July 16, 1957 F. I. RATAICZAK 2,799,550

DOOR BIASING DEVICE

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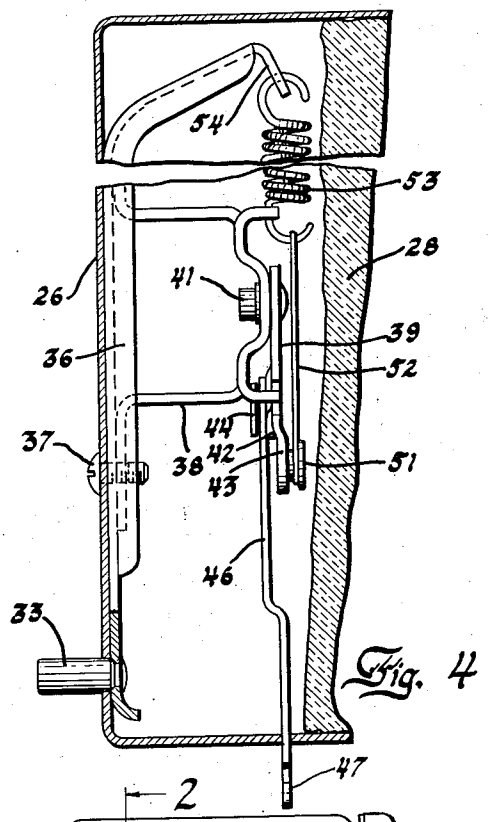



Fig. 4

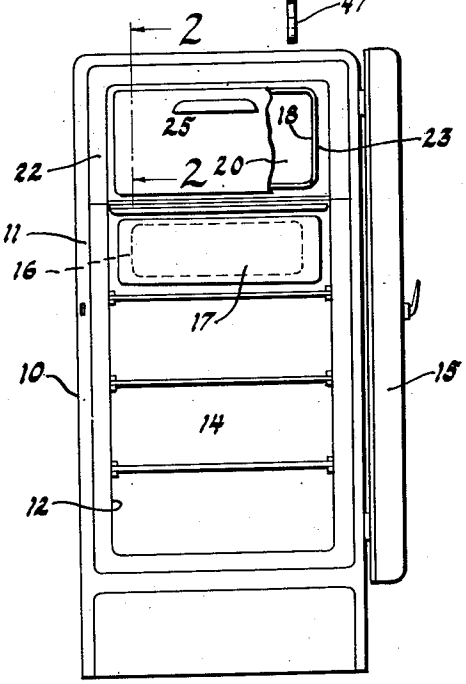



Fig. 1

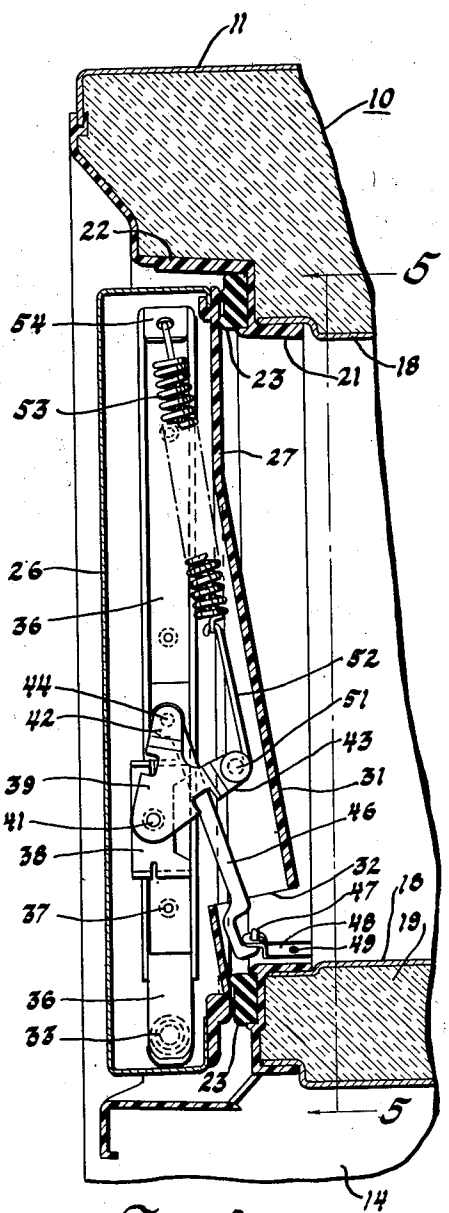


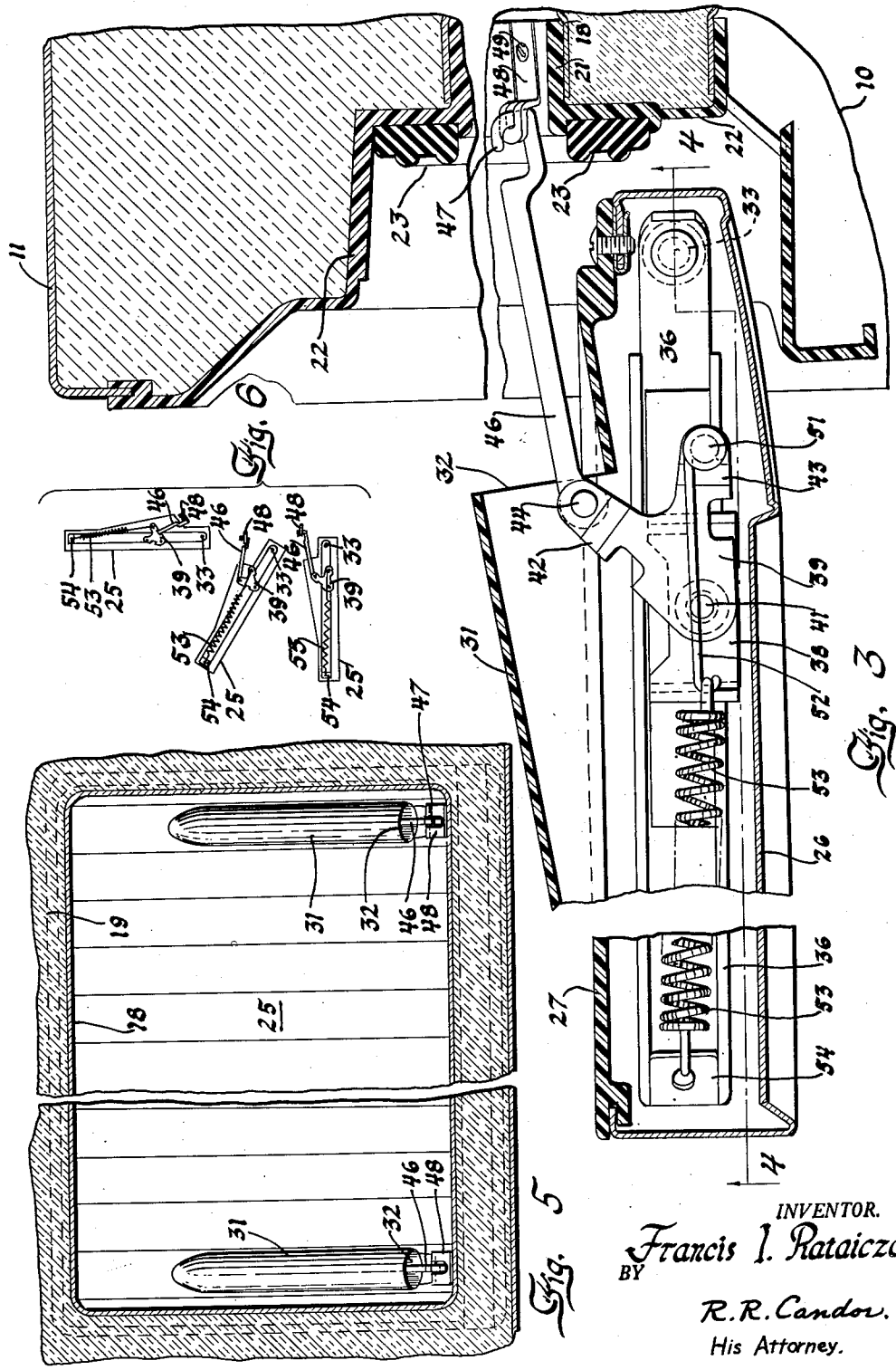

Fig. 2

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DOOR BIASING DEVICE

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2,799,550

# DOOR BIASING DEVICE

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2 Claims. (Cl. 312—319)

This invention relates to a biasing device for door and particularly to such a device for a vertically swinging refrigerated compartment door.

An object of my invention is to provide an improved door biasing device.

Another object of my invention is to provide a door biasing device which is effective while the door is closed and during a part only of the opening swinging movement of the door and which device is rendered ineffective to pull the door in a door closing direction in response to swing the door into a fully open position.

A further object of my invention is to provide a pivotally mounted vertically swinging door of a refrigerated food storage compartment of a refrigerator cabinet with means whereby a pull is applied to the door on one side of its pivotal mounting when the same is closed for sealing the compartment and which means is rendered ineffective to pull on the door on said one side of its pivotal mounting in response to swinging the door into a substantially horizontal plane.

A still further and more specific object of my invention is to provide a door for an access opening of a refrigerated food storage compartment of a refrigerator cabinet with a biasing device having a bell crank fulcrumed on the door and connected to an elongated coil spring of the device in such manner that movement of the door into open position shifts or changes the moment of an arm of the bell crank relative thereto to bring the action of the spring into alignment with the fulcrum point of the bell crank, whereby the pull of the spring of the device on the door in a door closing direction is rendered ineffective and the door remains open.

Further objects and advantages of the present invention will be apparent from the following description, reference being had to the accompanying drawings, wherein a preferred form of the present invention is clearly shown.

In the drawings:

Figure 1 is a front view of a multiple compartment refrigerator cabinet showing the cabinet door in open position and showing an inner door having my invention embodied therein;

Figure 2 is an enlarged vertical fragmentary sectional view taken on the line 2—2 of Figure 1 showing a freezing compartment in the cabinet having a door closing the access opening thereof;

Figure 3 is an enlarged broken sectional view, similar to Figure 2 showing the freezing compartment access opening door in open position;

Figure 4 is a fragmentary sectional view taken on the line 4—4 of Figure 3 showing the mounting of a biasing device on the freezer compartment door;

Figure 5 is a fragmentary sectional view showing the inner face of the compartment door and is taken on the line 5—5 of Figure 2; and

Figure 6 is a combined view schematically showing the biasing device of the present invention in three different positions relative to the door.

The present invention relates to a novel biasing device



for the door of a freezing compartment access opening in a refrigerator cabinet of the type disclosed in the Clifford H. Wurtz patent, Number 2,672,027, dated March 16, 1954, and in the co-pending application of Orson V. Saunders Ser. No. 369,373, filed July 21, 1953, entitled "Refrigerating Apparatus," now Patent No. 2,739,456, both assigned to the assignee of this application.

In the drawings of the present application, I show in Figure 1 thereof a refrigerator cabinet generally indicated by the reference numeral **10**. Cabinet **10** has a metal shell or housing **11** forming the outer top and side walls thereof and in which there is provided, by an inner liner **12** with insulation thereabout, an unfrozen food storage compartment **14** having a forwardly facing opening. An insulated door structure **15**, hingedly mounted upon the cabinet for horizontal swinging movement, normally closes the front opening in cabinet **10**. A plate or the like evaporator **16** of a closed refrigerating system (not shown) associated with cabinet **10**, concealed from view by a cover **17**, is utilized to cool the interior of compartment **14** to a temperature above 32° F. The liner **12** has an open top disposed a substantial distance below the top wall of the cabinet shell **11** to permit a freezing or frozen food storage compartment to be formed in the cabinet above the compartment **14** therein. A metal can-like member **18** having an open front is located above the liner **12** and is surrounded by insulated material **19** (see Figures 2 and 5) to form the liner of a freezing or frozen food storage compartment **20** in cabinet **10**. Liner or member **18** is supported in cabinet **10** in the manner shown and fully described in the above referred to patent and application. A refrigerant evaporator of the refrigerating system associated with cabinet **10** and in the form of a refrigerant expansion conduit (not shown) wrapped or coiled around and in contact with the outer surface of can member **18**, in the now conventional manner, is utilized to cool the interior of freezing compartment **20** to a temperature well below 32° F.

The edges of liner or can member **18** at the open front of compartment **20** are secured by screws or the like (not shown) to a flange **21** formed integrally on a non-metallic and preferably molded plastic breaker collar which has its sides and top attached to the cabinet outer walls or shell **11** in any suitable and now well-known manner. Collar **22** is provided with a channel which extends entirely around the front of frozen food compartment **20** and contains a foam rubber or the like resilient gasket or cushion **23**. Collar **22** forms a door jamb on the stationary structure or compartment **20** and a door structure, generally represented by the numeral **25** in Figure 1 of the drawings, is adapted to abut against gasket **23** to seal the access opening of the freezing or frozen food storage compartment. The door structure **25** for closing the open front of compartment **20** comprises an outer metal panel **26** and an inner preferably molded plastic panel **27** (see Figure 2) having insulating material **28** (see Figure 4) disposed therebetween. The panels **26** and **27** of door **25** may be assembled and secured together in any suitable manner such, for example, as is disclosed in the co-pending application of Orson V. Saunders, filed September 23, 1953, Ser. No. 381,771, entitled "Refrigerator Door," and assigned to the assignee of the present application, now Patent No. 2,708,294. Inner plastic panel **27** of the present door **25** is provided, near each of its sides, with an embossed portion **31** having an opening **32** therein (see Figures 2 and 5) for a purpose to be hereinafter described. Door **25** also includes side hinge pins **33** fitted in suitable mounting apertures (not shown) provided in collar or door jamb **22** to permit of its being swung vertically about such mounting to open and/or close the access opening of compartment **20**.

In accordance with my invention and in order to eliminate the necessity of a housewife holding a vertically swingable freezer compartment door down in open position, while transferring food products to and from the freezing compartment **20**, I provide door **25** with an improved biasing means or device. In the present structure, door **25** has a metal channel member **36** on each side thereof secured to panel **26** in any suitable manner such as by screws **37**. The door's hinge pins **33** are carried on channel members **36** and extend through openings in the sides of the door outwardly from the interior thereof. A metal bracket **38** at each side of door **25** is clamped to a channel member **36**, by screws **37**, and forms a mounting for a bell crank lever. A bell crank **39** fulcrumed upon each of the brackets **38**, by a stud **41**, is provided with the two arms **42** and **43**. Arm **42** of each bell crank **39** carries a stud **44** to which, one end of a rigid link **46** is pivotally mounted. The other or opposite end of link **46**, extends through the aperture **32** of inner door panel **27**, is hook shaped, as at **47**, and hooks into an aperture in a clip **48** secured by a screw or the like **49** to flange **21** on collar or door jamb **22**. The other arm **43** of each bell crank **39** carries a stud **51** to which one end of a connector **52** is attached. The other end of connector **52** hooks into one end of a biasing means or elongated coil spring **53** which has its other or opposite end connected to an upper part of door **25** such as to the upper end **54** of a channel member **36**. Arms **42** and **43** of the bell cranks **39** may be provided with cut-out portions for engaging stops provided on brackets **38** so as to prevent abnormal movement of arms of the bell cranks relative to brackets **38** when the springs **53** are detached from door **25** or when the links **46** are disconnected from their mounting clips **48**.

By referring to Figure 2 of the drawings, it will be noted that when door **25** is closed, the biasing means or elongated springs **53** at each side of the door are held, by the arm **43** of bell cranks **39** in a position so that their pulling action on the door is to one side of the fulcrum point **41** of the cranks and to one side of the pivotal mounting point, hinge pins **33**, of the door. In other words, the longitudinal axis or line of action of springs **53** is located to the right in Figure 2 of the drawings of a straight line extending through the end **54** of a bracket **36** and the pivot points **41** and **33** of the bell crank **39** and door **25** respectively. The pulling action of springs **53** on door **25** forces the peripheral portions of door panel **27** into tight abutting relation with the gasket **23** at the door jamb for compressing the gasket where necessary to insure a continuous seal of the compartment entirely around its access opening. Thus, the door **25** is strongly biased shut when it is in its closed position. Arms **42** and **43** of the bell cranks **39** are so spaced apart and arranged with respect to one another, relative to the fulcrum point of the cranks, that as door **25** is swung downwardly toward its open position, the pulling tension of the springs **53** on door **25** is increased throughout at least the first part of this opening movement of the door (see Figure 6) to counterbalance or counterpoise its weight. Such prevents the door from suddenly dropping all the way from its closed to its fully open position. As this opening movement of door **25** is continued, to move same farther toward the horizontal, rigid links **46**, being anchored to a wall of compartment **20**, by clips **48**, pull on arm **42** of the bell cranks **39** to thereby shift the bell cranks and change the moment of their arms. As door **25** is moved, from the intermediate position thereof as shown in Figure 6 of the drawings, into a fully open position or into a horizontal plane with respect to its door jamb, as shown in Figures 3 and 6 of the drawings, studs **51** on arm **43** of the cranks **39** cause the one end of connector **52** to be moved to the opposite side of a straight line between the pivot point of door **25** and the point of attachment of the upper end of springs **53** to the door. In other words, studs **51** on bell cranks **39** shift the one end of connector **52** so that the end of arms **43** are substantially in alignment with both the fulcrum point **41** of the bell crank and with the upper end of spring **53** attached to door **25**. This renders the biasing action of springs **53** to pull door **25** closed ineffective whereby the door remains open in a horizontal plane without manually holding same open. Thus, both arms and hands of a housewife are free for use in transferring food products to and from the frozen food storage compartment **20**. Door **25** must be manually started in motion upwardly of its open horizontal position whereafter the biasing device becomes effective and the tension of springs **53** thereof then pulls the door closed. The pulling force of the biasing device on door **25**, when the door is moved to closed position, is adapted to cause portions of the resilient gasket **23**, at certain points around the access opening of compartment **20**, to be compressed for insuring a continuous seal of the inner panel **27** of the door with the gasket **23** entirely therearound. Compression of the gasket **23** at certain points as described compensates for any misalignment between the door **25** and the front of compartment **20** or the door jamb due to manufacturing tolerances.



By mounting the spring and the bell crank of the present biasing devices on the door, substantially all of the device is concealed from view within panels of door **25** and, thus, the devices do not detract from the neat interior appearance of the refrigerator cabinet. This concealment of parts of the biasing device also prevents a housewife or other user of the refrigerator disclosed from getting fingers pinched or cut by movement of parts of the device during the act of vertically moving door **25** with respect to compartment **20**. It should be noted that as the door **25** is initially moved toward open position, the spring **53** is stretched more than when the door is closed and it naturally increases considerably in tension to counterpoise its weight. However, as the spring nears its furthermost stretch, when the door is a little more than half-way open, the pulling action thereof on the door is gradually decreased and the door freely moves into a horizontal open position whereupon the pulling tension of the springs on the door, in a direction to close the door, becomes neutralized to permit the door to remain open. The mechanical advantage derived by the use of a bell crank lever in a biasing device and the mounting of same on the door to change or shift the moment of arms of the bell crank permits at least the initial opening movement of the door to be effectively counterbalanced while at the same time providing an effective pull on the door when it is closed. The pull on the door, by the present device, properly seals the access opening of the frozen food storage compartment and permits its interior to be maintained at a desired low temperature out of communication with the lower unfrozen food compartment.

While the form of embodiment of the invention as herein disclosed constitutes a preferred form, it is to be understood that other forms might be adopted, as may come within the scope of the claims which follow.

What is claimed is as follows:

1. A refrigerator cabinet having a frozen food storage compartment and an unfrozen food storage compartment therein disposed one above the other and each provided with a front access opening, an outer door extending across both of said compartments for closing the opening in said cabinet, an inner door for the access opening of said frozen food compartment, said inner door having spaced apart and secured together panels forming a chamber therebetween, the bottom portion of said inner door being pivotally mounted to said cabinet for swinging movement from a substantially vertical shut position to a substantially horizontal open position, a biasing device for said inner door, said device comprising a bell crank within the chamber of said inner door fulcrumed thereon intermediate its top and its pivotal mounting, spring means having

one of its ends attached to an upper part of said inner door with its other end connected to one arm of said bell crank and a link having one of its ends connected to the other arm of said bell crank with its opposite end extending through the innermost panel of said inner door and anchored to a stationary part of said cabinet, the anchoring of said opposite end of said link being at a point spaced laterally a sufficient distance from the pivotal mounting of said inner door to hold said bell crank in a position to cause said spring means to bias the door closed when same is in said vertical shut position, said spring means counterpoising said inner door throughout a portion of the opening swinging movement thereof into a substantially horizontal plane, the fulcrum of said bell crank being swingable with said inner door about its pivotal mounting, and the stationary anchorage of said opposite end of said link shifting said bell crank about its fulcrum on said inner door during swinging of the fulcrum therewith to render the counterpoising and door closing action of said spring means relatively ineffective so that the weight of said inner door forms the sole means of maintaining same in said horizontal open position whereby it forms a transfer ledge at the front of said cabinet for receiving and supporting food products during rearrangement thereof in said frozen food compartment.

2. A refrigerator cabinet having a frozen food storage compartment and an unfrozen food storage compartment therein disposed one above the other and each provided with a front access opening having a door jamb, an outer door extending across both of said compartments for closing the opening in said cabinet, a yieldable gasket on the door jamb of said frozen food compartment, an inner door engageable with said gasket for closing said access opening of said frozen food compartment, said inner door having spaced apart and secured together panels forming a chamber therebetween, the bottom portion of said inner door being pivotally mounted to said cabinet for swinging movement from a substantially vertical shut position to a substantially horizontal open position, a biasing device for



said inner door, said device comprising a bell crank within the chamber of said inner door fulcrumed thereon intermediate its top and its pivotal mounting, a coil spring having one of its ends attached to an upper part of said inner door with its other end connected to one arm of said bell crank and a link having one of its ends connected to the other arm of said bell crank with its opposite end extending through the innermost panel of said inner door and anchored to a stationary part of said cabinet, the anchoring of said opposite end of said link being at a point spaced laterally a sufficient distance from the pivotal mounting of said inner door to hold said bell crank in a position to cause said coil spring to bias the door closed when same is in said vertical shut position against said gasket with such force as to effectively seal the frozen food compartment about said access opening thereof, said coil spring counterpoising said inner door throughout a portion of the opening swinging movement thereof into a substantially horizontal plane, the fulcrum of said bell crank being swingable with said inner door about its pivotal mounting, and the stationary anchorage of said opposite end of said link shifting said bell crank about its fulcrum on said inner door during swinging of the fulcrum therewith to render the counterpoising and door closing action of said coil spring relatively ineffective so that the weight of said inner door forms the sole means of maintaining same in said horizontal open position whereby it forms a transfer ledge at the front of said cabinet for receiving and supporting food products during rearrangement thereof in said frozen food compartment.

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