

[54] LID COUNTERBALANCE MECHANISM  
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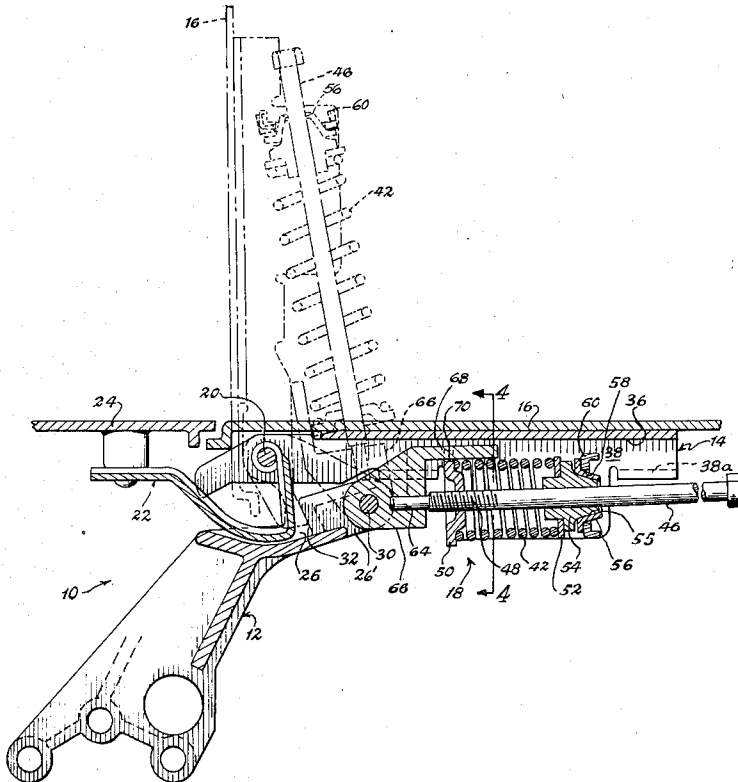
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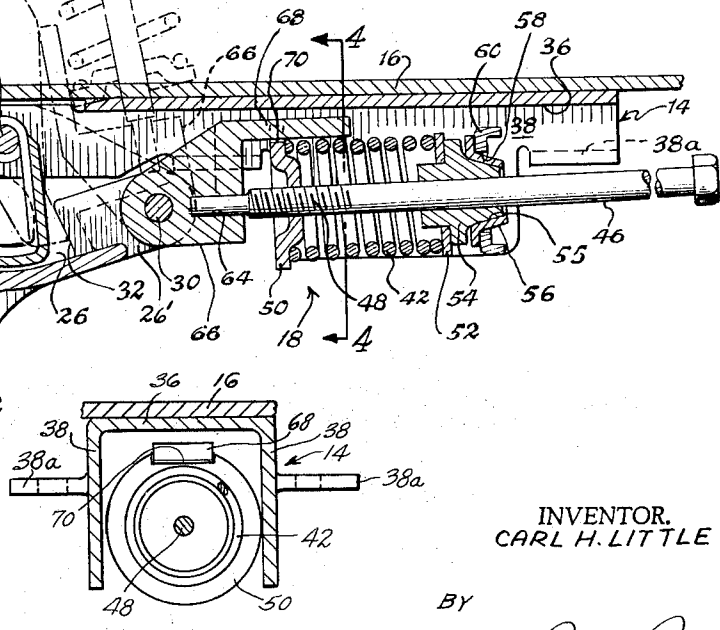
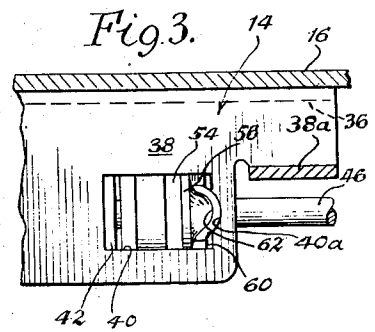
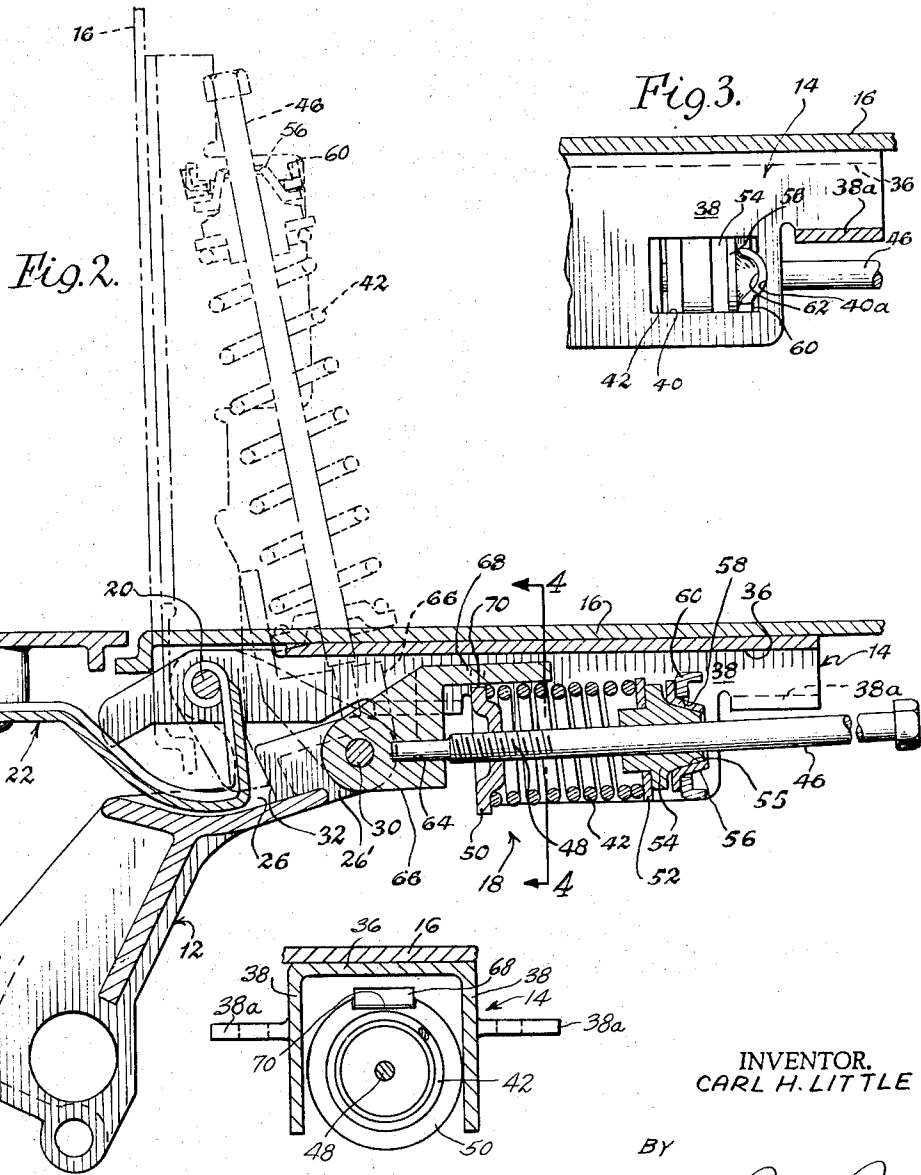
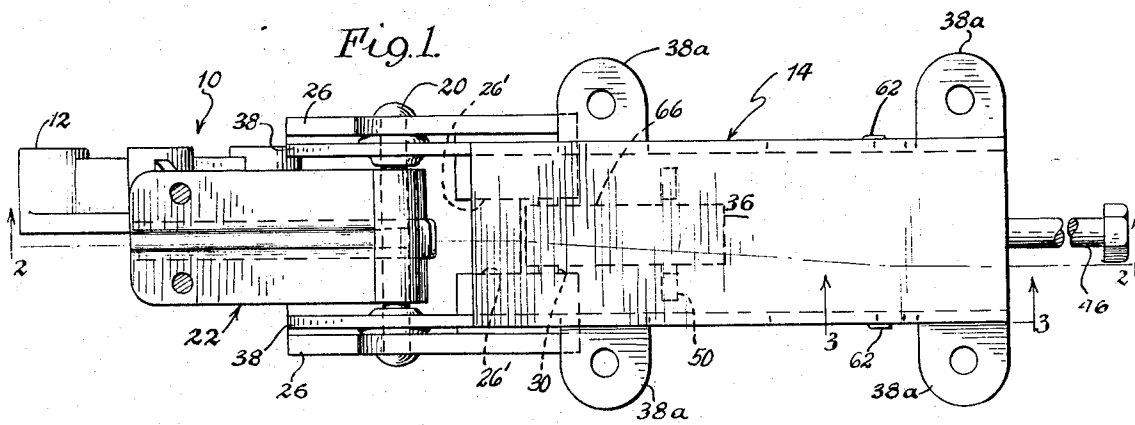
[57] ABSTRACT

A counter balance mechanism including a cabinet mounted stationary hinge part; a movable hinge part pivotally mounted on the stationary hinge part and connected for conjunctive vertical swinging movement with a cabinet lid; and a counter balance assembly including an adjustable compression spring arranged to bear adjacent its opposite ends on the hinge parts for establishing a moment tending to essentially counter balance torque effects of gravity on the lid throughout substantially the whole of the vertical swinging movements thereof.

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8 Claims, 4 Drawing Figures





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Fig. 4.

## LID COUNTERBALANCE MECHANISM

## SUMMARY OF THE INVENTION

The present invention is generally directed towards a mechanism for counter balancing the torque effects of gravity on vertically swinging cabinet lids. More specifically, the mechanism includes a stationary hinge part adapted to be fixed to a cabinet; a movable hinge part mounted on the stationary hinge part for pivotal movement about an essentially horizontally disposed first axis; a compression spring; and an assembly for coupling the spring to the hinge parts to establish a moment tending to counter balance gravity induced torque effects on a cabinet lid with which the movable hinge part is connected for conjunctive vertical swinging movements. The assembly includes a connector having a bore opening; a hinge pin for supporting the connector on the stationary hinge part for relative movement about an axis disposed essentially normal to the bore opening and parallel to the first axis; a constraining member carried for vertical tilting movements relative to the movable hinge part; a bolt having one end extending freely through the constraining member and having another end rotatably supported within the bore opening; and a plate threadedly carried by the bolt adjacent the connector, whereby to permit adjustments of the plate lengthwise of the bolt. The spring is in the form of a coil type compression spring arranged essentially concentrically of the bolt to bear adjacent its opposite ends on the plate and constraining member, such that displacements of the plate effect the degree to which the spring is compressed. The lid to be counter balanced may be carried directly on the movable hinge part. Alternatively, the lid may be independently hinge connected to the cabinet and movably coupled to the movable hinge part.

In accordance with a preferred embodiment, the connector is formed with a guide extension, which is arranged essentially parallel to the rod for sliding engagement with the plate, thereby to permit displacements of the plate to be effected by rotations of the bolt. A preferred construction would additionally feature the provision of a friction brake shoe, which is arranged for frictional engagement with the rod; the brake shoe dampening movements of the movable hinge part as a function of spring compression variations of the spring incident to movable hinge positional changes.

## DRAWINGS

The nature and mode of the present invention will now be more fully described in the following detailed description taken with the accompanying drawings wherein:

FIG. 1 is a top plan view illustrating the mechanism of the present invention employed as a combination lid hinge and counter balance support;

FIG. 2 is a sectional view taken generally along line 2—2 in FIG. 1, but with lids attached;

FIG. 3 is a view taken generally along line 3—3 in FIG. 1; and

FIG. 4 is a sectional view taken generally along line 4—4 in FIG. 2.

## DETAILED DESCRIPTION

Reference is now made particularly to FIGS. 1 and 2, wherein the mechanism of the present invention is generally designated as 10. Mechanism 10 includes a sta-

tionary or base hinge part 12, which is to be suitably fixed to a cabinet, not shown; a movable hinge part 14 for supporting a cabinet opening covering lid 16; a counter balance and motion snubbing assembly 18; and a hinge pin 20 for supporting hinge part 14 on hinge part 12, whereby lid 16 is supported for vertical swinging movements from an essentially horizontally disposed lid closed position into an essentially vertically disposed lid opened position. If desired, a second movable hinge part 22 may also be mounted on hinge pin 20 for the purpose of independently supporting a second or rear service cabinet opening covering lid 24. However, the presence of hinge part 22 or lid 24 is not necessarily a part of the present construction. Also, for any given installation, one or more of mechanisms 10 may be employed, depending on the weight and/or dimensions of lid 16.

As will be apparent from viewing FIGS. 1 and 2, the upper end of stationary hinge part 12 is bifurcated in construction, thereby to define parallel side flange members 26 to which are joined parallel inset side flange members 26'; members 26 being formed with aligned bearing openings for receiving opposite ends of hinge pin 20 and member 26' being formed with aligned bearing openings for receiving opposite ends of a second hinge pin 30. Moreover, rearwardly facing surfaces of flange members 26' are shaped to define shoulder abutments or stops 32, only one being shown in FIG. 2.

Movable hinge part 14 is of generally inverted U-shaped cross sectional configuration including a top or connecting flange portion 36 and a pair of identically configured depending leg flange portions 38. As will be apparent from viewing FIG. 3, leg flange portions 38 are formed adjacent their forward ends with aligned cutouts 40 for use in supporting the front end of assembly 18 whereas the rear ends of the leg flange portions are formed with aligned apertures to receive hinge pin 20 and adapted to engage with shoulder abutments 32 to define the full opening position of lid 16, which is shown in phantom line in FIG. 2. Cutouts 40 are preferably formed with arcuate notches 40a. Hinge part 14 may be suitably fixed to lid 16, as by fastener devices, not shown, which extend through side flanges 38a carried by each of leg flange portions 38, thereby insuring conjunctive vertical swinging movements of the hinge part and lid. However, for installations where the lid is independently supported on the cabinet by a separate hinge, hinge part 14 may be movably coupled to the lid to provide for conjunctive movements.

Assembly 18 is best shown in FIG. 2 as including a coil type compression spring 42, which is arranged concentrically of a stepped-diameter bolt 46 having a screw threaded intermediate portion 48. Spring 42 is arranged to bear adjacent its opposite ends on a spring plate or adjustment nut 50 threaded onto bolt portion 48 and a retainer disc or the like 52; retainer 52 in turn bearing on one end of a resiliently deformable, plastic brake shoe 54, which is arranged concentrically of and in frictional engagement with the front end portion of bolt 46. The forwardly facing end of shoe 54 is arranged in engagement with the converging inner or bearing walls 55 of a through bored, cup shaped member 56, which is in turn received within opening 58 of a U-shaped mounting plate 60 by which assembly 18 is constrained relative to or mounted on hinge part 14. The specific construction of shoe 54 forms no part of

the present invention; such shoe having been previously described in commonly assigned U.S. Pat. No. 3,187,374. It is believed sufficient for the understanding of the present invention to note that the "snubbing" action of shoe 54 on rod 46 dampens movement of lid 16 as a function of the compression variations of spring 42 incident to lid positional changes.

Opposite ends of mounting plate 60 are formed with dimpled ears 62, only one being shown in FIG. 3, which extend outwardly through cutouts 40 for receipt in notches 40a, thereby to support and constrain the forward end of assembly 18 on leg flange portions 38 for relative vertical pivoting or tilting movements. As will be apparent from viewing FIG. 2, bolt 46 passes freely through member 56 and mounting plate opening 58, and thus is free to reciprocate, tilt and undergo rotary adjustment movements relative to hinge part 14. If desired, plate 60 may be formed as an integral part of hinge part 14 and the bolt freed for tilting movements relative thereto by permitting member 56 to tilt within opening 58. Also, a suitable hinge pin arrangement may be employed to pivotally support plate 60.

The rear end portion of bolt 46 is rotatably received with a bore opening 64 formed in a connector 66; the latter being mounted for pivotal movement by second hinge pin 30 thereby serving to constrain assembly 18 relative to hinge part 12. Connector 66 is formed with a guide extension or finger 68 arranged to extend co-directionally with bore opening 64. Spring plate 50 is formed with a top edge opening slot 70, which is dimensioned to slideably receive guide extension 68. This construction is preferred in that it permits rotations of bolt 46 to produce reciprocating movements of plate 50 lengthwise of the bolt for the purpose of adjustably varying the extent to which spring 42 is initially compressed, whereby permitting adjustments of the counterbalancing effect of the mechanism on lid 16. Alternatively, if space considerations permit the insertion of a tool, not shown, for the purpose of constraining rotations of plate 50, guide extension 68 may be dispensed with. Also, if desired, the components of assembly 18 may be reversed, such that connector 66 is through bored to slideably receive rod 46 and plate 60 serves as an end bearing for the rod.

When lid 16 is in its closed position illustrated in full line in FIG. 2, spring 42 is subject to maximum compression, as determined by prior adjustments of spring plate 50; the spring establishing a moment tending to pivot the lid into open position.

The "snubbing action," which is produced by frictional engagement of shoe 54 with rod 46 always opposes movement of lid 16, and thus alternately acts in opposition to and in conjunction with spring 42 during opening and closing movements of the lid, respectively. Thus, the "snubbing" action cooperates with the spring to define a counter balance envelope for the lid. When the gravity produced torque curve of lid 16 falls within its envelope, the lid is "balanced" and prevented from coasting towards either of its open or closed positions. However, when for instance a portion of the torque curve of the lid is disposed about its envelope, as is preferred during the last 10° to 15° of lid closing movement, the lid is not "balanced" and gravity is permitted to force same into a tightly closed position.

In the preferred construction, the moment of spring 42 acting alone is preferably matched as close as possible to the gravity produced torque curve of the lid, and

the "snubbing" action of the brake shoe employed to compensate for any counter balancing deficiencies in the patterning of the spring moment as well as to prevent coasting of the lid. However, when the spring moment can be properly matched with the lid torque curve and/or coasting of the lid is not objectionable, the brake shoe may be eliminated.

I claim:

1. A mechanism for use in counter balancing the weight of a lid supported on a cabinet for vertical swinging movements between closed and open positions, said mechanism comprising;

a stationary hinge part adapted to be fixed to said cabinet;

a movable hinge part;

means for pivotally connecting said movable hinge part to said stationary hinge part for vertical swinging movements relative to said cabinet about an essentially horizontal hinge axis, said movable hinge part being adapted to be coupled to said lid for conjunctive vertical swinging movements when said movable hinge part is swung about said hinge axis;

first and second constraining means supported for vertical pivotal movements on said stationary hinge part and said movable hinge part, respectively;

a bolt carried by said first and second constraining means to extend essentially transversely of said hinge axis, one of said first and second constraining means providing a rotary end bearing support for one end of said bolt, an other of said first and second constraining means providing a rotary and slide support for an other end of said bolt, said bolt having a screw threaded portion arranged intermediate said first and second constraining means;

a plate member threadedly received on said bolt threaded portion; and

a compression spring arranged to bear adjacent opposite ends thereof on said plate member and said other of said first and second constraining means, whereby movement of said plate member axially of said bolt threaded portion varies compression of said spring, said spring establishing a moment tending to at least substantially counter balance the torque effects of gravity on said lid throughout substantially the whole of the vertical swinging movements thereof.

2. A mechanism according to claim 1, wherein said movable hinge part is adapted to be fixedly connected to said lid.

3. A mechanism according to claim 1, wherein friction means are provided for dampening movements of said movable hinge part as a function of compression variations of said spring incident to movable hinge part positional changes, said friction means bearing in engagement with said bolt and being arranged intermediate for engagement by said spring and said other of said first and second constraining means.

4. A mechanism according to claim 1, wherein said one of said first and second constraining means includes a guide projection arranged to extend essentially parallel to said bolt, and said guide projection constrains said plate member from rotation, whereby upon rotations of said bolt said plate member is moved axially of said bolt.

5. A mechanism according to claim 1, wherein said one of said first and second constraining means is said first constraining means.

6. A mechanism according to claim 1, wherein said one of said first and second constraining means constrains said plate member from rotation relative thereto, whereby upon rotation of said bolt relative to said first and second constraining means said plate member is moved axially of said bolt to vary compression of said spring.

7. A mechanism for use in counter balancing the weight of a lid supported on a cabinet for vertical swinging movements between closed and open positions, said mechanism comprising:

a stationary hinge part adapted to be fixed to said cabinet;

a movable hinge part;

means for pivotally connecting said movable hinge part to said stationary hinge part for vertical swinging movements relative to said cabinet about an essentially horizontal hinge axis, said movable hinge part being adapted to be coupled to said lid for conjunctive vertical swinging movements when said movable hinge part is swung about said hinge axis;

first and second constraining means supported for vertical pivotal movements on said stationary hinge part and said movable hinge part, respectively;

a bolt carried by said first and second constraining means to extend essentially transversely of said hinge axis, one of said first and second constraining means providing a rotary end bearing support for one end of said bolt, an other of said first and second constraining means providing a rotary and slide support for an other end of said bolt and defining a bearing surface;

friction means arranged for frictional engagement with said bolt, said friction means having one end thereof arranged in engagement with said bearing surface;

plate means fixed to said bolt adjacent said one end of said bolt for adjustable movements axially thereof; and

a compression spring arranged to bear adjacent opposite ends thereof on said plate means and an opposite end of said friction means whereby said friction means is biased into engagement with said bearing surface and directed thereby into frictional surface engagement with said bolt and whereby adjustable movements of said plate means axially of said bolt varies compression of said spring, and said spring and said friction means cooperating to es-

ablish a moment for counter balancing the torque effects of gravity on said lid throughout substantially the whole of the vertically swinging movements thereof.

8. A mechanism for use in counter balancing the weight of a lid supported on a cabinet for vertical swinging movements between closed and open positions, said mechanism comprising:

a stationary hinge part adapted to be fixed to said cabinet;

a movable hinge part;

means for pivotally connecting said movable hinge part to said stationary hinge part for vertical swinging movements relative to said cabinet about an essentially horizontal hinge axis, said movable hinge part being adapted to be coupled to said lid for conjunctive vertical swinging movements when said movable hinge part is swung about said hinge axis;

first and second constraining means supported for vertical pivotal movements on said stationary hinge part and said movable hinge part, respectively;

a bolt carried by said first and second constraining means to extend essentially transversely of said hinge axis, one of said first and second constraining means being formed with a bore opening for rotatively receiving one end of said bolt and forming an end bearing support therefor, an other of said first and second constraining means providing a rotary and slide support for an other end of said bolt, said bolt having a screw threaded portion arranged intermediate said first and second constraining means;

a plate member threadedly received on said bolt threaded portion, said one of said first and second constraining means slidably engaging said plate member for constraining said plate member for rotation relative thereto, whereby upon rotation of said bolt said plate member is forced to move axially of said bolt threaded portion; and

a compression spring arranged to bear adjacent opposite ends thereof on said plate member and said other of said first and second constraining means, whereby movement of said plate member axially of said bolt threaded portion varies compression of said spring, said spring establishing a moment tending to at least substantially counter balance the torque effects of gravity on said lid throughout substantially the whole of the vertical swinging movements thereof.

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