United States Patent [19]

Mizushima et al.

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[45] **Apr. 9, 1974**

[54] **SYNTHETIC RESIN BOX WITH DOUBLE WALL STRUCTURE**

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[73] Assignee: **Mitsubiski Rayon Company Ltd.,** Tokyo, Japan

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[21] Appl. No.: **217,681**

Related U.S. Application Data

[62] Division of Ser. No. 63,677, Aug. 14, 1970, Pat. No. 3,688,384.

[30] **Foreign Application Priority Data**

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Dec. 19, 1969	Japan	44-101695
Dec. 29, 1969	Japan	44-123951
Dec. 29, 1969	Japan	44-123952
Mar. 24, 1970	Japan	45-24091

[52] **U.S. Cl.** ..... **220/9 F,** 220/80, 229/14 H

[51] **Int. Cl.** **B65d 25/18**

[58] **Field of Search** ..... 220/9 F, 80; 206/46 FC, 206/46 FR; 229/14 C, 14 H

[56] **References Cited**

UNITED STATES PATENTS

1,973,930	9/1934	Rammer	229/14 C
3,091,946	6/1963	Kesling	220/9 F X

FOREIGN PATENTS OR APPLICATIONS

1,392,905	2/1965	France	229/14 H

Primary Examiner—George E. Lowrance
Assistant Examiner—Stephen Marcus
Attorney, Agent, or Firm—Wenderoth, Lind & Ponack

[57] **ABSTRACT**

A synthetic resin-made box with double wall structure, adapted for use as the box frame of a refrigerator or the like, includes a double-walled box body of a synthetic resin with wall sections constituting the inner wall of the box body formed integrally. The wall sections constituting the outer wall of the box body are formed separately and extend obliquely outwardly with one edge each thereof connected to the respective inner wall sections. After molding the outer wall sections are brought to normal positions extending horizontally or vertically in adjacent relation to the inner wall sections. The adjacent edges of the outer wall sections are connected by means of coupling members. The the space defined between the inner wall and outer wall is filled with a heat insulating material. The open rear end of the box body is closed with a closure plate.

3 Claims, 16 Drawing Figures

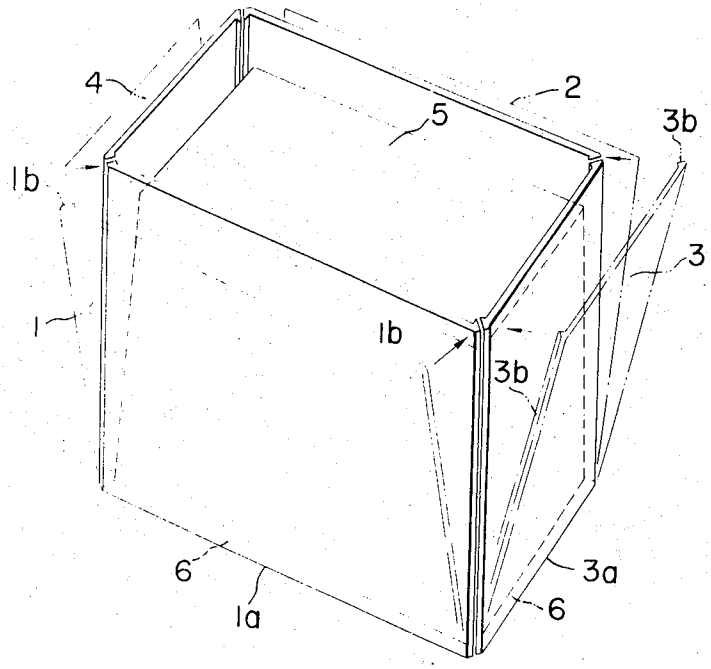


FIG. 1

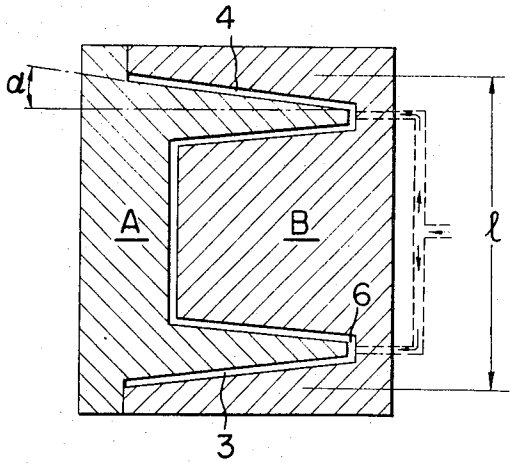


FIG. 2

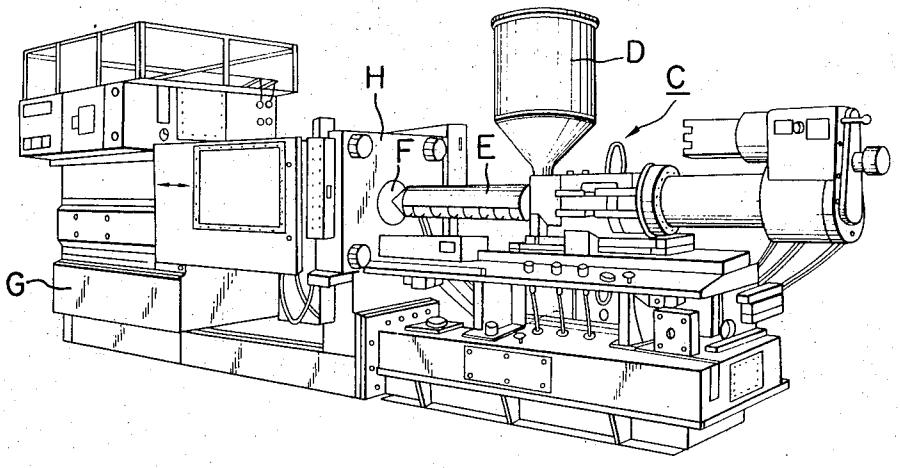


FIG. 3

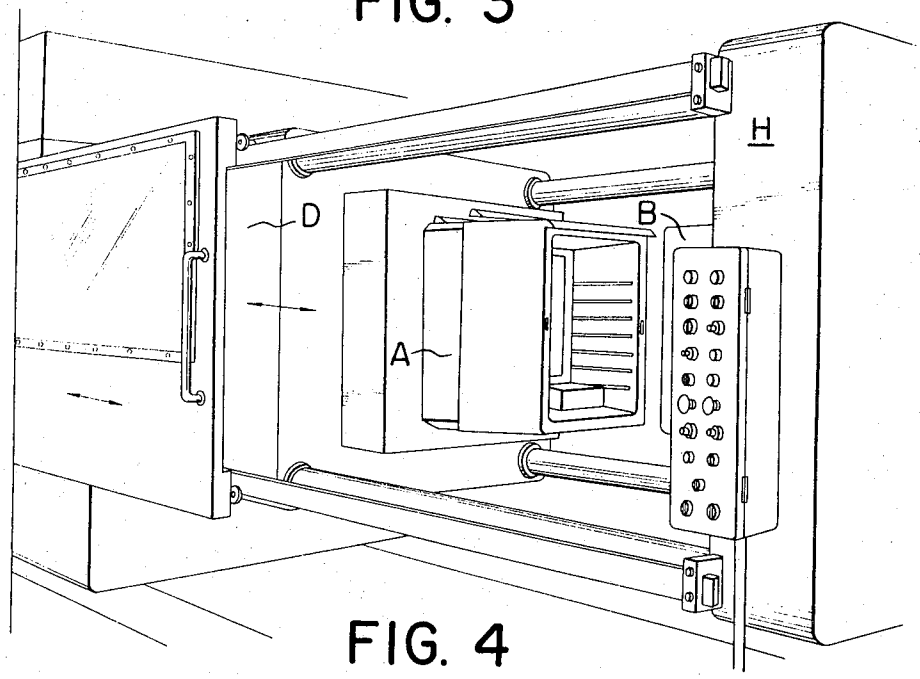


FIG. 4

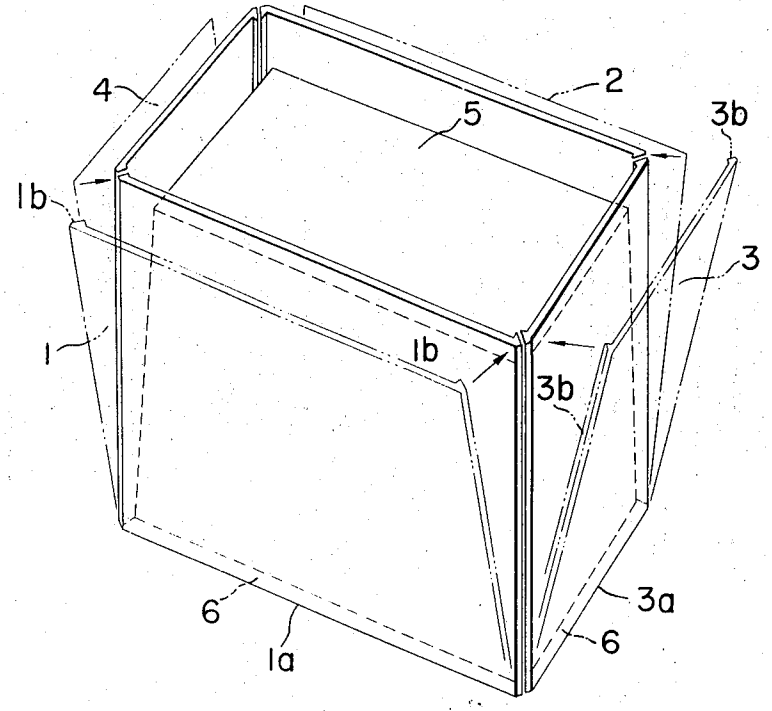


FIG. 5

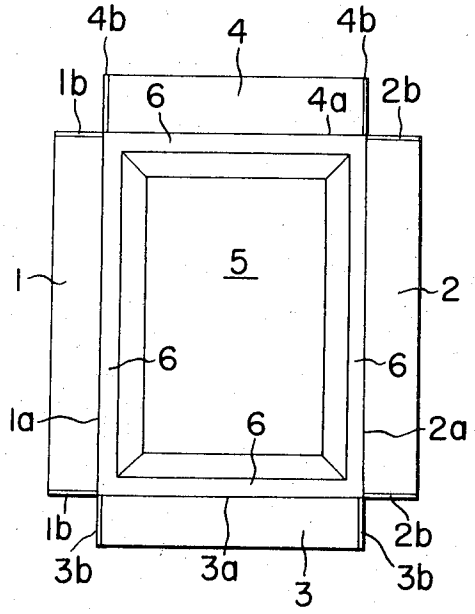


FIG. 6

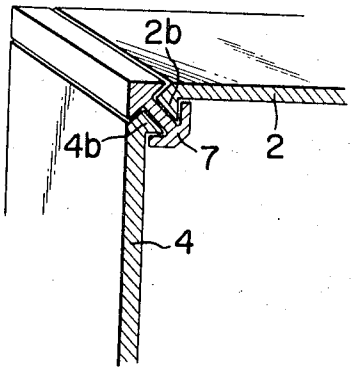


FIG. 7

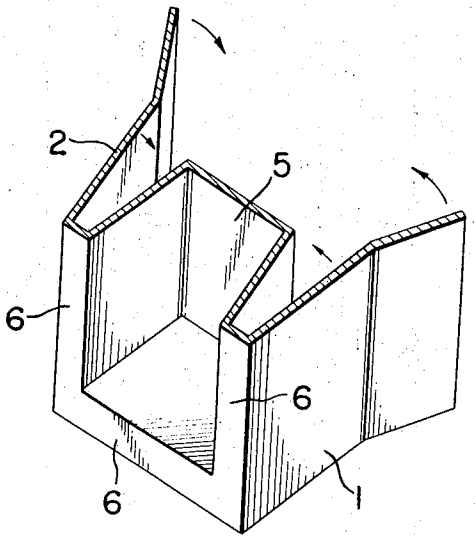


FIG. 8

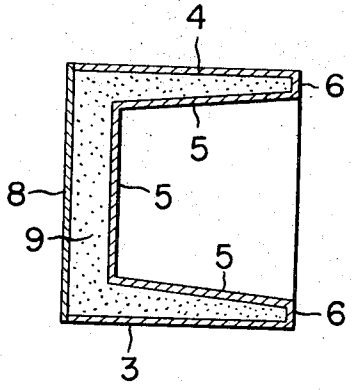


FIG. 9

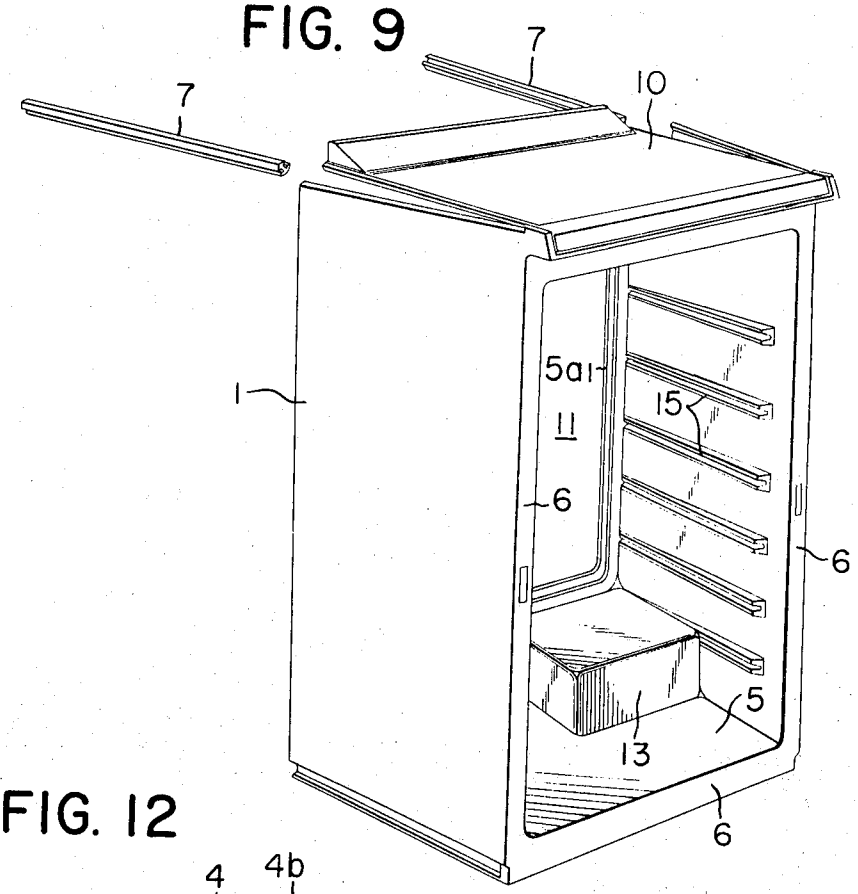


FIG. 12

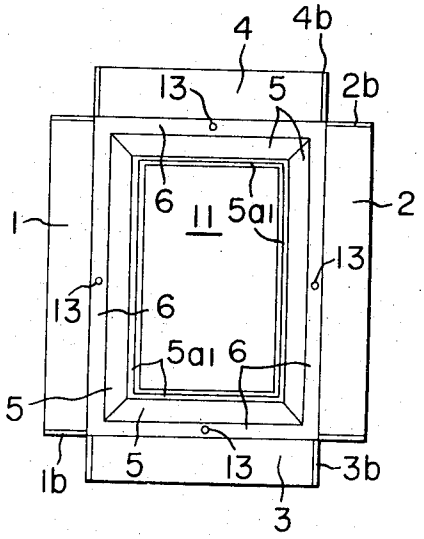


FIG. 11

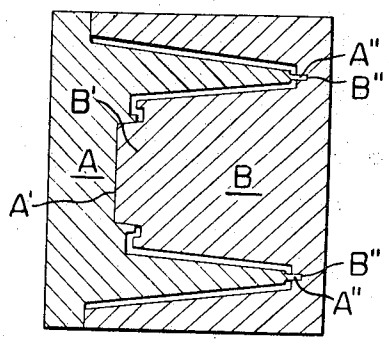


FIG. 10

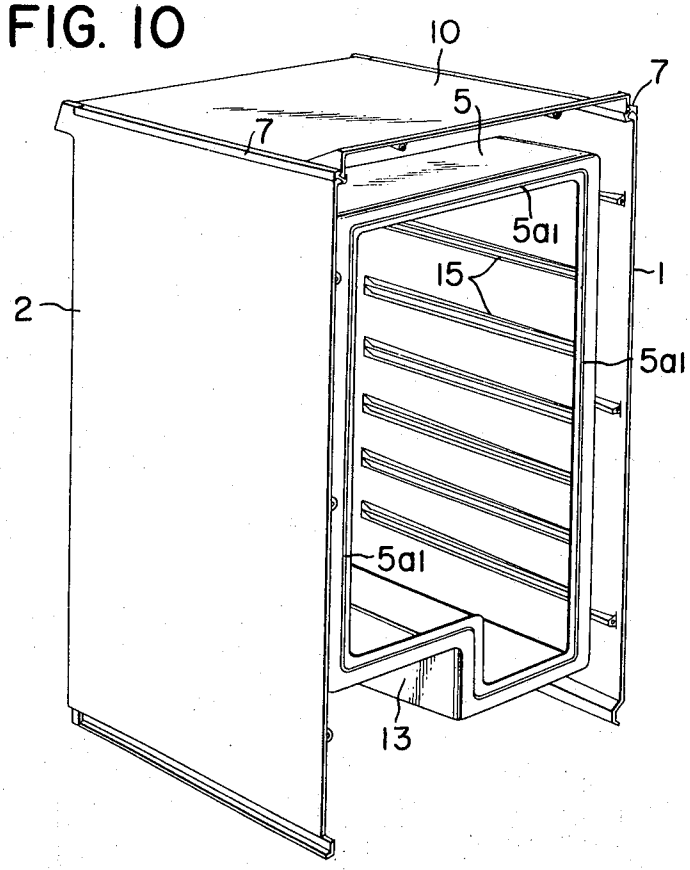


FIG. 13

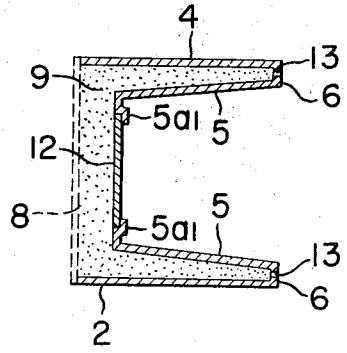


FIG. 16

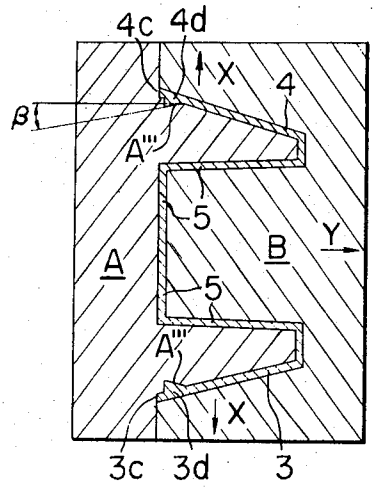


FIG. 14

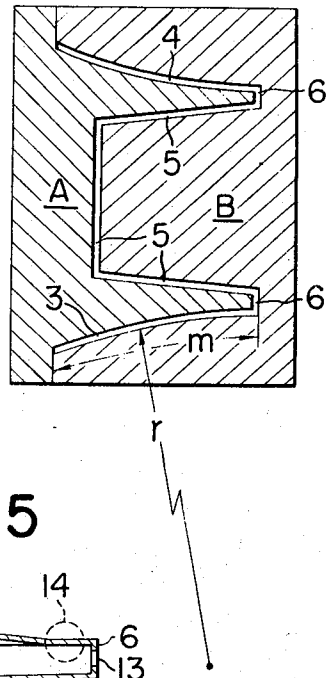
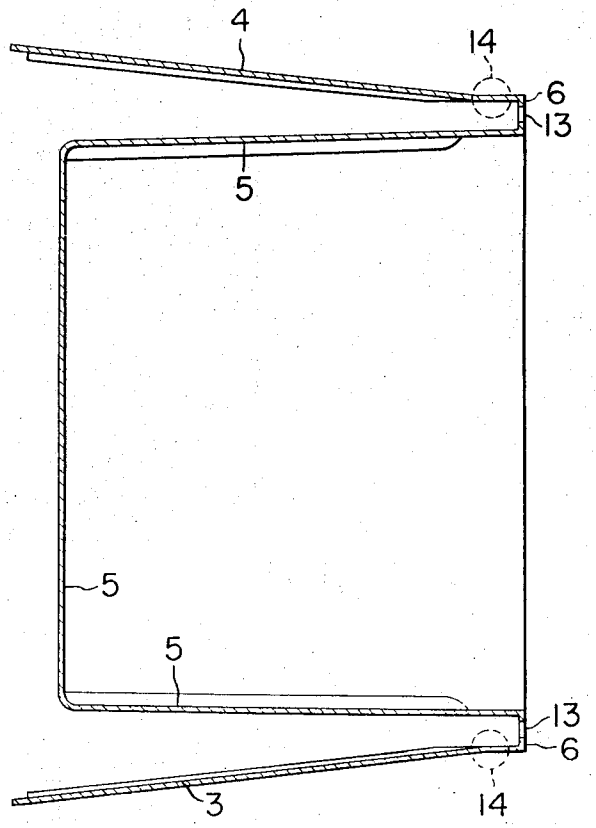


FIG. 15



SYNTHETIC RESIN BOX WITH DOUBLE WALL STRUCTURE

This is a division of application Ser. No. 63,677 filed Aug. 14, 1970, now U.S. Pat. No. 3,688,384.

BACKGROUND OF THE INVENTION

The present invention relates to a method of producing synthetic resin-made boxes with double wall structure which are primarily used as the box frames of refrigerators, hot boxes, dish-washing machines, etc.

With reference to a refrigerator, the inner and outer walls of the box frame thereof are usually made from a steel plate having a special rust-proof coating thereon. Therefore, it is possible that the coating is separated from the steel plate due to collision against other articles or during use of the refrigerator for an extended period, thus degrading the appearance of the refrigerator. Once such condition has occurred, the box frame rusts immediately as a result of water contacting the exposed steel plate. This not only further degrades the apperance of the box frame, but also causes the box frame to be progressively structurally damaged from the rusted portion. However, when the box frame is made of a synthetic resin, particularly of ABS resin material having excellent mechanical properties, such as shock resistant property, hardness and tensile strength, the entire box frame can be maintained with an attractive appearance over an extended period, without being damaged by collision against other articles and being rusted by contact with water or other liquids, and thus the aforesaid disadvantage can be eliminated. In the production of such a box frame, it is most advantageous to mold the box frame integrally by means of an injection molding machine, from the standpoint of the cost of metal mold and the working cycle. However, by conventional methods, it is practically impossible to mold the box frame integrally since the box frame is double-walled. Further, when an injection molding machine is used, the metal molds must have at least 1 degree of gradient to provide for separation of the molds and, in molding a large sized box, such as a box frame of a refrigerator, such a slight gradient will result in a large dimensional difference between the top and bottom of the box, which causes a wedge-shaped gap to be formed between the outer wall surface of the refrigerator end the adjacent wall when the refrigerator is placed, for instance, at the corner of a kitchen, thus spoiling the appearance of the kitchen.

SUMMARY OF THE INVENTION

The present invention has been made with these points in mind, and the principal object of the invention is to provide a novel synthetic resin-made box with double wall structure in which the inner and outer wall sections can be molded integrally and which enables the influence of a slip gradient of the metal molds used to be eliminated from the outer wall sections.

Another object of the invention is to provide a novel synthetic resin-made box with double wall structure, of the character described above, in which a section of the outer wall of the box is provided separately after molding, so that a desired shape and function may be imparted to one section of the box.

Still another object of the invention is to provide a novel synthetic resin-made box with double wall structure, of the character described above, having an optional pattern formed on the outer wall sections.

Still another object of the invention is to provide a novel synthetic resin-made box with double wall structure, of the character described above, having shelf-supporting ribs formed on the inner wall sections.

Still another object of the invention is to provide a novel synthetic resin-made box with double wall structure, of the character described above, in which the outer wall sections formed have a uniform strength.

Still another object of the invention is to provide a novel synthetic resin-made box with double wall structure, of the character described above, in which the inner and outer wall sections molded can be easily separated from the metal molds, and having a back panel which can be easily connected.

Still another object of the invention is to provide a novel synthetic resin-made box with double wall structure, of the character described above, in which the box is molded with means which facilitate mounting of fittings for a door panel.

In order to attain the objects of the invention set forth above, according to the invention there is provided a synthetic resin-made box with double wall structure, formed by molding a double-walled box body of a synthetic resin in a metal mold by injection molding. The inner wall sections of the box body are formed integrally and the outer wall sections thereof are formed having one end each connected thereof to the inner wall sections. The outer wall sections are separated from each other and extend obliquely outwardly from such one end thereof. After the box body is removed from the mold the outer wall sections are brought into the normal positions extending vertically or horizontally in adjacent relation to the respective inner wall sections. The adjacent edges of the outer wall sections are connected with each other.

As stated above, while the inner wall of the box body is formed integrally in a progressively converged shape, the sections of the outer wall of the box body are formed separately and distributed in such a manner as to provide a slip gradient to the metal mold. Therefore, in the formation of the outer wall sections both the use of a metal mold having a slip gradient and the integral formation of the outer wall sections become possible. Furthermore, since the outer wall sections are formed separately, they can be formed in a rectangular or square shape and, since the outer wall sections thus formed are subsequently brought into the normal positions extending vertically or horizontally and the adjacent edges thereof are connected with each other, the outer wall of the box can be assembled into the shape of a cube or a rectangular parallelepiped, regardless of the slip gradient of the metal mold. Thus, according to the invention the outer wall of the box can be formed integrally, even by the use of an injection molding machine and a metal mold having a slip gradient and moreover the outer wall thus formed is in the shape of a cube or a rectangular parallelepiped. Therefore, in accordance with the present invention there is formed a large sized box, such as the box frame of a refrigerator, of a synthetic resin in a desired shape highly efficiently and at a low cost.

BRIEF DESCRIPTION OF THE INVENTION

Other objects, features and advantages of the present invention will become apparent from the following de-

scription of preferred embodiments of the invention when taken in conjunction with the accompanying drawings, in which:

FIG. 1 is a vertical cross-sectional view exemplifying a metal mold used in the formation of a synthetic resin box according to the present invention;

FIG. 2 is a perspective view of an injection molding machine incorporating the metal mold of FIG. 1, which is used for forming the box of this invention;

FIG. 3 is a fragmentary perspective view showing portions of the injection molding machine;

FIG. 4 is a perspective view a box body molded by the metal mold of FIG. 1;

FIG. 5 is a plan view of the box body shown in FIG. 4;

FIG. 6 is a fragmentary perspective view showing, in transverse cross-section, the adjacent outer wall sections coupled together by means of a coupling member;

FIG. 7 is a fragmentary perspective view exemplifying means for closing the back side of the box body;

FIG. 8 is a vertical cross-sectional view of a box with a double wall structure obtained from the box body molded by the metal mold of FIG. 1;

FIG. 9 is a perspective view of the box, with shelf-supporting ribs, notches and a motor housing concurrently formed therewith and with a separate panel attached to the top end thereof;

FIG. 10 is a perspective view of the box body, showing the back side thereof;

FIG. 11 is a vertical cross-sectional view showing another form of the metal mold;

FIG. 12 is a plan view of a box body molded by the metal mold of FIG. 11;

FIG. 13 is a vertical cross-sectional view of a double-walled box obtained from the box body molded by the metal mold of FIG. 11;

FIG. 14 is a vertical cross-sectional view of still another form of the metal mold;

FIG. 15 is a vertical cross-sectional view of a box body molded by a metal mold similar to that shown in FIG. 14; and

FIG. 16 is a vertical cross-sectional view of still another form of the metal mold.

DETAILED DESCRIPTION OF THE INVENTION

The present invention will be described in detail hereinafter with reference to an embodiment in which a box frame of a refrigerator is produced. In the production of the box frame, use is made of a metal mold unit consisting of a pair of cooperating metal molds, such as metal molds A and B shown in FIG. 1, which are capable of molding a double-walled box body in such a manner that the inner wall sections or panels thereof are formed integrally into the shape of a progressively inwardly converged box and the outer wall sections or panels afe formed separately from each other, with one edge each thereof connected to the free edges of the inner wall sections, and extending obliquely outwardly from such one edge. The box body is molded by metal molds A, B and an injection molding machine C, shown in FIGS. 2 and 3, which is of the type known in the art, in the usual manner.

Referring to FIGS. 2 and 3, the injection molding machine C includes a hopper D for feeding a pelletized resin therethrough, a screw conveyor E for melting the pelletized resin and conveying the molten resin towards a nozzle F to extrude it therethrough, a mold mount G being movable in the direction of the arrows with one of the metal molds A mounted thereon, and another mold mount H with the other metal mold B mounted thereon in opposed relation to metal mold A. In operation, the mold mount G is advanced with the metal mold A thereon, to bring the metal mold A into engagement with the metal mold B in the state shown in FIG. 1, and then the molten resin is injected into the clearance defined between the metal molds A and B through the nozzle F. After the resin has been solidified, the mold mount G is retracted with the metal mold A thereon and then the resultant molding is removed from metal mold A. In the present invention, since the metal molds A, B are constructed as shown in FIG. 1, the resultant molding will take the form as shown in FIGS. 4 and 5. Namely, in the embodiment illustrated the molding, that is a double-walled box body, has an outer wall consisting of outer wall sections 1, 2, 3, 4 which are separated from each other and extend obliquely outwardly from one edge 1*a*, 2*a*, 3*a*, 4*a* each thereof respectively, and an inner wall 5 which is formed integrally in the shape of a progressively inwardly converged box. The outer wall sections 1 and 2, and 3 and 4, i.e. the opposed outer wall sections are formed in the same shape and size, and these outer wall sections 1, 2, 3, 4 are connected to the inner wall 5 through connecting portions 6 which respectively extend from edges 1*a*, 2*a*, 3*a*, 4*a* of the outer wall sections towards the inner wall 5. Each of the outer wall sections 1, 2, 3, 4 is concurrently formed at each side edge thereof with an enlarged engaging portion 1*b*, 2*b*, 3*b* or 4*b* as best shown in FIG. 6. The outer wall sections 1, 2, 3, 4 thus formed are brought into the normal vertical positions in the directions of the arrows respectively and the engaging portions 1*b*, 2*b*, 3*b*, 4*b* of the adjacent outer wall sections are coupled together by means of a coupling means 7 as shown in FIG. 6, which coupling means 7 serve simultaneously as a decorative element. Thus, the outer wall sections 1, 2, 3, 4 are assembled into an integral outer wall.

Now, the invention described above will be further illustrated by way of practical example.

A box body of the type described above was molded of Diapet ABS (the tradename of the ABS resin produced by Mitsubishi Rayon Company, Ltd.), which box body has an inner wall of 700 × 370 × 400 mm in size, an outer wall of which one pair of opposed wall sections were 850 × 453 mm in size and the other pair of opposed wall sections were 450 × 453 mm in size, and a wall thickness of 3 mm, the width of the connecting portions 6 being 40 mm. In this case, metal molds defining an angle of inclination (the angle α in FIG. 1) of 9°30′ and having 12 gates open at the connecting portins 6 were used. The resin was injected at a temperature of 270°C., using an injection molding machine having a mold-tightening capacity of 2,200 tons, while maintaining the metal molds at a temperature of 55° – 65°C. After the box body thus molded was removed from the metal molds, the outer wall sections were brought into the normal positions and coupled together at their side edges by means of the metallic coupling means 7 as shown in FIG. 6.

In the manner described, a synthetic resin box with double wall structure is obtained, but in this state, a heat insulating material has not been filled in the space between the inner and outer walls of the box. Further,

the back side of the box has not been closed. However, the heat insulating material may be filled in the space between the inner and outer walls after or at the same time when the outer wall sections are coupled together. In the latter case, the heat insulating material is inserted between the outer wall and the inner wall, immediately before the outer wall sections **1, 2, 3, 4** are coupled together, whereby the charging of the heat insulating material and the coupling of the outer wall sections **1, 2, 3, 4** can be accomplished concurrently and the subsequent heat insulating material-charging operation can be eliminated. For closing the back side of the box, a pair of the opposed outer wall sections **1, 2** may be made longer than those shown in FIGS. **4** and **5,** and the extended portions of such outer wall sections may be flexed in the directions of the arrows shown in FIG. **7** and coupled together at their confronting edges by means of suitable means, such as the coupling means **7** shown in FIG. **6,** or alternatively a back wall or panel, formed separately, may be attached to the open back side of the box and secured thereto by suitable means such as the coupling means **7** of FIG. **6.** Thus, a double-walled box is formed, with the space between the inner and outer walls thereof being filled with the heat insulating material, which can be used as the box frame of a refrigerator of the type having an opening and closing door. Such a box is shown in FIG. **8,** in which reference numeral **8** designates the back panel and **9** designates the heat insulating material, such as foamed polyurethane or foamed styrol. Besides the ABS resin, the box may be molded of such resins as polypropylene, polyethylene, etc.

Other advantageous features of the present invention will be described hereunder: As is well known, the surface of the top panel **4** of a refrigerator is used as dresser, etc. and, therefore, it must be resistive to heat and wear. If the top panel is made of a synthetic resin material, however, such properties cannot be imparted to the top panel, so that the box is molded with no top plate and a metallic top panel **10,** prepared separately, is attached to the top end of the box by means of the coupling members **7** of FIG. **6,** as shown in FIGS. **9** and **10.** It may be necesary to use a top panel of complicated configuration or to provide a condensing unit (not shown) on the bottom plate **3,** depending upon the type of refrigerator, and in such a case, the outer section **3** or **4** of the box body is not needed. In these cases, the desired shape may be imparted or the desired provision may be made, in the same manner as described above.

In forming the box illustrated in FIGS. **1, 4** and **5,** the shaping surfaces of the metal molds A and B are flat and hence the surfaces of the outer wall sections **1, 2, 3, 4** of the molded box body become flat and smooth. Where a pattern is desired to be formed on these surfaces, an aventurine or engraved pattern is previously formed on the shaping surfaces of the metal molds A, B, whereby a pattern as shown in FIGS. **3, 9** and **10** can be obtained on the outer surfaces, for example, of the wall sections **1** and **2,** concurrently with the molding of the box, and the subsequent pattern-forming operation can be eliminated.

Further, in forming the box illustrated in FIG. **1, 4** and **5,** since the shaping surfaces of the metal molds A, B are flat as stated above, the inner surface of the inner wall also becomes flat and smooth. However, by forming recesses in the shaping surfaces prior to the molding, the complementary ribs **15** (or projections) are formed on the inner surface of the inner wall as exemplified in FIGS. **9** and **10,** which may be used as shelf-supporting ribs when the box is used as the box frame of a refrigerator. Such practice is advantageous in eliminating the operation of forming such ribs or projections, otherwise required subsequently of the molding operation.

Still further, in the method illustrated in FIGS. **1, 4** and **5,** it is possible to mold a double-walled box integrally and in a desired shape, such as the shape of a rectangular parallelepiped, owing to the fact that the outer wall of the box is not subjected to the influence of the slip gradient of the metal molds, as stated previously. On the other hand, however, the following problem arises: Namely, in the operation described above the outer wall sections **1, 2, 3, 4** are molded extending obliquely outwardly from edges **1***a*, **2***a*, **3***a*, **4***a* thereof. Therefore, when the method is applied to the molding of a large-sized box, such as that used as the box frame of a refrigerator, and the gates of the metal molds are located at the connecting portions **6** between the inner and outer walls, the areas of projection will become so large, i.e. the length l in FIG. **1** becomes so large, that an extremely large molding machine must be used. For instance, in case of the box frame of a refrigerator on the order of 105 × 530 mm in size, the area of projection is about 900 cm^2 and thus it becomes necessary to use a molding machine which has a mold-tightening capacity of 3,500 tons. However, the maximum mold-tightening capacity of the presently available molding machines is about 2,500 tons. Thus, the production of a large box as mantioned above would require a molding machine of large capaicty as mentioned above to be newly designed, which of source is expensive. This is economically disadvantageous. However, if the metal molds A, B ar constructed such that a land B′ formed on the metal mold B is received in a depression A′ formed in the metal mold A, at the time of molding, as shown in FIG. **11,** the area of projection of the metal molds is decreased accordingly and it becomes unnecessary to use a large capacity molding machine. The form of the box body immediately after molding by such metal molds is shown in FIG. **12.** Namely, the molded double-walled box body has an outer wall consisting of sections **1** to **4** formed separately and extending obliquely outwardly, and an inwardly converged inner wall **5,** the outer wall sections **1** and **2** being rectangular in shape and of the same size, the outer wall sections **3** and **4** being rectangular in shape and of the same size, and outer wall sections **1, 2, 3, 4** being connected to inner wall **5** through connecting portions **6.** An opening **11** is formed in the bottom wall of the inner wall **5,** leaving a rim of a width $5a_1$ around the periphery thereof. After molding the box body in the manner described, the outer wall sections are brought into the normal positions extending vertically as viewed in FIG. **4** and the side edges **1***b* to **4***b* of the adjacent walls are coupled together by means of the coupling members **7** to form an integral outer wall. The opening **11** is closed by a plate member **12** as shown in FIG. **13,** which is suitably formed, such as by vacuum forming. For the sake of decreasing the areas of projection, the opening **11** is preferably as large as possible, but in case of the box frame of a refrigerator, the size and shape of the opening **11** should be suitably selected while considering various equipment, such as a motor, to be provided

at this portion. An embodiment thereof is shown in FIGS. **9** and **10.** In the embodiment of FIGS. **9** and **10,** the opening **11** is seen at the center of the box frame, and at the right lower portion of the opening is formed a box-shaped motor compartment **13** which is open to the back side of the box frame. In case of a box, such as the box frame of a refrigerator, it is unnecessary to form all of the four outer wall sections as stated previously and, in this embodiment, the outer wall section corresponding to the bottom plate of the box frame is omitted. As shown in FIG. **11,** the metal molds A, B are respectively provided with projections A'' and bores B'' for receiving projections A''. The interlocking engagement between these projections A'' and bores B'', plus the interlocking engagement between the aforesaid land A' and depression B', stabilizes the relative position of the metal molds A and B, and enables a molding of high precision to be obtained. However, the interlocking engagement between the projections A'' and the bores B'' results in the formation of holes **13** in the molding, as shown in FIGS. **12** and **13,** and these holes **13** must be closed by suitable means. Where the holes **13** are formed at suitable locations and are rectangular in shape, these holes may be utilized for mounting an instrument, such as a control panel. Likewise, the opening **11** may also be utilized for mounting equipment although it is finally closed with the closure plate **12** as stated above. Namely, in a refrigerator or the like, a condenser is mounted on the outside surface of the back panel of the box frame and an evaporator is mounted in the upper portion of the box frame. When the opening **11** is formed in the back panel of the box frame, mounting of this equipment can be achieved only by previously assembling the major portion of the refrigeration system and inserting the evaporator into the box frame from the back side. Thus, the mounting operation of the equipment can be extremely simplified. The difference between the metal molds A, B of FIG. **1** and the metal molds A', B' of FIG. **11** brings about the following difference in the injection molding machine used: Namely, in molding a double-walled box body having an inner wall of 700 × 370 × 400 mm in size, an outer wall consisting of front and back wall sections of 850 × 450 mm in size and side wall sections of 450 × 450 mm in size, a connecting portion **6** of 40 mm in width and a wall thickness of 3 mm, using Diapet ABS (the tradename of the ABS resin produced by Mitsubishi Rayon Company, Ltd.), at an angle of inclination of the metal molds (the angle α in FIG. **1**) of 9°30', by injecting the resin at the connecting portion **6,** when the opening **11** was not intended to be formed in the inner wall, the area of projection was about 5,000 cm^2 and a molding machine of 2,200 tons in mold tightening capacity was required. Whereas, when the opening **11** of 650 × 320 mm in size was intended to be formed in the inner wall, the area of projection was decreased to about 2,700 cm^2 and a molding machine of only 1,250 tons in mold tightening capacity was required for molding the box body.

In forming the box in each of the embodiments described above, the following problem will be encountered: Namely, when the box body to be molded is large in size and used as the box frame of a refrigerator or the like, the edges **1***a*, **2***a*, **3***a*, **4***a* of the box body must be equal to or even larger in thickness than the other portions, since a door is connected thereto, and in this case, difficulty is encountered in bringing the outer wall sections back to the normal positions after molding. For this reason, in the case of a large box body, it would be considered that this portion be formed with a thickness smaller than that of the other portions to facilitate the movement of the outer wall sections. However, such practice is unsatisfactory because, in case of the box frame of a refrigerator or the like, the subject portion undergoes an external force every time the door, connected thereto, is opened or closed, and will undergo failure in a short period of time. However, if the outer wall sections **1, 2, 3, 4** of the box body are molded in an arcuate shape by the use of metal molds A, B of the type shown in FIG. **14,** it will be possible to mold the portions **1***a*, **2***a*, **3***a*, **4***a* of the respective outer wall sections at a thickness equal to or larger than that at the other portions and at right angles to the connecting portions **6.** Namely, since the outer wall sections **1, 2, 3, 4** are curved gently as a whole, they can be brought back to the normal positions by deforming them little by little and it is unnecessary to reduce the thickness at any portion thereof. In addition, since a heat insulating material, such as foamed polyurethane or foamed styrol, is placed in the space between the inner wall and the outer wall sections when the outer wall sections are brought back to the normal positions, as stated previously, the heat insulating material aids in shaping each outer wall section into a flat panel and consequently the appearance of the box body is not impaired. In practice, however, it is desirable to form the subject portions in the manner as indicated by numeral **14** in FIG. **15.** In the metal molds of FIG. **14,** the radius of curvature r is selected within the range of $m < r < 3m$ wherein m is the length of the curved wall section.

In practicing the embodiments described above, there also arises the following problem: Namely, in removing the molded box body from the metal molds upon separating the metal molds from each other, the box body tends to remain on the mold B, since the contacting area of the box body is larger with the mold B than with the mold A, and in this case the outer wall sections **1, 2, 3, 4** and the inner wall **5** are held so deep in the mold B that the removal of the box body is not easy and takes a considerably long time, making quick molding impossible. If the box body is removed with an unreasonable force, the outer surfaces of the outer wall sections **1, 2, 3, 4** will possibly be damaged. However, such a problem may be solved by the following method: Namely, recesses A''' are formed in the metal mold A on which the molded box body is desired to be retained, as shown in FIG. **16,** so as to form stoppers **1***d*, **2***d*, **3***d*, **4***d* (**1***d* and **2***d* being not shown in the drawing) on the inside surfaces adjacent the outer edge portions **1***c*, **2***c*, **3***c*, **4***c* (**1***c* and **2***c* being not shown in the drawing) of the outer wall sections. In this case, it is necessary that the inward surfaces of the stoppers **1***d*, **2***d*, **3***d*, **4***d* be inclined by an angle β (about ± 1° relative to a horizontal plane) inwardly relative to the inside surfaces of the respective outer wall sections **1, 2, 3, 4** (see FIG. **16**). By so doing, the molded box body is retained on the metal mold A, when the metal molds A and B are separated from each other, due to the engagement of the stoppers **1***d*, **2***d*, **3***d*, **4***d* with the respective recesses A'''. After the metal mold B has been relatively moved away from the metal mold A, the molded box body is removed from the metal mold A, by pulling the inner wall **5** in the direction of the arrow Y upon releas-

ing the outer wall sections **1, 2, 3, 4** by pulling them in the directions of the arrows X shown in FIG. **16.** The stoppers **1***d*, **2***d*, **3***d*, **4***d* formed on the inside surface of the other edge portions **1***c*, **2***c*, **3***c*, **4***c* of the outer wall sections can advantageously be used for mounting the back panel **8.**

Where the box body thus molded is used as the box frame of a refrigerator, hinges for opening and closing the door and a magnet for holding the door in its closed position under magnetic attraction must be provided on the connecting portions **6.** The operation of attaching such elements to the box frame may be eliminated if the hinges and the magnet are placed, prior to the injection of a molten resin, in recesses formed in the metal mold A at the portions corresponding to the connecting portions **6** of the molded box body and then injecting the molten resin, whereby said parts are embedded in the connecting portions concurrently with molding. It is also advantageous, for achieving smooth injection of the molten resin and thereby molding even a large sized box body quickly, to progressively reduce the width of the gap, formed between the metal molds A and B, at a location remote from the resin injecting side (the connecting portions **6**) and thereby progressively reducing the thicknesses of the outer wall sections **1, 2, 3, 4** and the inner wall section **5** accordingly.

Although the present invention has been described and illustrated herein in terms of specific embodiments thereof, it should be understood that the invention is not restricted only to such embodiments, but that many changes and modifications are possible without deviating from the spirit and scope of the invention.

What is claimed is:

1. A box having a double wall structure of injection molded synthetic resin, said box comprising:

a box-shaped inner wall having a first end, a second end and a plurality of wall sections formed integrally with said second end and with each other, said wall sections expanding outwardly toward said first end;

an outer wall having an open end and a plurality of wall sections, each of said wall sections of said outer wall being integrally formed with one of said wall sections of said inner wall at said first end thereof, said wall sections of said outer wall being separated at the adjacent side edges thereof, said wall sections of said outer wall being molded to normally diverge outwardly toward said open end of said outer wall;

said wall sections of said outer wall being deformed toward said wall sections of said inner wall with said adjacent side edges of said wall sections of said outer wall in contact to define a space between said wall sections of said inner and outer walls;

a plurality of separate coupling members, each of said coupling members securely connecting said adjacent side edges of said wall sections of said outer wall; and

a heat insulating material filling said space.

2. A box as claimed in claim **1,** wherein said second end of said inner wall is closed.

3. A box as claimed in claim **1,** wherein said second end of said inner wall has an opening therein, and further comprising a plate closing said opening.

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