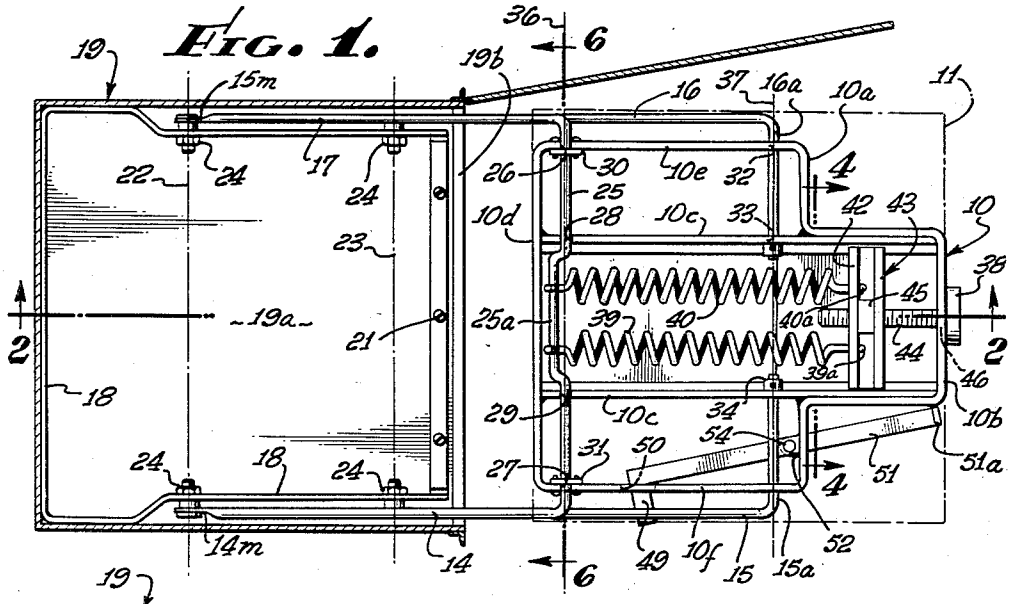
May 31, 1960 E. E. BREY 2,938,631

MOVABLE SHELF SUPPORT FOR KITCHEN CABINET OR THE LIKE

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FIG. 1.



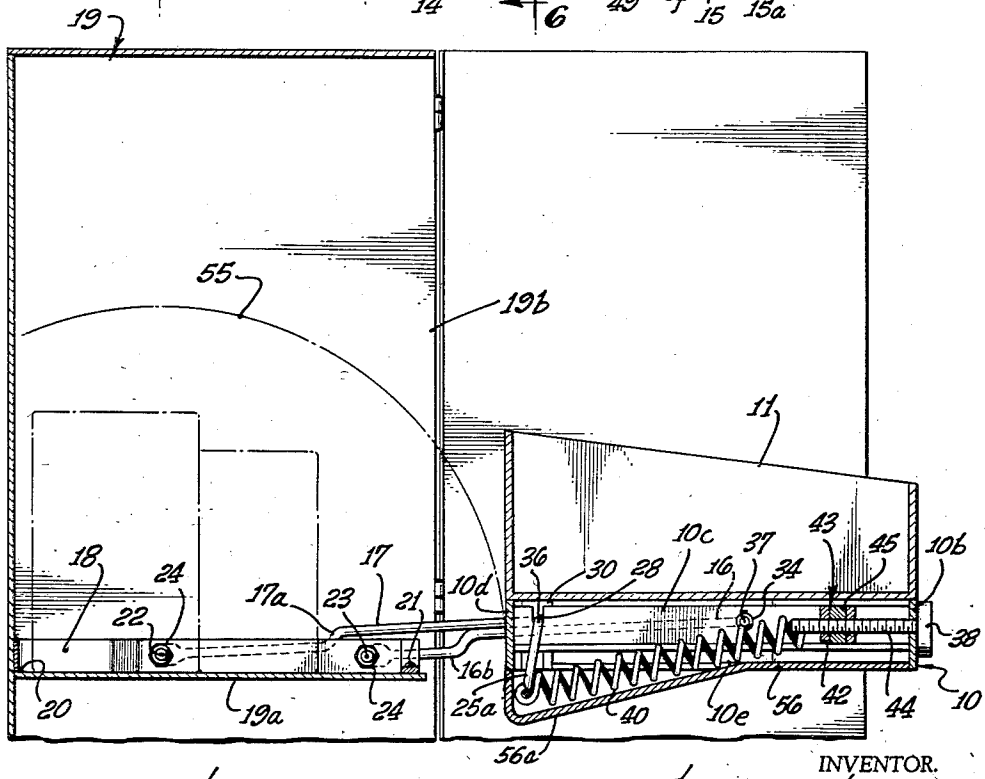


FIG. 2.

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MOVABLE SHELF SUPPORT FOR KITCHEN CABINET OR THE LIKE

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FIG. 3.

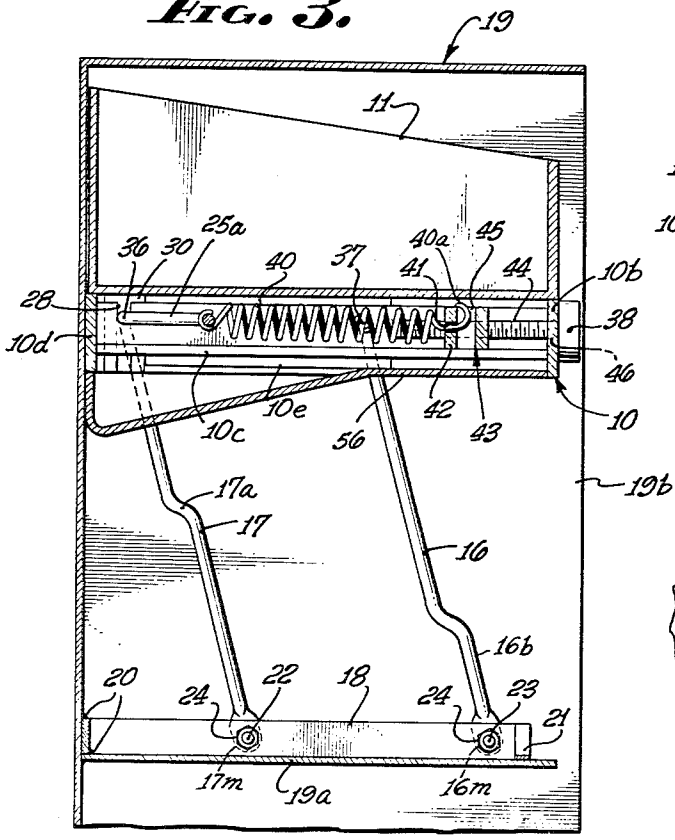


FIG. 4.

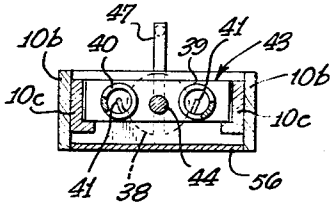


FIG. 5.

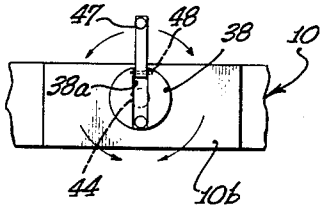


FIG. 6.

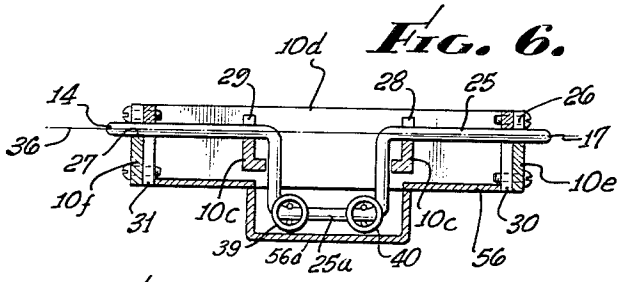
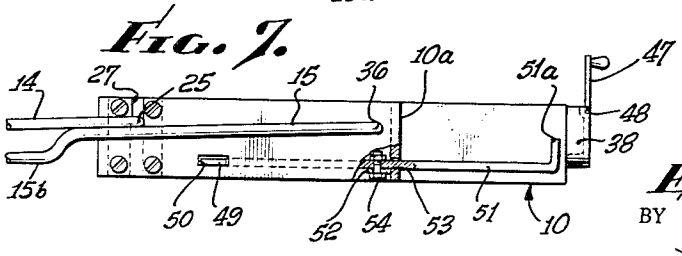


FIG. 7.



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MOVABLE SHELF SUPPORT FOR KITCHEN CABINET OR THE LIKE

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FIG. 8.

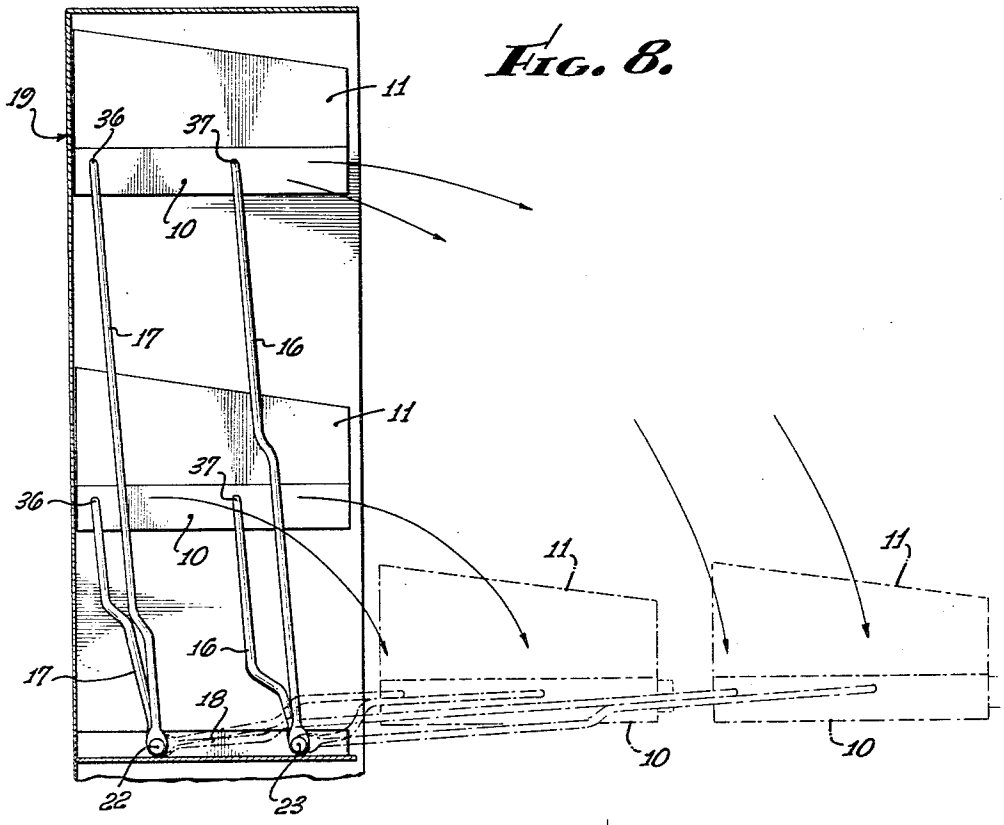
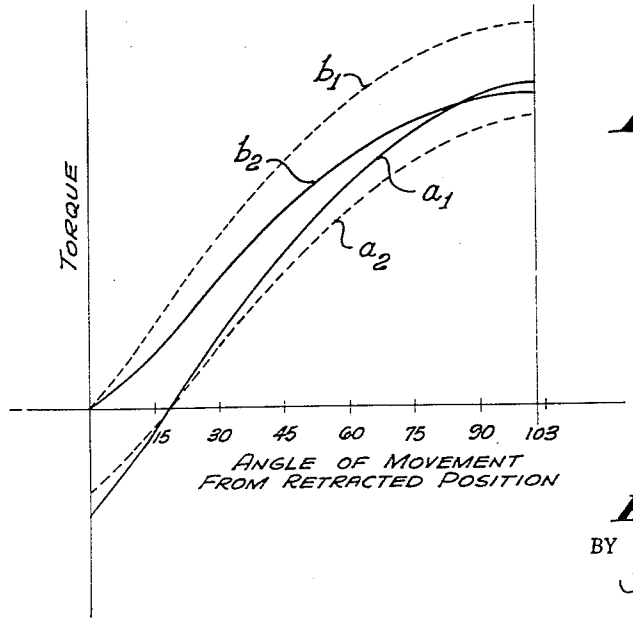


FIG. 9.



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2,938,631

MOVABLE SHELF SUPPORT FOR KITCHEN CABINET OR THE LIKE

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Filed Jan. 31, 1958, Ser. No. 712,384

14 Claims. (Cl. 211—92)

This invention relates to cabinets, particularly to a movable suspension for a shelf, bin or the like, whereby a high shelf may be made accessible by a simple manipulation.

One of the objects of this invention is to provide a device that makes maximum use of available storage facilities in a kitchen or the like without requiring the use of the notoriously hazardous stepladder.

Parallelogram linkages have been provided in order to maintain a movable shelf or the like in a horizontal position throughout its range of movement. Another object of this invention is to provide improved apparatus of this character.

In apparatus of this character, provisions must be made for counterbalancing the shelf. This is essential in order to prevent the loaded shelf or bin from slamming downwardly with substantial impact. Some attempts have been made to achieve a desired counterbalancing system, but in general, these have been unsuccessful. In order to achieve appropriate counterbalancing, attention must be given to the fact that the torque exerted by the shelf and its load varies in accordance with the position of the shelf. It is, accordingly, another object of this invention to provide a counterbalancing system for a swingable shelf of this character that allows for this variable.

Another problem in connection with counterbalancing arises from the fact that the actual load on the shelf may vary substantially. It is, accordingly, another object of this invention to provide an adjustable counterbalancing system for a swingable shelf support of this character, whereby appropriate counterbalancing is provided for all loads.

Yet another object of this invention is to provide structure that incorporates simple means whereby the user may adjust the counterbalancing system in accordance with the load. Thus, if the user changes the load, the counterbalancing system is readily adjusted to an extent corresponding to the change in load.

Still another object of this invention is to provide a movable shelf support of this character which maintains stability within the cabinet when it is in retracted position.

Still another object of this invention is to provide a device of this character in which the counterbalancing mechanism is located at the movable frame of a platform rather than at the relatively stationary parts of the parallelogram suspension. It is thus possible to mount the entire device without any interference with other storage space.

Still another object of this invention is to provide a support of this character which takes relatively little room, whereby there is virtually no interference with the storage space beneath the shelf mounted upon the support.

Still another object of this invention is to provide multiple swingable support structures which can be nested or stacked in a single installation.

Still another object of this invention is to provide a simple, readily manipulable latch mechanism for holding the shelf support in projected position. This makes possible simple operation. Thus, it is unnecessary to hold the support manually in projected position or simultaneously to adjust the counterbalancing mechanism when the load is partially removed from the shelf.

Still another object of this invention is to provide a swingable support which, by simple operations, can readily be attached to a cabinet structure or the like.

Still another object of this invention is to provide a shelf support of this character which comprises relatively few parts and that can be made economically.

This invention possesses many other advantages, and has other objects which may be made more clearly apparent from a consideration of one embodiment of the invention. For this purpose, there is shown a form in the drawings accompanying and forming part of the present specification. This form will now be described in detail, illustrating the general principles of the invention; but it is to be understood that this detailed description is not to be taken in a limiting sense, since the scope of this invention is best defined by the appended claims.

Referring to the drawings:

Figure 1 is a top plan view of the support to a cabinet and illustrated in projected position, the shelf or bin carried by the support being removed in order to illustrate the parts of the support, and the cabinet being shown in section;

Fig. 2 is a sectional view taken along the plane indicated by line 2—2 of Fig. 1;

Fig. 3 is an enlarged sectional view similar to Fig. 2, but illustrating the support in its retracted position;

Fig. 4 is an enlarged sectional view taken along the plane indicated by line 4—4 of Fig. 1;

Fig. 5 is a fragmentary front view of the handle and crank structure;

Fig. 6 is an enlarged sectional view taken along the plane corresponding to line 6—6 of Fig. 1, and illustrating the rear supporting arms and angularly movable anchor for the counterbalancing springs;

Fig. 7 is a side view of a portion of the support, a part of the apparatus being broken away and illustrated in section, said Fig. 7 showing in detail the manually operable latch mechanism for holding a support in projected position;

Fig. 8 is a diagrammatic view illustrating the manner in which two movable supports may be positioned in juxtaposed or nested relationship; and

Fig. 9 is a graph illustrating the torques exerted by the shelf at different loads and the torques exerted by the counterbalancing springs at different adjustments.

A frame 10 (Fig. 1) forms a base upon which a shelf or bin 11 (Fig. 2) may be secured. In the present instance, the frame 10 is made of bar stock appropriately bent to provide a generally rectangular configuration.

The front section 10*a* of the frame 10 has a centrally disposed, forwardly projecting offset portion 10*b*. Reinforcing bars 10*c*, in the form of angle irons, extend from the front section 10*a* (Fig. 1) to the rear section 10*d* of the frame 10 (see also Figs. 4 and 6). The forward ends of the bars 10*c* have their vertical flanges welded or otherwise suitably secured respectively within the sides of the offset portion 10*b*. The rear ends of the bars 10*c* abut the rear section 10*d* and are appropriately secured thereto, as by welding.

The frame 10 can be made in any other appropriate manner as, for example, by draw die techniques.

The frame 10 is movably mounted by the aid of a parallelogram linkage comprising four arms 14, 15, 16 and 17. (See Figs. 1, 2 and 3.) A generally rectangular bracket 18, affixed suitably to a metal cabinet 19, pivotally mounts corresponding ends 14*m*, 15*m*, 16*m* and 17*m* of the arms 14, 15, 16 and 17. The bracket 18 is secured, in the present instance, to a shelf 19*a* (Fig. 2)

of the cabinet **19**. For this purpose, the rear portion of the bracket **18** is welded, as at **20** (Fig. 3), both to the rear wall of the cabinet **19** and to the rear portion of the shelf **19***a*. The forward portion of the bracket **18** is bolted, as at **21** (Fig. 1), to the forward portion of the shelf **19***a*.

The rear arms **14** and **17** are pivotally mounted on the respective side elements of the bracket **18** for angular movement about a common horizontal axis **22** (Figs. 1 and 3). The arms **15** and **16** are mounted similarly on the respective side elements of the bracket **18** for movement about a parallel horizontal axis **23** (Figs. 1 and 3). The axes **22** and **23** lie in a common horizontal plane and they extend parallel to the plane of the opening **19***b* in the front wall of the cabinet **19**.

Bearing assemblies **24** (Fig. 1) cooperate with apertured flattened ends of the arms **14, 15, 16, 17** for mounting the arms on the outer sides of the bracket **18**. The side elements of the bracket **18** are offset (Fig. 1) so that the bracket **18** is provided with a corner that can be placed against the inside corner of the cabinet even though the arms are located on the outside of the bracket **18**.

The rear arms **14** and **17** are formed in this instance as the respective ends of a U-shaped rod (Figs. 1 and 6). The central connecting portion **25** joining the upper ends of the rear arms **14** and **17** serves as a means for pivotally joining the rear arms to the frame **10**. This portion **25** is thus accommodated at opposite sides in upwardly opening recesses **26** and **27** (Figs. 1, 6 and 7) formed at the rear ends of the side sections **10***e* and **10***f* of the frame **10**. The connecting portion **25** also extends through corresponding upwardly opening slots **28** and **29** (Figs. 1, 3 and 6) in the rear portions of the reinforcing bars **10***c*. The bottoms of the recesses **26, 28, 29** and **27** form bearings for the connecting portion **25**, the recesses all being aligned. Retainer brackets **30** and **31** (Fig. 6), fastened to the side sections **10***e* and **10***f* of the frame **10**, confine the connecting portion **25** ot the bottom of the slots **26** and **27**.

The forward arms **15** and **16** have inwardly bent ends **15***a* and **16***a* (Fig. 1) respectively passing through apertures **32** in the side sections **10***e* and **10***f* of the frame **10**. The terminal portions of the bent ends **15***a* and **16***a* pass through corresponding apertures **33** in the reinforcing bars **10***c*. Collars **34**, secured to the terminal portions of the bent ends **15***a* and **16***a*, hold the ends against separating movement relative to the frame **10**. The apertures **32** and **33** form bearings for forward arms **15** and **16**, and define an axis **37** of relative movement of the frame **10** and the forward arms.

The recesses for the connecting portion **25** define an axis **36** (Fig. 3) of relative movement between the frame **10** and the rear arms **14** and **17**. The four axes **36, 37, 22** and **23** define corners of a parallelogram, the distance between the axes **36** and **37** at the frame **10** being equal to the distance between the axes **22** and **23** at the mounting bracket **18**, and the distance between the axes **22** and **36** for the rear arms **14** and **17** being equal to the distance between the axes **23** and **37** for the forward arms **15** and **16**. Accordingly, a parallelogram support for the frame **10** is defined, and a plane including the axes **36** and **37** maintains its horizontal orientation throughout the range of movement of the frame **10**.

As shown in Fig. 3, the rear section **10***d* of the frame **10** (or the shelf **11** should it slightly overhang this rear section) forms an abutment engageable with the rear wall of the cabinet for defining the retracted position of the device.

The rear axis **36** of movement of the frame **10** is substantially closer to the rear section **10***d* than is the axis **22** from the rear portion of the mounting bracket **18**. Accordingly, for a straight wall cabinet, the frame **10** may be positioned such that the arms **14, 15, 16** and **17** incline rearwardly relative to the cabinet opening when the frame **10** is in retracted position (Fig. 3). In this orientation, the weight of the shelf and contents tends to rotate the arms **14, 15** and **16** in a counterclockwise direction about their axes **22** and **23**, corresponding to further engagement of the frame **10** with the rear wall of the cabinet **19**. Accordingly, in this orientation, the frame **10** is self-biased toward a stable, retracted position.

In order to move the frame outwardly, a torque must be exerted on the apparatus such that the upper axes **36** and **37** pass beyond a position of maximum height relative respectively to the axes **22** and **23**. This torque is applied manually, as by the aid of a handle **38** (Fig. 5) affixed to the offset portion **10***b* of the frame **10**. This handle is accessible immediately beneath the forward portion of the shelf or bin **11** (Figs. 2 and 3).

The arms **14, 15, 16** and **17** (Fig. 2) determine the limiting projected position of the frame **10**. In the projected position, a plane including the movable axes **36** and **37** lies slightly above the plane including the axes **22** and **23**. Thus, the arms do not move quite to the 90° position from the orientation in which the axes **36** and **37** are uppermost. The rear arms **14** and **17** have intermediate offset portions, as at **17***a*, that provide clearance relative to the forward bearing structures **24** and the flattened ends of the forward links **15** and **16**. In the projected position illustrated in Fig. 2, the forward portions of the arms **14** and **17** contact the rear portions of the forward arms **15** and **16**. This provides the limit to movement of the frame **10**. The forward arms **15** and **16** are likewise offset, as at **15***b* and **16***b*, in order to clear the ends of the rear links **14** and **17**.

When the arms **14, 15, 16** and **17** pass beyond the position of maximum elevation, the weight of the loaded frame **10** tends to move it toward the projected position illustrated in Fig. 2. The horizontal lever arm at which the loaded shelf acts to produce a torque varies from zero to the length of the arms themselves, depending upon the position of the frame **10**. The torque, due to weight, tending to so move the frame **10**, can be recognized as a simple trigonometric function, varying as the sine of the angle of the arms from the position of maximum height of the frame axes **36** and **37**. This function is illustrated by the lines a_1 and a_2 in Fig. 9, the different lines corresponding to different loads. Obviously the counterbalancing torque should similarly vary. A spring structure is provided for this purpose. In the present instance, the spring structure includes companion tension coil springs **39** and **40** (Fig. 1). Opposite ends of each of the coil springs **39** and **40** are attached respectively to the frame **10** and a crank **25***a* (Figs. 1, 3 and 6) forming a part of the arm structure **14—17**. In the present instance, the crank **25***a* is formed as an offset portion of the joining portion **25**.

The right-hand ends of the springs **39** and **40** pass through apertures **41** (Figs. 3 and 4) in a movable transverse bar **42** mounted on the horizontal flanges of angle irons **10***c* attached to the frame **10**. The terminal portions of the springs **39** are anchored as, for example, by hook portions **39***a* and **40***a* engaging the upper edges of the bar **42**. Optionally a pivotal connection may be provided between the end of the springs and the bar **42**.

The bar **42** forms a part of a carriage structure **43** opposite sides of which rest upon the horizontal flanges of the reinforcing bars **10***c* (Fig. 1). A lead screw **44** passes through a threaded element **45** (Figs. 1 and 3) joined to the carriage **43**, and determines the position of the carriage **43** and hence the position of the right-hand ends of the springs along the frame **10**. The lead screw **44** is joined to the handle **38** and passes inwardly of the frame **10** through a front opening **46** in the offset portion **10***b* of the frame **10**.

A crank **47** (Fig. 5), fitting within a transverse slot **38***a* of the handle **38**, facilitates rotation of the lead screw **44** and hence adjustment of spring tension. The

crank 47 is movable to operative position by rotation about a mounting pin 48 at one end of the slot 38*a*.

The left-hand or rear ends of the springs 39 and 40 are looped (Figs. 3 and 6) about the central portion of the offset crank 25*a*.

A cover plate 56 (Figs. 3 and 6) is secured to the bottom of the frame and cooperates with the shelf 11 on top of the frame to provide a complete protective enclosure. The plate 56 has a central depression, as at 56*a*, to allow movement of the springs 39 and 40 to the position illustrated in Fig. 2.

The offset portion 25*a*, about which the springs 39 and 40 are looped, is disposed at an angle of somewhat less than 90° to the line joining the axes 22 and 36 of the rear arms 14 and 17. The angularity is such that lines joining the ends of each of the springs (Fig. 3) pass through the axis 36 when the apparatus is in the retracted position of Fig. 3. Thus, the angle (in this instance about 72°) is the complement of the rearward angle of inclination of the arms (in this instance about 18°). The springs 39 and 40 in this position accordingly exert no torque tending to urge the connecting rod 25 angularly about its axis of mounting 36. Thus, the springs 39 and 40 exert no effect upon the position of the support in the orientation illustrated in Fig. 3.

When the support is moved from the position illustrated in Fig. 3, a line joining the ends of the springs 39 and 40 passes beneath the axis 36, the crank 25*a* rotating about this axis. Hence, the springs 39 and 40 now exert a restoring torque opposing such movement. It may be noted that the spring force tends at all times to seat the carriage on the flanges of the bars 10*c* since the offset 25*a* always projects downwardly relative to the axis 36. If the force exerted by the springs 39 and 40 be considered constant and if it is assumed that the spring force is always parallel to the frame 10, obviously the restoring torque will be a sine function. But the springs 39 and 40 lengthen during this movement, and an extra restoring torque arises due to this. The elongation is significant only near the projected position of the device.

Furthrmore, the springs do not act in a direction parallel to the frame, and hence, the lever arm increases at a faster rate than a sine function, but the same maximum lever arm is reached at an angle of less than 90°, corresponding to the tangent position of the springs to the circle described by the crank, as illustrated by phantom lines in Fig. 2. This factor is most noticeable near the retracted position of the device. Hence, the two factors complement each other in generally preserving a sinusoidal restoring torque function. By appropriate choice of the spring constant and length of the crank arm radius relative to the length of the springs, an exceptionally good complementary relationship can be obtained.

Lines b_1, b_2 illustrate in Fig. 9 the total restoring torque, different lines corresponding to different preset tensions in the springs.

By adjusting the tension of the springs 39 and 40, as by rotation of the handle 38, the restoring torque can be made slightly less than the torque due to weight at the projected position of Fig. 2. This is indicated by the lines a_2 and b_2 in Fig. 9. Thus, by slight overpowering of the springs, the weight holds the device in projected position. The counterbalancing torque is, however, always greater than the torque due to weight, except at the projected position, because the counterbalancing force increases steadily from the position of Fig. 3, while the torque due to weight opposes the springs only after the arms 14, 15, 16 and 17 are moved to the vertical position. However, as may be appreciated from Fig. 9, the difference between the torque curves is small and, accordingly, only a slight effort is required to move the device to the projected position.

Before load is removed from the support, the frame 10 is locked in projected position to ensure against abrupt upward swinging of the device.

In order to lock the frame 10, a latch mechanism (Figs. 1 and 7) is provided. A latching lever 51 has an end 49 movable outwardly of the side frame section 10*f* via a recess 50 in which it is guided. The end 49 extends in a path of the forward arm 15 when the projection 49 is moved to its maximum outward position. When the frame 10 is in a projected position, the projection 49 lies beneath the arm 15. Upon attempted movement of the frame 10 to the retracted position, the arm 15 tends to move relative to the frame 10 in a counterclockwise direction about the axis 37, and hence downwardly toward the lever end 49. When the end 49 is shifted inwardly, the device can be retracted.

The lever 51, on which the latching element 49 is formed, is pivoted intermediate its length on a lug 52 secured on the inside of the frame 10, the lever 51 passing through an adjoining aperture 53 which permits angular reciprocation of the lever 51. A bolt 54, cooperating respectively with the lever 51 and the lug 52, mounts the lever 51 for angular adjustment about a vertical axis. The forward end of the lever 51 is upwardly bent, as at 51*a*. This end of the lever 51 lies adjacent the offset portion 10*b* of the frame 10 and is readily accessible for manipulation by the operator.

The size of the shelf or bin supported on the frame 10 is not critically dependent upon the size of the frame 10 itself. The same mechanism may support a shelf of any desired length.

As shown in Fig. 2, the frame 10 always lies on the outer side of an arc 55 centered at the rear axis 22. Hence, articles stored on the shelf 19*a* within the area described by the arc will not be disturbed by movement of the frame 10. Providing extra tall articles are not stored at the forward portion of the shelf below, the device does not interfere with any other storage facilities.

As illustrated in Fig. 8, a pair of swingable support structures are provided whereby two relatively high shelves can be made accessible. The upper support has arms substantially longer than those illustrated in Figs. 1, 2 and 3, and the support accordingly projects a substantial distance forwardly of the cabinet opening. It is possible to move both devices to projected position so that the shelves or bins are simultaneously accessible. However, both devices operate independently and without interference with respect to each other.

The inventor claims:

1. In a retractable device for facilitating access to a high space: at least two parallelogram linkage parts; mounting means for corresponding ends of the parts; support means secured to the other ends of the parts; the support means being swingably mounted by the parts for movement through an angle of approximately ninety degrees between a retracted upper position in which the support means extends above said mounting means, and an accessible lower projected position in which the support means projects laterally on one side of the mounting means; said linkage parts defining with both said means at least four parallel axes that define the apices of a parallelogram in a plane normal to said axes, the first two of said axes being located at the support means and the second corresponding two of said axes being located at said mounting means; the first two axes being substantially vertically above the second two axes at retracted position; the linkage parts being relatively angularly movable with respect to said support means about said first axes, and relatively angularly movable with respect to said mounting means about said second axes; a tension spring device secured at one end to one of said means, and at the other end to one of said parts, the place of securing of said spring device to said one part being spaced from the axis of relative angular movement of the said one means and said part, whereby said place moves relative to said one means angularly about said axis as a center as the linkage

parts are moved; the place of securing of the spring device to said one part being substantially aligned with a line joining said one axis and the place of securing of said one part to said one means when said support is in retracted position, and both of said places then being on one side of said axis whereby said spring device exerts a torque increasing substantially sinusoidally as the support means and linkage parts are moved from said retracted position to said projected position.

2. The combination as set forth in claim 1 together with means movable along the said one means providing an adjustable place of securing of said tension spring device to said one means; and means for determining one of a number of positions of said movable means.

3. The combination as set forth in claim 1 in which said one means is said support means; adjustable means mounted on said support means for moving the said place of securing of said spring device to said support means in a direction away from said axis along the direction of said alignment; an angularly adjustable handle carried by the support means; and means operated by angular movement of said handle for determining any one of a number of positions of said adjustable means.

4. The combination as set forth in claim 1 in which abutment means determines the retracted position of said support means, and so located that the load of said support means, when in retracted position, provides a torque urging said linkage parts toward retracted position.

5. The combination as set forth in claim 1 in which abutment means determines the retracted position of said support means, and so located that the load of said support means, when in retracted position, provides a torque urging said linkage parts toward retracted position; and means for adjusting the force exerted by said spring device whereby the torque due to said spring device substantially counterbalances the torque due to the load of said support means when said support means is at projected position.

6. The combination as set forth in claim 1 in which abutment means determines the retracted position of said support means, and so located that the load of said support means, when in retracted position, provides a torque urging said linkage parts toward retracted position; and means for shifting the place at which said spring device is secured to said one means for compensating for a changed load of said support means; the spring constant of said spring device and the relative location of said places being so chosen that the incremental torque due to expansion of said spring device and the shifting of the line of action of said spring device complement each other to maintain a substantially sinusoidal variation in torque due to said spring device.

7. The combination as set forth in claim 1 in which abutment means determines the retracted position of said support means, and so located that the load of said support means, when in retracted position, provides a torque urging said linkage parts toward retracted position; and means for shifting the place at which said spring device is secured to said one means for compensating for a changed load of said support means; the spring constant of said spring device and the relative location of said places being so chosen that the incremental torque due to expansion of said spring device and the shifting of the line of action of said spring device complement each other to maintain a substantially sinusoidal variation in torque due to said spring device; movement of the support means to an intermediate position, corresponding to an initial angle from retracted position, being required before the support means exerts a torque urging the support means to projected position whereby the spring device may be adjusted so that the torque exerted thereby exceeds the torque due to said support means by a small amount decreasing substantially to zero as the support means is moved from said intermediate position to said projected position.

8. In a retractable supporting device: a support; a parallelogram linkage having a pair of stationary parallel axes and a pair of parallel movable axes, and including a pair of links respectively joining a stationary and a movable axis; said support being carried by those ends of the links which are connected to the movable axes; resilient means for urging the linkage toward retracted position; said means being resiliently expandible; means anchoring opposite ends of the resilient means so that both anchors move as the support is moved, one anchor moving angularly about a movable axis, and so that the anchors move apart as the support moves toward extended position.

9. The combination as set forth in claim 1 together with means for adjusting the force exerted by said spring device whereby the torque due to said spring device substantially counterbalances the torque due to said support means when said support means is at projected position; and a manually operable latch for holding said support means at projected position to allow adjustment of said force adjusting means when the load on said support means is changed, said latch comprising a lever pivotally mounted on said support having one end adjacent said force adjusting means and having another end movable in the path of angular movement of one of said linkage parts relative to said support means.

10. In a retractable device for facilitating access to a high space: a first pair of arms; a second pair of arms; means mounting the first pair of arms for movement about a common first axis; means mounting the second pair of arms for movement about a common second axis parallel to the first axis; a support pivotally connected to the first and second pairs of arms at third and fourth parallel axes to provide a parallelogram mounting therefor, the support being swingable between a retracted upper position in which the third and fourth axes extend substantially above the first and second axes respectively and a lower projected position in which the third and fourth axes extend to one side of the first and second axes; a bar joined to the movable ends of the first arms adjacent said third axis for movement with said first arms, and having at least a portion offset from said third axis, said portion extending in a direction from said third axis toward said fourth axis when said support is in retracted position whereby said portion moves angularly about said third axis and beneath said support upon movement of said support away from retracted position; and a tension spring secured at one end to the support at a place substantially aligned with said third and fourth axes, and at the other end to said offset portion for counterbalancing the support.

11. In a retractable device for facilitating access to a high space: a first pair of arms; a second pair of arms; means mounting the first pair of arms for movement about a common first axis; means mounting the second pair of arms for movement about a common second axis parallel to the first axis; a support pivotally connected to the first and second pairs of arms at third and fourth parallel axes to provide a parallelogram mounting therefor, the support being swingable between a retracted upper position in which the third and fourth axes extend substantially above the first and second axes respectively and a lower projected position in which the third and fourth axes extend to one side of the first and second axes; a bar joined to the movable ends of the first arms adjacent said third axis for movement with said first arms, and having at least a portion offset from said third axis, said portion extending in a direction from said third axis toward said fourth axis when said support is in retracted position whereby said portion moves angularly about said third axis and beneath said support upon movement of said support away from retracted position; a carriage guided by the support for movement along a path corresponding substantially to a line between said third and fourth axes; a tension spring secured at one end to said offset portion and at the other end to said carriage for counterbalancing the support; and means for adjusting

the position of said carriage for compensating for different loads on said support.

12. In a retractable device for facilitating access to a high space: a first pair of arms; a second pair of arms; means mounting the first pair of arms for movement about a common first axis; means mounting the second pair of arms for movement about a common second axis parallel to the first axis; a support pivotally connected to the first and second pairs of arms at third and fourth parallel axes to provide a parallelogram mounting therefor, the support being swingable between a retracted upper position in which the third and fourth axes extend substantially above the first and second axes respectively and a lower projected position in which the third and fourth axes extend to one side of the first and second axes; a bar joined to the movable ends of the first arms adjacent said third axis for movement with said first arms, and having at least a portion offset from said third axis, said portion extending in a direction from said third axis toward said fourth axis when said support is in retracted position whereby said portion moves angularly about said third axis and beneath said support upon movement of said support away from retracted position; a carriage guided by the support for movement along a path corresponding substantially to a line between said third and fourth axes; a tension spring secured at one end to said offset portion and at the other end to said carriage for counterbalancing the support; a handle mounted on the support for angular movement about an axis substantially aligned with said path; and means operated by angular movement of said handle for determining the position of said carriage for compensating for different loads on said support.

13. In a retractable device for facilitating access to a high space; a first pair of arms; a second pair of arms; means mounting the first pair of arms for movement about a common first axis; means mounting the second pair of arms for movement about a common second axis parallel to the first axis; a support pivotally connected to the first and second pairs of arms at third and fourth parallel axes to provide a parallelogram mounting therefor, the support being swingable between a retracted upper position in which the third and fourth axes extend substantially above the first and second axes respectively and a lower projected position in which the third and fourth axes extend to one side of the first and second axes; a bar joined to the movable ends of the first arms adjacent said third axis for movement with said first arms, and having at least a portion offset from said third axis, said portion extending in a direction from said third axis toward said fourth axis when said support is in retracted position whereby said portion moves angularly about said third axis and beneath said support upon movement of said support away from retracted position; a carriage guided by the support for movement along a path corresponding substantially to a line between said third and fourth axes; a tension spring secured at one end to said offset portion and at the other end to said carriage for counterbalancing the support; a handle mounted on the support for angular movement about an axis substantially aligned with said path; means operated by angular movement of said handle for determining the position of said carriage for compensating for different loads on said support; and a selectively operable latch mounted on the support and having a manually engageable part adjacent said handle for holding said support in projected position.

14. In a retractable device for facilitating access to a high space: a first pair of arms; a second pair of arms; means mounting the first pair of arms for movement about a common first axis; means mounting the second pair of arms for movement about a common second axis parallel to the first axis; a support pivotally connected to the first and second pairs of arms at third and fourth parallel axes to provide a parallelogram mounting therefor, the support being swingable between a retracted upper position in which the third and fourth axes extend substantially above the first and second axes respectively and a lower projected position in which the third and fourth axes extend to one side of the first and second axes; a bar joined to the movable ends of the first arms adjacent said third axis for movement with said first arms, and having at least a portion offset from said third axis, said portion extending in a direction from said third axis toward said fourth axis when said support is in retracted position whereby said portion moves angularly about said third axis and beneath said support upon movement of said support away from retracted position; a carriage guided by the support for movement along a path corresponding substantially to a line between said third and fourth axes; a tension spring secured at one end to said offset portion and at the other end to said carriage for counterbalancing the support; a handle mounted on the support for angular movement about an axis substantially aligned with said path; a lead screw carried by the handle for rotation therewith; means carried by the carriage engaging the lead screw for determining the position of said carriage for compensating for different loads on said support; and a crank foldable within the handle for facilitating rotation of said handle.

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