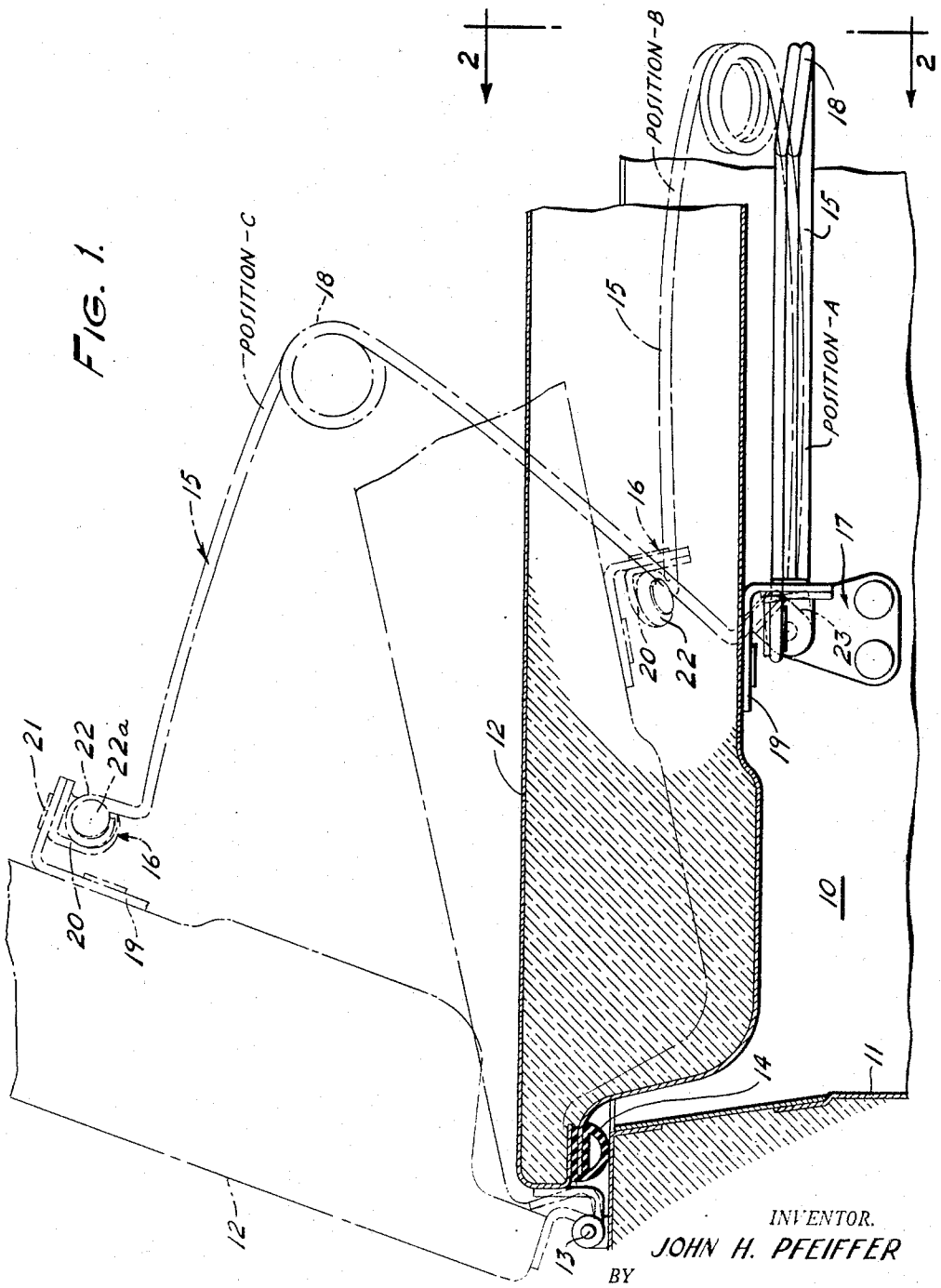
April 17, 1951 J. H. PFEIFFER 2,549,128

LID STAY

Filed June 11, 1948 2 Sheets-Sheet 1

FIG. 1.

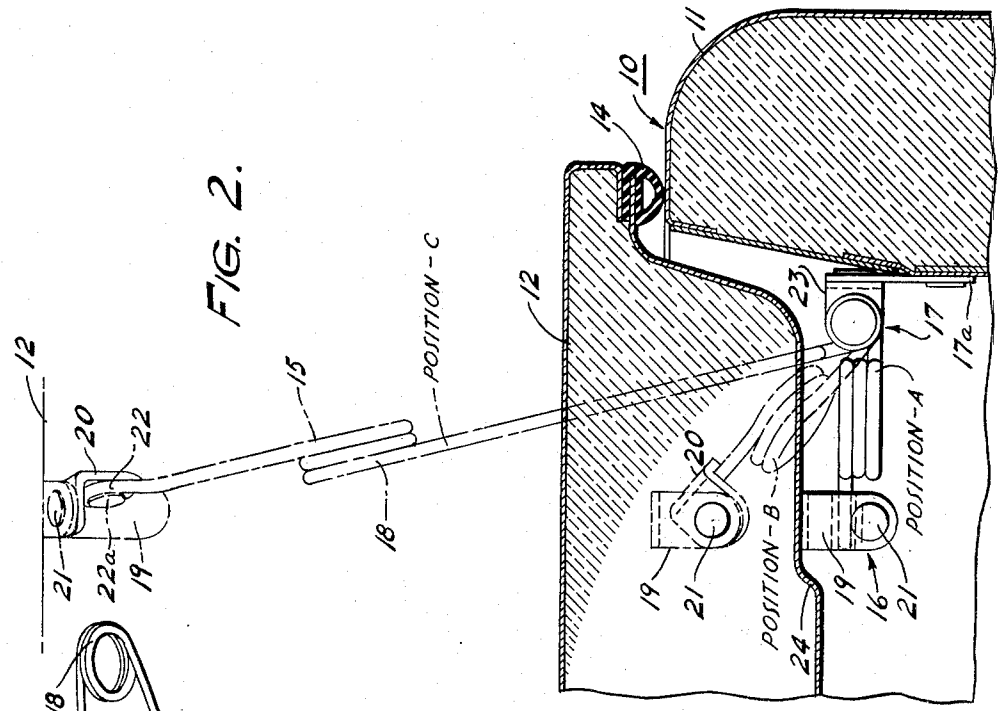


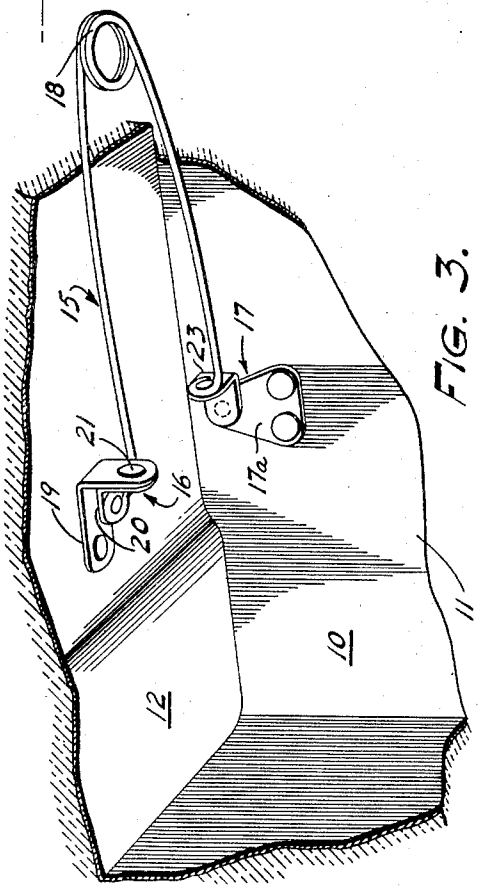
INVENTOR.
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AGENTS

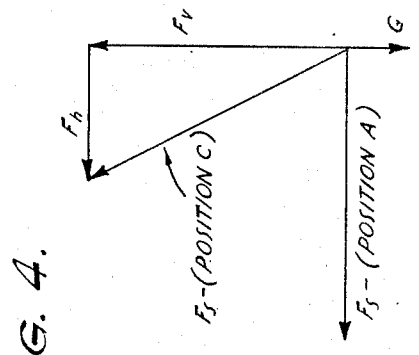
April 17, 1951 J. H. PFEIFFER 2,549,128

LID STAY

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LID STAY

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4 Claims. (Cl. 217—60)

1

The invention described and claimed herein has to do with support or "stay" devices adapted for use with doors, lids or the like.

While of broader applicability, the apparatus of the present invention is particularly useful with refrigerator cabinets and, still more especially, is of utility with freezer chests of the horizontal, or top-access type. Accordingly, the invention is illustrated and described hereinafter as applied to the cabinet structure of a top-access freezer chest.

Chests of this character, as well as refrigerator cabinets generally, are commonly provided with relatively heavy insulated doors or lids, and problems have presented themselves in providing a lid support, or stay, which will serve as a counterbalance during opening and closing movements of the lid, will maintain the lid in fully open position without other support, and yet is of such character as to exert little or no opening force when the lid is completely closed. Devices have been developed which meet these general specifications, but such devices have frequently been unduly cumbersome and expensive and—when the lid is closed—have occupied space which would otherwise be available for the storage of foodstuffs.

With the foregoing in mind, it is the primary object of the present invention to provide an extremely simple and inexpensive lid support or stay, particularly characterized in that it not only meets the above-stated general requirements, but further assumes such a position, upon closing of the lid or door, as to occupy a minimum amount of the useful space within the cabinet. It is a feature of my invention that the lid may readily be recessed sufficiently to receive the stay, when the latter is in the position which it occupies when the lid has been closed.

The present invention is also characterized in that the maximum lid-supporting force exerted by the stay structure is available at those times, during the opening and closing cycle, when the effect of gravity is of importance.

In the achievement of the foregoing general objectives, I utilize a simple resilient member having a coil spring portion intermediate the ends thereof, which resilient member is so constructed, and associated with the cabinet structure, that it exerts virtually no force tending to open the lid, when said lid is completely closed, whereas an increasing amount of force is available to urge the lid toward open position, as said lid is raised slightly from its closed position.

Other objects and advantages, as well as a more

2

specific elaboration of the manner in which the aforesaid objectives are realized, will be fully understood upon study of the following disclosure, taken in conjunction with the accompanying drawings, in which:

Figure 1 is a fragmentary sectional view of a refrigerator or freezer chest cabinet, taken in a plane normal to the axis of the hinging means, the view showing the novel apparatus of the present invention applied to a freezer chest and illustrating various positions occupied by the stay structure during movements of the cabinet lid;

Figure 2 is a fragmentary sectional view illustrating the apparatus as viewed in the direction indicated by the line 2—2 applied to Figure 1;

Figure 3 is a somewhat diagrammatic perspective illustration of the apparatus, as viewed from the inside of the cabinet looking upwardly toward the lid stay, the lid being indicated as occupying the closed position; and,

Figure 4 is a vectorial representation of the vertical and horizontal components of force exerted by the stay structure, in different positions of lid adjustment.

Now making more detailed reference to the drawings, and particularly to Figures 1 and 2 thereof, there is fragmentarily illustrated a freezer chest cabinet 10 comprising vertically extending insulated wall structure 11, and a top-access door 12 pivotally mounted, as at 13, for vertical swinging movements about a horizontal axis lying along the rear portion of the cabinet. In accordance with common practice, the door is provided with a gasket 14 which extends peripherally about said door and is adapted to seat against the upper surface of the wall structure 11 and thereby seal the interior of the cabinet against the access of air or moisture.

In particular accordance with the present invention, the refrigerator or chest 10 is provided with a resilient member 15 pivotally secured to both the lid and the cabinet wall, as by supports designated generally at 16 and 17, respectively, said resilient member comprising the lid support or stay aforesaid. The resilient member preferably, and as shown, takes the form of a length of comparatively heavy spring wire, the mid-portion of which is coiled, as indicated at 18, to provide for extension and retraction of the stay, as well as to provide a substantial portion of the force to be exerted by said stay.

Each of the supports 16 and 17 includes a mounting plate and an element adapted for pivotal movement with respect to the said plate. Considering the support element 16, for example,

it will be seen that the mounting plate takes the form of an angle bracket 19 a portion of which is secured to the lid, in any suitable manner, and a portion of which extends downwardly from said lid and upon which is carried a second angle member 20, one leg of the latter being pivotally connected to the base or support angle 19 through the agency of a pin 21 (see particularly Figures 2 and 3). The other leg, or extension, of angle member 20 serves as a support for a wrapped terminal portion 22 of resilient member 15, said portion 22 being pivotally secured to the said leg of angle 20 in any convenient manner, as by the pin shown at 22*a*.

Generally similar provision is made to accommodate pivotal securement of the opposite end of the resilient member to the cabinet structure. To this end, a supporting plate 17*a* has pivotally secured thereto an angle member 23, which is essentially similar to the aforesaid angle member 20. A leg of said angle member 23 extends inwardly of the cabinet and an end of the resilient member 15 is connected to said leg through the agency of a wrapped portion similar to the wrapped portion 22 above mentioned. This construction will be clearly understood from Figures 2 and 3.

As illustrated in Figure 2, the member 15 is secured to the lid at a point spaced horizontally from the point of securement of said member to the cabinet wall structure, and it is further to be noted that the aforesaid points lie substantially in the same horizontal plane. The significance of these factors will be evident, as the description proceeds.

By virtue of the above-described construction, the angle member 20, through which the stay is secured to the lid, is free to swing in a plane extending at right angles with respect to the general plane of the lid, the swinging movement of said angle member being well illustrated in the several positional showings of Figure 2. Similarly, the angle member 23 is mounted for swinging movements in a plane adjacent to and parallel with the plane of the side wall to which said angle member 23 is secured. Freedom for the pivotal movements aforesaid is of importance in achieving the objectives of the present invention, as will be appreciated from what follows.

To facilitate an understanding of the operation of the stay structure, three positions of the stay and lid have been illustrated in each of Figures 1 and 2. These positions are identified as positions A, B and C, in each of said views, and represent, respectively, retracted, intermediate and extended positions occupied by the resilient stay member 15 during opening and closing movements of the door or lid 12.

It will be understood that the force exerted between the ends of member 15 is an expanding force, that is, a force tending to move the member to the extended position, identified as position C. This force is, of course, exerted transversely to the axis of coils 18 and, as will be appreciated, when the stay occupies the lower position (position A) the force is expended between supports 16 and 17, in a plane paralleling the general plane of the lid 12, and is not effective to raise the lid. When the member 15 has expanded to the extended position (position C) the major portion of the force of the stay is exerted in a vertical direction and is available to support the lid. As the stay approaches and passes through an intermediate position (position B) the vertical component of the spring force increases very rapidly. It is to be understood that, in any position of the mechanism, the horizontal component of force is exerted along the axis of the hinge structure and is not a factor in supporting the lid.

Thus, during opening movements of the door, the spring or stay moves from a generally horizontal position to a generally vertical position, it being understood that the above-described pivotal connections provide freedom for such movement. In the horizontal position, that is when the lid is closed, the stay structure occupies very little space and, as represented at 24, the inner panel of the door is preferably recessed to accommodate at least a portion of the vertical dimension of the stay assembly, when in said horizontal position.

Now making reference to Figure 4, which comprises a vectorial representation of the vertical and horizontal components of force exerted by the stay structure during movements of the lid, the force exerted by the spring is identified as F_s. The vertical component of the force is designated as F_v, and the horizontal component as F_h, the force of gravity acting upon the lid structure being represented at G. As indicated above, the horizontal component is "taken by" the hinge structure.

It is to be understood that the directions in which the spring extends, during movements of the mechanism, are determined by constraints imposed by the nature of the linkage and, in this connection, it will be observed that the horizontal spacing between the ends of the spring member 15 is constant throughout the range of movement of the stay, said horizontal spacing being determined by the fixed horizontal distance between mounting assemblies 16 and 17. Also, while the two ends of the resilient member are so mounted as to accommodate movement of the stay through approximately 90°, that is, from the horizontal to the vertical position (such movements being provided for by virtue of the pivotal connections described above) the position of one end of the resilient member remains fixed by virtue of its securement to the side wall structure and th other end thereof is constrained to follow movements of the lid.

Now considering, for example, the vertical and horizontal components of force exerted by the spring during a cycle of movement beginning at position A and terminating at extended position C, it will be apparent, from the vectorial representation of Figure 4, that the vertical component is essentially zero when the spring occupies the lower position. Thus, when the lid is closed, the force of gravity operates to maintain the lid tightly sealed against the cabinet structure. When the lid is raised slightly, a vertical component of force is introduced, and the structure may be so designed that the lid will continue its upward movement under the influence of the force exerted by the stay alone, when said vertical component exceeds gravity. Similarly, during closing movements of the lid, sufficient force is applied to the top of the lid to overcome the amount by which the vertical component (in position C) exceeds gravity, and the lid may then be moved downwardly against the counterbalancing effect of the structure.

If desired, the design may be such as to cause the stay structure to urge the door against the cabinet, when the closed position is reached. This may be accomplished by lowering pivotal point 21 to an extent sufficient to introduce a vertical component of force exerted in a direc-

tion opposite to the vertical component exerted when the lid is open. Alternatively, of course, an equivalent result may be accomplished by raising the pivotal assembly 17.

In the vector diagram the force of the spring and the magnitude of the gravitational couple are assumed to be constant, in the interest of simplicity in illustration. In actuality, both of these forces diminish as the lid is raised, and the effect of such decreases is advantageous. This will be understood when it is realized that, as the stay structure approaches fully extended position—in which position less force is exerted than is exerted in the lower and intermediate positions—less force is required, since the effect of gravity acting upon the lid has correspondingly decreased.

From the foregoing description it will be evident that the present invention provides support or stay structure which not only has the operational characteristics regarded as essential in this class of apparatus, but, further, is of highly simplified and inexpensive character. The device of the invention is especially advantageous in that it minimizes loss of cabinet storage space, this factor being of particular significance since it eliminates the risk of damaging foodstuffs or other stored material.

As will be understood, the apparatus is susceptible of design modifications within the purview of the invention. For example, doors of various weights, and differing in span, may make it desirable to vary the force exerted by the spring, the location of the points of pivotal securement, and like factors. Similarly, the apparatus could be utilized with doors hinged for swinging movements about a vertical axis, in which event the effect of gravity may be disregarded. However, it will be recognized that such changes and modifications are contemplated as may come within the scope of the appended claims.

I claim:

1. In combination with structure including a cabinet and closure means hingedly mounted for opening and closing movements with respect to said cabinet, a support device having spaced end portions resiliently urged apart, and means pivotally associating one of said end portions with said cabinet and the other of said end portions with said closure means, whereby said device may react between said cabinet and closure means and exert force tending to move said closure means to open position, said pivotal means accommodating movements of said device from a position in which the force exerted between the end portions thereof is exerted in a direction generally parallel to the hinge axis to a position in which at least the major portion of the force exerted between said end portions is exerted in a direction transverse to the hinge axis.

2. In combination with structure including a cabinet and a top-access lid hingedly mounted for opening and closing movements with respect to said cabinet, stay structure for said lid comprising a member having spaced end portions resiliently urged in opposite directions, means pivotally linking one of said end portions with said cabinet and the other of said end portions with said lid, whereby said member may react between said cabinet and lid and exert force effective to urge said lid toward open position, said member being movable about said linking means—in response to closing of the lid—to a position in which substantially all the force exerted between the ends thereof is exerted in a direction generally parallel to the hinge axis and is not effective to support said lid.

3. In combination with structure including a cabinet and closure means hingedly mounted for opening and closing movements with respect to said cabinet, means adapted to urge said closure means toward open position, said means comprising: a generally U-shaped spring member the free ends of which tend to spread, and means pivotally linking one of said ends with said cabinet and the other of said ends with said closure means, said spring member being movable about said linking means—in response to closing of said closure means—to a position in which both of said ends lie substantially in a plane paralleling the hinge axis.

4. In combination: a cabinet; a top-access lid hingedly mounted for opening and closing movements with respect to said cabinet; and means adapted to urge said lid toward open position, said means comprising; a member having spaced end portions resiliently urged in opposite directions; and means pivotally linking one of said end portions with said cabinet and the other of said end portions with said lid, whereby said member may react between said cabinet and lid and exert force effective to urge said lid toward open position, said member being movable about said linking means—in response to opening of said lid—to a position in which said end portions lie in a generally upright plane, and said member being movable about said linking means—in response to closing of the lid—to a position in which said end portions lie substantially in a horizontal plane.

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