Thermoformed thermoplastic packaging for containing consumer product, the packaging comprising first and second thermoformed packaging halves (10, 20), the two halves not being integrally formed with each other, each half comprising a half-cavity (14, 24) formed by positive displacement of the thermoplastic relative to a zero displacement rim (12, 22), the two halves being positionable to engage each other to form a whole cavity from the two half-cavities, wherein the first half comprises at least one male attachment portion (26) formed by positive displacement relative to the zero displacement rim of the first half, the second half comprising at least one female attachment portion (16) formed by positive displacement relative to the zero displacement rim of the second half, the two halves being mechanically attachable together by insertion of the at least one male attachment portion into the at least one female attachment portion, thereby mechanically attaching the two halves without engaging them to form the whole cavity.
Packaging for Consumer Products

Technical Field

The invention relates to a thermoformed thermoplastic packaging for containing consumer goods and a process for forming the packaging.

Background

Thermoformed packaging made from thermoplastic polymers is widely used to package consumer goods, in particular consumer goods in retail outlets such as supermarkets.

In one particular arrangement two cavity halves are provided which can be brought together to form a whole cavity, each cavity half typically forming a base and a lid respectively. Often the two cavity halves are hinged together, to assist in loading the packaging with consumer products and then subsequently engaging the two halves to seal and form the cavity.

As the cavities are formed by thermoforming, their relative displacement can be said to be in a positive sense relative to a surrounding rim, which can be said to have zero displacement.

It is also known to facilitate the engagement of the two cavity halves by providing for mechanical engagement, e.g. by snap-fit relative male and female portions. Such engagement portions are typically near the outside rim. In such arrangements, the male engagement portion is thermoformed in a negative sense and the female engagement portion in a positive sense. Thus, when the two halves are brought together, although the two cavity halves, both being positively formed will form the cavity, the two engagement portions, one being negatively formed and the other being positively formed, will engage with each other, the male entering the female, to provide a mechanical interlock.
Such packaging can then be used to display and package consumer goods, and opened by pulling the lid away from the base, releasing the male engagement portion from the female engagement portion.

It is also typically the case that such thermoformed packaging is formed from a single thermoformed sheet. In such a case there is typically a hinge provided, to allow the two cavity halves to fold together to form the cavity and seal and package the contained consumer products.

**Summary of the Invention**

In a first aspect, the invention relates to a thermoformed thermoplastic packaging for containing consumer goods, the packaging comprising first and second thermoplastic thermoformed packaging halves, the two halves not being integrally formed with each other, each half comprising a half-cavity formed by positive displacement of the thermoplastic relative to a zero displacement rim, the two halves being positionable to engage each other to form a whole cavity from the two half-cavities, wherein the first half comprises at least one male attachment portion formed by positive displacement relative to the zero displacement rim of the first half, the second half comprising at least one corresponding female attachment portion formed by positive displacement relative to the zero displacement rim of the second half, the two halves being mechanically attached together by insertion of the at least one male attachment portion into the at least one female attachment portion, thereby mechanically attaching the two halves without engaging them to form the whole cavity.

Thus, the attachment means provides for the two halves to be attached together in an adjacent manner, in much the same way as if the two halves had been integrally formed from the same thermoplastic material. As the whole cavity is not formed by the action of the attachment means, the packaging can then be filled with consumer product, and then subsequently
the two packaging halves brought together to form the whole cavity, thus engaging them together and sealing the consumer products in the packaging.

However, as they are not integrally formed, the two halves can be made from different thermoplastic materials. This may be of particular benefit if a particular material property is desired. For example it may be desirable to have a clear, colourless essentially zero opacity lid portion, e.g. made from PET, to allow the contained consumer products to be seen by a consumer through the packaging. However it may be beneficial to have a base made from a different material, e.g. polypropylene, which is microwaveable.

In such an instance, the consumer product contained could be a microwavable food product. The consumer can then remove the, possibly non-microwaveable lid portion, and place the food product contained within its microwaveable base, into a microwave for heating.

Additionally or alternatively, the first and second halves each have a respective different material thickness. For example they could both be made from the same material, e.g. PET, but one has a material thickness of 200 microns and the other has a thickness of 100 microns. For example, the base might be made from a thicker material, providing rigidity, whilst the lid could be made from thinner material, saving cost.

Typically, after attachment to each other, the two halves are positioned adjacent each other with the openings to their respective cavity-halves being accessible. In this arrangement it is preferable that the first and second halves are movable to form the whole cavity by means of a hinge.

Typically therefore, the at least one male and female attachment portions are located parallel and adjacent to the hinge means. This is so that the two halves can be attached together along a closable hinge. The attached halves can then be easily filled with consumer product and the whole cavity formed
by closing the two cavity halves together and engaging them by moving them in respect of the hinge.

As the attachment means are thermoformed, they have a characteristic depth of displacement as well as a length and width of opening. It has been found to be advantageous if the male and female attachment portions have a length greater than their width providing elongate attachment portions.

This has been found to provide numerous advantages that will be discussed. For example, it has been found that it is simpler and easier to insert the male attachment portion into the female attachment portion. This is because it is possible to insert the male into the female only partially at one end of the elongate attachment portion. This is easier to do because the female attachment member is less constraining and can yield more easily due to the open channel of the female attachment means. Subsequently, fully inserting the male attachment means into the female attachment means is also more simple because the male is already partially inserted into the female and this is aligned and ready for final insertion.

In a preferred embodiment, the attachment portions have a length-to-width aspect ratio of from 1.5:1 to 15:1, preferably from 2:1 to 10:1, more preferably from 3:1 to 8:1.

Preferably the length of the attachment portions is from 1.0 to 10.0cm, preferably from 2.0 to 8.0cm, more preferably from 3.0 to 6.0cm.

It has also been found that there is an optimum number of attachment portions. Although one is a minimum, it has been found that a few together act to provide a secure attachment but also can allow the convenient subsequent removal of the two halves, when desired.

Thus, preferably there are from one to five male and female attachment portions respectively, preferably from two to four.
As discussed, preferably the attachment portions are adjacent a hinge means. Thus, preferably, the attachment portions are aligned in a row with their lengths aligned. This provides a strip of attachment means which provides a convenient attachment location together with the ability to remove the two halves by applying a tearing action when separation is desired.

Typically the attachment portions are snap-fit and the internal cavity of the female attachment portions is substantially the same as the external profile of the male attachment portions. However, it has been found to be advantageous to allow for a small difference between the male and female attachment portions. Thus, preferably the external profile of the male attachment portions is smaller than the internal profile of the female attachment portions. This has been found to make it easier to form the attachments and also easier to separate the two halves without compromising the attachment integrity.

In addition to the attachment means according to the invention, the packaging may also comprise known closure means, which act to provide a mechanical interlocking to form the whole cavity by engagement of the two half-cavities.

Thus, preferably the first half comprises at least one male engagement portion formed by negative displacement relative to the zero displacement relative to the rim of the first half, and the second half comprises at least one corresponding female engagement portions formed by positive displacement relative to the zero displacement relative to the rim of the second half, insertion of the at least one male engagement portion into the at least one female engagement portion thereby engaging the two halves together to form the whole cavity.

Such engagement portions are typically positioned on the opposite side of the packaging to any hinge and are also thus, preferably spatially separated from the attachment means according to the present invention.
In a second aspect, the invention relates to a process involving the steps of taking a packaging as described herein, and attaching the two halves together by insertion of the male attachment means into the female attachment means, thereby attaching the two halves together without engaging them to form the whole cavity.

Preferably, the process involves the at least one male attachment member being placed above the at least one female attachment member so that the two halves partially overlap, followed by compressing the region of overlap together by application of a mechanical compressor which moves along the portion of overlap from one side to another thus sequentially inserting the male attachment member into its respective female attachment member.

Preferably, the process involves packaging wherein the attachment members are aligned in a row with their lengths aligned, wherein the mechanical compressor moves along the row, sequentially compressing the male attachment members into the female attachment members.

This process is preferably followed by placing consumer product into one of the half-cavities, followed by engaging the two cavity-halves together to form the whole cavity.

In a third aspect, the invention relates to a process involving the steps of taking a packaging containing consumer product and which the two halves are engaged together, followed by disengaging the two halves to expose the consumer product, followed by separating the two halves by performing a tearing action in the region of the attachment means.

The consumer product can be any of a very wide range of products that can be presented in such packaged thermoformed packaging. For instance the consumer goods can be, but are not limited to, eggs, bakery products and re-heatable food products.
The invention will now be illustrated, by way of example, and with reference to the following figures, in which:

Figure 1 is a perspective view of a base half of a thermoformed packaging according to the invention.

Figure 2 is a side view of the packaging half shown in figure 1.

Figure 3 is a plan view of the packaging half shown in figure 1.

Figure 4 is a perspective view of a lid half of a thermoformed packaging according to the present invention.

Figure 5 is a side view of the packaging half shown in figure 4.

Figure 6 is a plan view of the packaging half shown in figure 4.

Figure 7 is a perspective view of the base half of figures 1 to 3 and the lid half of figures 4 to 6 attached together.

Figure 8 is a side view of the attached packaging halves shown in figure 7.

Figure 9 is a perspective view of the packaging shown in figure 7 with the packaging shown partially closed by means of a hinge.

Figure 10 is a perspective view of the packaging shown in figure 7 with the two halves engaged to form a whole cavity.

Figure 11 is a side view of the engaged packaging shown in figure 10.
Turning to the figures, figures 1 to 3 show a base packaging half 10 according to the present invention, which has been formed by thermoforming a thermoplastic material, e.g. PET or polypropylene.

The base 10 comprises a zero displacement rim 12, which arises from the original thermoformable sheet where no thermoforming displacement has occurred and a half-cavity 14 of width 90mm and length 150mm formed by positive displacement of 18.5mm of the thermoplastic relative to the zero displacement rim 12.

The base 10 also comprises three female attachment portions 16 of width 10mm and length 43mm formed by positive displacement of 6mm relative to the zero displacement rim 12, and a hinge 18. The female attachment portions 16 each possess six cavities, three along each of the inside long walls facing each other. These facilitate the snap-fit of the male attachment portions, as described later.

The base 10 also comprises female engagement portions 19 formed by positive displacement relative to the zero displacement rim 12, to facilitate engaging and sealing the whole cavity.

Figures 4 to 6 show a lid packaging half 20 according to the present invention, which has been formed by thermoforming a thermoplastic material, e.g. PET or polypropylene.

The base 20 comprises a zero displacement rim 22, which arises from the original thermoformable sheet where no thermoforming displacement has occurred and a half-cavity 24 of width 90mm and length 150mm formed by positive displacement of 23mm of the thermoplastic relative to the zero displacement rim 22.

The base 20 also comprises three male attachment portions 26 of width 9.5mm and length 42.5mm formed by positive displacement of 5.5mm relative
to the zero displacement rim 22. The male attachment portions 26 each possess six protrusions, three along each of the inside long walls facing each other. These protrusions fit into the corresponding cavities provided by the female attachment portions to facilitate snap-fit.

The base 20 also comprises male engagement portions 29 formed by negative displacement relative to the zero displacement rim 22, to facilitate engaging and sealing the whole cavity.

As can be seen from figures 1 to 6, the male and female attachment portions 16, 26 are snap-fit, in that the male attachment portions comprise a rim which is slightly larger than the female attachment portion opening.

The packaging is formed by pressing the male attachment portions 16 into the female attachment portions 26, to provide the result shown in figure 7.

As can be seen in figure 9, the packaging can be closed by action of hinge 18.

The whole cavity can then be formed by the action of the male engagement portions 29 and the female engagement portions 19, to form the sealed packaging as shown in figures 10 and 11.
Claims

1. Thermoformed thermoplastic packaging for containing consumer goods, the packaging comprising first and second thermoformed packaging halves, the two halves not being integrally formed with each other, each half comprising a half-cavity formed by positive displacement of the thermoplastic relative to a zero displacement rim, the two halves being positionable to engage each other to form a whole cavity from the two half-cavities, wherein the first half comprises at least one male attachment portion formed by positive displacement relative to the zero displacement rim of the first half, the second half comprising at least one corresponding female attachment portion formed by positive displacement relative to the zero displacement rim of the second half, the two halves being mechanically attachable together by insertion of the at least one male attachment portion into the at least one female attachment portion, thereby mechanically attaching the two halves without engaging them to form the whole cavity.

2. Packaging according to claim 2, wherein the first and second halves are made from respective different thermoplastic material.

3. Packaging according to claim 2 or claim 3, wherein the first and second halves each have a respective different material thickness.

4. Packaging according to any one of the preceding claims, wherein the first and second halves are movable to form the whole cavity by means of a hinge.

5. Packaging according to claim 5, wherein the at least one male and female attachment portions are located parallel and adjacent to the hinge means.
6. Packaging according to any one of the preceding claims, wherein the male and female attachment portions have a length greater than their width providing elongate attachment portions.

7. Packaging according to claim 6, wherein the attachment portions have a length-to-width aspect ratio of from 1.5:1 to 15:1, preferably from 2:1 to 10:1, more preferably from 3:1 to 8:1.

8. Packaging according to claim 6 or claim 7, wherein the length of the attachment portions is from 1.0 to 10.0cm, preferably from 2.0 to 8.0cm, more preferably from 3.0 to 6.0cm.

9. Packaging according to any one of the preceding claim, wherein there are from one to five male and female attachment portions respectively, preferably from two to four.

10. Packaging according to any one of claims 6 to 9, wherein the attachment portions are aligned in a row with their lengths aligned.

11. Packaging according to any one of the preceding claims, wherein the attachment portions are snap-fit.

12. Packaging according to any one of the preceding claims, wherein the first half comprises at least one male engagement portions formed by negative displacement relative to the zero displacement relative to the rim of the first half, and the second half comprises at least one corresponding female engagement portions formed by positive displacement relative to the zero displacement relative to the rim of the second half, insertion of the at least one male engagement portion into the at least one female engagement portion thereby engaging the two halves together to form the whole cavity.
13. Packaging according to any one of the preceding claims, wherein the two halves are attached together by the insertion of the at least one male attachment portion into the at least one female attachment portion.

14. Packaging according to claim 13, wherein the two halves are engaged together to form a whole cavity and contain a consumer product in the cavity.

15. A process involving the steps of taking a packaging according to any one of claims 1 to 14, and attaching the two halves together by insertion of the male attachment means into the female attachment means, thereby attaching the two halves together without engaging them to form the whole cavity.

16. A process according to claim 15, wherein the at least one male attachment member is placed above the at least one female attachment member so that the two halves partially overlap, followed by compressing the region of overlap together by application of a mechanical compressor which moves along the portion of overlap from one side to another thus sequentially inserting the male attachment member into its respective female attachment member.

17. A process according to claim 16 wherein the packaging is according to claim 10, wherein the mechanical compressor moves along the row, sequentially compressing the male attachment members into the female attachment members.

18. A process according to any one of claims 15 to 17, which is followed by placing consumer product into one of the half-cavities, followed by engaging the two cavity-halves together to form the whole cavity.

19. A process involving the steps of taking a packaging according to claim 14, followed by disengaging the two halves to expose the consumer.
product, followed by separating the two halves by performing a tearing action in the region of the attachment means.
Fig. 3
A. CLASSIFICATION OF SUBJECT MATTER

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)

B65D

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 practicable, search terms used)

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C. DOCUMENTS CONSIDERED TO BE RELEVANT

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Date of the actual completion of the international search: 11 April 2016

Date of mailing of the international search report: 22/04/2016

Name and mailing address of the ISA:
European Patent Office, P.B. 5818 Patentlaan 2 NL-2280 HV Rijswijk
Tel. (+31-70) 340-2040, Fax: (+31-70) 340-3016

Authorized officer: Fournier, Jacques

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