

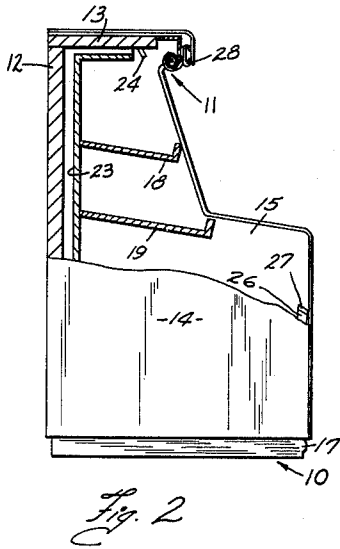
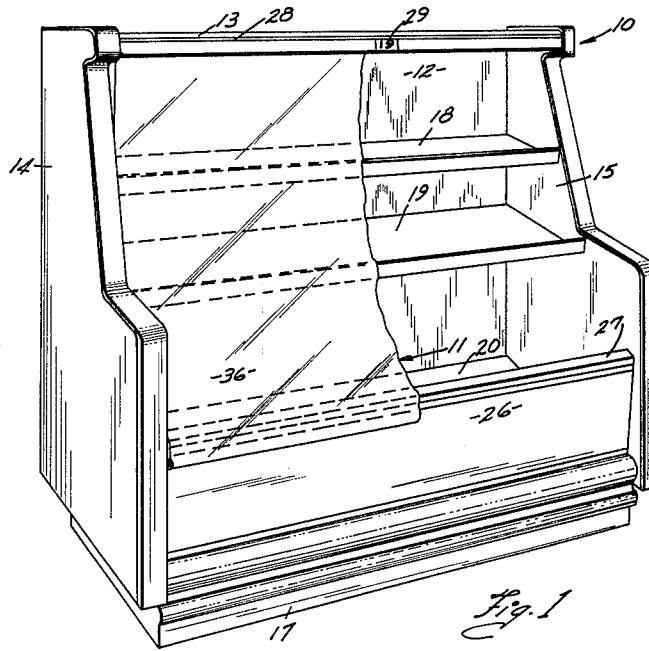
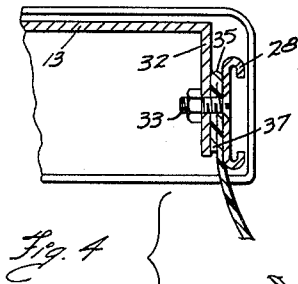
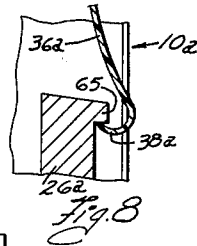
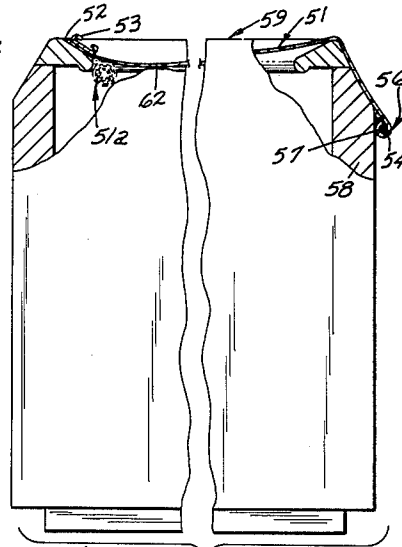
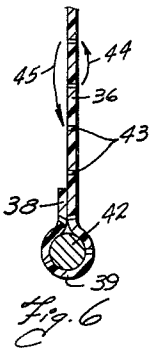
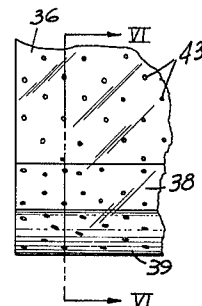
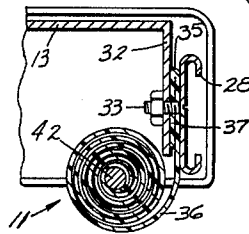
March 22, 1966

W. R. DONKER

3,241,899

CLOSURE STRUCTURE

Filed Sept. 16, 1963



INVENTOR
WILLIAM R. DONKER
BY

Woodhams, Blanchard & Flynna
ATTORNEYS

3,241,899

CLOSURE STRUCTURE

William R. Donker, Silver Creek Township, Cass County, Mich., assignor to Econo-Cover, Dowagiac, Mich., a copartnership consisting of Emil Darr, William R. Donker, and John M. Pendergrass

Filed Sept. 16, 1963, Ser. No. 309,206
6 Claims. (Cl. 312-116)

This invention relates in general to a closure structure and, more particularly, to a curtain structure for covering the open access surface of a display-type refrigerator or food freezer.

Display-type refrigerators, having open access surfaces and capable of maintaining foods in a frozen condition, have been used for many years. Accordingly, it is well known that many problems, previously unsolved, have developed from the use of this type of equipment, even though its value in protecting and selling produce is unquestioned. For example, and quite obviously, the continuously open access surface, particularly in the frontwardly opening or horizontal display units, permits large amounts of cool air to "spill out" of the freezer and thereby create several undesirable results.

In the first place, heat losses resulting from the spill out of cold air necessitate a much larger and much more costly refrigerating system than would be required to refrigerate the same amount of cubic space in a completely enclosed freezer. For example, an average front access freezer, which is 12 feet long and has 60 cubic feet of capacity requires at least a 7½ horsepower motor for operating the compressor, only. However, a fully enclosed freezer of the same capacity requires no more than a one horsepower motor. It is common knowledge that the large horsepower motor is required to operate a larger, hence more costly, compressor and that all of the other related parts of the refrigeration system are correspondingly larger and more expensive. Thus, both the initial cost and the maintenance cost are greatly increased by using a front access, display freezer in place of an enclosed freezer.

The spill out of the refrigerated air, particularly in large food markets where several freezers are located in the same part of the market, creates a cold floor condition near said freezers, which is particularly noticeable in the morning. If the thermostat is located anywhere near the freezers, the remainder of the store will be too hot both in the summer and during the winter. That is, in the summer the cooling thermostats will indicate that the air space in the store is adequately cool and, as expected, the heating thermostats will indicate that the store is too cold in the winter. This may create customer discomfort, which may reduce sales. However, there is no question that the spill out of cold air in the winter causes the heating system of the market to compete with the refrigerating system of the freezers, even at night, so that an uncomfortable compromise is the best that can be achieved under existing circumstances.

It will be noted that, in the foregoing discussion, most of the problem resulted from the fact that cold air has been permitted to spill out of the freezer during at least a twelve-hour period (between 9 p.m. and 9 a.m.) when very few, if any, customers are in the market. Thus, it becomes clearly evident that some means for at least minimizing this spill out of cold air during the unoccupied hours of the market would greatly reduce the problem.

It is also common knowledge in the freezer field that the defrost cycle of the freezer must be set for the most severe conditions that will normally be encountered. Any other approach could result in heavy losses due to food spoilage. In general, the defrost mechanisms in

open access freezers are set to operate at least once during each 24 hour period of normal use. Broadly speaking, an increase in the number of defrost cycles results in a decrease in the defrost period due to the smaller amount of frost which can or will collect between defrost cycles. It is known that excessive defrost cycles produce a deleterious effect upon the food in the freezer. On the other hand, the additional frost which can collect between less frequent cycles can affect adversely the appearance of the merchandise. However, the condensation created during each defrost cycle in either case often produces an initial frost upon the packages and on the inside of the freezer which the defrosting was intended to remove, thereby reducing the efficiency of the following operation of the refrigeration system.

Some front access display freezers have as many as four defrost cycles during each 24 hour period. However, as pointed out above, during at least half of each 24 hours the market is not open and, therefore, it is unnecessary to have the access opening uncovered. Thus, at least one, and possibly two, of the defrost cycles in every 24 hour period are unnecessary, insofar as the utility of this type of front access freezer is concerned. That means the defrost cycles which occur during the daytime, when the display case is being used, would probably be adequate to carry the unit through the night, if it were not for the fact that the refrigerated air is spilling out during the entire night. Where a single defrost cycle is used, covering of the access opening at night would reduce the collection of frost, hence the length of the defrost cycle.

Some efforts have been made in the past to minimize the foregoing problems by draping covers of various kinds over the access surface of the display freezers, particularly during the night. However, these efforts have not been successful and have not been widely accepted by refrigerator manufacturers for several reasons. In the first place, manufacturers of open access display freezers have been either unable or unwilling to say that the problems created by existing covers are less than problems which they overcome. In the second place, the existing covers required to close the average access surfaces are large and difficult to handle and to store. Moreover, the ever present problem of sanitation has made certain types of covers unfit for use in food markets. That is, the food inspectors would seriously object to certain types of covers, even though they might reduce heat losses.

In addition to all of the above-mentioned problems, it has been found that a moisture proof curtain placed over the access surface of a frontwardly opening food freezer will collect substantial amounts of condensation when the dew point is reached during a defrost cycle. Such condensation will either deposit itself on the food in the freezer at the end of the defrost cycle, or it will freeze solid on the curtain when the temperature is suddenly and abruptly lowered during the final stages of the defrost cycle. Accordingly, if a transparent sheet material is used, it may be clouded with condensation after a defrost cycle and not only be difficult to store but will obstruct a view of the contents of the freezer.

Accordingly, and in view of the numerous problems mentioned in the preceding paragraphs, as well as others not specifically mentioned, it has been the object of this invention to provide:

(1) A curtain structure for a display freezer having an open access surface, said curtain structure being mounted upon the display freezer so that it quickly moves into an inconspicuous, storage position near one edge of the access surface, when the contents of the freezer are on normal display, and so that it can be

quickly moved into its extended, closing position to minimize, if not prevent, the spill out of cold air when the freezer is not serving its display function.

(2) A curtain structure, as aforesaid, which is arranged and constructed so that it will automatically move into a tightly rolled, self-supporting storage position, where it will not interfere with the normal use of the freezer, which has a holding device along the free edge thereof for removably connecting said free edge to the food freezer when the curtain is in its closed position, which can be fabricated from a transparent material which is constructed so that it minimizes the deposit of condensation thereon during a defrost cycle of the food freezer, and which is very easy to keep clean.

(3) A curtain structure, as aforesaid, which is relatively inexpensive to manufacture, which is adapted for use on either a frontwardly opening access surface or an upwardly opening access surface, which is very easy to install and which is attractive in appearance so that it does not detract from the pleasing appearance of the display freezer, with which it is used, even when said curtain is in its closed position.

Other objects and purposes of this invention will become apparent to persons familiar with this type of equipment upon reading the following descriptive material and examining the accompanying drawing, in which:

FIGURE 1 is a front perspective view of a display freezer having a frontwardly opening access surface and including a fragment of a curtain structure embodying the invention.

FIGURE 2 is a broken, end elevational view of a display freezer having a said curtain structure shown in its storage position.

FIGURE 3 is an enlarged fragment of FIGURE 2 disclosing the curtain structure in said storage position.

FIGURE 4 is an enlarged, broken fragment of FIGURE 2 showing the curtain structure in its extended and operating position.

FIGURE 5 is an enlarged fragment of the curtain structure appearing in FIGURE 1.

FIGURE 6 is a sectional view taken along the line VI—VI in FIGURE 5.

FIGURE 7 is a broken, end elevational view of a top access display freezer including a portion of a curtain structure embodying the invention.

FIGURE 8 is a fragment of FIGURE 4 showing a modified structure.

For convenience of description, the terms "upper," "lower," "left," "right," "front" and "rear" and terms of similar import will have reference to the corresponding parts of the structure appearing in FIGURE 1, which discloses the front and left sides of a front access display freezer. The terms "inner," "outer" and terms of similar import will have reference to the geometric center of the display freezer shown in FIGURE 1 and to the curtain structure of the invention.

General construction

The objects and purposes of the invention, including those set forth above, have been met by providing for a display freezer having an open access surface, a curtain structure which is secured along one edge thereof adjacent one edge of the access surface and which is capable of extending across and covering said access surface. The curtain structure includes a resiliently flexible sheet which is pre-stressed so that it will roll upon itself toward its secured edge unless it is positively presented, by a force which in some circumstances must be stronger than gravity, from rolling upon itself. The curtain structure also includes holding means near the edge thereof remote from the secured edge whereby the curtain structure is releasably connected to the display freezer adjacent the opposite edge of said access surface, whereby said curtain structure is held in a position substantially completely covering said access surface.

In a preferred embodiment of the invention, the sheet material from which the curtain structure is made is a transparent plastic having a plurality of very small openings therethrough whereby a small circulation of air between the two sides of the sheet material can occur to minimize the temperature differential between the surface layers of air on the opposite sides of the sheet material. Also, in the preferred embodiment of the invention, the sheet material is moisture proof and the means for releasably connecting the free edge of the curtain structure to the display freezer includes a magnetized rod.

Detailed description

The food freezer 10 (FIGURE 1) illustrates one form of display-type freezer or refrigerator with which the curtain or closure structure 11 of the invention may be used. Briefly, and in a substantially conventional manner, the freezer 10 has a rear wall 12 (FIGURES 1 and 2), a top wall 13 and a pair of end walls 14 and 15 which are supported upon a base pedestal 17. Shelves 18, 19 and 20 are supported upon and between the end walls 14 and 15 so that they project outwardly from the rear wall 12 in a conventional manner and for the conventional purpose of supporting food.

The rear wall 12 and top wall 13 have a passageway 23 therealong which opens frontwardly and downwardly near the front end of the top wall in a conventional manner. Thus, cooled air can be moved from the refrigeration system (not shown) of the freezer 10 upwardly and then frontwardly through the passageway 23. A deflector 24 is located in front of the upper end of the passageway to deflect the cold air downwardly in a stream toward the lower front side of the freezer, also in a conventional manner, where it is drawn back into the refrigerating system by a device (not shown) developing a sub-atmospheric pressure.

The freezer 10 has a front wall 26 (FIGURE 1) of comparatively short vertical extent, which wall may be made of magnetizable metal near the upper edge 27 thereof. A tag mold 28, which is designed to hold price tags 29, is secured to the downwardly extending, front flange 32 on the top wall 13 by nuts and bolts 33 (FIGURE 3).

The above-described freezer construction is substantially conventional and, therefore, except for certain details thereof of which are expressly related to the curtain structure 11, does not constitute a part of the invention.

The curtain structure 11 (FIGURES 1 and 4) includes a sheet 36 of resiliently flexible material, such as the plastic material known by the trade name of Mylar, which is capable of receiving a substantially permanent curvature of small radius and having a relatively long memory. That is, the sheet material 36 must be such that, when curved as appearing in FIGURE 3, it will remain in a tight roll fully capable of supporting its own weight, even though it is repeatedly unrolled, as appearing in FIGURES 1 and 4, and is often left in the unrolled position for relatively long periods of time, such as in excess of three or four days. There are several varieties of plastic materials, particularly those referred to generally as the acetates, which are capable of receiving a curvature or set, as stated above, for serving the purpose of the invention. It will be apparent that certain metals would also be capable of such setting and performance.

The upper or outer free edge portion 35 of the sheet material 36 (FIGURE 3) is folded upon itself to provide a reinforced hem or edge element 37. In this particular embodiment, the edge element 37 is placed between the front flange 32 and the tag mold 28 where it is securely held by the bolts 33 which pass through appropriate openings in the tag mold 28, the front flange 32 and the edge element 37. An independent stiffening element may be inserted into the hem 37 or simply attached to the edge portion 35, if desired, in place of the hem.

5

The edge element 37 is preferably mounted so that the curtain structure 11 will curl into its retracted or storage position of FIGURE 3 adjacent to and rearwardly of the front flange 32 on the top wall 13. Accordingly, the retracted curtain structure 11 will be very nearly out of sight, hence inconspicuous. Yet, when it becomes desirable to move the curtain structure 11 into its extended position of FIGURES 1 and 4, it can be easily and manually grasped and moved downwardly away from the retracted position adjacent the front flange 32.

In this particular embodiment, the lower edge portion 38 (FIGURES 5 and 6) of the sheet material 36 is folded upon itself and connected to the adjacent part of the sheet to form an elongated sleeve 39 integral with said sheet material. The connection of the lower edge with the remainder of the sheet material may be effected by an adhesive, by heat sealing or the like, depending upon the type of sheet material which is used. In fact, a stitching may be used for this purpose. The upper edge portion 35 of the sheet material 36 may be secured to the adjacent part of the sheet material in a similar manner, if desired.

An elongated, magnetized rod 42 is snugly disposed within the sleeve 39 and is sufficiently magnetized so that when placed against the metallic upper edge 27 of the front wall 26, which is a magnetizable metal, the magnetic attraction between the rod 42 and the upper edge 27 will be greater than the force created by the curvature in the sheet material 36 and tending to urge the curtain structure 11 out of its FIGURE 4 position into its retracted FIGURE 3 position. It has been found that a relatively light-weight rod is capable of providing the necessary magnetic attraction required to serve this purpose. Thus, the presence of the rod 42 in the sleeve 39 does not materially affect the capability of the sheet material 36 to roll itself into its retracted position of FIGURE 3.

In a preferred embodiment of the invention, the sheet material 36 is provided with a plurality of relatively widely spaced and relatively small openings 43 through which small amounts of air can and will move when the curtain structure 11 is in its extended position of FIGURE 1. That is, when the refrigeration system is in operation, the downward movement of the air discharged from the end of the passageway 23 will produce low pressure areas adjacent the inner surface of the sheet material 36, according to well-known and well-understood physical laws, whereby small amounts of air will be drawn through some of the openings 43. However, this will increase the pressure within the food compartment whereby air will be forced out of said openings in other areas of said sheet material. On the other hand, due to the tendency of the surface layer air on a sheet material to remain relatively static, again according to well-known physical laws, it is thought that the movement of air through the openings 43 will tend to be fairly localized and, accordingly, will tend to circulate about as indicated by the arrows 44 and 45 in FIGURE 6, or various combinations thereof. It has been found that this localized circulation moves the warm air from adjacent the outer surface of the extended curtain 11 into the boundary layer zone adjacent the inner surface of the curtain and thereby maintain a minimal temperature differential between the two surfaces of the sheet material. It is believed that the same circulation will occur when the refrigeration system is not operating and air is moving upwardly along the inner surface of the sheet due to convection currents.

Accordingly, during a defrost cycle, where reasonably normal temperatures and humidities are maintained in the market in which the freezer is located, the dew point will not be reached adjacent the inner surface of the curtain 11. Thus, condensation will not collect upon the inner surface of the curtain 11, which contributes heavily to the problems of previous cover devices, as discussed above.

6

Certain impurities can be deposited upon any cover, including the sheet material 36, with water vapor or by the food handlers when said cover is in its operating position. The openings 43 serve the further purpose of ventilating the curtain structure 11, when it is in its retracted position of FIGURE 3, so that such contamination at least has a chance to escape. Moreover, moisture can also escape from within the rolled sheet 36 if it has collected thereon while the curtain 11 was in use.

It must be emphasized at this point that the amount and location of the openings 43, while not critical, are such that no appreciable amount of heat loss is developed as the result of their presence in the sheet material 36. Moreover, it is also pointed out and emphasized that the openings 43 are provided for the express purpose of minimizing, if not eliminating, the problem of condensation occurring upon the inner side of the sheet material 36 during a defrost cycle without increasing the heat loss appreciably. However, where this problem of condensation is not serious, as where fewer defrost cycles are used or required, or where the condensation can be ignored, then the use of sheet material 36 having no openings 43 therethrough may be acceptable. In one instance, the ratio between the diameter of the openings 43 and the space therebetween was found to be effective at 1 to 6, where the diameter of each opening was about 1 millimeter.

Operation

It will be apparent from the foregoing descriptive material that the curtain structure 11 can be mounted upon a freezer 10, for operation therewith, by securing the stiffened, upper edge portion 35 thereof between the tag mold and the front flange 32 on the top wall 13. Due to the prestressed curvature in the sheet material 36, said curtain structure 11 will remain in its retracted and coiled position of FIGURES 2 and 3 whenever it is not in use. When it becomes desirable to cover the front access surface of the freezer 10, the curtain structure 11 can be manually grasped and pulled downwardly with the fingers behind the coil until the lower portion of the curtain structure 11 drapes over the upper edge 27 of the front wall 26. The lower portion of the curtain structure is then moved against the front wall 26 which, being made of magnetizable metal, is attracted by the magnetized rod 42, thereby holding the curtain structure 11 in its extended, operating position of FIGURE 1.

Depending upon the way in which the sheet material 36 is draped across the access surface of the freezer 10, there may be a slight opening at the opposite ends thereof. However, by comparison with the amount of surface exposed prior to the closing of the curtain structure 11, this amount of end opening is virtually negligible. Under some circumstances there is a substantial recess in the end walls 14 and 15 adjacent the opposite ends of the curtain structure 11, it is possible to provide small end curtain structures having substantially the same structural features as the large curtain structure 11 and co-operating with the curtain structure 11 to totally enclose the access surface.

The small openings 43 in the preferred embodiment of the invention provide for a small amount of circulation between the boundary layers of air adjacent the opposite sides of the sheet material, whereby a minimal temperature differential is maintained between the opposite sides of said sheet material. Accordingly, as stated above, the dew point is rarely if ever reached on the inner surface of the sheet material, even during a defrost cycle and, therefore, the deposit of condensation on the sheet is avoided.

When it becomes desirable to open the curtain structure, the lower edge portion thereof is manually moved away from the front wall 26, where it has been held by the magnetic attraction of the rod 42, and then permitted

to follow its normal natural tendency to coil upon itself until it reaches its retracted position of FIGURES 2 and 3.

Modified structure

FIGURE 7 illustrates an upwardly opening or top access freezer 50 having a curtain structure 51 which may be substantially identical in construction with the curtain structure 11, described above. The fixed edge portion 52 of the curtain structure 51 may be held by a tag mold 53 to one edge of the freezer along its access surface 59. The opposite or movable edge 54 of the curtain structure 51 contains an integral sleeve 56 in which a magnetized rod 57 is snugly held for magnetic attraction with the metal side wall 58 of the freezer 50, whereby the curtain structure 51 is held in its extended, operating position covering the access surface 59 of said freezer 50.

The curtain structure 51 (FIGURE 7) may be fabricated from a sheet material 62 which is either perforated or unperforated, as the need dictates. When the magnetized rod 57 is moved away from the side wall 58, the curtain structure 51 will automatically roll upon itself and assume the broken line position 51a where it is stored when not in use.

FIGURE 8 illustrates a further modification of the invention wherein the lower edge 38a of the sheet material 36a does not require a magnetized rod for releasably connecting it to the front wall 26a of the freezer 10a. That is, the front wall 26a has an overhanging lip 65 which is hooked by the lower curved edge 38a due to the curvature provided in the sheet material 36a. Accordingly, it will be apparent that other types of fastening means may be provided within the scope of this invention.

Although preferred embodiments of the invention have been described above for illustrative purposes, it will be understood that variations or modifications of such disclosures, which do not depart from the scope of the following claims, are fully contemplated.

What is claimed is:

1. In a display-type, refrigerated food cabinet having an access opening communicating with atmosphere, curtain structure for substantially covering said access opening, comprising:

moistureproof and resiliently flexible sheet means having first and second, spaced and opposite edges, said sheet means being prestressed so that it will roll upon itself around an axis substantially parallel with said first edge, said stress being such that said structure is self-supporting in a tightly rolled position when said structure is suspended from said first edge thereof, said sheet means having a plurality of relatively small and spaced openings therethrough, whereby small amounts of air can move from the boundary layer of air on one side of the sheet to the boundary layer of air on the opposite side of the sheet;

means for attaching the first edge of said sheet means to said cabinet near one edge of said access opening, whereby said position of said structure is near said one edge of said opening, the distance between said first and second edges of said sheet means being greater than the distance between said one edge and the opposite edge of said access opening;

first engaging means on said cabinet near the other edge of said access opening; and

second engaging means connected to said sheet means near its second edge and engageable with said first engaging means on said cabinet for releasably holding said second edge of said sheet means against movement with respect to said cabinet and thereby preventing said sheet means from rolling upon itself.

2. A structure according to claim 1, wherein said openings have an average diameter of approximately one millimeter, the average spacing between said opening being

in excess of approximately four times the average diameter of said small openings.

3. In a display-type, refrigerated food cabinet having a substantially frontwardly facing access opening communicating with atmosphere, a curtain structure for substantially covering said access opening, comprising:

moistureproof and resiliently flexible sheet means having first and second, spaced and substantially parallel edges, said sheet means being substantially permanently prestressed so that it will roll upon itself around an axis substantially parallel with said first edge, said stress being such that such structure is self-supporting in a tightly rolled position when said structure is suspended from said first edge thereof; means for attaching the first edge of said sheet means to said cabinet along the upper one of said edges of said access opening, whereby said position of said structure is near and substantially parallel with the upper edge of said opening, the distance between said first and second edges of said sheet means being greater than the distance between the upper and lower edges of said access opening;

first engaging means on said cabinet near the lower edge of said access opening; and

second engaging means connected to said sheet means near its second edge and engageable with said first engaging means on said cabinet for releasably holding said second edge of said sheet means against movement with respect to said cabinet and thereby preventing said sheet from rolling upon itself.

4. A structure according to claim 1, wherein said sheet means is substantially rectangular and fabricated from substantially transparent plastic material; and

wherein said axis is substantially horizontal and is moved laterally with respect to said first edge as said sheet means is rolled and unrolled.

5. A structure according to claim 1, wherein the access opening faces frontwardly and said one edge thereof is substantially above said opposite edge, said sheet means being manually engageable substantially throughout its length when it is in said tightly rolled position;

wherein said sheet means is substantially rectangular and substantially transparent; and

wherein said axis is substantially horizontal and is moved upwardly and downwardly with respect to said first edge as said sheet means is rolled and unrolled, respectively.

6. A structure according to claim 3, wherein said sheet means is fabricated from plastic material and has a plurality of relatively small and spaced openings therethrough.

References Cited by the Examiner

UNITED STATES PATENTS

1,730,685	10/1929	Ramsey	312—297 X
2,041,258	5/1936	Mitchell	160—121
2,062,856	12/1936	Armbruster	312—273
2,212,326	8/1940	Piken	4—149
2,238,187	4/1941	Sanchez	160—237
2,794,325	6/1957	Shearer	62—256 X
2,852,143	9/1958	Taber	211—49
3,107,361	10/1963	Glutting	4—149
3,186,185	6/1965	Bently	312—297 X

FOREIGN PATENTS

1,302,247	7/1962	France.
1,154,246	9/1963	Germany.
145,841	6/1954	Sweden.

CLAUDE A. LE ROY, *Primary Examiner.*

FRANK B. SHERRY, *Examiner.*

A. FRANKEL, *Assistant Examiner.*