Aug. 25, 1964 L. MAYON ETAL 3,146,047

SUPPORTING APPARATUS

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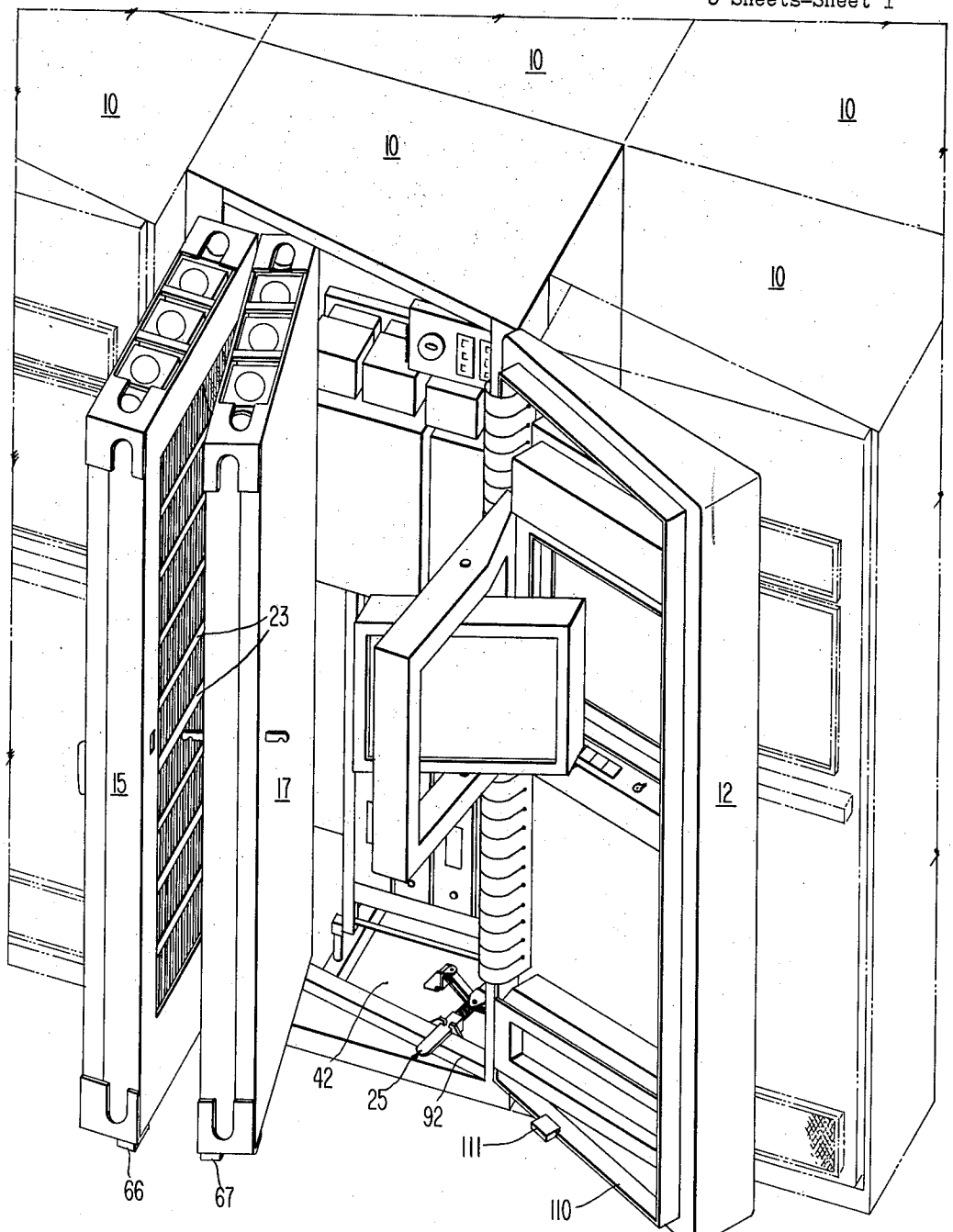


Fig. 1

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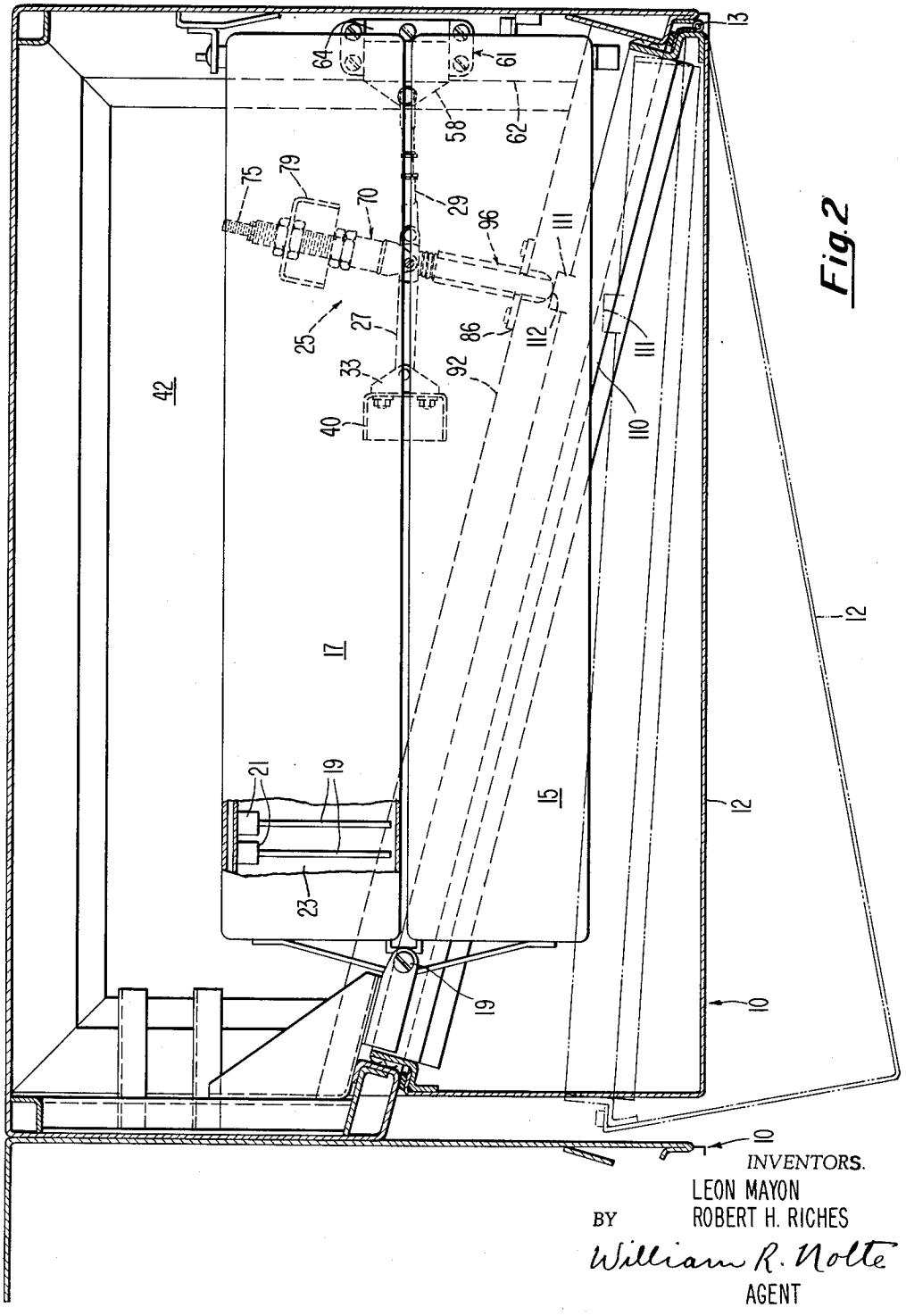


Fig.2

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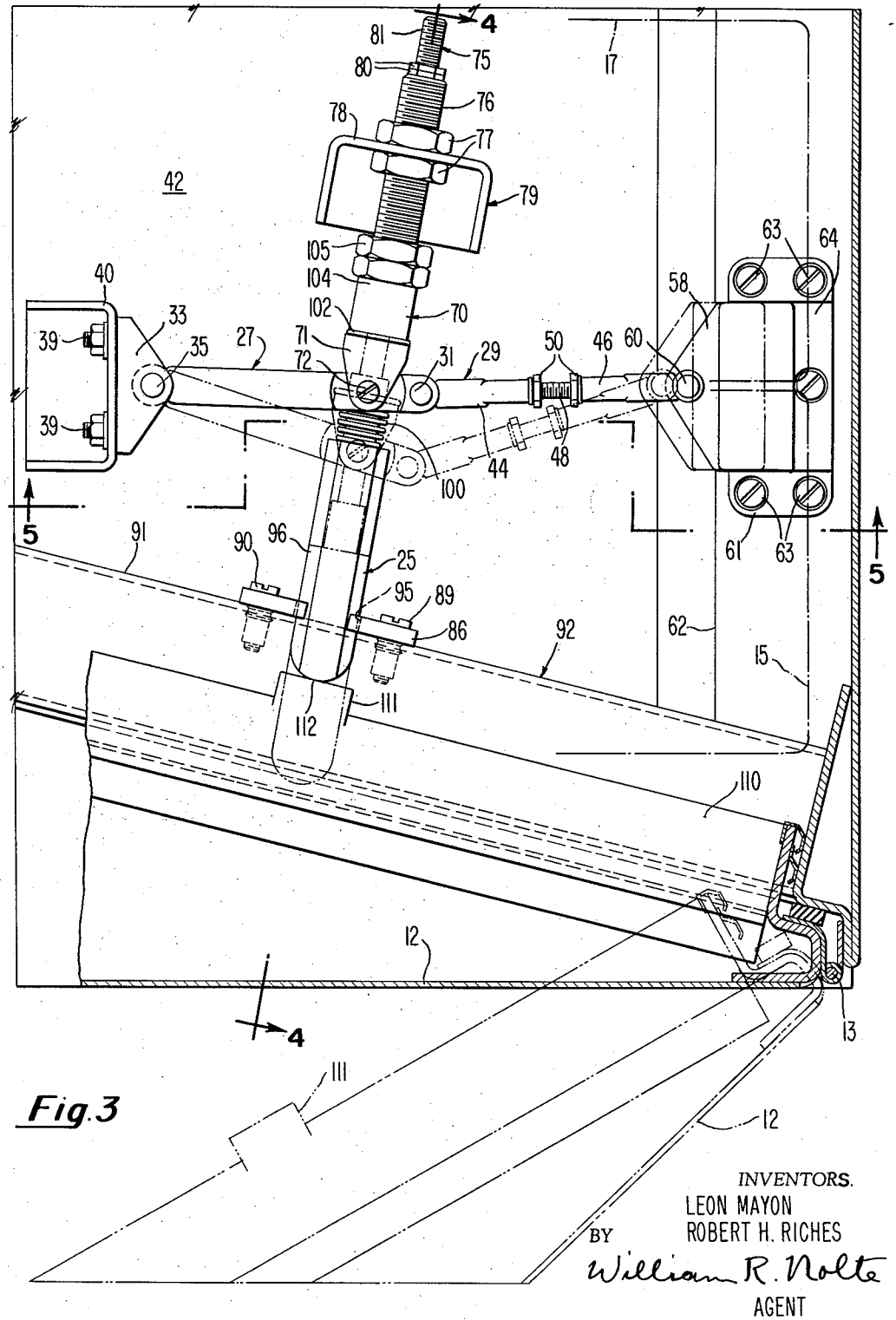


Fig. 3

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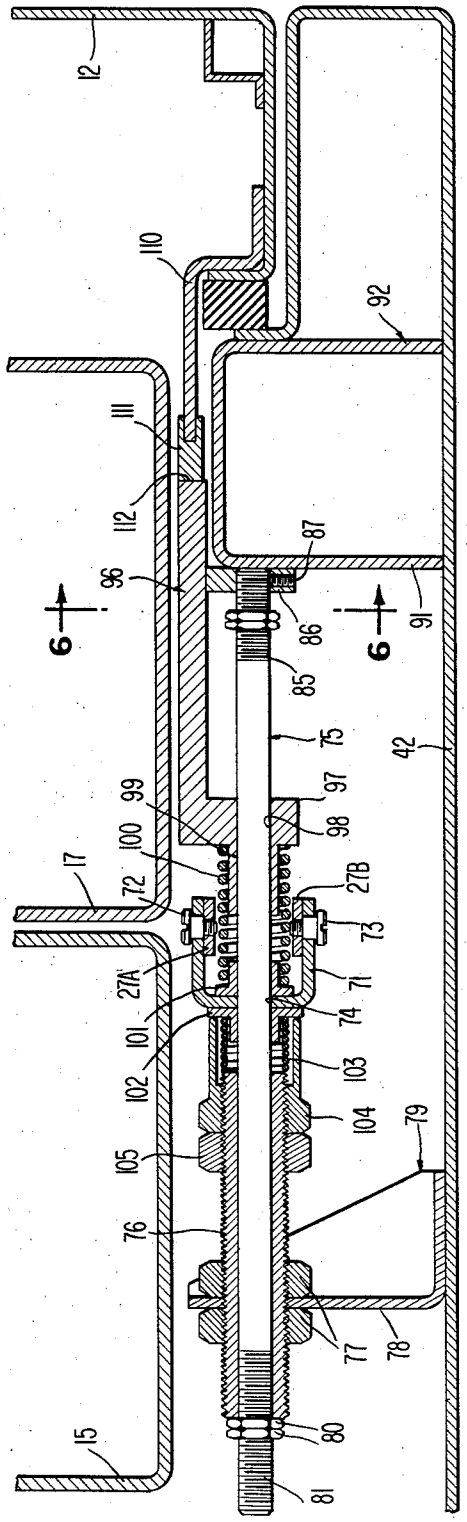


Fig.4

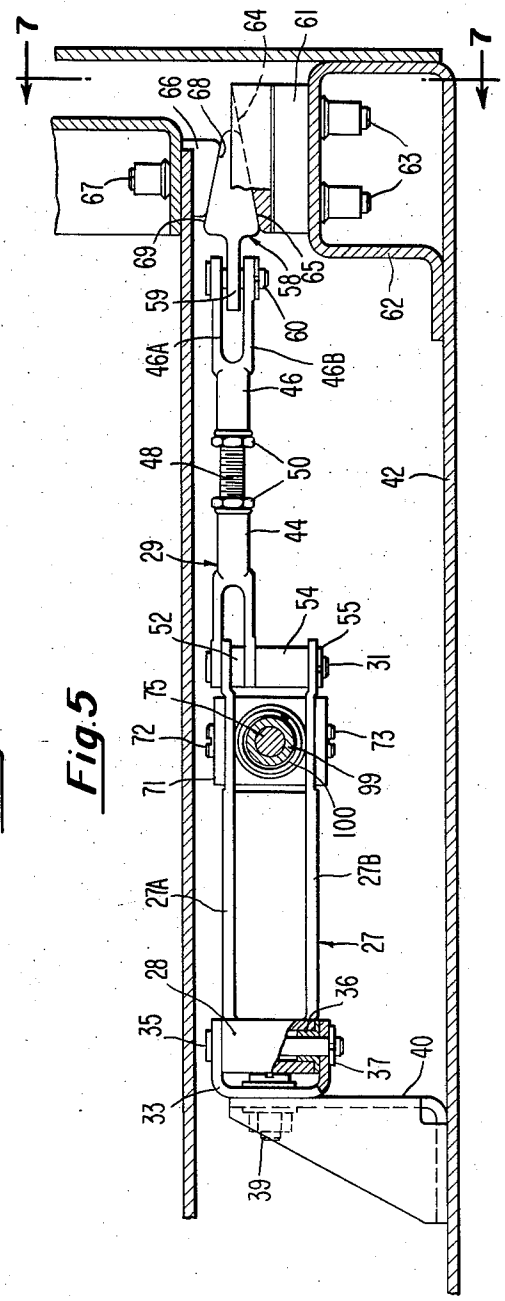


Fig.5

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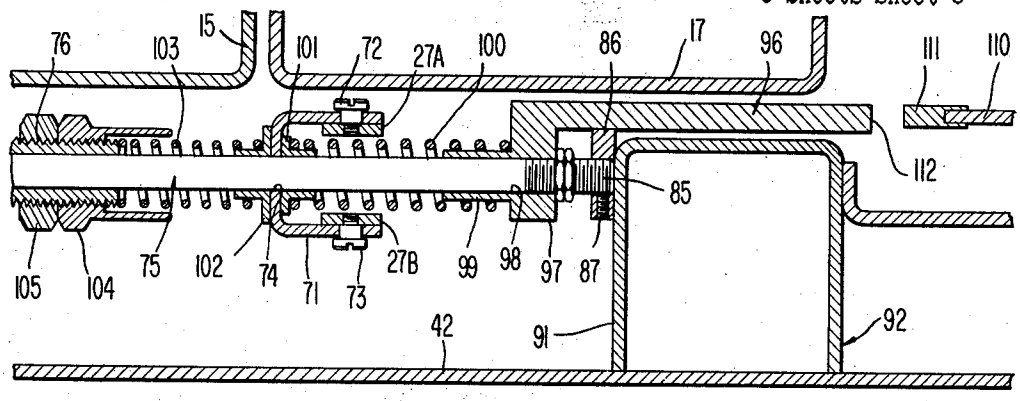


Fig.8

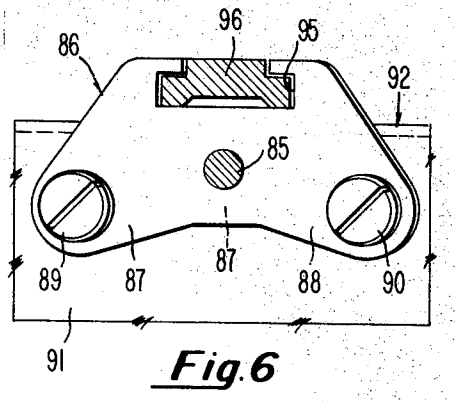


Fig.6

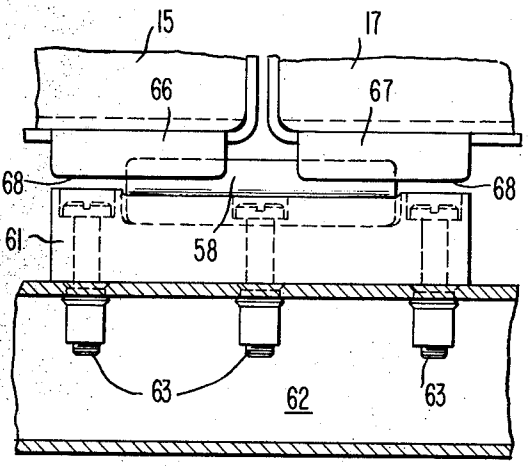


Fig.7

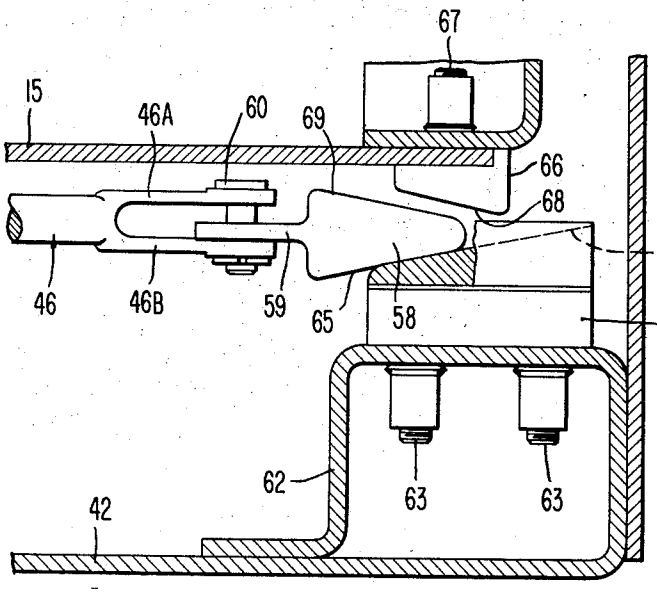


Fig.9

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3,146,047

SUPPORTING APPARATUS

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Filed Aug. 15, 1962, Ser. No. 217,009
14 Claims. (Cl. 312—319)

This invention relates to supporting apparatus, and more particularly to supporting apparatus for securing hinged rack assemblies within cabinets employed to house computer systems in their naturally hung positions.

It has been found convenient in certain instances to house present day computer systems of large size and complexity in a series of cabinets disposed in side-by-side and back-to-back arrangement. When so disposed, access to such cabinets has been by means of a door hinging open from the front of each cabinet. In addition, because of the multiplicity of electrical components required, it has been found desirable to house the latter in rack assemblies which may likewise be hinged about another axis within each cabinet. The electrical components within each such rack assembly may include a large number of printed circuit cards having multiple electrical contacts which are received in mating female electrical sockets and mounted upon supporting rails within the assemblies. Due to the combined weight of the structural frame members and the many electrical components housed therein, the assemblies if unsupported over long periods of time tend to become distorted and in some instances to cause separation of the multiple electrical contacts from their mating receptacles.

It is an object of this invention, therefore, to provide improved supporting apparatus for such rack assemblies which avoids one or more of the disadvantages of the prior art arrangements.

Other objects of our invention will be set forth in the following description and drawings, which illustrate a preferred embodiment thereof, it being understood that the above statement of the objects of the invention is intended generally to explain the same without limiting it in any manner.

FIGURE 1 is a perspective view showing a plurality of cabinets in side-by-side and back-to-back arrangement with one of the cabinets in its open position and illustrating the general placement of the apparatus of the present invention therein;

FIGURE 2 is a plan view of one of said cabinets in its closed position, partially in section, with the topmost portion of the cabinet removed;

FIGURE 3 is an enlarged plan view, partially in section, showing a lower portion of one of the cabinets employing the supporting apparatus of the present invention;

FIGURE 4 is a sectional view taken along the line 4—4 of FIGURE 3;

FIGURE 5 is an elevational view of the apparatus partially in section taken along the line 5—5 of FIGURE 3;

FIGURE 6 is a sectional view taken along the line 6—6 of FIGURE 4;

FIGURE 7 is a sectional view taken along the line 7—7 of FIGURE 5;

FIGURE 8 is a sectional view similar to FIGURE 4 showing the apparatus in its inoperative position;

FIGURE 9 is a sectional view similar to FIGURE 5 and showing a portion of the lifting apparatus, greatly enlarged, in its inoperative position.

Referring to FIGURES 1 and 2, a series of cabinets **10** are illustrated in side-by-side and back-to-back arrangement, with the front panel **12** of one of the cabinets shown in its open hinged position about pivot **13**. A plurality of rack assemblies **15**, **17**, hinged about a common axis **19** are disposed along an edge of the cabinet

opposite to that about which front panel **12** swings. The rack assemblies **15**, **17**, by way of example as shown in FIGURE 2 include a plurality of printed circuit cards **19**, of conventional construction, and having electrical contacts along marginal edges which are received in female socket blocks **21**. Top and bottom edge portions of the cards may be supported between rails **23**, FIGURE 1, extending transversely of the rack assemblies. Upon the latter assemblies being allowed to stand for long periods of time in their open or unsupported positions as seen in FIGURE 1, the electrical connections between the printed circuit cards and their sockets may become loosened and hence produce faulty electrical connections therebetween due to the distortion or sag of the structural frames of the assemblies about the hinge axis **19**.

In order to support said rack assemblies in their naturally hung positions in a manner to avoid such distortion and consequent disadvantages when the rack assemblies are in their normally closed positions as illustrated in FIGURES 2 and 4, the apparatus of the present invention indicated by reference character **25** is provided. A plan view of a preferred embodiment of the invention illustrated in FIGURE 3, is shown as including a plurality of interconnected link assemblies **27** and **29**, pivotally connected one to the other by means of pivot **31**. Link assembly **27** includes upper and lower link plates **27A**, **27B** secured to bushing **28**, FIGURE 5. The end of link assembly **27** remote from pivot **31** and containing bushing **28**, is received within a U-shaped bearing plate **33** for pivotal movement relative thereto. The latter pivot includes a pin **35**, bushing **36**, and a locking ring **37**. The U-shaped bearing plate **33**, and the connection carried thereby, is permanently secured in its location by bolts **39**, to an upright flange of angle bracket **40** which extends from the base panel or floor **42** of the cabinet. The other previously referred to link assembly **29** is shown as consisting of a pair of clevises **44**, **46** which are interconnected to each other by threaded rod **48** and check nuts **50**. The pivotal connection **31** joins the forked end of clevis **29** to link assembly **27**, and includes upper and lower spacers **52**, **54**, and lock ring **55**. The other corresponding clevis **46** receives tongue portion **59** of wedge **58** by means of pivot pin **60**.

The distance between the arms **46A** and **46B** of the latter clevis **46** is greater than the thickness of the tongue **59** of wedge **58** whereby permitting movement of the wedge **58** relative to the axis of pin **60**.

In order to guide the wedge member **58** during travel between its operative and inoperative positions as shown in FIGURE 3 of the drawings, a block support **61** is shown mounted upon the box-like flange portion **62**, FIGURE 5, the latter being integral with the floor panel **42** of the cabinet. The block **61** is mounted to the top surface of the box-like section by means of bolts **63**. The guide block support in addition includes an inclined grooved surface **64** upon which rides a like-inclined lower surface **65** of wedge **58**. The wedge includes an upper surface **68** which is reversely inclined relative to lower surface **65** and which engages taper blocks **66** and **67** fixed to the lower marginal edge portions of rack assemblies **15** and **17**, see also FIGURE 1.

As seen in greater detail in FIGURE 5, taper block **66** is shown affixed to rack assembly **15** by means of bolts **67** and includes a surface **69** which is like inclined as surface **68** of wedge **58** and engages the same when the latter is in its operative position in which rack assembly **15** and rack assembly **17**, FIGURE 3, are supported in a manner to prevent distortion of the same. The width of wedge member **58** viewed transversely is sufficient to span and engage both blocks **66** and **67** affixed to the lower surfaces of rack assemblies **15** and **17** respectively

when the same are in their closed positions as seen in FIGURE 7. When the interconnected link assemblies 27 and 29 are moved to their phantom line positions as seen in FIGURE 3, the wedge member 58 is withdrawn out of contact with the surface 69 of block 66 in the manner as illustrated in FIGURE 9. When so moved relative to the inclined surface 64 of block 61, the tongue portion 59 of wedge 58 bottoms on the lower clevis arm 46A.

With reference to FIGURE 3, the link assemblies 27 and 29 may be actuated between their full and dotted line positions by the fulcruming mechanism 70 disposed transversely with respect to link assembly 27. As seen in greater detail in FIGURE 4, the fulcruming apparatus includes a channel fulcrum 71 affixed to the top link plate 27A by means of pivot shoulder screw 72. In a similar manner shoulder screw 73 provides a pivotal connection between the lower link plate 27B and the lower horizontal flange of the fulcrum 71. An aperture 74 is provided in the central web of the channel to permit its travel along transverse shaft 75 which is secured at its left end, as seen in FIGURE 4, by means of threaded sleeve 76, check nuts 77, which engage the upright flange 78 of bracket 79. The bracket 79 is suitably secured to base plate 42 of the cabinet and the previously mentioned check nuts 77, grip opposite surfaces of the flange 78 of the bracket, to thereby support the sleeve 76 in rigid relationship relative thereto. Sleeve 76 may be suitably located relative to shaft 75 by means of nuts 80 which engage threaded portion 81 of the transverse shaft 75.

The opposite end of shaft 75 is threaded as at 85 and is received in a guide rack support member 86 and secured therein by means of set screw 87. As seen in FIGURE 6, the guide rack support member 86 includes a pair of downwardly extending flange portions 87, 88, which are apertured to receive bolts 89 and 90 respectively, and which secure the member to an upright flange portion 91 of box section 92. The latter constitutes a structural support upon the floor 42 of the cabinet. The upper portion of the guide rack support member is notched as at 95 and receives therein an elongated slide member 96. The slide member includes a downwardly depending flange 97, FIGURE 4, which is apertured as at 98 and further includes a sleeve-like extremity 99 which extends coaxially with the shaft 75. The sleeve-like extremity constitutes a spring guide for one end of compression spring 100, while the other end of the spring is engaged by spring retainer 101 received on shaft 75 and which abuts and transmits pressure to one face of the central flange of fulcrum 71. A second spring retainer 102 also mounted for movement along shaft 75 abuts the opposite face of the central flange portion of fulcrum 71 and receives a compression spring 103 which has a smaller rate of compression then the spring 100. The opposite end of spring 103 abuts an end of the aforementioned threaded sleeve member 76 and is further received within the sleeve portion of the rack support stop 104 which is threaded upon sleeve 76. Check nut 105 is effective to lock the aforementioned rack support stop in a predetermined position upon sleeve 76. With reference to FIGURE 3 it should be noted that in the full line position of the apparatus the angle formed by link assembly 27 with link assembly 29, is not a straight line, that is, the angle formed by the link assemblies is less than 180°. This angular relationship is limited by the aforementioned rack support stop 104 which is provided to prevent the link assemblies 27 and 29 from assuming a dead center relationship as will be described in greater detail hereinafter.

Referring to FIGURE 4, the lower portion of the front door panel 12 includes an offset member 110 which carries upon its upper extremity a striker tip 111, which in turn engages the slide 96 at edge face 112 thereof. When the door 12 is hinged to its open position as seen in the phantom line position of said door in FIGURE 3 of the drawings, and as further illustrated in FIGURE 8, the previously mentioned compression spring 103 is effective

to actuate the link assemblies 27 and 29 to thereby open the apparatus to its inoperative position. Initially upon release of the striker tip 111 from the slide 96, the compression spring 100, which is of greater magnitude than compression spring 103, first expands and partially advances the slide 96 to the right along shaft 75. At the point where the smaller spring 103 is equalized in compression force with the compression in the larger spring 100, the former is then effective to move the link assemblies 27 and 29 from their locked or full line positions to their dotted line or unlocked positions as shown in phantom see FIGURE 3. When the link assemblies are so opened, the rack assemblies 15 and 17 of the cabinet may be opened to the positions as shown in FIGURE 1 of the drawings and the relationship of the wedge member 58 and tongue 59 thereof is as illustrated in FIGURE 9. Wedge 58 is thereby moved out of engagement with block 66 affixed to the lower surface of rack assembly 15, and the tongue portion 59 of the wedge is shown supported by the lower forked arm 46B of clevis 46.

Upon completion of a desired inspection or other servicing operation, the rack assemblies 15 and 17, and front panel 12 of the cabinet may thereafter be restored to their closed positions. During the movement of panel 12 to such a closed position, the striker tip 111, FIGURES 4 and 8, engages slide 96, and operates to move the same to the left upon shaft 75 to thereby partially compress the spring 100 and apply force to counter the smaller compression spring 103. Upon further travel of the slide 96 to the left due to action of panel 12, FIGURE 8, and upon the compression spring 100 equalizing and overcoming the force in the smaller compression spring 100, the link assemblies 27 and 29 are caused to be moved to their locked or operative position as illustrated in FIGURE 3, in which wedge member 58 has been moved into engagement with blocks 66 and 67 of the rack assemblies 15 and 17 respectively.

From the above-described embodiment of the invention it is apparent that when the apparatus is moved to its locked position by means of the fulcruming force applied through compression spring 100 the wedge 58 is effective to engage the taper blocks 66 and 67 in a manner to secure the rack assemblies 15, 17 in their naturally hung positions. When so locked the rate of compression of said spring 100 and the angle formed by the wedge surfaces 65 and 69 combined are effective to produce a net force upwardly an amount approximately equal to the weight of the respective racks at their areas of contact with surfaces 68 of said taper blocks 66, 67 respectively. Moreover, if the net weight of said rack assemblies were changed by an increase or a decrease in the number of electrical components housed within said assemblies, the compression spring and the angle of the tapered surfaces 65 and 69 of the wedge 58 would compensate accordingly in the amount of upward force applied to the rack assemblies by the latter.

While there has been described what at present is considered to be the preferred embodiment of the invention, it will be obvious to those skilled in the art that various changes and modifications may be made therein without departing from the invention, and it is therefore, aimed in the appended claims to cover all such changes and modifications as fall within the true spirit and scope of the invention.

What is claimed is:

1. In apparatus for supporting a rack assembly relative to a hinge axis, the combination comprising, a first member mounted at one of its ends to a pivot support, a second member pivoted at one of its ends to the other end of said first member, a wedge shaped member secured to the other end of said second member, guide means for confining said wedge means along a radial path of movement with respect to said pivot support, said wedge means in one position of movement along said path being engageable with the rack assembly to exert a force on the latter parallel to said hinge axis and in another position

along said path being free from engagement with said rack assembly, and means for moving said pivot connection interconnecting said first and second members circumferentially about said pivot support whereby the axes of both said first and second members are in approximate alignment with said radial path.

2. In apparatus for supporting a rack assembly relative to a hinge axis, the combination comprising, a first member mounted at one of its ends to a pivot support, a second member pivoted at one of its ends to the other end of said first member, a wedge shaped member secured to the other end of said second member, guide means for confining said wedge means along a radial path of movement with respect to said pivot support, said wedge means in one position of movement along said path being engageable with the rack assembly to exert a force on the latter parallel to said hinge axis and in another position along said path being free from engagement with said rack assembly, and means for moving said first and second members from a position in which the axes of the members form an obtuse angle with one another wherein said wedge means is out of engagement with said rack means, to a second position in which the axes of said first and second members are in alignment with each other and wherein said wedge means is in engagement with said rack assembly.

3. In apparatus for supporting a rack assembly about a hinge axis, the combination comprising, a pair of interconnected links, a pivot mounting and support for one of said links, wedge means secured to an end of the other of said links, guide means disposed in a direction transverse to said hinge axis for receiving one surface of said wedge means, the opposite surface of said wedge means being adapted in one position of the latter to engage said rack assembly, and fulcrum means for moving said interconnected links so that said wedge means is moved in said guide means and into engagement with said rack assembly to apply force to the same in a direction parallel to said hinge axis.

4. In apparatus for supporting a rack assembly about a hinge axis, the combination comprising, interconnected link means, pivot means supporting said link means, wedge means secured to said link means, guide means disposed in a direction transverse to said hinge axis for receiving said wedge means, and fulcrum means connected to said interconnected link means to vary the angular relationship between the same to thereby cause said wedge means to be moved relative to said guide means and into engagement with said rack assembly.

5. In apparatus for securing a rack assembly about a hinge axis, the combination comprising, interconnected link means, pivot means supporting said link means, wedge means pivotally supported by said interconnected link means and mounted for movement relative to said link means along a line generally parallel to the axis of said pivot means, guide means for said wedge means, and fulcrum means for varying the angular relationship between said interconnected link means to thereby move said wedge means in said guide means and along said line parallel to the axis of said pivot means.

6. In apparatus for securing a rack assembly against deformation about a hinge axis, the combination comprising, a pair of interconnected links, a pivot mounting and support for one of said links, wedge means secured to an end of the other of said links, block support means having an inclined surface complemental with said wedge means for guiding the same along one surface thereof, slide means affixed to said rack assembly and having an inclined surface complemental with another surface of said wedge means for engagement therewith, and fulcrum means for moving said interconnected links so that said wedge means is moved relative to said block support and said slide means to thereby engage said rack assembly to prevent deformation of the latter about said hinge axis.

7. The combination as set forth in claim 6 wherein said fulcrum means includes a shaft mounted transversely to said interconnected link means and a U-shaped member slidable upon said shaft and pivotally interconnected to said interconnected link means.

8. The combination as set forth in claim 7 wherein said fulcrum means includes a first compression spring and a slide member mounted for movement on said shaft adjacent one side of said U-shaped member, and a second compression spring mounted adjacent said opposite side of said U-shaped member.

9. In apparatus for supporting a rack assembly parallel to its hinge axis, the combination comprising, a pair of pivotally interconnected links, a pivot mounting and support for one of said links, wedge means secured to an end of said other link, support means including a guide surface for receiving said wedge means during sliding movement relative thereto, said wedge means in one position of movement in said support means being engageable with said rack assembly to apply force thereto in a direction parallel to said hinge axis, fulcrum means associated with one of said links for moving said interconnected links so that said wedge means is moved from a position out of engagement with said rack assembly to a position in said guide means in which the same is in engagement with said rack assembly to thereby apply force to the latter in a direction parallel to said hinge axis, said fulcrum means including first and second yieldable means disposed upon an axis transverse to one of said interconnected links and operative in opposition to each other, whereby upon application of force to said first yieldable means along said transverse axis said interconnected links are moved in a manner in which said wedge means engages said rack assembly, and upon release of said force from said first yieldable means said second yieldable means is effective to move said interconnected links in an opposite direction to cause said wedge means to be moved out of engagement with said rack assembly.

10. In apparatus for supporting a rack assembly parallel to its hinge axis, the combination comprising, a pair of pivotally interconnected links, a pivot mounting and support for one of said links, wedge means secured to an end of said other link, support means including a guide surface for receiving said wedge means during sliding movement relative thereto, said wedge means in one position of movement in said support means being engageable with said rack assembly to apply force thereto in a direction parallel to said hinge axis, fulcrum means associated with one of said links for moving said interconnected links so that said wedge means is moved from a position out of engagement with said rack assembly to a position in said guide means in which the same is in engagement with said rack assembly to thereby apply force to the latter in a direction parallel to said hinge axis, said fulcrum means including first and second compression springs, a shaft mounting said springs for movement along an axis transverse to said one link and in opposition to each other, whereby upon application of a force to said first compression spring, said second spring is overcome and said interconnected links are moved in a manner to cause said wedge means to engage said rack assembly, and upon removal of said force from said first compression spring said second spring means is effective to move said interconnected links in an opposite direction to cause said wedge means to be moved out of supporting engagement with said rack assembly.

11. In apparatus for supporting a rack assembly having first and second members hinged about a common axis, said members when in a closed position having complemental edge portions disposed in side by side relationship, the combination comprising, a pair of interconnected links, pivot means mounting one end of one link for rotation thereabout, wedge means secured to an end of said other member, support means for said wedge means, and fulcrum means for moving said interconnected links so that said wedge means is moved into engagement with said complemental edge portions of said

first and second members to thereby support said first and second members in a direction parallel to said hinge axis.

12. In apparatus for supporting a rack assembly relative to its hinge axis, the combination comprising, interconnected link means, pivot means supporting said interconnected link means for angular movement, wedge means secured to said interconnected link means and adapted to engage said rack assembly, fulcrum means connected to said interconnected link means for locking said wedge means into engagement with said rack means, and stop means associated with said fulcrum means to limit the movement of the same in one direction to thereby prevent said link assembly from assuming a dead center relationship.

13. The combination as set forth in claim 12, wherein said fulcrum means includes a shaft mounted in a fixed position, a member mounted for slidable movement on said shaft and pivotally connected to said interconnected link means, and first and second compression springs having different rates of compression mounted on said shaft and upon opposite sides of said last named member, and means movable in one direction for compressing said first compression spring to overcome said second spring and thus move said interconnected links in a manner to cause said wedge means to engage said complemental edges of said rack members, and upon movement of said movable means in an opposite direction said first compression spring is restored to its uncompressed state and said second compression spring actuates said interconnected links in an opposite manner to withdraw said wedge from said complemental edges of said first and second rack members.

14. In apparatus for supporting a rack assembly having first and second members hinged about a common axis and a third member movable relative to said first and second members, said first and second members when in a closed position having complemental edge portions disposed in side by side relationship, the combination comprising, a pair of interconnected links, pivot means mounting one end of one link for rotation thereabout, wedge means secured to an end of said other member, support means for said wedge means, fulcrum means associated with said interconnected links, said fulcrum means being responsive to said third member in one direction of movement thereof to cause said interconnected links to move said wedge means into engagement with the complemental edge portions of said first and second members, and said fulcrum means being responsive to movement of said third member in a reverse direction to cause said interconnected links to withdraw said wedge means out of engagement with the complemental edge portions of said first and second members.

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