Dec. 5, 1961 P. P. BENDER 3,011,223

CABINET WITH SELF-CLOSING DOORS

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Fig. 1

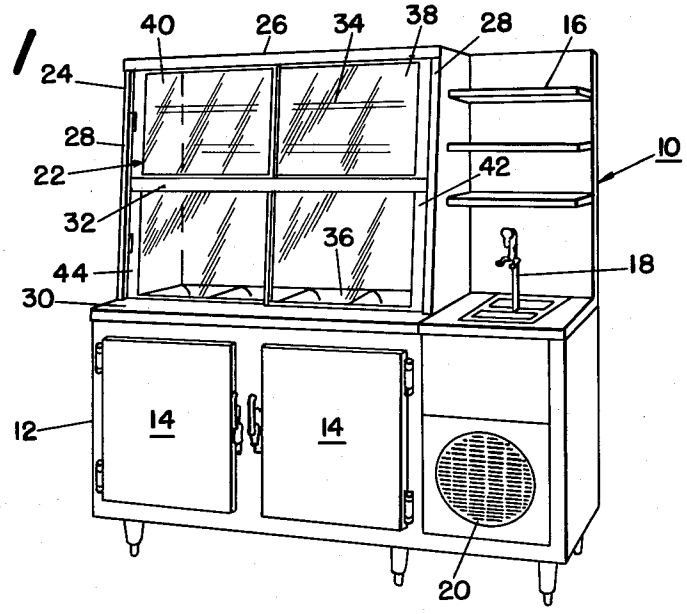
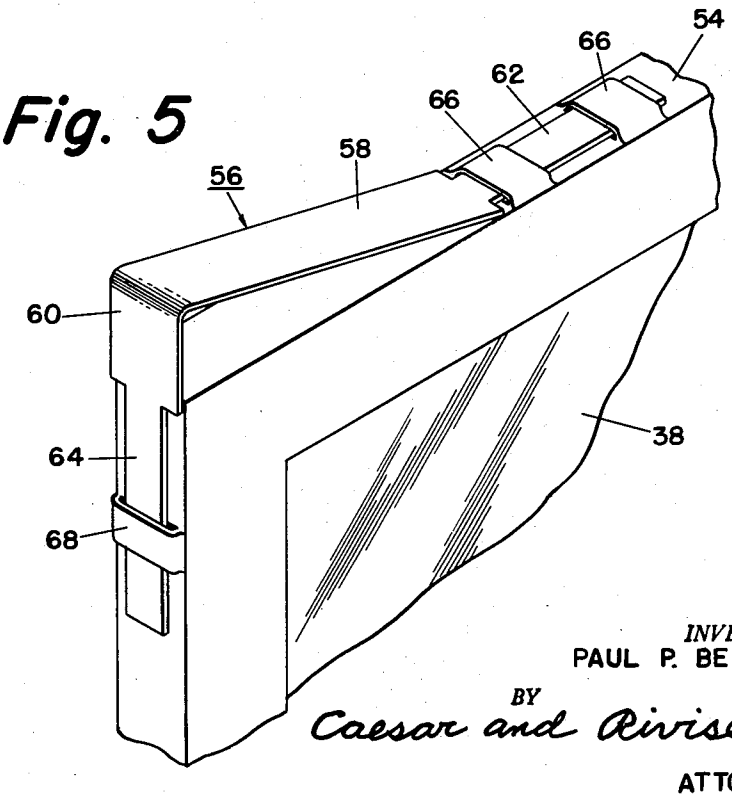


Fig. 5



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Fig. 2

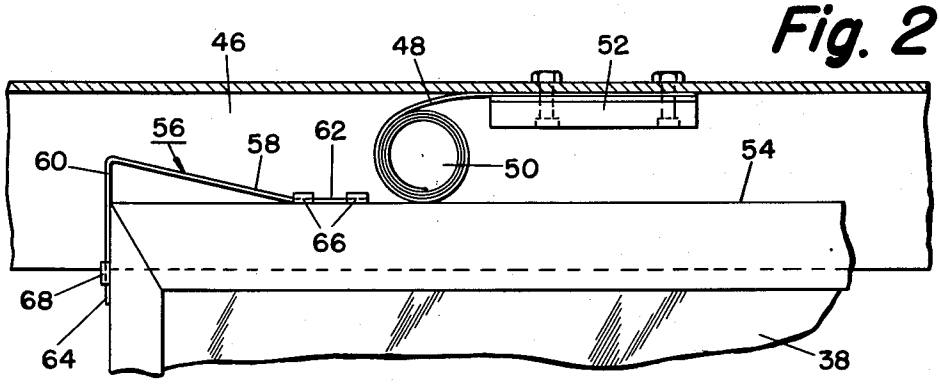


Fig. 3

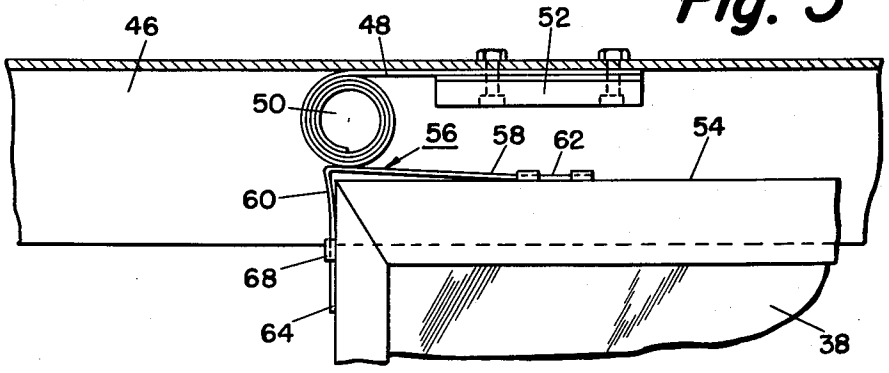
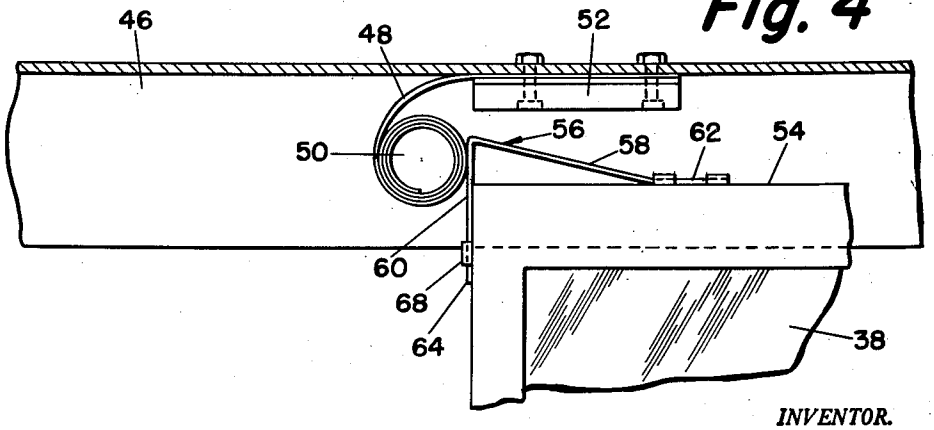


Fig. 4



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CABINET WITH SELF-CLOSING DOORS

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Filed Mar. 11, 1959, Ser. No. 798,618
2 Claims. (Cl. 20—19)

This invention relates to a door construction for storage and display cabinets and it particularly relates to a self-closing type of door construction. This application is a continuation-in-part of copending application Serial No. 742,955 filed June 18, 1958.

As was stated in the aforementioned copending application, display cabinets having transparent windows or doors are used for various purposes, especially in restaurants or the like. Such storage cabinets, which are frequently refrigerated, must necessarily be kept closed at all times except when food is inserted or removed. In order to prevent the doors from being inadvertently left open, they are generally provided with self-closing means which will automatically close the doors when pressure is removed therefrom.

In addition to being self-closing, these doors should be removable in order to permit adequate cleaning of both the interior of the cabinet and of the track means upon which the doors ride.

In the aforesaid copending application, applicant obtained the desired results by providing a cabinet having a door mechanism which included in the track means a spring strip, having a constant resistance to uncoiling, corresponding to each door. These spring strips were each biased into a coil arranged to abut the upper trailing edge of the corresponding door so that when the door was pulled back into the open position and then released, the strip would then return to its coil position, pushing the door back into its closed position in the process.

In the aforesaid copending application, in order to insert the doors into the track in a position to be engaged by their corresponding spring coils, each door was first inserted so that its upper edge engaged the bottom of the coil and forced the coil radially upward. The door was then moved longitudinally until its trailing edge cleared the coil, after which the coil descended into its normal position abuting the trailing edge. It was necessary to provide sufficient clearance in the track for the coil to move upwardly under the pressure of the door. For this purpose a slot was provided in the upper wall of the track and a spring biased finger partially closed this slot. When the coil was pushed upwardly it passed through the slot against the resilient pressure of the finger.

Although the above described type of construction has proved to be very effective for the desired purpose, the use of such slots and spring fingers tended to increase the cost and complexity of the apparatus and also increased the maintenance problems because of the somewhat delicate spring finger and slot arrangements.

It is one object of the present invention to overcome the above difficulties by providing a door construction which permits the door to be easily inserted and removed from the track while retaining the spring coil within the confines of the track.

Another object of the present invention is to provide an arrangement of the aforesaid type which is much simpler in construction and has much less tendency to become damaged than the prior type of construction.

Another object of the present invention is to provide an arrangement of the aforesaid type wherein the cost of manufacture is substantially less than that of the previous type of construction.

Other objects and many of the attendant advantages of this invention will be readily appreciated as the same becomes better understood by reference to the following

detailed description when considered in connection with the accompanying drawings wherein:

FIG. 1 is a front perspective view of a display cabinet embodying the present invention;

FIG. 2 is a fragmentary side view, partly in section and partly in elevation, of the track member and door; the door being shown in the process of being inserted into the track;

FIG. 3 is a view similar to that shown in FIG. 2 but showing the trailing edge of the door passing beneath the spring coil as the door is moved longitudinally of the track;

FIG. 4 is a view similar to that of FIGURES 2 and 3 but showing the door after it has moved past the spring coil; the coil being shown in operative position behind the trailing edge of the door; and

FIG. 5 is a fragmentary perspective view of a corner of the door showing the spring cam in position thereon.

Referring now in greater detail to the various figures of the drawings wherein similar reference characters refer to similar parts, there is shown a cabinet generally designated **10** which comprises a base portion **12** containing a refrigerated chamber closed by doors **14**, a side portion provided with shelves **16**, a water fountain **18** below the shelves **16** and a compressor unit **20** below the water fountain. The compressor **20** is operatively connected to refrigerator coils (not shown) in the chamber in the base portion. These refrigerator coils supply cold air both in the chamber and also in the interior of the food display case indicated at **22**.

The food display case **22** has an open front defined by a framework **24** which includes top frame member **26**, side frame members **28** and counter portion **30** at the bottom. Extending across the open front, at the center of the display case **22**, is a bar **32** which is connected at either end to the side frame members **28**.

Within the case **22** are provided a series of vertically spaced movable shelves **34**, while at the bottom are provided a number of trays **36**. The bar **32** divides the case into two compartments with a pair of sliding glass doors or panels **38** and **40** closing the upper compartment and a pair of doors or panels **42** and **44** closing the lower compartment. Each door comprises a frame enclosing a glass pane and the frame is provided with a handle or the like in the ordinary manner.

The construction described above is substantially identical with that disclosed in copending application Serial No. 742,955.

Each door is slidable in a channel type track formed either in the top frame member **26** or in the bar **32**, depending on the location of the door.

The channel type track member is indicated in FIGURES 2, 3 and 4 at **46**; this track member **46** exemplifying the track portions of both the top frame member **26** and the bar **32**, which track members are identical. Each channel type track member is provided with a top wall, a pair of side walls and an open slot at the bottom. In order to accommodate the two doors used in closing each compartment, a pair of such channel track members are provided in side-by-side relationship at the upper end of each compartment. The lower edges of the doors are provided with grooved rollers adapted to ride on a rib type track along the lower edge of each compartment. This particular type of construction has been clearly illustrated in applicant's copending application and is therefore not illustrated in the present application.

Positioned within channel track member **46** is a metal strip **48** which is resiliently biased into a coil **50**. The strip **48** is preferably constructed of stainless steel or high carbon spring steel and is stressed incrementally along its length rather than cumulatively, as is the case with ordinary springs. Consequently, the strip **48** main-

tains a constant resistance to uncoiling through its entire longitudinal deflection. One such spring strip 48 is provided in each channel track member 46, of which there are four to accommodate the four doors; two for the upper compartment and two for the lower compartment. The coils 50, into which the strips 48 are biased, are preferably positioned at approximately the median portion of the corresponding track member.

The strip 48 is secured to the upper wall of the corresponding track member 46 by any desirable means such as welding, soldering, bolting, riveting or the like. Adjacent the coil 50, the track member is provided with a bumper bar 52 which is preferably constructed of a resilient or flexible material. This bumper bar 52 is used to prevent spring coil 50 from bouncing back beyond its original position when the corresponding door is removed.

Each of the doors 38, 40, 42 and 44 are substantially identical so that a description of one suffices for a description of all. In this context, the door 38 is shown in FIGURES 2, 3 and 4 as having a straight upper edge 54 to the trailing portion of which is connected a cam spring 56. This cam spring 56 comprises an upwardly inclined arm 58 integral with a vertical arm 60. At the free edge of the inclined arm 58 is provided a reduced finger portion 62 while at the free end of the vertical arm 60 is provided a reduced finger portion 64. The cam spring 56 is removable from the door 38 and is held thereon by means of loops 66 on the upper edge of the door and similar loop 68 on the trailing edge of the door. When the fingers 62 and 64 are inserted beneath their respective loops, the arms 58 and 60 form a wedge shaped cam element which may be pressed down almost flat against the top edge of the door by a downward pressure thereon. This is permitted because of the slidable action of the finger 64 beneath the loop 68 and the flexibiilty of the spring arm 58. The removable nature of the cam spring 56 permits cam springs of varying contours and dimensions to be selectively used.

In the operation of the device, with the door 38 removed, the spring coil 50 occupies most of the vertical width of track member 46. To insert the door 38, the upper edge 54 of the door is inserted under the top frame member 26 and into the channel 46 from below. The door is generally inserted midway of the length of the channel (as shown in FIG. 2). The door is then slid longitudinally to the right (as viewed in FIGURES 2, 3 and 4) until the cam spring 56 comes into contact with spring coil 50. When this happens (as is illustrated in FIG. 3) since the pressure of the spring coil 50 is greater than that of the cam spring 56, additional longitudinal movement of the door causes the coil 50 to press down upon the cam spring 56 which is flattened out almost against the top edge of the door, while its finger 64 moves downwardly. As soon as the trailing edge of the door passes the coil 50, the natural bias of the cam spring 56 causes it to assume its normal position (as shown in FIG. 4). In this position, the coil 50 abuts the vertical arm 60 of the cam spring. Since the cam spring is relatively rigid against a force in the longitudinal direction, its vertical arm 60 acts as a bearing surface for the coil 50 whereby when the door is pushed to the open position (to the left as viewed in FIGURES 2, 3 and 4) the cam spring 56 pushes back on the coil 50 causing it to uncoil. Thereafter upon release of longitudinal pressure against the door, the force of the coil on the arm portion 60 of the cam spring causes the door to be pushed back into its closed position.

As more fully described in applicant's copending application, the wedge shaped element (in this case the cam spring 56) extends to a height above the center line of the coil, so that when the door is pushed back against the coil, it will push it back in a straight direction. If it were below the center line of the coil, there would be an inclined vector force which would tend to push the coil upwardly against the upper wall of the track and cause binding and possible damage to the coil.

After the upper edge of the door has first been inserted, the lower edge of the door is lifted over the bar 32 until the rollers on the lower edge of the door engage over the rails or rib type tracks on the bar 32. Thereafter, the door is pushed to the right until the trailing edge of the door and the cam spring 56 clears the coil 50. From that point on, whenever the door is pushed back into open position, it pushes back the spring coil 50 which uncoils the strip 48. When the door is thereafter released, the spring strip 48 acts to automatically and gently move the door back into closed position; the gentleness being due to the constant tension of the spring strip.

The door is removed in reverse fashion by sliding the door to the left, lifting the door up to clear the lower tracks and then pulling the door out from under the upper track 46. When this is done, the strip 48 returns the coil 50 to its normal position while the bumper bar 52 (as explained above) prevents movement of the coil beyond its normal position.

Similarly to what was described in the aforementioned copending application, the doors 38 and 40 are arranged to close in opposite directions, as are also doors 42 and 44. Therefore the spring strip 48 corresponding to door 38 is biased into its coil 50 in an opposite direction from the spring strip corresponding to door 40. The same is true for the spring strips corresponding to doors 42 and 44.

Obviously many modifications and variations of the present invention are possible in the light of the above teachings. It is, therefore, to be understood that within the scope of the appended claims, the invention may be practiced otherwise than as specifically described.

What is claimed as the invention is:

1. A self-closing door arrangement comprising a housing, an opening in said housing, a channel track on at least a portion of the inner periphery of said opening, a spring strip in said channel track, said spring strip being resiliently biased into a coil, a door panel removably positioned in said opening with one edge thereof extending into said channel track and being slidable therein, said door panel having an upper edge portion and a trailing edge portion, a wedge shaped cam spring positioned on said upper edge portion adjacent said trailing edge portion, said cam spring comprising an inclined arm connected to said upper edge portion of said door panel and a straight arm slidably connected to said trailing edge portion of said door panel, said inclined arm being flexably movable toward and away from said upper edge portion coincident with slidable movement of said straight arm on said trailing edge portion, and said coil being positioned in the path of movement of said cam spring as said cam spring is moved by the sliding action of said door panel, said coil acting to impose a camming force on said cam spring causing said inclined arm to move toward said upper edge portion as said cam spring passes into contact with said coil.

2. The arrangement of claim 1 wherein said cam spring is removably connected to said door panel, said inclined arm having a finger portion freely slidable within loop means on said upper edge portion of the door panel and said straight arm having a finger portion slidably engaged within loop means on said trailing edge portion of the door panel.

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