Aug. 17, 1954 A. E. NAVE ET AL 2,686,703

COMBINED SECTIONAL LINER AND SHELF STRUCTURE FOR REFRIGERATOR DOORS AND THE LIKE

Filed May 3, 1951 2 Sheets-Sheet 1

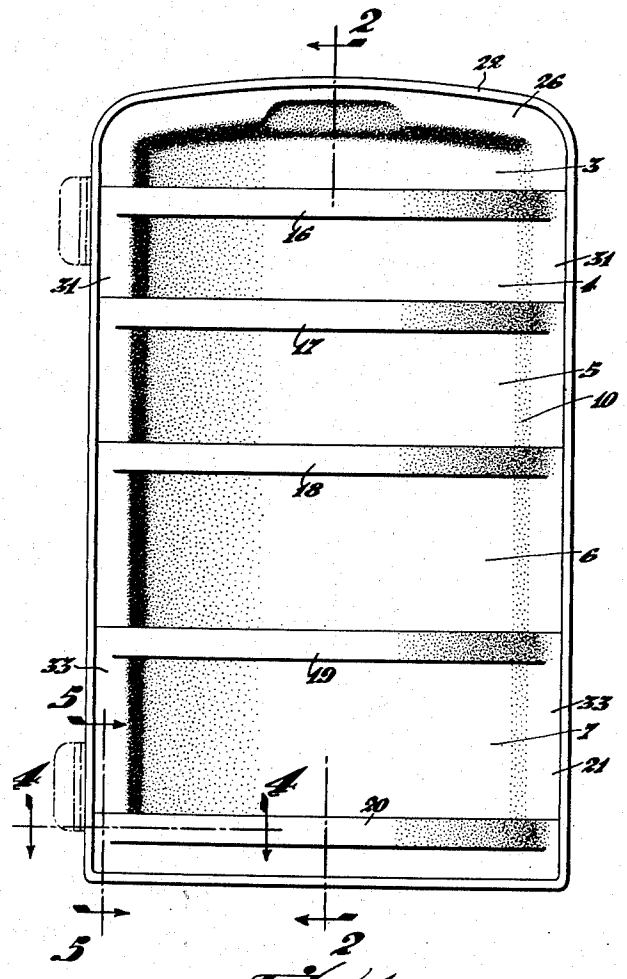


Fig. 1

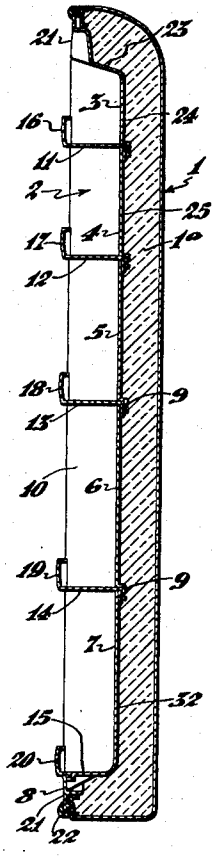


Fig. 2

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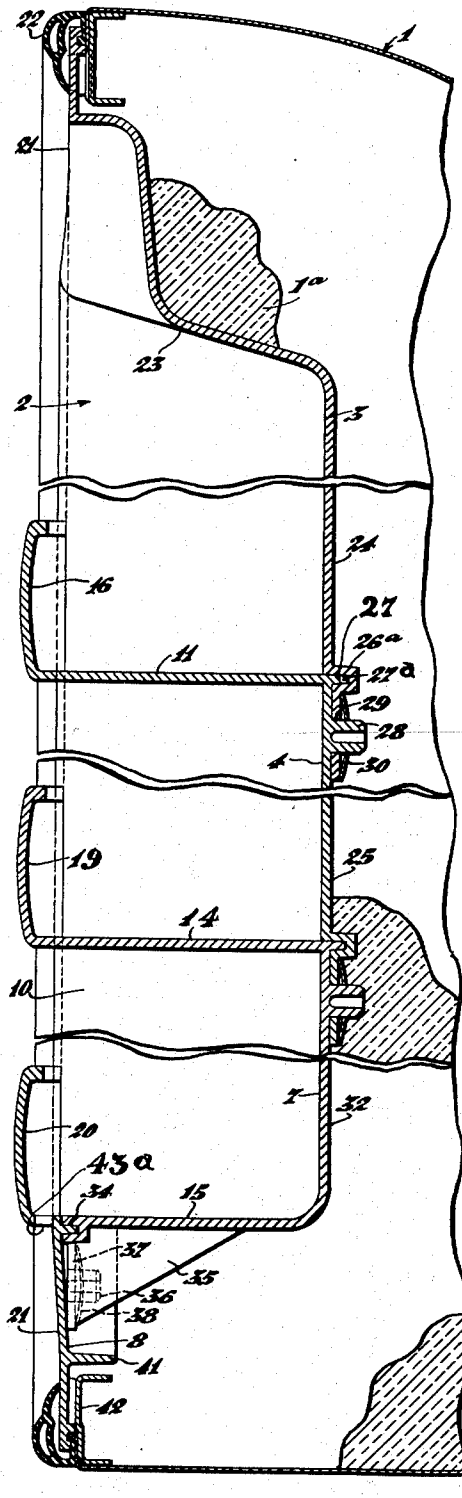


Fig. 3

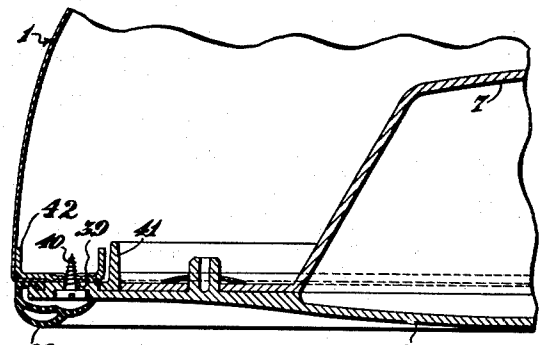


Fig. 4

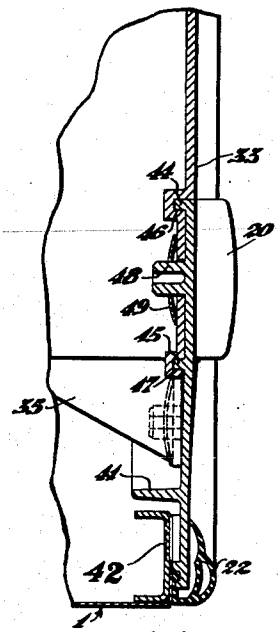


Fig. 5

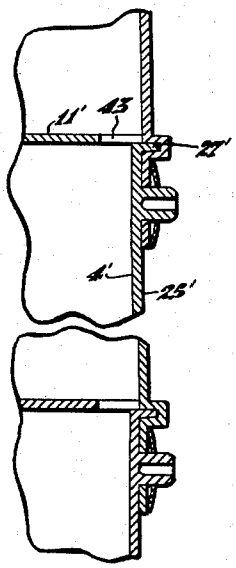


Fig. 6

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COMBINED SECTIONAL LINER AND SHELF STRUCTURE FOR REFRIGERATOR DOORS AND THE LIKE

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7 Claims. (Cl. 312—111)

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The present invention relates to a refrigerator structure and more particularly to an improved sectional liner for the interior of a refrigerator door.

Shelves attached to the inner face of a refrigerator door have become increasingly popular during the last few years. In fact today modern refrigerator design has been leaning more and more in this direction in an effort to supply the public with refrigerators of greater economy and utility.

It is current practice to construct the inner liner for such a refrigerator door from a single large sheet of moldable material which is formed to define a large shallow recess. Within this recess and secured to the liner may be provided a plurality of shelves made from metal or plastic. The most advanced refrigerator designs employ shelves which are molded as units, not only to facilitate attachment to the liner but also to present a more pleasing appearance.

Despite the advances that have been made in this field, it has been perceived that limitations exist in present constructions which afford opportunity for improvement. It has been found in practice that a large sheet of paper phenolic laminate, from which the liner is usually made, can only be formed into a relatively shallow recess and that the recess must be defined by very gradual curves since the relatively limited pliability of the material does not permit formation of any deeply drawn configurations.

Another shortcoming of present constructions is that the liner can not be formed into any intricate shapes to accommodate butter conditioners, receptacles, controls, and similar attachments.

Another difficulty is that the liner material is normally different from that used in the refrigerator breaker strip, which is usually injection molded from polystyrene or similar plastic. This difference in materials makes it difficult, if not impossible, to produce a perfect match of colors between the breaker strip and the liner which is very objectionable since the advanced refrigerator designs today incorporate colored interiors.

Another shortcoming of the present structure is that the volume within the liner recess below the last shelf assembly usually can not be effectively employed because the lower curved wall of the recess can not be formed into a horizontal shelf surface since the liner material does not lend itself to such an extreme molding operation.

A still further limitation of the present manufacturing procedure is that a separate set of dies must be employed to form the liner for each refrigerator door of different size. Thus, although a given shelf assembly may be used on several different doors, separate liners must be provided for each size door.

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Persons skilled in the art have long realized that the advantages of modern injection molding techniques could be utilized in manufacturing door liners by making the entire liner and its shelf components at one time, thus creating a one-piece injection molding of great size and complexity. This procedure has not been found commercially feasible because of the very large size molding presses and the concomitant large investment necessary for making such liners. Furthermore, such a molding requires dies of great complexity which would tend to preclude modification of the design from time to time as is inevitably necessary to meet the changing demands of the public. Another disadvantage of such a large molding is that the molding time is excessive. In addition, relatively heavy wall thicknesses have to be employed to assure that the mold will fill completely. This increases material costs significantly.

The present invention makes it possible to overcome all of the foregoing difficulties and further makes possible the construction of refrigerator doors having benefits not heretofore attainable.

Thus, an important object of the present invention is to provide a domestic refrigerator door having an inner liner made in sections to facilitate the construction of liners for different size doors from a limited number of available sections.

It is also an important object of the present invention to provide a liner section having a portion of the vertical liner wall molded integrally with an associated shelf. An important related object is the provision of a molded liner section comprising a shelf and shelf rail integrally formed with a portion of the vertical rear wall of the liner.

An advantage of the invention is the provision of concealed joints for joining adjacent liner sections together, the joints being interlocking to increase both liner and shelf strength. An ancillary advantage of the invention is that the joints project from the rear of the assembled liner and aid in retaining the door insulation in place.

Another object is to provide sectional door liners for refrigerator doors in which each liner section may be injection molded from polystyrene or any equivalent plastic molding material. Further, it is an object of the present invention to

provide a door liner made from a plurality of easily molded sections which may be readily joined together to form a rugged liner assembly with integral shelves of pleasing appearance.

It is also an object of the present invention to provide a door liner made from molded sections, each of which may have a different color, making possible the construction of refrigerators having considerably more eye-appeal than heretofore possible.

A still further object of the invention is to provide a sectional door liner made from a plurality of sections any one of which may be replaced, if necessary, because of damage incurred during manufacture or actual use.

Another advantage of the present invention is the provision of a door liner construction having a shelf-bearing recess of greater depth and considerably more volume than considered practical heretofore.

A still further advantage of the present invention is that the design and construction of the novel refrigerator door may be changed by the manufacturer to meet changing public demands with a minimum of new tooling and with minimum loss of parts made for refrigerator doors used on previous models.

It is also an object of the present invention to provide a sectional liner assembly which is self-centering within an opening defined by the margin of the exterior door shell.

A further important object of the present invention is to provide a door liner which makes possible the utilization of modern molding techniques in the construction of an elaborate door having a variety of relatively elaborate shelves or devices attached to its inner face.

The novel features that are considered characteristic of the invention are set forth in the appended claims; the invention itself, however, will best be understood from the following description of a specific embodiment when read in conjunction with the accompanying drawings, in which:

Fig. 1 is a front elevational view of a domestic refrigerator door including a plurality of shelves, the door being constructed according to the teachings of the present invention;

Fig. 2 is a vertical sectional view taken on plane 2—2 of Fig. 1 showing a plurality of liner sections joined to form the liner assembly of the refrigerator door;

Fig. 3 is an enlarged vertical sectional view similar to Fig. 2, showing a liner assembly made from fewer sections than the liner of Fig. 2;

Fig. 4 is a partial horizontal sectional view taken on plane 4—4 of Fig. 1 showing the construction of the liner adjacent the margin of the door.

Fig. 5 is a vertical sectional view taken on plane 5—5 of Fig. 1 showing other details of the construction at the margin of the door; and

Fig. 6 is a vertical sectional view taken on the same plane as plane 2—2 of Fig. 1 showing a modified type of joint for uniting the sections of the door liner.

With reference to Figs. 1 and 2, a door made according to the principles of the present invention incorporates an outer shell, generally designated 1, to which is attached an inner liner assembly, generally designated 2. This liner assembly is constructed from a plurality of sections indicated by reference numerals 3 through 8, inclusive. Each section is an entity which extends horizontally between the vertical sides of shell 1, contiguous sections being joined by interlocking joints indicated at 9. The usual thermal insulation 1a is provided between the liner and shell to minimize heat leakage.

As illustrated in Fig. 2 each molded section cooperates with the adjacent sections to define a recess 10 within the door which may be utilized for the storage of small articles to be refrigerated. These articles may be supported by shelves 11—15 which are associated with the various sections of the liner.

It is to be noted that shelf 15 is formed by the bottom horizontal wall of section 7 which wall also defines the lowermost extent of recess 10 within the door. Thus, the entire interior volume of the door may be effectively utilized for storage purposes, a condition which has not been attainable heretofore.

A vertical guard or retaining rail is associated with each of the shelves. These guard rails have been indicated by reference numerals 16 through 20, inclusive, guard rails 16 through 19 being molded integrally with shelves 11 through 14, respectively. Guard rail 20 is formed integrally with liner section 8 and is associated with shelf 15 of section 7.

As illustrated in Fig. 1, the guard rails blend smoothly into a relatively flat marginal area 21 which surrounds and defines the liner. Surrounding area 21 and held between the liner assembly and outer shell is a rubber sealing gasket 22 which cooperates with a portion of the refrigerator cabinet to seal the interior thereof and minimize heat leakage. The guard rails must blend smoothly and completely into marginal area 21 so as not to interfere with the proper seating of gasket 22.

The exact arrangement of the sections which comprises the door liner may be varied as necessary to meet the particular requirements of the refrigerator with which the door is to be used. While a door liner having five shelves is shown in Fig. 2, the same structural principles may be employed to construct a door liner having three shelves as indicated in Fig. 3 or any other convenient number of shelves. In fact the individual sectional components of the liner shown in Fig. 3 may be identical with certain of the components of the door shown in Fig. 2. Thus a given number of liner sections may be employed in various combinations and permutations to make door liners of different arrangements and sizes.

With reference to Figs. 1, 2, and 3, it will be noted that top liner section 3 has an upper inclined wall 23 which defines the upper limit of the door recess. This liner section includes an integral vertical rear wall 24 which extends downwardly to embrace the rear wall 25 of contiguous liner section 4 and also includes flat marginal walls 26 which constitute portions of marginal area 21 of the assembled liner.

Section 4 of the door liner not only includes vertical wall 25 but also has formed integrally therewith a horizontal shelf 11 and integral guard rail 16. Sections 3 and 4 may be joined by an interlocking joint including a groove 27 formed in the lower projecting portion 26a of wall 24 and a tongue 27a coplanar with shelf 11 and formed integrally with liner section 4. Tongue 27a forms a close fit in groove 27 and constitutes a strong fluid tight joint which effectively seals the interior of the door and mutually strengthens the joined sections.

The joints between the liner sections are not

only concealed from view but also project from the rear of the assembled liner into insulation 1a. This is highly beneficial since the joints aid in keeping the insulation in place and prevent settling of the insulation within the cavity of the door as it is repeatedly slammed during use.

As indicated in Fig. 3, studs 28 may be formed integrally with wall 25 of shelf section 4. These studs are positioned to pass through openings 29 provided in the lower portion of wall 24 of shelf section 3. Spring metal fasteners 30 may be forced over studs 28 to hold the contiguous liner sections in tight engagement.

If desired, the tongue and groove joints between the liner sections may be cemented to further increase the strength of the assembled liner.

With reference to Fig. 1 it will be noted that wall 25 of shelf section 4 blends smoothly into marginal walls 31 which, in conjunction with marginal walls 26, form marginal area 21 of the liner assembly.

The principles of construction hereinbefore described may be used in joining together each of the contiguous liner sections 4, 5, 6 and 7. In fact, if it is considered desirable, sections 4, 5, and 6 may be identical in every respect, producing a liner assembly having shelves spaced at uniform vertical intervals.

As indicated in Figs. 2 and 3 the lowermost section of the liner differs somewhat from the other liner sections. For instance, section 7 includes integral shelf components 14 and 15 as well as guard rail 19. These components are joined through a vertical rear wall 32 which is also formed integrally with marginal walls 33 in a manner similar to the other liner sections.

Guard rail 20 which cooperates with shelf 15 may be formed integrally with liner section 8 which defines the lower portion of marginal area 21. A tongue and groove joint may be used between shelf 15 and guard rail 20 as indicated at 34. The joint may be additionally strengthened by the provision of gussets 35 formed integrally with shelf 15 of liner section 7. Studs 36 may be formed integrally at the rear of section 8 to embrace a wall portion 37 depending from shelf 15 between gussets 35. Here again, spring steel fasteners 38 may be provided to hold the adjacent sections together tightly.

As illustrated in Fig. 4, each of the marginal walls of the liner sections may be provided with recesses 39 for receiving the heads of screws or similar fasteners 40 which hold the assembled liner to shell 1 of the door. Since each liner section is injection molded, it is very easy to provide recesses 39 in any configuration desired to accommodate the type of fasteners employed. The heads of screws 40 may be completely disposed beneath the face of marginal area 21.

It is to be noted that the margintl walls of each liner section may be provided within inwardly projecting flange 41 which cooperates with channel 42, surrounding the inner edge of shell 1, in centering the assembled liner and greatly facilitates the insertion of screws 40 so that the door may be completely and easily assembled without the use of any fixtures.

It may be considered desirable to provide slots at the rear of each shelf to facilitate cleaning and permit drainage and air circulation between the adjacent liner sections. A structure including this feature has been illustrated in Fig. 6 in which is shown a part of a liner section 4'. This section includes an integral rear wall 25' joined to a shelf portion 11'. As in the previously described construction, a tongue 27' is also formed integrally with the section but not in coplanar relationship with shelf portion 11'. Instead, tongue 27' has been staggered slightly to facilitate the molding of a slot 43 adjacent to the vertical wall of the liner to permit cleaning, drainage and air circulation. With reference to Fig. 1, the lower portion of guard rail 20 may be formed to define a slot 43a. This slot, which serves the same purpose as slots 43, must be located forwardly adjacent the guard rail to permit drainage from the lower part of the liner assembly.

Fig. 5 shows the structural arrangement of the marginal area where the guard rails join the marginal walls. As indicated in this figure, guard rail 20, which is typical of the other guard rails, blends smoothly into marginal wall 33. The end of the guard rail, which is shown in cross section, is provided with upper and lower tongues 44 and 45, respectively, which are tightly engaged with grooves 46 and 47, respectively, formed in the lower portion of wall 33. A stud 48 with spring fastener 49 is also provided to aid in holding the tongue and groove joints in tight engagement.

It will be appreciated by those skilled in the art that the before described construction facilitates the use of color on the interior of a refrigerator door. For instance, each of the adjacent door sections could be made of different color plastics which blend to form a harmonious entity.

Furthermore, it will be recognized that any section of the liner can be readily replaced should the section be damaged at any time.

It will also be appreciated that the liner sections are, in effect, building blocks which may be joined in various combinations to produce different shelf spacing and to form door liners of different overall dimensions. For instance, by adopting a constant width door for all sizes of refrigerators manufactured, it would be possible to make a wide variety of door liners simply by increasing or decreasing the number of sections used.

It is to be emphasized that each section of the liner may be very easily molded by presently known and available injection molding equipment and techniques. Furthermore, the sections can be molded without the use of expensive dies that would militate against changes of design of the door liner as required to meet changing public taste.

In molding the individual sections, intricate designs and configurations could readily be incorporated in the liner to accommodate butter conditioners and similar attachments. Furthermore, the recess defined with the door by the assembled sections can be made deeper so as to include a greater volume than heretofore. In addition, the volume can be increased by virtue of the smaller curvature of the surfaces bounding the recess made possible by injection molding the sections.

It is to be noted that each liner section can be readily withdrawn from its mold. No re-entrant surfaces are involved; and a liner section including guard rail, shelf, and rear wall can easily be made in a simple two-piece mold.

Having described a preferred embodiment of our invention, we claim:

1. A sectional refrigerator door liner comprising a plurality of separate horizontally disposed liner sections, each section including a rear wall

formed integrally with marginal walls, said marginal walls of adjacent sections forming a common smooth marginal area, and interlocking joints between adjacent sections.

2. A refrigerator door liner comprising a plurality of sections certain sections comprising a rear wall, a shelf formed integrally with said rear wall, a guard rail formed integrally with said shelf, and marginal walls formed integrally with said rear wall, said marginal walls and the ends of said guard rail blending into a common marginal area.

3. A section of a liner assembly for a refrigerator door comprising a vertically disposed wall, an integral outstanding horizontal shelf extending outwardly from the top of said rear wall, an integral guard rail extending vertically from said shelf and parallel to said rear wall, marginal walls integral with said rear wall and the ends of said guard rail, and joining means formed integrally with said rear wall.

4. A sectional liner assembly for a refrigerator door comprising a plurality of integrally molded horizontally disposed plastic sections; the uppermost of said sections including an integral marginal wall and vertical rear wall; the lowermost of said sections including an integral guard rail and a marginal wall; the sections intermediate said uppermost and lowermost sections each including an integrally molded guard rail, shelf, rear wall, and marginal walls; the marginal walls of all of said sections cooperating to define a flat marginal area; and means for securely joining adjacent sections of said liner, the rear walls of said liner sections cooperating to define a recess centrally within the liner assembly.

5. A liner assembly for a refrigerator door comprising a plurality of horizontally disposed separate sections, means for joining together adjacent sections to form the liner assembly, certain of said sections having recessed rear walls, each of said sections including marginal walls correspondingly positioned to form a coplanar flat marginal area on the assembled liner, certain of said sections including integrally formed article supporting means formed integrally with the rear wall portions of said sections, said sections also including projecting flanges for centering the liner assembly within the refrigerator door.

6. In a door liner assembly which includes a planar marginal area surrounding a centrally formed recess in which is disposed a plurality of horizontally positioned shelves, a plurality of integral horizontal sections; means for joining said sections together; the uppermost of said sections including a marginal wall, a recessed rear wall, and an inclined wall defining the upper limit of the recess in the assembled liner; the lowermost of said sections including a marginal wall and a guard rail formed integrally therewith; the intermediate sections including a recessed rear wall, at least one outstanding shelf, and marginal walls formed integrally therewith.

7. In a refrigerator door liner assembly having a planar marginal area surrounding a centrally disposed recess in which is positioned a plurality of horizontally disposed article retaining shelves, a plurality of separately molded liner sections, each of said sections including a portion of said marginal area, certain of said sections including integrally molded article supporting shelves, and all of said sections containing cooperating interfitting concealed means for securely joining said sections together to form the liner assembly.

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