

March 19, 1940.

C. A. FOURNESS ET AL

2,194,301

CELLULOSIC PRODUCT

Filed Sept. 24, 1937

2 Sheets-Sheet 1

Fig. 1

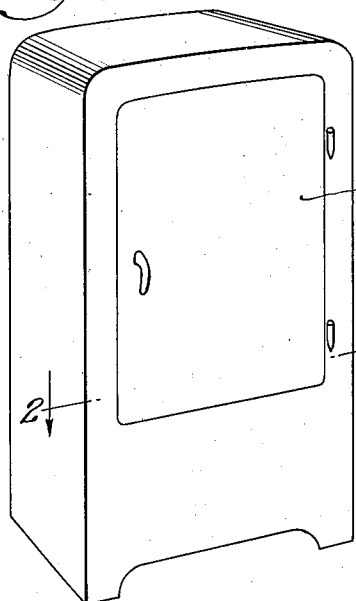


Fig. 2

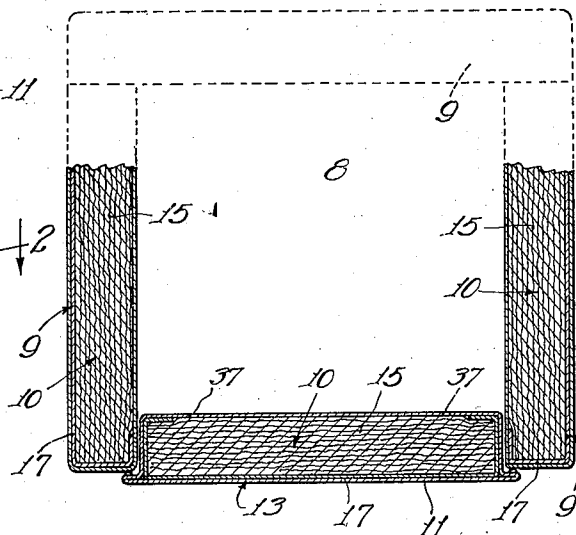


Fig. 3

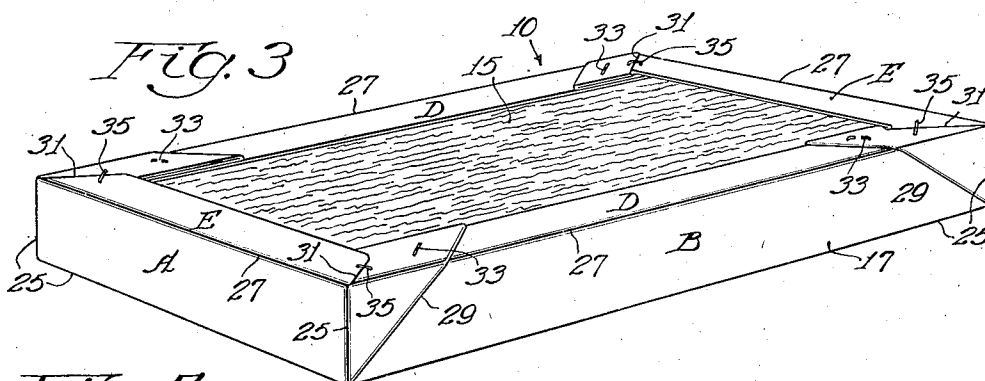
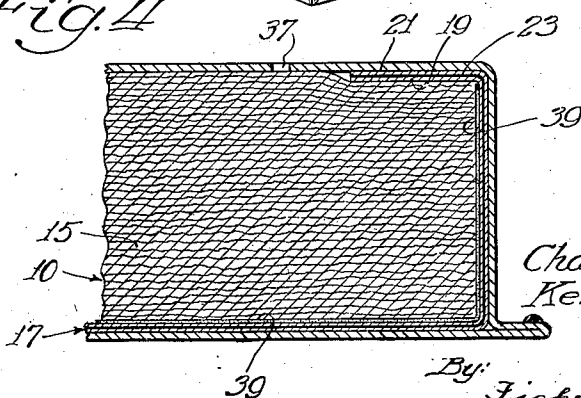


Fig. 4



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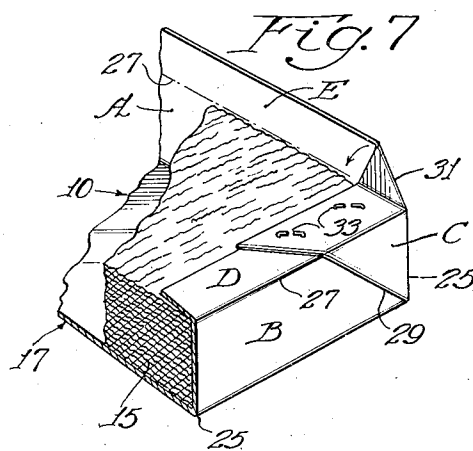
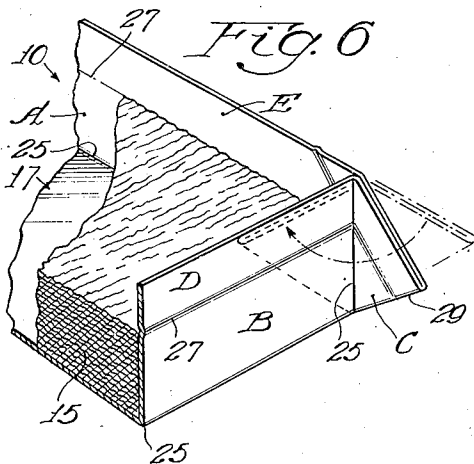
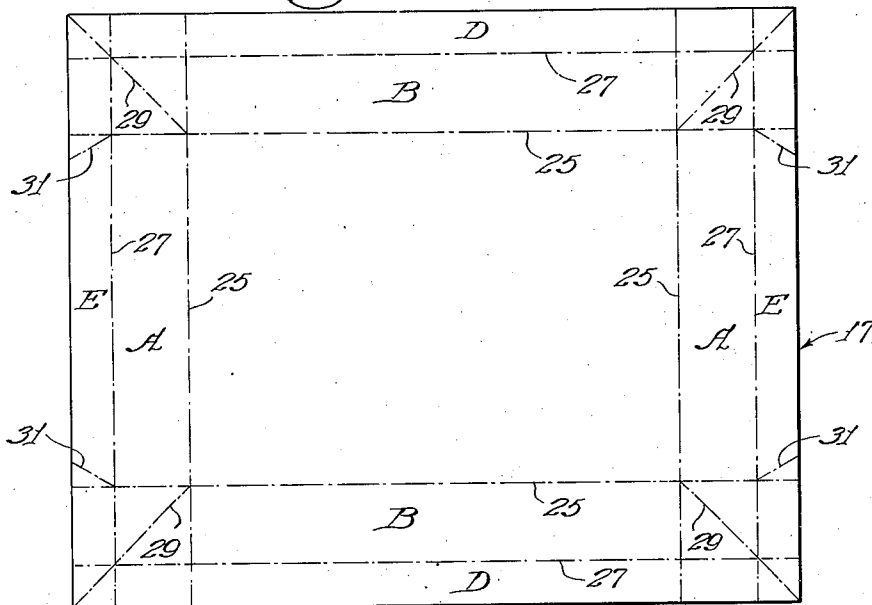
2,194,301

CELLULOSIC PRODUCT

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2 Sheets-Sheet 2

Fig. 5



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UNITED STATES PATENT OFFICE

2,194,301

CELLULOSIC PRODUCT

Charles A. Fourness, Appleton, and Kenneth J. Harwood, Neenah, Wis., assignors to Paper Patents Company, Neenah, Wis., a corporation of Wisconsin

Application September 24, 1937, Serial No. 165,468

4 Claims. (CL 220—9)

Our invention relates generally to the art of thermal insulation and has particular relation to thermal insulation suitable for use in insulating the walls of refrigerators or the like.

5 The provision of satisfactory insulation for refrigerators and especially mechanical refrigerators has, for many years, presented a rather serious problem to the art. Since it is not generally considered economically practical to hermetically seal the outer walls of refrigerators, 10 some atmospheric air enters the insulation spaces of a refrigerator from time to time, and since portions of these spaces or their defining walls are at a temperature below the dew point, condensation occurs. This condensation tends to be greatest adjacent the cold inner wall of the refrigerator, which is usually of metal, and if the insulation is loose or in bulk form, over periods of time it often results in serious wetting 15 which greatly reduces the insulating efficiency of the insulating material and sometimes causes permanent deterioration of that insulating material.

To overcome this objectionable wetting and to facilitate handling of bulk insulating materials, it has been proposed to completely enclose the insulation in a fairly strong, moisture-proof or waterproof paper or paperboard covering which is sealed with asphalt or similar material so as to form a water-tight cell. This type of construction is expensive, and while theoretically the sealed covering which it provides should prevent wetting of the insulation contained therein, in practice it does not accomplish its intended purpose. Water vapor will go through a much more impervious membrane than will water in the liquid state, and some water vapor does get inside these sealed cells despite the precautions taken to render the cell walls completely moisture-tight. Once inside, the vapor condenses into moisture on the cell insulation adjacent the cold side of the insulation space, and it then becomes substantially impossible to get it out. Accumulation of the condensed water follows, and after a period of time the insulating ability of the cell is seriously affected.

Other attempted solutions of the problem include the use of membrane seals between the inner and outer faces of the insulation and the adjacent walls of the insulation space. This construction is subject to the same objections as the construction described in the previous paragraph. In fact, the problem is so troublesome that some manufacturers have resorted to the use of refrigerator boxes having hermetically sealed outer walls. This arrangement will, of course, eliminate moisture condensation on the insulation, but it is an extremely expensive type of construction.

The principal object of the present invention,

therefore, is to produce an improved insulating means suitable for use in refrigerators or the like which shall be free from the disadvantages of the prior art structures. Other objects of the invention are to produce an improved insulating 5 means of the cell type for use in refrigerators or the like which shall not only be free from the objections of the prior art cell structures, but which shall be much less expensive and much easier to manufacture in any desired size; to provide an improved covering for insulating cells in accordance with the present invention which can be made from a single sheet of material with a minimum of fastenings; and to provide an improved means for disposing of the moisture 15 which condenses on the inner wall of the insulating space in refrigerators or the like, especially those utilizing insulating cells in accordance with the present invention.

Additional objects and advantages of our invention will be made more apparent in the accompanying drawings and by reference to the following description of one preferred embodiment thereof. In the drawings—

Figure 1 is a perspective view of a refrigerator of the type to which the present invention particularly relates;

Figure 2 is a fragmentary, enlarged, sectional view on the general line 2—2 of Figure 1;

Figure 3 is a perspective view illustrating the features of an insulating cell constructed in accordance with the present invention;

Figure 4 is an enlarged, fragmentary view illustrating certain of the features of the present invention;

Figure 5 is a plan view illustrating the crease or fold lines which are formed in the cover sheet of the insulating cell of our invention; and

Figures 6 and 7 are fragmentary perspective views illustrating two of the intermediate steps in the folding of the corners of the cover sheet of the insulating cell of our invention.

A mechanical refrigerator is illustrated generally in Figure 1 and includes walls for defining a food compartment 8 (Figure 2) within which is located a suitable evaporation or cooling unit (not shown). In accordance with the usual practice in the art, the walls of this refrigerator are of double construction, preferably being made of metal sheets coated with lacquer or porcelain, so as to provide box-like spaces, illustrated at 9, for receiving the wall insulation. This insulation is preferably in the form of a unit or cell 10 of such dimensions that it may be easily inserted into one of the wall spaces 9 during the assembling of the refrigerator, and when in position is adapted to substantially completely fill that space. The door 11 is likewise of double wall construction, and the space 13 between the inner and outer walls of the door is occupied

by an insulating cell similar to the cells 10 used in the other portions of the refrigerator.

As mentioned previously, the cells used in the past included a body of suitable insulating material and a box-like covering or casing for that material, usually of waterproof paper or paperboard, which was completely sealed for the purpose of making the cell waterproof. In the construction of the present invention, each of the cells 10 includes a body 15 of insulating material contained within a box-like shell 17 which is almost entirely open on one face, as is illustrated particularly in Figure 3.

The insulating material forming the body 15 of each of the cells 10 preferably comprises a low density pad or bat of suitable thickness formed by superposing a plurality of thin, creped, cellulosic sheets; insulation of this type being disclosed in Biederman Patent No. 2,102,233, which was granted on December 14, 1937 and which is assigned to the assignee of this invention, and in the co-pending application of Charles A. Fourness, Serial No. 99,520 which was filed on September 5, 1936, and which is also assigned to the assignee of the present invention. Preferably, the sheets have asphalt incorporated therein in order that the resultant insulation shall be water-resistant, and, if desired, fire proofing chemicals, insecticides, germicides, bactericides, fungicides, or the like may be incorporated into the sheets or the bat. Sheets having a basis weight of from 4 to 9 pounds for 480 sheets 24 x 36 inches, and having from 10% to 30% asphalt, based on the weight of the cellulosic fiber, incorporated therein, have been found particularly suitable for the cell bodies. The number of plies used depends on the thickness desired, fifty plies of sheets having a basis weight of about five pounds giving a bat about two inches thick.

The enclosing shell 17 serves both to support the pad or bat making up the body 15 and also to aid in preventing moisture from entering the outer face and the edges of the cell when it is installed within one of the insulating spaces of the refrigerator. To this end, the shell 17 is preferably formed of laminated, moisture-proof paperboard. One particularly suitable board for this purpose comprises inner and outer plies 19 and 21 of paperboard which is about .015 inch thick, and which has a basis weight of 170 pounds for 480 sheets 24 inches by 36 inches, the plies 19 and 21 being joined together by a layer 23 of asphalt or similar material, which is about .005 inch thick, as is illustrated particularly in Figure 4. Paperboard of this type is substantially impervious to water or water vapor, and at the same time it is quite strong and may be bent or creased within quite wide limits without impairment of its strength or moisture resisting characteristics.

The manner of creasing the rectangular sheet of paperboard from which the shell 17 is made is one of the important features of the present invention, this creasing making possible the provision of a strong, open faced shell having narrow edge portions overlying the top surface of the insulating material body 15 for holding that material in place, without requiring any cutting or complicated working of the sheet from which the shell is made.

The first step in the formation of this shell is to cut a suitable rectangular blank as illustrated in Figure 5. Preferably, this blank is scored or creased as in a rotary creasing machine or the

like prior to its being folded about the insulating body 15, but if desired all or part of the crease lines may be made by hand as the shell blank is folded in place. The crease lines which are used in accordance with our invention include two, spaced, substantially parallel crease lines 25 and 27 extending parallel to and spaced from each of the four sides of the blank. The innermost crease lines 25 define a rectangle having dimensions substantially equal to the external dimensions of the pad or bat of insulating material which constitutes the cell body 15. The outermost lines 27 are spaced from the inner lines 25 a distance substantially equal to the thickness of the cell body 15.

In addition to the crease lines just described, each of the corners of the blank is creased along a diagonal line 29 extending outwardly from each intersection of the innermost lines 25 to the corners of the blank, as illustrated in Figure 5. If a pre-creased blank is used, it may also be provided with four short crease lines 31 each of which extends outwardly from one of the intersections of the lines 25 and 27 for facilitating the folding in place of the end edge sections of the shell. The crease lines 31, however, are conveniently formed when the shell blank is being folded in place.

The next step in the formation of the cell consists in the placing of the body 15 upon the center of the crease blank. The end and side portions A and B of the blank are then raised, and the corners folded along the diagonal crease lines 29, as indicated in Figure 6, to bring the two side portions of the corners together. Next, each of the folded corners, indicated at C in Figure 6, is bent around until one face thereof is in contact with one of the upstanding side portions B of the shell proper. Thereupon, the side portion B and the folded corner C are bent along the outer crease line 27 to form one of the narrow edge sections D which overlie the insulation body 15. When in this position, two staples 33 are passed through the doubled corner portion C and the adjacent edge section D, permanently fastening these portions in position, as illustrated in Figure 7. Then, the adjacent edge section E is folded along the outer crease line 27 and along the crease lines 31, and a third staple 35 is passed through each complete corner assembly to hold the folded edge sections in place.

When these operations have been completed on each of the four corners, the completed cell 10 will be in the form illustrated in Figure 3. The overlying top edge sections D and E serve to aid in holding the body pad or bat 10 of insulating material in place, and also materially strengthen the cell mechanically. At the same time, however, substantially the entire inner face of the cell remains open. The shell 17, by virtue of its multi-ply construction, renders the cell fully moisture-proof along one face and along its sides.

Each of the cells 10 is installed in the insulation space 9 for which it is intended with the open face thereof adjacent the inner or cold wall of that space. The high vapor transmission resistance of the shell 17 adjacent the outer or warm wall of the insulation space will cause such condensation as may occur within that space to be localized in the insulation adjacent the inner or cold wall. That wall is made either of porous construction or is provided with small holes or vent openings such as are indicated at 37 in Figures 2 and 4, whereby some circulation

of the cold dry air within the food compartment will take place through the insulation space. This air will serve to remove such moisture as may tend to condense within the insulation space and will effectively prevent any accumulation of water upon the body 15 of the cell. Thereby, the objections encountered in the use of completely enclosed insulating cells or in the use of moisture-proof membranes on the inner or outer sides of the insulation spaces will be completely overcome.

While a shell of the type previously described may of itself be relied upon to support the body 15 of insulating material in proper position therewithin, it is found advantageous to apply an adhesive, such as sodium silicate, asphalt, or the like, to the inner surface of the shell blank before it is being folded into place about the body 15. This adhesive serves to fasten the edges of the individual sheets or plies making up the cell body to the edges of the shell 17, and thereby assures that no relative displacement of the insulating material and the shell can occur during use. Adhesive material, so applied, is illustrated at 39 in Figure 4.

The insulating cell 10 which we have described in the foregoing possesses numerous advantages over the prior art arrangements and, in general, overcomes most of the objections experienced in using the prior art arrangements. Of great importance among these advantages, the cell of our invention is much less expensive to manufacture than the completely sealed cell known to the prior art. Die cut blanks and the extensive use of asphalt for sealing is entirely obviated. Further, and of even greater importance, the cell of our invention effectively localizes condensation in the inner portion of the insulating body thereof, and when used in an insulation space which is at least partially open to the food compartment of the refrigerator makes possible positive, automatic elimination of such moisture as may work its way into that space and condense.

It will be apparent to those skilled in the art that various modifications may be made in the structural arrangements which have been set forth in the foregoing. It is our desire, therefore, that the accompanying claims shall be accorded the broadest reasonable construction consistent with what is expressly set forth therein and the prior art.

We claim the following as our invention:

1. An insulating cell, particularly suitable for use in conjunction with refrigerators or the like, comprising a body of low density, insulating material made from a plurality of sheets of thin, creped, cellulosic tissue superposed one upon the other to give a pad or bat of the desired thickness, said pad or bat being generally rectangular in outline and generally rectangular in cross section, and a shell for supporting and enclosing said body of insulating material, said shell comprising a single sheet of waterproof paperboard or similar material folded about said body so as to enclose and seal the sides and one face thereof and to overlie narrow edge portions of the other face of said body whereby the overlying edge portions of the shell serve to retain said sheets within the shell, the open face of the cell permitting contact of the adjacent tissue sheet with a refrigerator wall.

2. An insulating cell, particularly suitable for use in conjunction with refrigerators or the like, comprising a body of low density insulating material made from a plurality of sheets of thin, creped, cellulosic tissue superposed one upon the other to give a pad or bat of the desired thickness, said pad or bat being generally rectangular in outline and generally rectangular in cross section, and a shell for supporting and enclosing said body of insulating material, said shell comprising a single sheet of paperboard or similar material folded about said body so as to enclose the sides and one face thereof and to overlie narrow edge portions of the other face of said body, said shell being formed from a waterproof sheet material and serving to seal the enclosed face and edges of said body against moisture, and at least a substantial portion of the inner surface of said shell being coated with an adhesive which serves to adhesively fasten said body to said shell when said shell is folded in place about said body whereby the overlying edge portions of the shell serve to retain said sheets within the shell, the open face of the cell permitting contact of the adjacent tissue sheet with a refrigerator wall.

3. In a refrigerator or the like, walls defining a food compartment, said walls including inner and outer wall members spaced some distance from each other so as to provide at least one generally box-shaped space for receiving insulation, an insulating cell disposed within said space, said cell including a generally box-shaped body of insulating material and a waterproof shell disposed about said body so as to cover the outer face and the side edges thereof, the inner face of said body of insulating material being uncovered, and openings in the inner one of said wall members at spaced points whereby air from said food compartment may circulate through said openings and across the open inner face of said insulating cell to permit removal from said space of water vapor accumulations present adjacent the outer layers of tissue contiguous to the inner wall member.

4. In a refrigerator or the like, walls defining a food compartment, said walls including inner and outer wall members spaced some distance from each other so as to provide at least one generally box-shaped space for receiving insulation, an insulating cell disposed within said space, said cell including a generally box-shaped body of low density insulating material, made from a plurality of sheets of thin, creped, cellulosic tissue superposed one upon the other, and a supporting shell disposed about said body so as to cover the outer face and the side edges thereof, the inner face of said body of insulating material being uncovered and said shell being of waterproof construction at least in the portion thereof covering the outer face of said body, and openings in the inner one of said wall members at spaced points whereby air from said food compartment may circulate through said openings and across the open inner face of said insulating cell to permit removal from said space of water vapor accumulations present adjacent the outer layers of tissue contiguous to the inner wall member.

CHARLES A. FOURNESS.
KENNETH J. HARWOOD.