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PATENT SPECIFICATION (11) 1 479 225

(21) Application No. 15300/75 (22) Filed 14 April 1975
(44) Complete Specification published 6 July 1977
(51) INT CL² B32B 3/28
(52) Index at acceptance
B2E 18Y 207 209 319 339 359 368 439 478 549 559 579 668

(19)

(54) A PAPER-BOARD BOX FOR WRAPPING REFRIGERATED MEAT

(71) I, EIJI KATO, a Japanese Subject of 2—11, Higashiteraokitadai, Tsurumi-ku, Yokohama-shi, Kanagawa-ken, Japan, do hereby declare the invention, for which I pray that a patent may be granted to me, and the method by which it is to be performed, to be particularly described in and by the following statement:—

This invention relates to a paper-board box, and more particularly to a paper-board box which can be used for wrapping of refrigerated meats, and which is capable of exhausting air and moisture discharged from said wrapped meats, particularly fish, animal or chicken meat, during the period in which refrigerated meat is contained therein for preservation and transportation.

Heretofore, in situations where meat has been wrapped in a paper box and then refrigerated, many problems have been noted, for example, the air and moisture normally discharged from the meat when the contents of the paper box are compressed on wrapping or packing are not sufficiently exhausted from the box. Consequently, the surface of the meat takes on a rough, irregular or cratered shape and ice tends to form and be entrapped in the meat. This seriously reduces the edibility and the value of the meat. Moreover, moisture tends to be frozen between the inner surface of the box and the meat surface so that it becomes difficult to remove from the box. Also since the box is insufficiently water proofed, the box tends to become wet and this reduces the strength of the box.

A box has recently been proposed which has fine raised patterns embossed randomly on the inner surface of the box. Since the embossed raised patterns however, are mutually independent, air and moisture tends to accumulate within the recesses of the box since it cannot be sufficiently exhausted out of the box.

According to the invention there is provided a paperboard box for wrapping refrigerated meat comprising single or multi-ply paper board provided with a water resistant coating and having a thickness of 20/100—80/100 mm, a degree of sizing of 900 or more seconds, degree of cobb water absorption of less than 32 g/m², which is embossed with rugose patterns having a length of 1—8 mm with a depth of 30—130% of the thickness of the paperboard, at an angle of 10—45° with respect to the surface of the paper board, at intervals of 0.5—8 mm and at a density of 2—11/cm², and having a water resistance of 20—350 g/m² at the rugose surface, an air permeability of 100—9,900 sec./100 cc and a bursting strength after embossing of 3.5—14 kg/cm² and having fine cracking in the water resistant coating where the board is embossed with the rugose pattern.

According to a further feature of the invention there is provided a paper board useful for forming a paper-board box for wrapping refrigerated meat which comprises: single or multi-ply paper board provided with a water resistant coating and having a thickness of 20/100—80/100 mm, a degree of sizing of 900 or more seconds, degree of cobb water absorption of less than 32 g/m², which is embossed with rugose patterns having a length of 1—8 mm with a depth of 30—130% of the thickness of the paper board at an angle of 10—45° with respect to the surface of the paper board, at intervals of 0.5—8 mm and at a density of 2—11/cm², and having a water resistance of 20—350 g/m² at the rugose surface, an air permeability of 100—9,900 sec/100 cc and a bursting strength after embossing of 3.5—14 kg/cm² and having fine cracking in the water resistant coating where the board is embossed with a rugose pattern.

The box of the present invention has better water resistance and waterproofing properties for meat wrapping purposes than normal paper board since it enables water to be discharged from the meat during refrigeration and subsequent melting. The

paper board is water resistant in itself, and in addition, is provided with a water resistant coating. The cobb water absorption degree is preferably below 25 g/m². The aforementioned sizing degree is obtained from test measurements according to JIS P—8122, and the cobb water absorption degree is obtained from test measurements according to JIS P—8140. The thickness of the paper-board should be 20/100—80/100 mm in order to maintain the bursting strength within the range of 3.5—14 Kg/cm² after embossing. The upper range is limited only by economic necessities and the lower range is determined by the pre-determined necessary strength. The degree of sizing of the paper box material is thus greater than normal paper board, since the strength of the paper-board box must be such to prevent abrupt deterioration when the box becomes moistened during usage. The bursting strength of the paper-board box is thus selected as indicated above so that when the box and contents are under the stress of packing, differential cracking will appear in the waterproof coating. That is, when the waterproofed coating paper is under stress it will be so altered that a large differential in air permeability will occur as between the uneven or embossed portions and the normal areas. This result in the accumulated air and moisture being gradually displaced through the paper plys and out of the box. Such cracking at the embossed portions is very fine and may be either visible or invisible. Cracks may also be formed when the rugose portions are embossed since when the paper is tensioned some paper fibers will be broken. These will occur however, mainly in the waterproof coating when the paper-board box contents are under stress.

As discussed above, the bursting strength of the paper-board box must be maintained within 3.5—14 Kg/cm² after embossing in terms of Müllen bursting strength as defined by JIS P—8131, preferably 3.5—12.5 Kg/cm². If the bursting strength of the paper-board box is greater than 14 Kg/cm², it becomes impossible for the air and moisture to be discharged from the box with the result that refrigeration will produce ice throughout the meat in the box. This results in greatly reducing the commercial value of the packed article. The cobb water absorption degree of the paper-board box is indicated as being below 32 g/m², so that the moisture may gradually disperse or be absorbed into the paper of the box.

The paper-board box of the present invention has another feature in that the rugose patterns are embossed randomly so that recessed grooves for communication between the rugose patterns are formed in order to facilitate discharge of the air and water produced when the meat is wrapped in the paper-board box.

The box of the present invention is shown in Figure 1, in which the fold lines and the partially folded structures can be seen. Figure 2 is a fragmentary prospective view showing the rugose surfaces of the box.

The shape of the rugose patterns embossed on the paper-board of the box of the present invention is not critical. Preferably, they are semi-elliptic or spherical recesses formed in such a manner that the length of one side is 1—8 mm, the intervals between the recesses are 0.5—8 mm, the density of the recesses is 2—11/cm², the angle of the recess with respect to the surface of the paper board of the box is 10°—45°, its depth is 30—130% of the thickness of the paper, preferably 70—110%, and the recesses may be so arranged as to be in a zig-zag configuration, the recessed side preferably being on the inside of the box. If the depth of the recesses are less than 30% of the thickness of the paper-board, the recesses will not function to permit sufficient discharge of the air and moisture from the paper-board box. If they are over 130%, the paper board of the box will be so penetrated by the recesses as to lose the intended function of the recesses, because if there are fine penetrated holes throughout the paper board of the box, which are caused by excessive recessing, the moisture initially discharged from the content in the paper box is frozen therein which will prevent discharge of subsequently formed air and moisture.

Further, if the angle of the recesses with respect to the surface of the paper board of the box is less than 10°, the recesses cannot function properly to form the desired cracking in the waterproof board of the rugose patterns of the paper board of the box when under the tension present during the wrapping of the meat. There would thus be lacking the fine cracking necessary to permit air and water discharge as described above. On the other hand, if the acute angle thereof is over 45°, the paper board of the box will be broken when embossed so as not to possess the necessary strength in the form of a paper-board box.

If the intervals between the recesses are over 8 mm or the density of the recesses is less than 2/cm², the distribution of the water proof coating of the rugose portions of the paper-board box becomes excessively uneven so that the air and moisture cannot be sufficiently discharged from the box. This results in the formation of foaming and stripe scarring on the surface of the contents. On the other hand, if the intervals between the recesses are less than 0.5 mm, or the density thereof is over 11/cm², the strength of the paper-board box will be so

weakened that compression of the contents in the paper box on wrapping becomes difficult. In addition, if the length of one side of the recesses is less than 1 mm, it is difficult to obtain recesses having the aforementioned necessary depth omitted if e length thereof is over 8 mm, the cracks formed, per recess is far below what is required.

The paper-board box of the present invention has still another feature, namely that recessed grooves of 3/100—65/100 mm in depth are formed linearly or nonlinearly for connecting the rugose patterns with each other as well as with the upper four peripheral edges of the box in order to evenly and efficiently discharge from the box the air and moisture produced when meat is packed and compressed therein.

In view of the moisture produced upon refrigerating and thawing of the meat and the force applied to the paper box upon removal of the meat from the paper box for usage, the water resistance of the paper board of the box after embossing is defined as 20—350 g/m² at the rugose surface and the air permeability thereof is defined as 100—9,900 sec./100cc. The air permeability is preferably 150—4,500 sec./100cc. The above cited water resistance values are obtained as described in JIS Z—0208. The above air permeability values are obtained from the measurement test described in JIS P—8117. If the water resistance is less than 20 g/m² at the recess surface, the moisture in the paper-board box cannot be sufficiently discharged from the box so that the box contents are subject to deterioration, while if the water resistance is above 350 g/m² at the recess surface, an excessive amount of moisture is absorbed in the paper-board box weakening it excessively. The water resistance is preferably 80—260 g/m². If the air permeability is less than 100 sec./100cc, the air in the paper-board box is excessively exhausted so that proper preservation and stability of the contents cannot be maintained, whereas if the air permeability is above 9,900 sec./100cc, the air in the box is not sufficiently discharged with the result that the quality of the contents is unacceptably lowered. Thus, the air permeability of the paper board of the box is preferably within 150—4,500 sec./100cc. The numerical values specified in this specification are averages of ten measured values except abnormal ones.

If the paper-board box is completely dehydrated, fine spaces tend to appear between the contents and the box with the result that the air in the spaces shifts about, thus proper preservation of the box contents cannot be maintained. However, the paper-board box of the present invention is slightly absorbent of the moisture so as to enable close contact between the contents and the paper-board box thereby preventing the box contents from drying, thus maintaining proper preservation. Further, the easy separation and removal of the contents from the paper-board box is facilitated.

As indicated in the foregoing description, the paper-board box of the present invention can maintain the strength of the box against exposure to moisture during usage can gradually discharge the air and moisture from the box for proper preservation of the contents and also can prevent the content in the box from drying, thereby maintaining proper content preservation and can facilitate easy removal of the contents from the box under conditions of use as described above. There is thus provided an article of great commercial and industrial value.

The following Example is given by way of illustration of the invention.

Example.

A multi-ply paper board provided with a water resistant coating at its sides and having a thickness of 50/100 mm, a sizing degree of 2,200 seconds and a cobb water absorption degree of 23 g/m² was embossed and thereby was provided thereon with semi-elliptic recesses having a side length of 2.5—4.5 mm distributed at a density of 4/cm² and at an interval of 2 mm, having a depth of 90% of the thickness of the paper board and formed in a zig-zag configuration at an angle of 20° with respect to the surface of the paper board. A paper board box having an air permeability of 1,200 sec/100 cc, a water resistance of 150 g/m² at the recess surface and a bursting strength of 10.5 kg/cm² was produced from this paper board, and fish was packed therein. The box and contents were then compressed for 3.5 hours at a pressure of 40 kg/cm² during refrigeration. As a result, it was found that the fish contained in the box were maintained indefinitely in a desired state of preservation for shipping and storage and that the contents of the box were easily removed from the box for sale and use as food.

WHAT I CLAIM IS:—

1. A paper-board box for wrapping refrigerated meat comprising single or multi-ply paper board provided with a water resistant coating and having a thickness of 20/100—80/100 mm, a degree of sizing of 900 or more seconds, degree of cobb water absorption of less than 32 g/m², which is embossed with rugose patterns having a length of 1—8 mm with a depth of 30—130% of the thickness of the paper-board, at an angle of 10—45° with respect to the surface of the paper board, at intervals of 0.5—8 mm and at a density of 2—11/cm², and having a water resistance of 20—350

weakened that compression of the contents in the paper box on wrapping becomes difficult. In addition, if the length of one side of the recesses is less than 1 mm, it is difficult to obtain recesses having the aforementioned necessary depth omitted if the length thereof is over 8 mm, the cracks formed, per recess is far below what is required.

The paper-board box of the present invention has still another feature, namely that recessed grooves of 3/100—65/100 mm in depth are formed linearly or nonlinearly for connecting the rugose patterns with each other as well as with the upper four peripheral edges of the box in order to evenly and efficiently discharge from the box the air and moisture produced when meat is packed and compressed therein.

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As indicated in the foregoing description, the paper-board box of the present invention can maintain the strength of the box against exposure to moisture during usage can gradually discharge the air and moisture from the box for proper preservation of the contents and also can prevent the content in the box from drying, thereby maintaining proper content preservation and can facilitate easy removal of the contents from the box under conditions of use as described above. There is thus provided an article of great commercial and industrial value.

The following Example is given by way of illustration of the invention.

Example.

A multi-ply paper board provided with a water resistant coating at its sides and having a thickness of 50/100 mm, a sizing degree of 2,200 seconds and a cobb water absorption degree of 23 g/m² was embossed and thereby was provided thereon with semi-elliptic recesses having a side length of 2.5—4.5 mm distributed at a density of 4/cm² and at an interval of 2 mm, having a depth of 90% of the thickness of the paper board and formed in a zig-zag configuration at an angle of 20° with respect to the surface of the paper board. A paper board box having an air permeability of 1,200 sec/100 cc, a water resistance of 150 g/m² at the recess surface and a bursting strength of 10.5 kg/cm² was produced from this paper board, and fish was packed therein. The box and contents were then compressed for 3.5 hours at a pressure of 40 kg/cm² during refrigeration. As a result, it was found that the fish contained in the box were maintained indefinitely in a desired state of preservation for shipping and storage and that the contents of the box were easily removed from the box for sale and use as food.

WHAT I CLAIM IS:—

1. A paper-board box for wrapping refrigerated meat comprising single or multi-ply paper board provided with a water resistant coating and having a thickness of 20/100—80/100 mm, a degree of sizing of 900 or more seconds, degree of cobb water absorption of less than 32 g/m², which is embossed with rugose patterns having a length of 1—8 mm with a depth of 30—130% of the thickness of the paper-board, at an angle of 10—45° with respect to the surface of the paper board, at intervals of 0.5—8 mm and at a density of 2—11/cm², and having a water resistance of 20—350

g/m² at the rugose surface, an air permeability of 100—9,900 sec./100cc and a bursting strength after embossing of 3.5—14 Kg/cm² and having fine cracking in the water resistant coating where the board is embossed with the rugose pattern.

2. A paper-board box according to Claim 1, wherein said rugose patterns are in the form of semi-elliptic and/or spherical recesses, said recesses being arranged in a zig-zag configuration.

3. A paper-board box according to Claim 2 in which the peripheral edges of the box and the rugose patterns are connected by linear or non-linear recessed grooves having a depth of from 3/100 mm to 65/100 mm.

4. A paper board useful for forming a paper-board box for wrapping refrigerated meat which comprises: single or multi-ply paper board provided with a water resistant coating and having a thickness of 20/100—80/100 mm, a degree of sizing of 900 or more seconds, degree of cobb water absorption of less than 32 g/m², whiich is embossed with rugose patterns having a length of 1—8 mm with a depth of 30—130% of the thickness of the paper-board, at an angle of 10—45° with respect to the surface of the paper board, at intervals of 0.5—8 mm and at a density of 2—11/cm², and having a water resistance of 20—350 g/m² at the rugose surface, an air permeability of 100—9,9000 sec./100cc and a bursting strength after embossing of 3.5—14 Kg/cm² and having fine cracking in the water resistant coating where the board is embossed with a rugose pattern.

5. The paper board of Claim 4, wherein said rugose patterns are in the form of semi-elliptic and/or spherical recesses, said recesses being arranged in a zig-zag configuration.

6. The paper board of Claim 4, wherein the peripheral edges of the board and the rugose patterns are connected by linear or non-linear recessed grooves having a depth of from 3/100 mm to 65/100 mm.

7. A paper-board box substantially as herein described with reference to and as illustrated in Figures 1 and 2 of the accompanying drawings.

8. A paper board as claimed in Claim 4 and substantially as hereinbefore described.

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Printed for Her Majesty's Stationery Office by the Courier Press, Leamington Spa, 1977.
Published by the Patent Office, 25 Southampton Buildings, London, WC2A 1AY, from which copies may be obtained.