(54) Title: A CONTAINER FOR FOOD

(57) Abstract: A container (7) for receiving a food product is formed from a shaped blank of paper, paperboard, cardboard or a similar material. The container is formed using radio frequency welding to eliminate the use of glue resulting in a circular, more economic, ovenable and more hygienic process for assembling the container.
A CONTAINER FOR FOOD

This invention relates to a container for receiving a food product and in particular the invention is concerned with containers that can be formed by folding a shaped blank of paper, paperboard, cardboard or a similar material. (References in this specification to ‘paperboard’ are to be taken to include paper, cardboard and similar materials).

Containers for food products such as sandwiches tend to be manufactured from paperboard or from plastics. Paperboard is generally preferred as it is recyclable and biodegradable, and regarded as more environmentally friendly than the plastics alternative.

From the point of view of trying to maintain freshness of the food, WO 03018410 discloses various paperboard containers which are rendered substantially airtight by means of applying a barrier coating to the surface of the blank which forms the inner surface of the folded container, the container being closed off by a plastics film heat sealed thereto. The coating also prevents grease or fat from the food permeating through the paperboard. To secure the blank in the form of the container, traditionally it may be either glued or heat treated. The use of glue is often undesirable in the food packaging field, as it can be messy and time consuming to apply, and is not suited to creating an airtight seal.

Known heat treatments for securing the blank include flame sealing, the application of hot air, direct application of heat by a heating element, or various other methods. A problem associated with these methods is the production of intense heat which affects not only the parts of the container to be welded, as intended, but also the rest of the container. This can result in degradation or distortion of other components of the container, such as the thin plastics film window used to close the container and through which the food product can be viewed. It is also known to coat the surface of the
blank which forms the outer surface of the container with acrylic, and excess heat here results in the surface becoming dry and brittle.

The present invention provides a container for receiving a food product and folded from a blank having a plurality of foldable portions for abutting one another when the blank is folded, the container comprising a main body defining an opening for receiving the food product and the surface of the blank having a coating which is susceptible to RF welding, abutting portions of the blank being sealed together by RF welding.

RF (radio frequency) welding is a known welding technique whereby RF (and/or microwave frequency) electromagnetic radiation is applied to a material, causing molecular oscillation with the consequent melt forming a weld. The molecules need to be dipolar.

By virtue of using RF welding to seal together abutting portions of the blank, the need to use glue is eliminated, resulting in a quicker, more economic, ovenable and more hygienic process for assembling the container. It is also possible thereby to create a container which is substantially water and air-tight, as long as the coating is itself water and air-tight. RF welding also results in an extremely strong bond.

In RF welding, a precisely defined beam of radiation can be emitted upon the surface or point to be welded with little extraneous heat being produced. By virtue of the localised effect of the radiation, the other components of the container are not affected thereby, and it is thus possible to weld the container with the plastics film already in place if so desired. This is especially advantageous when the container has an integral lid including a thin plastics film window which is sealed to the blank before it is folded to form the container. Furthermore, the acrylic coating which may be on the outer surface of the container is not affected in the regions where no RF welding occurs.
The blank can be made of a recyclable composite material which would normally require the application of a variety of different adhesives or different sealing temperatures under conventional heat treatments. However, by the use of RF welding the surfaces can be bonded together in a relatively simple manner. In cases where the food product is inserted into the main body of the container before the abutting portions are sealed together, RF welding can be used without damaging the food product.

Advantageously, RF welding can be used to weld acrylic materials. Hence the blank could be coated with acrylic only. Acrylic coating is biodegradable, thereby making the main body of the container compostible and biodegradable, and it is further possible to use a biodegradable plastics film window resulting in a container that is entirely biodegradable.

The high intensity electromagnetic field associated with the RF welder can be applied to the abutting portions by using electrodes pressed against the inner and outer surfaces of the abutting portions.

The present invention also provides a method of forming a container for receiving a food product from a blank having a plurality of foldable portions for abutting one another, the container comprising a main body defining an opening for receiving the food product, and the blank having a coating susceptible to RF welding, wherein the foldable portions are brought into abutment with one another and RF electromagnetic radiation is applied to the abutting portions thereby sealing them together.

In a preferred embodiment, the edges of the foldable portions in the region of the opening lie in substantially the same plane as the plane of the opening along at least part of the length of the edges. The part of the edges of the foldable portions that lie in the same plane as the opening may be a majority of the length of the edges or the entirety of the length.
In containers that are glued or heat sealed the edges of the foldable portions of the blank are configured to lie at an angle of about 10° to the plane of the opening to enable the foldable portions to be sealed together; if the edges lay in the same plane as the opening it would be difficult to obtain an effective seal right to the edge of foldable portion. This issue is circumvented by the use of RF welding as an effective seal can be obtained with foldable portion running to the edge of the container and this improves the integrity of the container.

Preferably a radiused cut is provide in the region of the intersection between flap edges of the container and flange-forming portions. Further, the radiused cut is offset from the crease line. This feature further improves the integrity (air tightness) of the main body to increase the shelf life of the food product.

The integrity of the container is improved by each of the features referred to above, whether they are utilised collectively or individually, and they allow the container to be gas-flushed in increase the shelf life of the food product still further.

The main body of the container could also be used as part of a “hybrid” product where a different material is used to form the lid of the product. For example, the container could be used to hold, say, margarine, and the lid could be formed from a conventional plastics material. The “hybrid” pack would retain the appearance and feel of the conventional pack but the majority of the pack would be entirely recyclable.

Various other advantages optional features of the invention are set out in the dependent claims.
A clear understanding of the present invention will be gained from the following detailed description, given by way of example only, with reference to the accompanying drawings, in which:

Figure 1 is a plan view of a container blank according to an aspect of the invention;

Figure 2 is a first perspective view of a blank partially assembled into a container;

Figure 3 is a second perspective view of a blank partially assembled into a container;

Figure 4 is a perspective view of a container according to an aspect of the invention;

Figure 5 is a perspective view of a second container embodying the invention;

Figure 6 is an enlarged view of a preferred embodiment of portion of the blank shown in Figure 1; and

Figure 7 is a partial perspective view of a preferred embodiment and of the container shown in Figure 4.

The container blank shown in Figure 1 may consist of paper, paperboard, cardboard or a similar material. The surface of the blank that is used to form the inner surface of the container is coated with a coating susceptible to RF welding. Generally, plastics materials are most ideal for RF welding. In one embodiment the coating is of polyethylene. Acrylic coatings can also be used. The surface of the blank forming the outer surface of the container is coated with a water based acrylic emulsion. The blank
includes a generally rectangular central portion 1 also referred to as rear portion 1, with a minor pair of parallel sides 2 defined by fold lines and a major pair of parallel sides 3 also defined by fold lines.

Integraly formed with the rear portion 1 along the fold lines 2 are side panels of essentially identical shape and attached to the rear panel along fold lines 3 are end panels 5, also of substantially identical shape. The outermost edges of the side and edge panels are defined by fold lines 6 and, as can be clearly seen from Figure 4, the outermost edges of the side and end panels 6 are arranged to lie in a common plane and thus define a uniplanar opening to the main body of the container, generally designated 7.

Fold lines 8 delineate tabs or flaps 10 which extend along the length of the end panels 5. The flaps 10 are contiguous with the side panels 4 in the region of the rear portion 1, and cuts 9 separate the flaps from the side panels 4 in this area. The cuts 9 extend up to, but not through the folding lines 2 and 8 in the region of the rear portion 1.

Elongate rectangular flange-forming flaps 11 are integral with the side and end panels 4, 5. The flange-forming flaps 11 are delineated from the side and end panels 4, 5 by the fold lines 6. In relation to the end panels, fold lines 8 extend in the form of fold lines 12 onto the flange-forming portions to define substantially square end areas 13 of the flange-forming flaps 11. In relation to the side panels, the flange-forming flaps 11 extend at each end beyond the extremity of the side panels 4. The extended sections of the flange-forming flaps 11 are substantially identical in size and shape to the square end areas 13 of the adjacent flange-forming flaps.

With reference to Figures 2 and 3, the blank is assembled such that the flaps 10 lie internally of the side panels 4. The square end areas 13 of the flange-forming flaps 11 associated with the end panels 5 overlie the
extended end portions of the flange-forming flaps associated with the side panels 4, and the container is sealed in the configuration shown in Figure 4 by RF welding of the abutting portions including flaps 10, side panels 4, square end areas 13 and the flange-forming flaps 11.

The RF weld can be applied in a linear fashion to form a straight weld represented in Fig. 4 by lines 14. Other configurations of weld can be used, e.g. spot welds. The welds 14 can be made by applying electrodes (not shown) to either side of the abutting portions 4, 10 although any arrangement of RF welding apparatus sensible to the skilled person can be used. An RF electrical signal is applied to the electrodes to produce the necessary radiation to melt the coating on the surface of the blank forming the inner surface of the container. A typical frequency used in RF welding is 27.12 MHz. The coating does not have to be provided over the whole of the abovementioned surface of the blank, for the purpose of RF welding, which requires merely that there is some coating sandwiched between the abutting portions 4, 10, 11, 13. RF welding can also be applied in the shaded regions 16 of overlap between the square end areas 13 and the flange-forming flaps 11, although it is not essential to the airtight sealing of this configuration of container.

The front or upper surface of the flange defined by the flange-forming flaps 11 presents a barrier coated surface. Once a sandwich or other food product is placed within the container main body 7, a film of plastics can be heat sealed to the presented surface of the flange to provide, with the main body, a substantially airtight compartment for the food product. The plastics film can also be RF welded to the container and is preferably clear to allow the contents of the container to be inspected by the consumer. Due to the comparative coldness and localised effect of the RF weld, it is possible to seal the plastics film to the flaps 11 before sealing of the paperboard abutting portions takes place, without causing damage to the
plastics film. It is of course, also possible to seal the plastics film to the flaps 11 after sealing of the abutting portions.

Fig. 5 shows an alternative construction of container, embodying the present invention, in which a lid 17 is formed integrally with the main body 7 of the container. A thin plastics window 18 is provided which can be sealed to the lid before or after folding of the blank to form the container although it is generally preferable to seal the plastics window 18 to the lid 17 before doing so. Conventional heat treatment of the main body subsequently in order to seal the paperboard surfaces e.g. using male and female heating members involves bringing the heating members into close proximity with the window 18 and great care is thus needed to avoid damaging the window. However, by virtue of RF welding the paperboard surfaces together, the window 18 is substantially unaffected.

Figures 6 and 7 show features that may be used independently or in combination in a preferred embodiment of the invention. With reference to Figure 6, a radiused cut 15 is provided at the intersection of the flap 10 and the end area 13 of the flange forming flap 11. The radiused cut is set away from the fold lines 8 and 12 by a small distance such that it does not interfere with the folding of the blank in this region. Thus, the integrity of the seal formed between the abutting flange-forming flaps 11 when the container is assembled is not prejudiced and the shelf life of the product is increased.

In Figure 7, a modified flap 10a has an outermost edge 19 that is configured to lie substantially in the same plane as the common plane that defines the opening to the main body of the container along at least a part of its length.
The invention is not restricted to the configuration of the containers described herein, which could take any form sensible to the skilled person and which are suitable for the application of RF welding.
Claims

1. A container for receiving a food product and folded from a blank having a plurality of foldable portions for abutting one another when the blank is folded, the container comprising a main body defining an opening for receiving the food product and the surface of the blank having a coating which is susceptible to RF welding, abutting portions of the blank being sealed together by RF welding.

2. A container according to claim 1, wherein a lid is sealed to the container to close the opening.

3. A container according to claim 2, wherein the lid comprises a plastics film, paperboard or a combination thereof.

4. A container according to claim 3, wherein the lid is RF welded to the container.

5. A container according to claim 2, wherein the lid comprises a metallic foil.

6. A container according to any one of claims 2 to 5, wherein the lid is integral with the main body and includes an aperture which is closed by a thin plastics film sealed to the lid.

7. A container according to any one of the preceding claims, wherein the coating is of a plastics material.

8. A container according to claim 7, wherein the coating is of polyethylene or acrylic.
9. A container according to any one of the preceding claims wherein the blank is made of paperboard.

10. A container according to any one of the preceding claims, wherein the abutting portions are RF welded together by the application of an electrode to either side of the abutting portions.

11. A container according to any one of the proceeding claims, wherein the edges of the foldable portions in the region of the opening lie in substantially the same plane as the plane of the opening along at least a part of the length of the edges.

12. A container according to any one of the proceeding claims, wherein the main body of the container comprises a substantially rectangular rear portion with opposed pairs of major and minor sides, and pairs of side panels and end panels are integrally connected to the rear portion at the minor and major opposed sides respectively, the side panels having the side edges which extend at oblique angles to said minor opposed sides, the outermost edges of the side and end panels, which combine to define the opening of the container, each have an integral flange-forming portion, and a radiused cut is provided in the region of the intersection between the flap edge and the flange-forming portions.

13. A blank for forming a container as defined in any one of the preceding claims.

14. A method of forming a container for receiving a food product from a blank having a plurality of foldable portions for abutting one another, the container comprising a main body defining an opening for receiving the food product, and the blank having a coating susceptible to RF welding, wherein foldable portions are brought
into abutment with one another and RF electromagnetic radiation is applied to the abutting portions thereby sealing them together.

15. A method according to claim 12, wherein a lid is sealed to the container to close the opening.

16. A method according to claim 13, wherein the lid comprises a plastics film, paperboard or a combination thereof.

17. A method according to claim 13, wherein the lid comprises a metallic foil.

18. A method according to any one of claims 12 to 15, wherein the abutting portions are RF welded together by applying an electrode thereto.

19. A container substantially as herein described with reference to the accompanying drawings.

20. A blank substantially as herein described with reference to the accompanying drawings.

21. A method substantially as herein described with reference to the accompanying drawings.
INTERNATIONAL SEARCH REPORT

A. CLASSIFICATION OF SUBJECT MATTER

| IPC 7     | 8650/20 |

According to International Patent Classification (IPC) or to both national classification and IPC.

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

| IPC 7     | 8650 |

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched.

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

EPO-Internal

C. DOCUMENTS CONSIDERED TO BE RELEVANT

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<td>WO 03/018410 A1 (COLPAC LIMITED; WRIGHT, PHILIP; MILLS, FRANK; GOLDMAN, NEIL)</td>
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<tr>
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<td>6 March 2003 (2003-03-06) cited in the application abstract; claims 1,11-13; figures 1-5 page 5, paragraph 2 - page 8, paragraph 1</td>
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<tr>
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<td>US 2002/162764 A1 (SHERLINE DREW ET AL)</td>
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<td></td>
<td>7 November 2002 (2002-11-07) paragraph ‘0034! - paragraph ‘0035!; figure 1</td>
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<td>A</td>
<td>GB 2 321 236 A (* COLPAC LIMITED)</td>
<td>1,6,13, 14</td>
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<td></td>
<td>22 July 1998 (1998-07-22) page 3, last paragraph - page 5, last paragraph; figures 1,4,6</td>
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Further documents are listed in the continuation of box C. Patent family members are listed in annex.

* Special categories of cited documents:
  *A* document defining the general state of the art which is not considered to be of particular relevance
  *E* earlier document but published on or after the international filing date
  *L* document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
  *O* document referring to an oral disclosure, use, exhibition or other means
  *P* document published prior to the international filing date but later than the priority date claimed

*"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

*"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

*"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

*"S" document member of the same patent family

Date of the actual completion of the international search

2 February 2005

Date of mailing of the international search report

11/02/2005

Name and mailing address of the ISA

European Patent Office, P.B. 5818 Patentlaan 2 NL – 2280 HV Rijswijk
Tel. (+31-70) 340-2040, Tx: 31 651 epos nl,
Fax: (+31-70) 340-3013

Authorized officer

Segeren, H

Form PCT/ISA/010 (second sheet) (January 2004)
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<td>A</td>
<td>DE 43 32 490 A1 (EUGEN ZIPPERLE GMBH &amp; CO KG SPEZIALFABRIK FUER AUTOZUBEHOER, 71679 ASP) 8 June 1995 (1995-06-08) claim 1</td>
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**INTERNATIONAL SEARCH REPORT**

**Box II** Observations where certain claims were found unsearchable (Continuation of item 2 of first sheet)

This International Search Report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1.☐ Claims Nos. because they relate to subject matter not required to be searched by this Authority, namely:

2.☒ Claims Nos.: 19–21
   because they relate to parts of the International Application that do not comply with the prescribed requirements to such an extent that no meaningful International Search can be carried out, specifically:
   see FURTHER INFORMATION sheet PCT/ISA/210

3.☐ Claims Nos. because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

**Box III** Observations where unity of invention is lacking (Continuation of item 3 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:

1.☐ As all required additional search fees were timely paid by the applicant, this International Search Report covers all searchable claims.

2.☐ As all searchable claims could be searched without effort justifying an additional fee, this Authority did not invite payment of any additional fee.

3.☐ As only some of the required additional search fees were timely paid by the applicant, this International Search Report covers only those claims for which fees were paid, specifically claims Nos.:

4.☐ No required additional search fees were timely paid by the applicant. Consequently, this International Search Report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:

**Remark on Protest**

☐ The additional search fees were accompanied by the applicant’s protest.

☐ No protest accompanied the payment of additional search fees.

Form PCT/ISA/210 (continuation of first sheet (2)) (January 2004)
Continuation of Box II.2

Claims Nos.: 19-21

Claims 19-21 are only based on references to the drawings thereby rendering the claimed combinations of features unclear to such an extent that a meaningful search is not possible.

The applicant's attention is drawn to the fact that claims relating to inventions in respect of which no international search report has been established need not be the subject of an international preliminary examination (Rule 66.1(e) PCT). The applicant is advised that the EPO policy when acting as an International Preliminary Examining Authority is normally not to carry out a preliminary examination on matter which has not been searched. This is the case irrespective of whether or not the claims are amended following receipt of the search report or during any Chapter II procedure. If the application proceeds into the regional phase before the EPO, the applicant is reminded that a search may be carried out during examination before the EPO (see EPO Guideline C-VI, 8.5), should the problems which led to the Article 17(2) declaration be overcome.
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<th>Patent document cited in search report</th>
<th>Publication date</th>
<th>Patent family member(s)</th>
<th>Publication date</th>
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<tr>
<td></td>
<td></td>
<td>GB 2378938 A ,B</td>
<td>26-02-2003</td>
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<td></td>
<td></td>
<td>US 2004238403 A1</td>
<td>02-12-2004</td>
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<td></td>
<td>TW 520336 B</td>
<td>11-02-2003</td>
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<tr>
<td></td>
<td></td>
<td>WO 02090207 A1</td>
<td>14-11-2002</td>
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<tr>
<td>GB 2321236 A</td>
<td>22-07-1998</td>
<td>NONE</td>
<td></td>
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<tr>
<td>DE 4332490 A1</td>
<td>08-06-1995</td>
<td>NONE</td>
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