be appreciated.

This hinging arrangement produces more than a simple and inexpensive door mounting. It provides a door hinge which will stay firmly in place throughout the entire door swing, but permits the door to be removed by deliberate action when desired. The removal action must be deliberate, it will not occur accidentally. The tab fits the slot much like a puzzle piece, and accordingly must be moved to an exact open position, and then lifted outwardly and upwardly in a simultaneous movement. Hence, a cabinet, oven or other door structure may be easily removed to make the cabinet interior more fully accessible for cleaning. The door will not be an obstacle to prevent reaching the remote areas of the cabinet.

Such door would not stay closed without some auxiliary holding device, and furthermore the tab 18 would not be able to withstand the weight of the door when the door is opened if it were interlocked to serve as a holding stop. The leverage of such a door would require a massive stop member located at the hinge. Accordingly, this invention is supplied to provide a spring retention of the door in a closed position and to balance the door when in the open position. Furthermore, this invention provides a limit for the door and therefore dictates the maximum open position thereof, and provides rigid holding support for the door while in the open position to resist any extra load that may be applied to the door.

This balancing and limiting device, according to the preferred embodiment of the invention, employs longitudinal rod 20 having a coil spring 21 entwined thereon as shown best in Figures 2 and 3 of the drawing. The first end of the rod 20 is in the form of a head 23. The second end is threaded and supplied with a nut 22. The spring extends between a fixed wall of the cabinet and the nut 22, and consequently the rod 20 may be pulled through the spring 21 and will build up increasing resistance at it is pulled through the spring.

As previously stated, most cabinets have a peripheral edge such as edge 13 which outlines the cabinet opening. Consequently a slot or hole 25 may be made in the peripheral edge 13 and will thus serve as a retainer surface carried by the cabinet. Obviously, in the absence of the edge 13 as a regular part of the cabinet, a bracket may be mounted to serve this same purpose. In any event, the spring 21 is retained against the inner surface of this re-

tainer surface, and in most instances will operate better if a washer **24** is positioned between the spring and the inner side of the retainer surface. Thus, with the spring held against the inner side of the retainer surface, and the second end of the rod **20** prevented from entering into the spring, the spring will constantly urge the rod **20** into the interior of the cabinet and will thus urge the head end **23** to a position flush with the exterior surface of the retainer, or the edge **13**.

The head end **23** is preferably flared to provide an enlarged engagement end. This end is pivotally attached to the door. A very simple and improved attachment is provided in the form of a keyhole slot **26** in the door **12**. This keyhole slot, as best illustrated in Figure 5 of the drawing, has a large opening **27** which is spaced from the ledge **16** a distance greater than the distance from ledge **16** to the hole or slot **25** in the edge **13**. A small slot **28** sized to about a width equal to the diameter of the rod **20** extends downwardly from the large opening **27**.

To install the door and engage the balancing and retaining device, the tab **18** is inserted into the receiving hole **19** in the ledge **16**. Door **12** is then extended at an angle about in a half closed position. The retaining device is installed with the head end **23** extending to the exterior of the cabinet and the spring engaging the inside of the retainer surface and retained by the nut **22**. Then the rod **20** is manually extended and pivoted to extend the rod in an upward direction to meet and engage with the large opening **27** of the keyhole opening **26**. In order to permit the rod **20** to swing in this manner, the hole or slot **25** is enlarged or elongated in a vertical direction. Once the head end **23** is engaged into the large opening **27**, the retainer device is released and will then tend to assume a horizontal position substantially as set forth in Figure 3, whereupon the head end **23** will move downwardly in the keyhole slot **26** into the small slot area **28**.

The spring **21** is a compression type coil spring and is of sufficient length to exert an initial retaining pressure to hold the door **12** in the closed position with a snug fit. As the door **12** is pivoted open, the head end **23** will be pulled outwardly and downwardly along the swing of the door in a plane which passes through the door and the hinge in a substantially vertical direction. The entire retainer and balancing device will therefore gradually swing to accommodate the rigid rod **20** to the shifting attachment points established by the small slot **28** and the hole or slot **25**. Due to the sizing of the hole **25**, the rod **20** is free to follow this constantly changing swing path.

The spring **21** will eventually reach full compression and therefore cease to be resilient. At this point the rod can advance no more and becomes a rigid support to hold the door against further pivotal movement and support any load that may be applied to the door. Therefore, the length of rod **20** and the full compression length of the spring **21** will determine the maximum open and the supported position of the door.

The spring **21** and the rod **20** may be designed as desired to produce a mere balancing effect, or a strong closing effect.

It would appear that the door would have to be held in an open position because of spring **21**. Such is not the case, however, because the structure is arranged to take advantage of a shifting mechanical advantage. When the door is fully opened, the weight of the door is largely on the spring. As the door is moved toward a closed position, the weight thereof shifts to a greater degree to the ledge **16**. Therefore, at some point intermediate the fully opened position and fully closed position, the force of the spring will be able to cause the door to pivot to a closed position.

Although the invention has been described in its preferred form with a certain degree of particularity, it is understood that the present disclosure of the preferred form has been made only by way of example and that numerous changes in the details of construction and the combination and arrangement of parts may be resorted to without departing from the spirit and the scope of the invention as hereinafter claimed.

What is claimed is:

1. In combination, a cabinet having a front entrance opening, a door pivotally mounted by a separable interfitted hinge permitting the door to be separated and rehung by interfitting the hinge parts, said door serving as a closure for said opening, a rod having first and second ends, a retainer surface carried by said cabinet at said opening, a rod passageway through said retainer surface above the pivotal mounting of the door within the area covered by said door, a coil compression spring having first and second ends, said rod passing through said coil compression spring, means preventing said second end of the rod from passing into said second end of the coil spring, said first end of the coil spring abutting the cabinet side of said retainer surface, said rod passing through the said rod passageway with said first end thereof extending to the exterior of the cabinet and with the remainder of the rod positioned in the cabinet, said rod first end and said door having mutually interfitted hook surfaces separable and rehookable at will, whereby said rod may be separated from the door and the door thereafter separated from the cabinet without tools.

2. In combination, a cabinet having a front entrance opening, a door pivotally mounted as a closure of said opening, said door having a first position fully closed over said entrance opening, a second position fully opened, a hinge construction providing a pivotal door mount, said hinge construction having a first part carried by said cabinet and a second part carried by the door, said first and second hinge parts being engageable and disengageable by interengagement only in said fully opened door position, a rod having first and second ends, a retainer surface carried by said cabinet at said opening, a rod passageway through said retainer surface above the pivotal mounting of the door sized with respect to said rod to allow said rod to swing on a plane passing at right angle through said door and the pivot mounting therefor, said rod passageway located within the area covered by said door, a coil compression spring having first and second ends, said rod passing through said coil compression spring, means preventing said second end of the rod from passing into said second end of the coil spring, said first end of the coil spring abutting the cabinet side of said retainer surface, said rod passing through the said rod passageway with said first end thereof extending to the exterior of the cabinet and with the remainder of the rod positioned in the cabinet, the normal condition of said spring being longer than the portion of the rod within the cabinet to provide some initial holding pressure on the rod, and detachable pivotal interconnection between the said first end of the rod and said door, said rod having a maximum extendability through said opening of the retainer surface to permit said door to swing less than to said second fully opened position, whereby the rod must first be unfastened from the door and the door may thereafter be swung to the removable position.

3. In combination, a cabinet having a front entrance opening with a peripheral edge wall therearound, a door pivotally mounted as a closure for said opening, said door having a first position fully closed over said entrance opening, a second position fully opened, a hinge construction providing a pivotal door mount, said hinge construction having a first part carried by said cabinet and a second part carried by the door, send first and second parts being engageable and disengageable by interengagement only in said fully opened door position, said door overlaying said peripheral edge wall, a rod having first and second ends, a hole through said edge wall above the pivotal mounting of the door sized with respect to said rod to

allow the rod to swing on a plane passing at a right angle through said door and the pivot mounting therefor, said hole located within the area overlain by said door, a coil compression spring having first and second ends, said rod passing through said coil compression spring, said first end of the rod having a nut threaded thereon to prevent the said second end of the rod from passing into said second end of the coil spring, said first end of the spring abutting the cabinet side of said edge wall, said rod passing through the said hole with said first end thereof extending to the exterior of the cabinet and with the remainder of the rod positioned in the cabinet, the normal condition of said spring being longer than the portion of the rod within the cabinet to provide some initial holding pressure on the rod, said first end of said rod having an enlarged head, said door having a keyhole slot with a rod head size opening spaced from the pivotal mounting a distance greater than the distance to said hole and a rod size slot extending therefrom toward said door pivot, said rod head interconnected to said door by interfitting into said keyhole slot, said rod having a maximum extendability

through said opening of the retainer surface to permit said door to swing less than to said second fully opened position, whereby the rod must first be unfastened from the door and the door may thereafter be swung to the removable position.

References Cited in the file of this patent

UNITED STATES PATENTS

516,005	Geer	Mar. 6, 1894
665,752	Pease	Jan. 8, 1901
686,603	Gossett	Nov. 12, 1901
1,536,391	Eastman	May 5, 1925
1,714,950	Earhart	May 28, 1929
2,076,173	Cocks	Apr. 6, 1937
2,657,420	Carbary	Nov. 3, 1953

FOREIGN PATENTS

17,021	Great Britain	Nov. 14, 1907
434,287	Great Britain	Aug. 29, 1935
537,032	France	Feb. 23, 1922