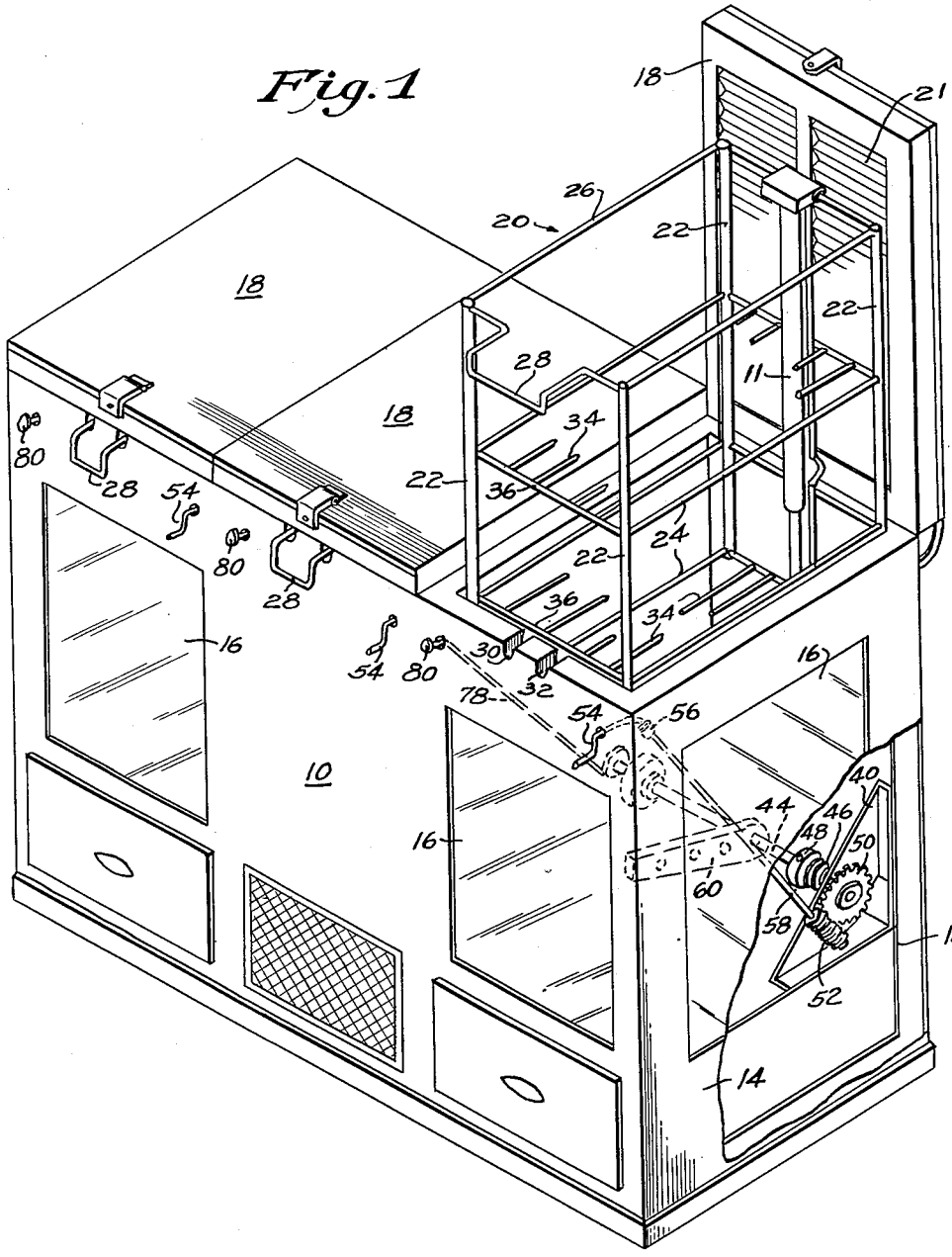
Oct. 14, 1952 D. COLLINS 2,614,020

SHELF ELEVATING MECHANISM AND CONTROL

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Fig. 1



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SHELF ELEVATING MECHANISM AND CONTROL

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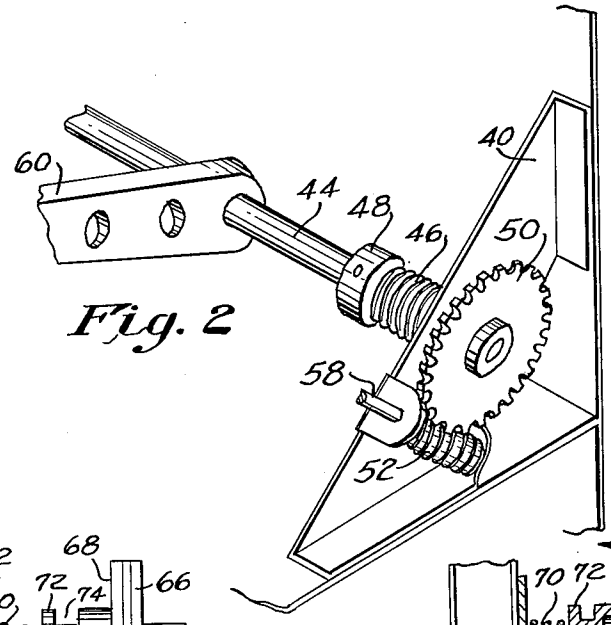


Fig. 2

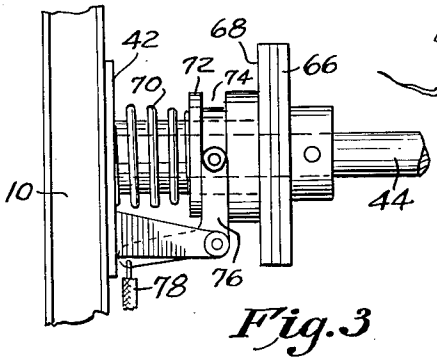


Fig. 3

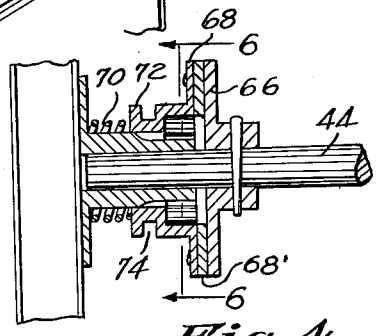


Fig. 4

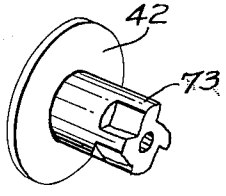


Fig. 5

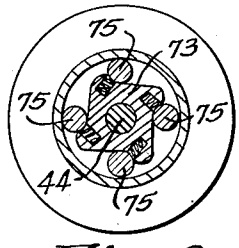


Fig. 6

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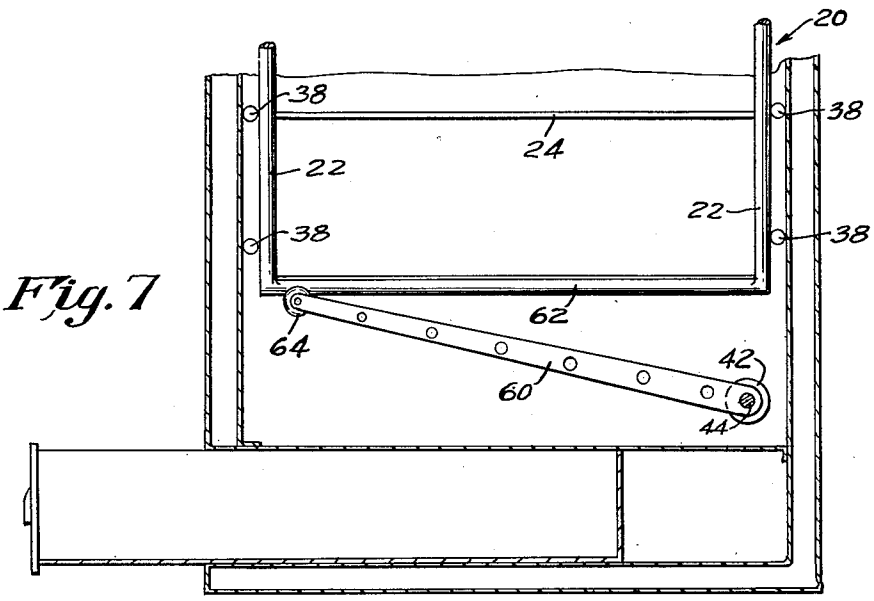
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SHELF ELEVATING MECHANISM AND CONTROL

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Fig. 7



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2,614,020

UNITED STATES PATENT OFFICE

2,614,020

SHELF ELEVATING MECHANISM AND CONTROL

Douglas Collins, Salisbury, N. C.

Application June 7, 1949, Serial No. 97,681

12 Claims. (Cl. 312—312)

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This invention relates to translatable material support means combined with means constantly tending to move the same in one direction and controllable means governing the movement in said one direction of the type permitting movement in a reverse direction independently of the controllable means.

The invention further relates generally to refrigerators and more particularly to that type of refrigerator in which access to the refrigerator is obtained through a door in the top of the refrigerator cabinet and within which cabinet is positioned a vertical movable shelf frame.

The present invention is a continuation-in-part of my prior filed application Serial No. 586,899, filed April 6, 1945, now Patent 2,549,664, dated April 17, 1951, and in which patent is disclosed the general organization set forth hereinafter without the particular details of the controllable means for governing the translation of the shelf frame.

It is therefore an object of the present invention to provide in combination with a translatable material support or shelf frame and means constantly exerting a force sufficient to translate the frame in one direction when loaded, the provision of releasable brake means controlling the force applying means and normally effective in all positions of movement of the frame to arrest movement of the frame so long as the force applied in the direction opposite the application of force by the force applying means is no greater than the loaded condition of the frame or support.

Specifically the present invention provides power means normally tending to lift the frame when it is loaded, a releasable brake normally effective to resist elevation of the frame but operative when release to permit the elevation thereof and combined with the brake an overrunning clutch operable independently of means controlling the releasable brake to permit lowering or reverse movement of the frame upon the application of a force greater than the force applied by the force applying means. It being borne in mind that the force applying means is adjustable and operative to raise the frame when the frame is loaded with material or articles and that the brake means will always hold the frame in any elevated position assumed under control of means for releasing the brake.

Specifically it is an object of the present invention to provide in combination with an open topped cabinet a vertically movable shelf frame, power means constantly exerting a force on the

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frame sufficient to elevate the same, means including a shaft operably connected between the frame and the power means to transmit the elevating force to the frame and a releasable combined brake and overrunning clutch mechanism carried in part by the shaft. The brake is normally engaged and normally effective to resist upward movement of the frame and the overrunning clutch permitting the frame to be lowered upon application of a force in excess of the lifting power and the load on the frame, the arrangement being such that the resistance of the brake which is normally applied does not have to be overcome in lowering, the only force to be overcome being the force constantly tending to elevate the frame.

It thus follows that the present invention provides a translatable shelf frame construction which under control of release means can be stopped in its movement in one direction in any of an infinite number of positions and upon force tending to move it in the opposite direction it will be stopped in any of an infinite number of positions independently of the control of the brake upon cessation of the force tending to move it in the opposite direction.

The above as well as other objects and advantages of the invention will be readily apparent when the following description is read in conjunction with the accompanying drawings, in which

Fig. 1 is an isometric view (partly cut away) of a refrigerator embodying the invention.

Fig. 2 is an enlarged isometric view of a portion of the shelf elevating mechanism thereof, shown at the right hand end of shaft 44 in Fig. 1,

Fig. 3 is an enlarged fragmentary view in elevation of a releasable brake mechanism located at the opposite end of said shaft.

Fig. 4 is a vertical sectional view of the mechanism shown in Fig. 3,

Fig. 5 is an isometric view of one of the parts of the brake mechanism,

Fig. 6 is a sectional view of the clutch portion of this mechanism, taken on line 6—6 of Fig. 4, and

Fig. 7 is a fragmentary vertical sectional view of a portion of the cabinet.

Referring now to Fig. 1 of the drawings, reference numeral 10 designates a refrigerator cabinet of the top door or top access type having a plurality of compartments, access to each of which is obtained from the top. Although the refrigerator is illustrated as being provided with

three comparments it is obvious that the number of compartments may be changed as desired, each compartment being identical in design with the others.

The refrigerator cabinet 10 is of double wall type in which the space between the walls is at least partially evacuated, as in my prior Patent No. 2,549,644, dated April 17, 1951, although thermal insulating material may optionally be used. A pump 11 which operates automatically upon the opening of the refrigerator door may be provided to maintain a partial vacuum in the space between the walls. This arrangement is described in detail in my prior patent referred to above, to which reference may be made for details of construction. The latter wall structure is shown in the cutaway portion of Fig. 1, reference numeral 12 indicating an inner side wall, and 14 indicating an outer side wall. The sides, front, bottom, and back of the cabinet 10 are constructed in similar fashion. A plurality of windows 16 are provided in the front and side, inner and outer walls of the cabinet 10 so that the inside of the refrigerator may be inspected easily.

Each compartment of the cabinet 10 is provided with a top door 18, all of the doors being identical in structure.

Each of the three compartments in the cabinet 10 is provided with an identical vertically movable rack or shelf frame 20. The rack 20 is made up of four vertical corner rods 22 on which are mounted horizontal wire shelves 24 at spaced vertical intervals. An upper reinforcing and handle member 26 having a front overhanging lip 28 is provided on each rack 20. The overhanging lip 28 rests in two grooves 30 and 32, formed in the upper edge of the front wall, when the rack 20 is in its lowermost position. The shelves 24 are of the usual refrigerator shelf type comprised of a plurality of slender rods 34 stretched across a horizontal frame 36, and secured thereto as by welding or the like.

Mounted on the inner front and back walls of the cabinet 10 are a plurality of rollers 38 (see Fig. 7) on which the vertical posts 22 of the rack 20 ride during vertical movement of the rack to reduce friction and to guide the rack during movement.

The mechanism for raising and lowering the racks 20 and thereby the top doors 18 will be described now. At one end of the rear and lowermost portion of each of the compartments is mounted a journal bracket 42 (Fig. 3) in which is journaled a horizontal shaft 44. Around the opposite end of shaft 44 is a coiled spring 46, one end of the spring 46 being secured to a collar 48 fast to the shaft 44. The other end of the spring 46 is secured to the hub of a gear 50 loosely mounted on the right end of the shaft 44, the hub being journalled in bracket 40.

The tension of the spring 46 may be adjusted by means of a worm 52 cooperating with the gear 50. The worm 52 may be rotated from the front of the cabinet 10 by means of a handle 54 connected to the worm gear 52 through a universal joint 56 and shaft 58. Mounted on and extending at right angles to the shaft 44 is a rocker arm 60 having at its outer end a roller 64. The roller 64 is situated to bear upon and ride along a bearing rod 62 extending centrally lengthwise of lowermost shelf 24 (see Fig. 7). Upon rotation of the shaft 44 by the action of spring 46, rocker arm 60 is rotated, roller 64 riding along the bottom of the rod 62 of lower shelf 24 as the rack 20 rises vertically under the force applied to it through the rocker arm 60.

On the left end of the shaft 44 is mounted the combined clutch and brake mechanism utilized for control of the rack lift mechanism just described, and best shown in Figs. 3 to 6 of the drawings. The friction brake comprising two sections, one of which identified by reference numeral 66 is fixedly keyed or secured to the shaft 44, the other brake section 68 is mounted on shaft 44 to permit relative rotation between the shaft and brake section 68. As shown in Figure 4, the brake section or disc 68 is journalled on the hub of journal bracket 42. The two brake sections 66 and 68 are normally held together by the thrust of a spring 70 biased between the journal member 42 and the collar 72 of a yoke or shift member 74. The brake section 68 is formed as an overrunning clutch, details of which are illustrated in Figs. 4 to 6. As shown, a friction facing disk 68′ is secured to the face of brake section or disk 68 in any conventional manner, for example by means of rivets. The overrunning clutch includes a fixed 4-lobed cam 73 and spring-pressed rollers 75 whose one-way action permits counter clockwise motion of the brake portion 68 while in brake-applying position with respect to brake section 66. In the construction illustrated, the rollers 75 are housed within the brake disc 68. The brake sections can be separated by means of a bell crank 76 actuated by means of a Bowden wire 78 one end of which is mounted on the outside of cabinet 10 and provided with an operating knob 80 (Fig. 1).

To elevate the rack 20 and to open the door 18 simultaneously it is necessary only to pull knob 80. This compresses spring 70 and separates the brake elements 66, 68 thus permitting spring 46 to rotate the shaft 44. Rotation of the shaft 44 urges roller 64 at the end of the rocker arm 60 against the rod 62 at the bottom of the rack 20, forcing the latter to rise vertically. The vertical travel of rack 20 causes it to contact the under surface of door 18 and open it as the rack 20 continues its upward movement. To lower the rack 20 it is necessary only to grasp the lip 28 of the rack and push down. The overrunning clutch contained in brake section 68 permits downward movement of the rack 20 unimpeded by brake 66, 68, which movement rewinds the spring 46 to its original tensioned condition.

The brake mechanism just described thus operates to retain rocker arm 60 (and hence rack 20) against upward movement except when knob 80 is pulled out, but permits downward movement of rack 20 against the tension of spring 46 without the additional resistance of the brake mechanism which would otherwise have to be overcome.

It will be seen from the above specification that I have provided an improved refrigerator construction fully satisfying all of the objects of my invention, but it is to be understood that the specific details disclosed herein may be modified in various ways without departing from the spirit of my invention as defined in the appended claims.

It is therefore clear that I have provided in combination with a translatable material support, such as a storage rack or shelf frame, and power means constantly exerting a force sufficient to translate the same in one direction, a unique combined brake and overrunning clutch mechanism. The power means specifically constituting a spring operative to normally rotate a shaft can be adjusted so as to accommodate

changing load conditions on the material support. The brake mechanism includes friction discs associated with the said shaft and means normally holding the discs in engagement so as to prevent movement of the shaft responsive to force applied by the spring. The brake mechanism is releasable by suitable control means so that under control of the control means the support is movable under the influence of the spring, which movement can be stopped in any of an infinite number of positions. The overrunning clutch or one way coupling embodied with the brake and shaft is such that the material support when moved in an opposite direction by a force greater than the force exerted by the power means permits turning of the shaft without the necessity of overcoming the frictional resistance of the brake mechanism independently of the control means so that as soon as the application of this force, which in this case is a lowering force, ceases the shelf frame stops since the brake is immediately re-applied.

Specifically as the shelf frame disclosed in the drawings is lowered, the power is restored to the spring means so that this spring is constantly effected to raise the shelf frame as soon as and as long as brake means are released.

I claim:

1. In a refrigerator, walls defining an open-top compartment, a storage rack assembly, guide means for guiding said rack assembly for vertical movement into and out of the top of said compartment, a shaft journaled in the lower portion of said compartment, means actuated by said shaft upon rotation thereof in one direction for elevating said rack assembly, power means for rotating said shaft in said one direction to elevate said rack assembly, manually releasable brake means normally effective in all vertical positions of said assembly to arrest movement thereof by preventing the rotation of said shaft by said power means in said one direction and operative when released to permit rotation of said shaft in said one direction, control means for releasing said brake means, and a one-way connection between said brake means and said shaft normally permitting rotation of said shaft in an opposite direction upon the application of lowering force to said assembly in excess of the elevating power of said power means, whereby said rack assembly may be stopped in any of an infinite number of positions in its upward movement by the brake means under control of said control means and said rack assembly may also be stopped in any of an infinite number of positions in its movement in a downward direction by said brake means independently of the control means upon the cessation of the application of a lowering force sufficient to overcome the elevating power of the power means.

2. In a refrigerator, walls defining an open-top compartment, a storage rack assembly, guide means for guiding said rack assembly for vertical movement into and out of the top of said compartment, a shaft journaled in the lower portion of said compartment, means secured to said shaft for rotation therewith and arranged to engage said rack assembly to elevate the same upon rotation of said shaft, power spring means for rotating said shaft in one direction to elevate said rack assembly, manually releasable brake means normally effective in all vertical positions of said assembly to arrest movement thereof by preventing the rotation of said shaft in said one direction by said spring means and permitting said rotation when released, and a one-way connection between said brake means and said shaft whereby lowering of said assembly restores power to said spring upon an application of lowering force to said assembly in excess of the elevating power of said power means.

3. In a refrigerator, walls defining an open-top compartment, a storage rack, guide rollers for guiding said rack for vertical movement into and out of the top of said compartment, a shaft journaled in the lower portion of said compartment, means secured to said shaft for rotation therewith and operably connected with said rack on its underside to elevate the same upon rotation of said shaft, adjustable power spring means constantly exerting a force sufficient for rotating said shaft in one direction to elevate said rack, manually releasable brake means normally effective in all vertical positions of said assembly to arrest upward movement thereof by preventing the rotation of said shaft by said spring means in said one direction, and a one-way overrunning clutch connected between said brake means and said shaft permitting rotation of said shaft in a reverse direction to restore power to said spring means upon application of a lowering force to said rack greater than the elevating power of said spring means.

4. In a refrigerator, walls defining an open-top compartment, a storage rack, guide means for guiding said rack for vertical movement into and out of the top of said compartment, a shaft journaled in the lower portion of said compartment, means secured to said shaft for rotation therewith and arranged to engage said rack to elevate the same upon rotation of said shaft in one direction, power spring means for rotating said shaft in said one direction to elevate said rack, friction brake mechanism normally effective in all vertical positions of said assembly to arrest upward movement thereof by preventing the rotation of said shaft by said spring means in said one direction, a one-way connection between said brake mechanism and said shaft permitting rotation of said shaft in a reverse direction to restore power to said spring means upon application of a lowering force to said rack greater than the elevating power of said power means, and control means extending outside a wall of said refrigerator for controlling the release of said brake mechanism.

5. Apparatus of the class described, comprising wall structures defining an open-top cabinet adapted to receive materials for storage or treatment, a vertically reciprocable material support mounted in said cabinet for movement through said top, controllable power means constantly exerting a force sufficient to elevate the support when loaded and adapted to elevate said support, releasable brake mechanism normally effective in all vertical positions of said support to arrest movement thereof under force applied by said power means in one direction for controlling the said power means, and a one-way overrunning clutch connected between said brake mechanism and said power means normally permitting lowering of said support upon the application of a lowering force thereto in excess of the elevating power of said power means, whereby said support may be stopped in any of an infinite number of positions in its elevating movement responsive to release the reapplication of said brake mechanism and said support may also

be stopped in any of an infinite number of positions in a lowering direction by said brake mechanism independently of the release thereof substantially immediately upon the cessation of application of a lowering force sufficient to overcome the elevating power of the power means.

6. In combination a vertically movable shelf frame, re-energizable force applying means constantly applying force to the frame to translate the same in one direction, and releasable normally applied brake mechanism acting in opposition to the force applying means to prevent movement of the frame in said one direction, control means for releasing said brake mechanism so that said frame will move responsive to said force applying means in said one direction and said brake mechanism including means rendering the same ineffective to oppose movement of said frame in a reverse direction so that movement of said frame in said reverse direction re-energizes said force applying means when a force is applied in said reverse direction in excess of the force applied by said force applying means, said brake mechanism being operative to substantially immediately arrest movement of said frame in any of an infinite number of positions in said one direction under control of said control means and in any of an infinite number of positions in said reverse direction independently of said control means.

7. Apparatus of the class described including wall structures defining an open top cabinet, a vertically reciprocable material support and means mounting the same within the cabinet for movement within the top, re-energizable power means constantly effective when energized to apply force to move said support in one direction, releasable normally applied friction brake means effective to oppose movement of said support in said one direction, manually operable means for releasing said brake mechanism to permit movement of said support in said one direction and a one way coupling constantly effective to permit movement of said support in a reverse direction so that movement in said reverse direction re-energizes said force applying means when a force is applied in said reverse direction in excess of the force applied by said force applying means, said brake mechanism being operative to substantially immediately arrest movement of said frame in any of an infinite number of positions in said one direction under control of said control means and in any of an infinite number of positions in said reverse direction independently of said control means.

8. In combination walls defining an open top cabinet, a vertically reciprocable shelf frame mounted within the cabinet, a shaft mounted in said cabinet and positioned beneath the lowermost position of said frame, spring means connected to said shaft and constantly effective when tensioned to rotate the same in one direction, means extending between said shaft and said frame to elevate said frame when said shaft rotates in said one direction, a brake disc carried by said shaft, a second brake disc surrounding said shaft, means normally holding said brake discs in abutting relationship to prevent movement of said shaft, a one way coupling embodied in part with said second brake disc to permit movement of said shaft in an opposite direction and control means for said second brake disc for disengaging the same to controllably permit elevation of said frame so that said spring is effective to elevate said frame while said brake discs are disengaged, said spring means being ineffective to elevate said frame when said discs are engaged and said one way coupling permitting lowering of said frame to tension said spring with said discs engaged.

9. In combination a translatable shelf frame, movable means for translating the same in one direction, a shaft for moving said movable means, re-energizable force applying means connected to said shaft for rotating the same in one direction and thus constantly applying force to said shaft and to said movable means sufficient to translate the frame in said first mentioned direction when loaded, releasable combined clutch and brake mechanism carried in part by said shaft and normally effective in all positions of said frame to arrest movement thereof responsive to the constantly applied force tending to translate the frame in said first mentioned direction, and including means constantly permitting rotation of said shaft in an opposite direction responsive to the application of an opposing force applied in a direction opposite that of said first mentioned direction greater than the amount of force applied by said force applying means so that application of the opposing force re-energizes said force applying means for subsequent application of force in said first mentioned direction, and means for releasing said brake mechanism to controllably permit translation of said frame in said first mentioned direction by said force applying means whereby said frame may be stopped in any of an infinite number of positions in its movement in said first mentioned direction by the brake mechanism under control of the means for releasing the brake mechanism and said frame may also be stopped in any of an infinite number of positions in its movement in a reverse direction by said brake mechanism independently of the means for releasing said brake mechanism substantially immediately upon the cessation of the application of an opposing force in said reverse direction that is greater than the force applied by said force applying means.

10. The combination as defined in and by claim 9 further including walls defining an open topped compartment, said translatable shelf frame constituting a vertically movable series of superposed shelf members mounted within the compartment for upward and downward movement through the open top, means for journalling the opposite ends of said shaft within the compartment beneath the lowermost position of said frame, said re-energizable force applying means constituting a spring operably connected to said shaft adjacent one end thereof, said combined clutch and brake mechanism being adjacent the opposite end of said shaft and carried in part by said shaft and in part being rotatably mounted on the adjacent journalling means.

11. The combination as defined in and by claim 10 in which said brake mechanism includes a brake disc member carried by said shaft, a second brake disc member surrounding said shaft, spring means normally holding said brake discs in abutting relationship to prevent movement of said shaft, and the means for releasing said brake mechanism including a shiftable member between said second disc and said spring and shiftably supporting said second disk member, a bell crank lever mounted for pivotation about a fixed axis including two arms one of which is con-

nected to said shiftable member and means connected to the other arm of said bell crank lever and extending exteriorly of the compartment and operable to pivot said bell crank lever to move said shiftable member against the action of said spring to release said brake mechanism.

12. The combination as defined in and by claim 11 and in which the means constantly permitting rotation of said shaft in an opposite direction includes an overrunning clutch housed within said second disc member comprising a stationary four-lobed cam and spring pressed rollers mounted between the lobes of said cam and said second disc member, the cam surfaces being disposed so as to permit rotation of said second disc member while in brake applying position in said opposite direction.

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