United States Patent [19]

Little

[11] **3,737,947**

[45] **June 12, 1973**

[54] **TWO LID COUNTERBALANCE MECHANISM**

[75] Inventor: **Carl H. Little,** Jamestown, N.Y.

[73] Assignee: **Weber-Knapp Company,** Jamestown, N.Y.

[22] Filed: **Dec. 13, 1971**

[21] Appl. No.: **207,141**

[52] **U.S. Cl.** **16/190,** 16/145

[51] **Int. Cl.** **E05f 1/12**

[58] **Field of Search** ..... 16/190, 180, 145, 16/146, 191, 85, 1 C, 71

[56] **References Cited**

UNITED STATES PATENTS

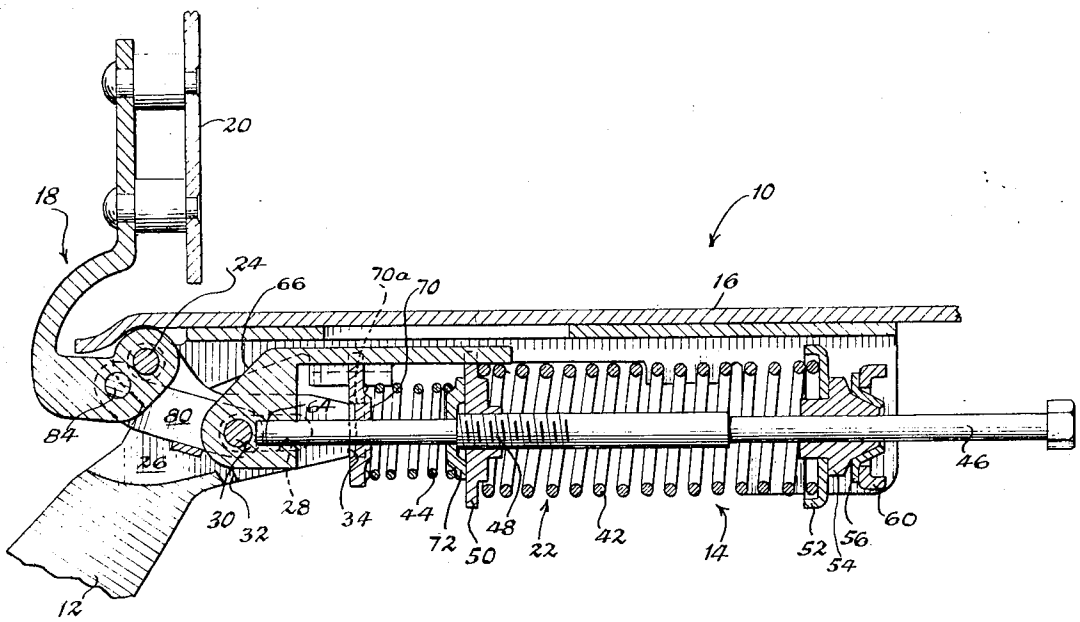
1,645,977	10/1927	Titus	16/190
3,187,374	6/1965	Lundell	16/190

Primary Examiner—James T. McCall
Assistant Examiner—Doris L. Troutman
Attorney—John B. Bean, Edwin T. Bean and R. Craig Kauffman et al.

[57] **ABSTRACT**

A cover mounting combination hinge and counterbalance mechanism, wherein two lids or covers may be carried and counterbalanced by a single mechanism.

7 Claims, 7 Drawing Figures



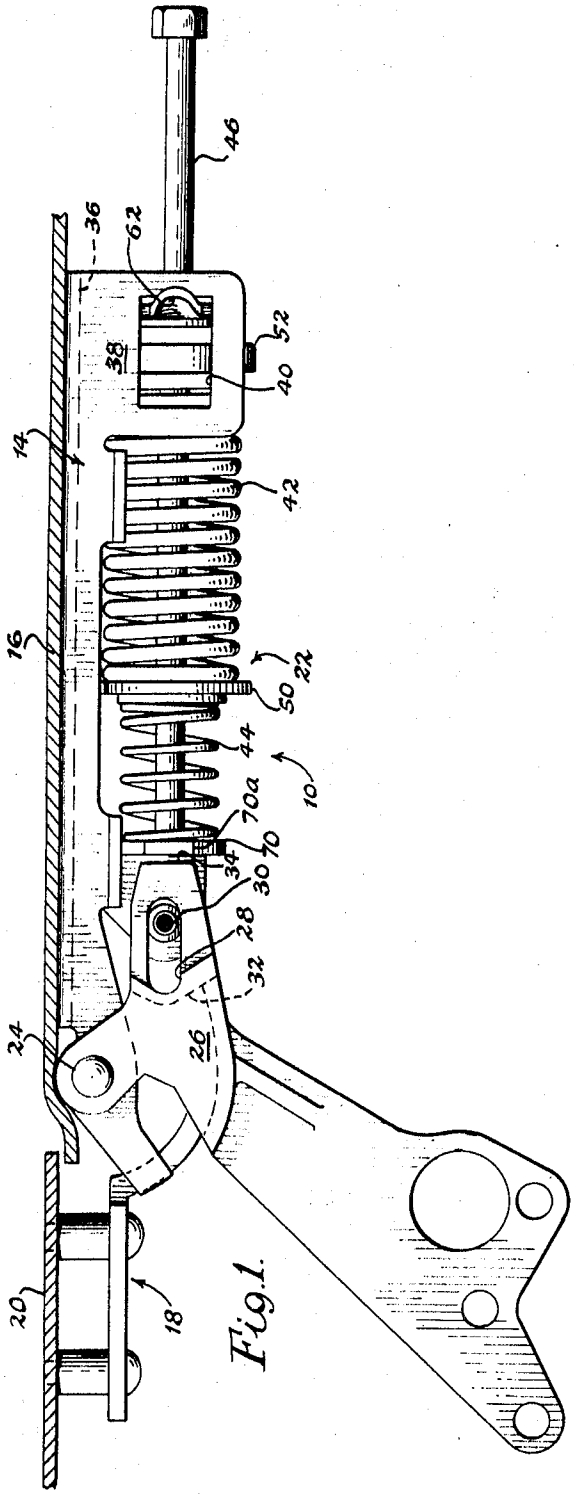


Fig. 1.

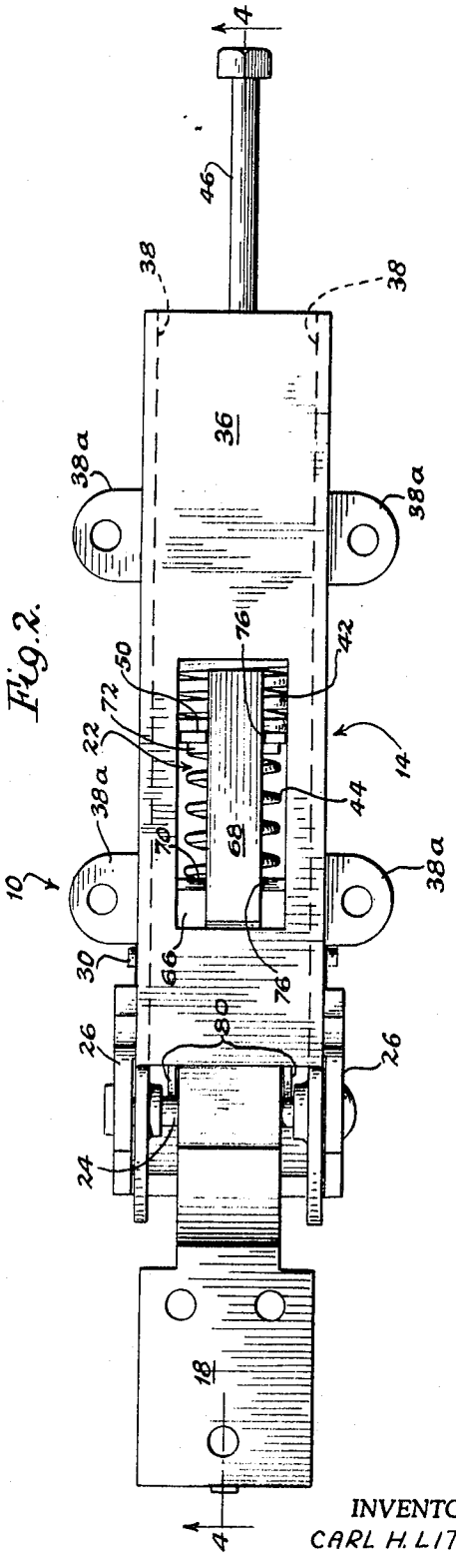


Fig. 2.

INVENTOR.
CARL H. LITTLE

BY

Dean & Dean
ATTORNEYS

Fig. 5

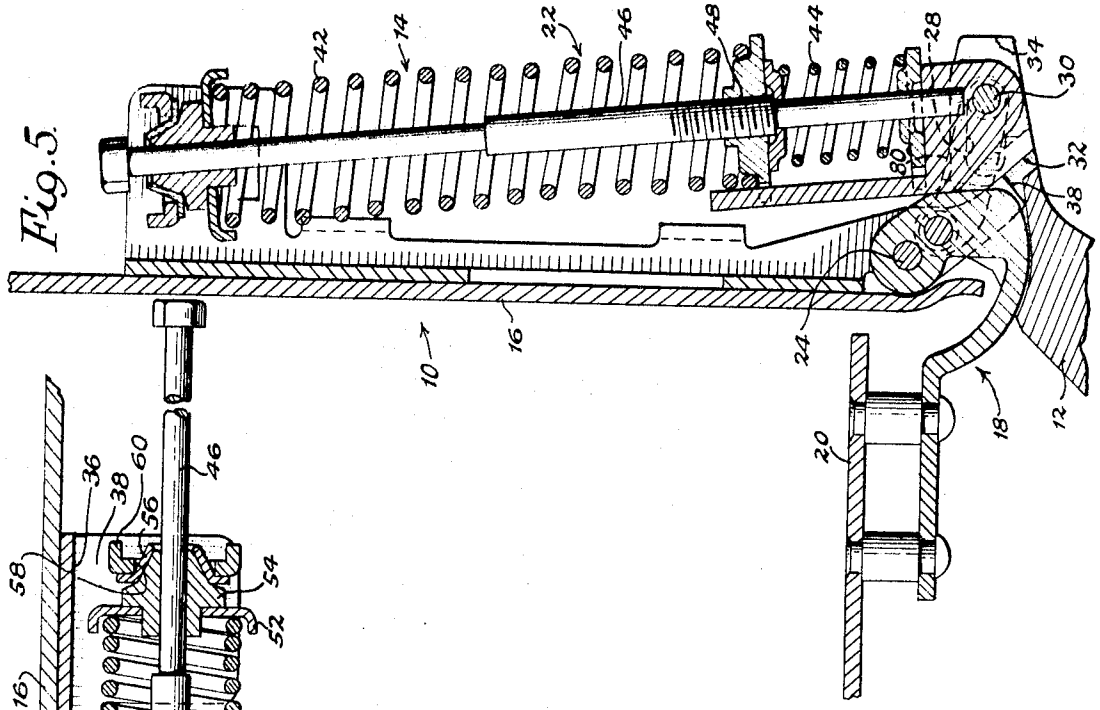


Fig. 4

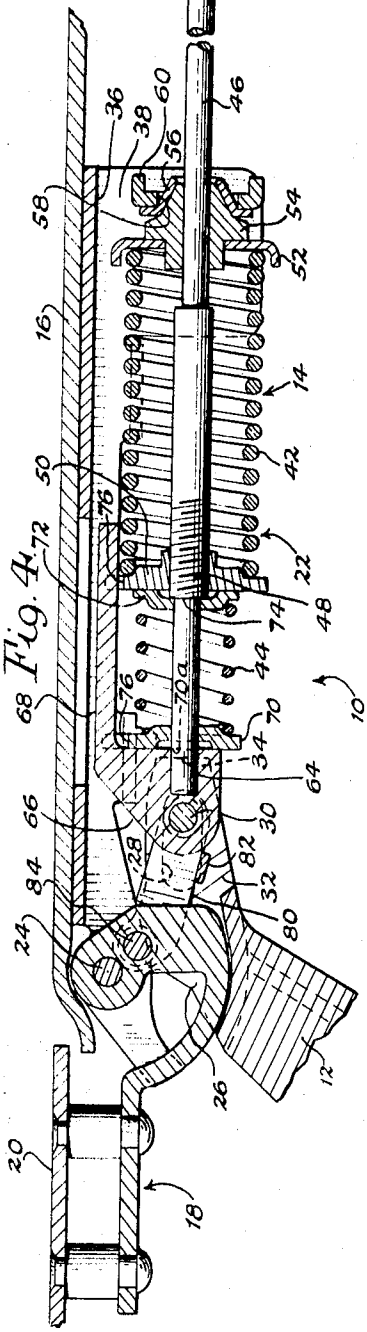
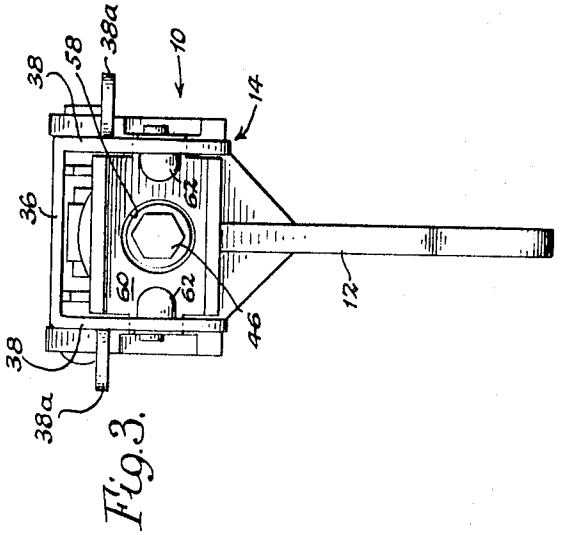


Fig. 3



INVENTOR.
CARL H. LITTLE

BY

Bean & Bean
ATTORNEYS

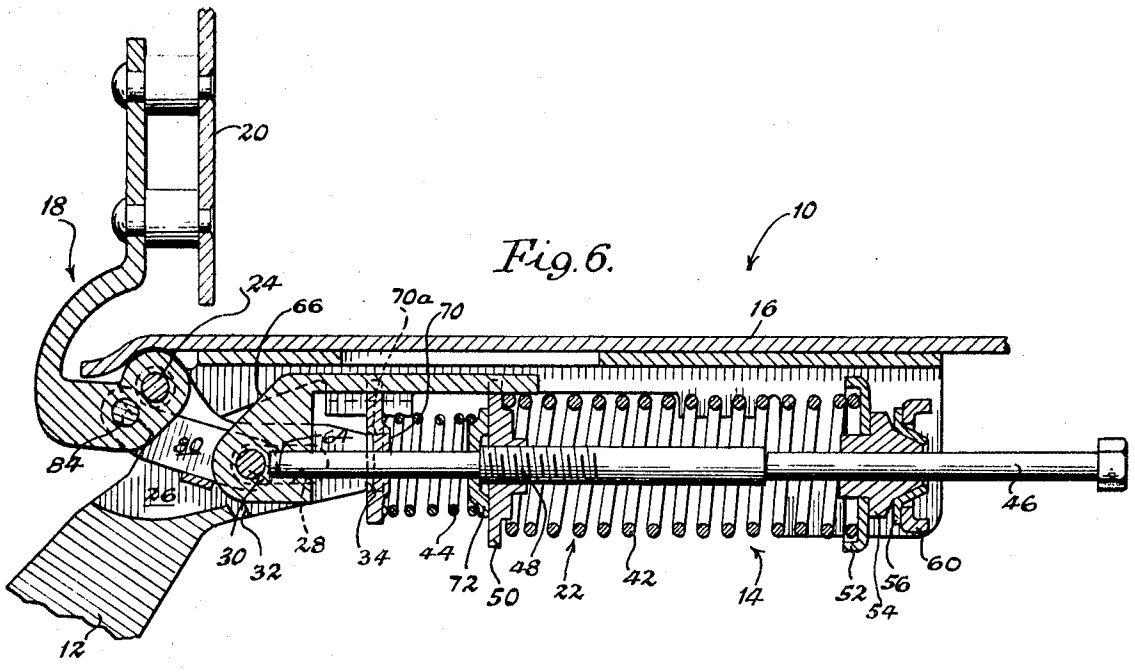
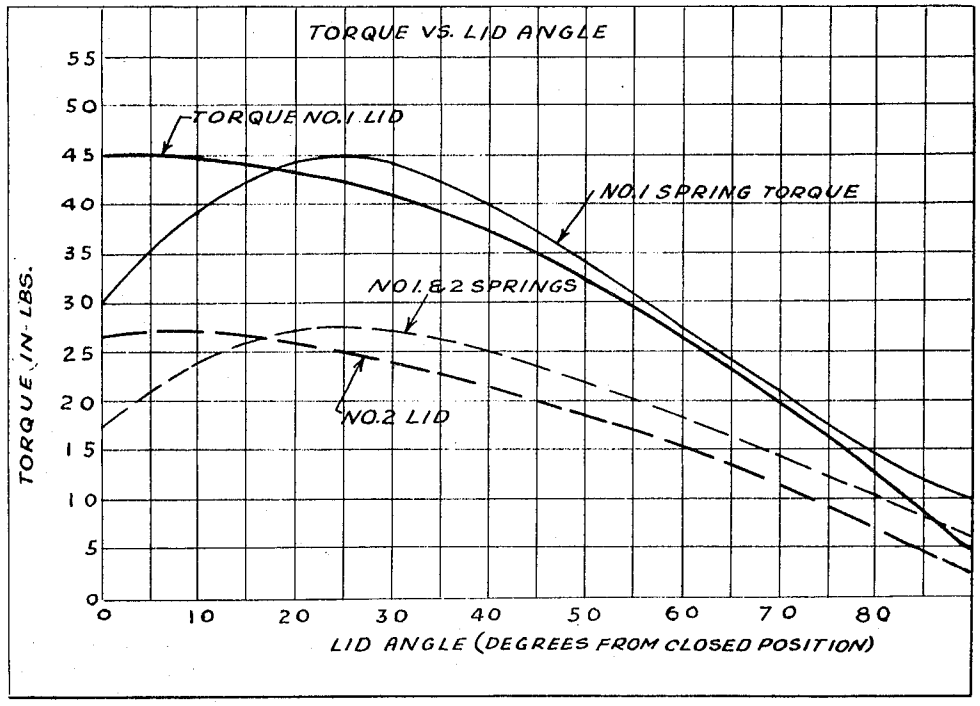


Fig. 6.

Fig. 7.



INVENTOR.
CARL H. LITTLE

BY

Beaur Beau
ATTORNEYS

TWO LID COUNTERBALANCE MECHANISM

SUMMARY OF THE INVENTION

The present invention is primarily directed towards a mechanism adapted to hingedly support a pair of lids on a cabinet for swinging movement in opposite directions between horizontally disposed closed and vertically disposed open positions, wherein the torque effects of gravity on the lids may be counterbalanced.

In the preferred form of the present invention, both lids are counterbalanced and their swinging movements dampened by a common friction device. Counterbalancing of lids having substantially varying gravity induced torque effects, due to weight and/or size considerations, may be effected by employing a pair of coil type compression springs, wherein a first spring is employed to counterbalance a first or relatively heavy lid and both springs working in opposition to one another are employed to counterbalance a second or relatively lightweight lid.

While the cover mounting combination hinge and counterbalance mechanism of the present invention will be primarily described with reference to a two lid construction, it will be understood that the mechanism incorporates novel features having utility in a single lid construction.

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 side elevational view of the preferred embodiment of the lid mounting combination hinge and counterbalance mechanism of the present invention;

FIG. **2** is a top plan view thereof;

FIG. **3** is a front elevational view thereof;

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

FIG. **5** is a view similar to FIG. **4**, but showing the first lid in open position;

FIG. **6** is a view similar to FIG. **4**, but showing the second lid in open position; and

FIG. **7** is a graphical comparison of the torque effect curves of the lids and the mechanism of the present invention without snubbing effects.

DETAILED DESCRIPTION

Reference is now made particularly to FIGS. **1–3**, wherein the lid mounting combination hinge and counterbalance mechanism of the present invention is generally designated as **10.** Mechanism **10** includes a stationary or base hinge part **12,** which is to be suitably fixed to a cabinet, not shown; a first moveable hinge part **14** for supporting a first or front cabinet opening covering lid **16**; a second moveable hinge part **18** for supporting a second or rear service cabinet opening covering lid **20**; a counterbalance and motion snubbing assembly **22**; and a single hinge pin **24** for simultaneously supporting hinge parts **14** and **18** on hinge part **12,** whereby lids **16** and **20** are supported for independent vertical swinging movements in opposite directions from essentially horizontally disposed lid closed positions into essentially vertically disposed lid opened positions. For any given installation, one or more of mechanisms **10** may be employed, depending on the weights and/or dimensions of lids **16** and **20.**

As will be apparent from viewing FIGS. **1, 2** and **4,** the upper end of stationary hinge part **12** is bifurcated in construction, thereby to define parallel side flange members **26,** which are formed with aligned bearing openings for receiving opposite ends of hinge pin **24** and aligned horizontally elongated slot openings **28** for receiving opposite ends of a second hinge pin **30.** Moreover, facing surfaces of flange members **26** are shaped to define shoulder abutments or stops **32,** only one being shown in FIGS. **4–6**; and front end edge surfaces of flange members **26** define abutments or stops **34.**

First hinge part **14** is best shown in FIGS. **1–3** as being 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.** Leg flange portions **38** are formed adjacent their forward ends with aligned cutouts **40** for use in supporting the front end of assembly **22**; whereas the rear ends of the leg flange portions are formed with aligned aperatures to receive hinge pin **24** and adapted to engage with shoulder abutments **32** to define the full opening position of lid **16.** First hinge part **14** may be suitably fixed to lid **16,** as by fastener devices, not shown, which extend through side flanges **38***a* carried by each of leg flange portions **38.**

Assembly **22** is best shown in FIGS. **4–6** as including first and second coil type compression springs **42** and **44,** respectively, which are 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 cup retainer **52**; cup 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 engagment with the converging inner or bearing walls of a through bored, cup shaped member **56,** which is in turn received within opening **58** of a U-shaped mounting plate **60.** 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.

As best shown in FIGS. **1** and **3,** opposite ends of mounting plate **60** are formed with dimpled ears **62,** which extend outwardly through cutouts **40** and serve to support the forward end of assembly **22** on leg flange portions **38** for relative vertical pivoting or tilting movements. As will be apparent from viewing the drawings, 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 first hinge part **14.**

The rear end portion of bolt **46** is rotatably received with a bore opening **64** formed in a connector **66**; the latter being pivotally mounted by second hinge pin **30** and formed with a guide extension or finger **68** arranged to extend co-directionally with bore opening **64.**

Again referring to FIGS. **4–6,** it will be seen that spring **44** is arranged to bear adjacent its opposite ends on a stop plate **70,** which normally lies in engagement with connector **66,** and on a washer **72,** which lies in engagement with bolt shoulder **74** adjacent threaded portion **48**; stop plate **70** and washer **72** being aper-

tured to freely receive bolt **46.** Both stop plate **70** and spring plate **50** are formed with top edge opening slots **76,** which are dimensioned to slidably receive guide extension **68.** The construction is such that upon rotations of bolt **46** with mechanism **10** in its inoperative or lid closed condition shown in FIG. **4,** spring plate **50** is constrained by guide extension **68** for reciprocating movements lengthwise of the bolt for the purpose of varying the extent to which spring **42** is initially compressed, whereby permitting adjustments of its counterbalancing effects on both of lids **16** and **20.** It will be appreciated that in the preferred form of the invention, adjustments of spring **42** do not directly effect spring **44,** and that spring **44** is subject to compression stress only during opening and closing movements of lid **20** after stop plate tabs **70a** have been placed in constrained engagement with stops **34.**

Again referring to FIGS. **2,** and **4–6,** it will be understood that in the preferred form of the invention connector **66** is also coupled to hinge part **18** by means of a pair of parallel links **80,** which are joined intermediate their ends by a cross piece **82.** Specifically, forward ends of links **80** are pivotally supported relative to connector **66** by second hinge pin **30,** whereas the rearward ends of the links are pivotally supported by a third hinge pin **84** carried by second hinge part **18.** In this construction, hinge pins **24, 30** and **84** are maintained essentially parallel.

Operation of mechanism **10** will now be described with reference to FIGS. **4–7.** With both of lids **16** and **20** in their closed positions illustrated in FIG. **4,** spring **42** is subject to maximum compression, as determined by prior adjustments of spring plate **50,** and spring **44** is preferably loose or in a non-compressed state. The moments produced by spring **42** are however, less than the torque effects of gravity on lids **16** and **20,** as indicated in FIG. **7,** and thus the lids are normally maintained by gravity in a tightly closed condition.

When it is desired to open lid **16,** an operator must initially apply sufficient lifting force to counterbalance gravity induced torque effects not compensated for by spring **42,** until a lid open angle of about 5°–15° is reached. Thereafter, the variable moment produced by spring **42** is sufficient to completely counterbalance the progressively decreasing lid torque until upward movement of the lid is arrested by engagement of leg flange portions **38** with shoulder abutments **32,** as shown in FIG. **5.** Throughout the range of movements of lid **16,** second hinge pin **30** is maintained adjacent the front end of slots **28** by the weight of lid **20** acting through hinge part **18** and links **80.**

When it is desired to open lid **20,** an operator must again initially apply sufficient lifting force to counterbalance gravity induced torque effects not compensated for by spring **42** until a lid open angle of between about 5° and 15° is reached; spring **44** being ineffective until stop plate tabs **70*a*** are moved into engagement with stops **34,** as a result of rearward movement of connector hinge pin **30** within slots **28.** Thereafter the variable moment produced by springs **42** and **44** working in opposition is sufficient to counterbalance the lid. By employing springs **44** of various spring constants and by varying the point at which stop plate tabs **70*a*** engage stops **34** during opening movement of lid **20,** the counterbalance curves may be precisely tailored to the torque curves of both lids, even though the weight of lid **16** may be considerably in excess of that of lid **20.** During opening movements of lid **20,** the weight of lid **16** maintains the front end of assembly **22** relatively stationary and second hinge pin **30** is permitted to move rearwardly within slots **28** until it engages the rear ends of such slots, thereby to define the full open position of lid **20.** As a practical matter, in the arrangement illustrated lids **16** and **20** may not be raised simultaneously.

While the effect of "snubbing action," which is produced by frictional engagement of shoe **54** with rod **46,** on the spring torque curves is not depicted in FIG. **7,** it will be understood by reference to above-mentioned U.S. Pat. No. 3,187,374, that such "snubbing" action always opposes movement of the lids. Thus, the "snubbing" action cooperates with the springs to define a counterbalance envelope for each of the lids. When the torque curve of a given lid falls within its associated envelope it 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 a given lid is disposed about its associated envelope, as is preferred during the last degrees of lid closing movement, the lid is not "balanced" and gravity is permitted to force same into a tightly closed position.

Various modifications of the present mechanism are anticipated including the deletion of spring **44** in cases where lids **16** and **20** have similar moments or torque curves. Further, in cases where lid **20** is seldom used or is extremely lightweight, counterbalancing thereof may be dispensed with by deleting links **80** and modifying the base hinge part to prevent lateral displacements of second hinge pin **30.** Moreover, for single lid installations, hinge part **18** may be completely dispensed with.

I claim:

1. A combination counter balance and hinge mechanism for supporting a pair of lids on a cabinet for vertical swinging movements in opposite directions between essentially horizontal closed and essentially vertical open positions, said mechanism comprising:

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

a first movable hinge part adapted to carry a first of said lids;

a second movable hinge part adapted to carry a second of said lids;

means for pivotally connecting said first and second hinge parts to said stationary hinge part whereby to permit independent vertical swinging movements of said lids in opposite directions;

a counter balance assembly; and

means coupling opposite ends of said assembly to said first and second hinge parts, said assembly establishing first and second moments tending to counterbalance the torque effects of gravity on said first and said second lids, respectively, throughout at least a substantial portion of the vertical swinging movements thereof.

2. A mechanism according to claim **1,** wherein the torque effect of gravity on said first lid is greater than on said second lid; and said assembly includes a pair of compression springs, a first of said springs establishing said first moment, and said first and second springs working in opposition establishing said second moment.

3. A mechanism for use in counterbalancing first and second lids supported for vertical swinging movements in opposite directions relative to a cabinet between es-

sentially horizontal closed and essentially vertical open positions, said mechanism comprising:

a stationary hinge part;

a first movable hinge part;

a second movable hinge part;

hinge pin means for pivotally connecting said first and second hinge parts to said stationary hinge part whereby to permit independent vertical swinging movement thereof in opposite directions, said first and second hinge parts being coupled to said first and second lids respectively for conjunctive vertical swinging movements when said first and second hinge parts are swung relative to said stationary hinge part as aforesaid;

an elongated bolt extending transversely of said hinge pin means;

first means for providing a slide support for one end of said bolt while permitting relative vertical swinging movements of said one end relative to said first hinge part;

second means for providing an end bearing support for another end of said bolt while permitting relative vertical swinging movements of said other end relative to said second hinge part;

means carried by said bolt intermediate the ends thereof;

a first compression spring disposed about said bolt to bear adjacent opposite ends thereof on said bolt carried means and said first means, whereby to continuously maintain said first compression spring in a compressed state;

a second compression spring disposed about said bolt intermediate said second means and said bolt carried means and being maintained thereby in no more than a minimum state of compression;

stop means positioned for engagement by said second compression spring upon vertical swinging movement of said second part from said horizontal position whereby to effect compression of said second spring intermediate said stop means and said bolt carried means, said first compression spring establishing a first moment tending to counterbalance gravity induced torque effects on said first lid during vertical swinging movements thereof, and said first and second compression springs working in opposition establishing a second moment tending to counterbalance gravity induced torque effects on said second lid during vertical swinging movements thereof.

4. A mechanism according to claim **3**, wherein said first and second lids are fixedly carried by said first and second movable hinge parts, and said hinge pin means is a single hinge pin.

5. A mechanism according to claim **4**, wherein said second means includes a connector member forming an end bearing support for said other end of said bolt, first pivot pin means, slot means defined by said stationary hinge part, said slot means extending transversely of said hinge pin means and slideably and rotatably receiving said first pivot pin means, second pivot pin means, and link means, said first and second pivot pin means pivotally connecting opposite ends of said link means to said connector member and said second hinge part for relative vertical swinging movement.

6. A mechanism according to claim **3**, wherein said bolt carried means includes first and second members, said first member being arranged in bearing engagement with said first compression spring and being threadably carried by said bolt for movement lengthwise thereof whereby to adjustably vary the compression of said first compression spring, said second member being arranged for engagement with said second compression spring and constrained by said bolt for movements lengthwise thereof towards said first member, and said second means end supports said bolt for rotation relative thereto about an axis extending lengthwise of said bolt.

7. A mechanism according to claim **6**, wherein said first and second lids are fixedly carried by said first and second movable hinge parts, said hinge pin means is a single hinge pin, said second means includes a connector member forming an end bearing support for said other end of said bolt, first pivot pin means, slot means defined by said stationary hinge part, said slot means extending transversely of said hinge pin means and slidably and rotatably receiving said first pivot pin means, second pivot pin means, and link means, said first and second pivot pin means pivotally connecting opposite ends of said link means to said connector member and said second hinge part for relative vertical swinging movement.

* * * * *