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(56) Documents cited
GB 2187702 A GB 1404417 A GB 1378140 A
GB 1199998 A EP 0116394 A1 WO 88/00907 A1
WO 87/02965 A1

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(54) Modified atmosphere pack

(57) A modified atmosphere pack has a meat product 1 vacuum skin packed on a tray 2 by means of a semi-permeable web 4, and that assembly is then enclosed by a post-heatshrunken horizontal form-fill-seal enclosure of an impermeable film 7 surrounding a modified atmosphere space 9. A front rim on the tray holds the film 7 clear of the tray base 6. A

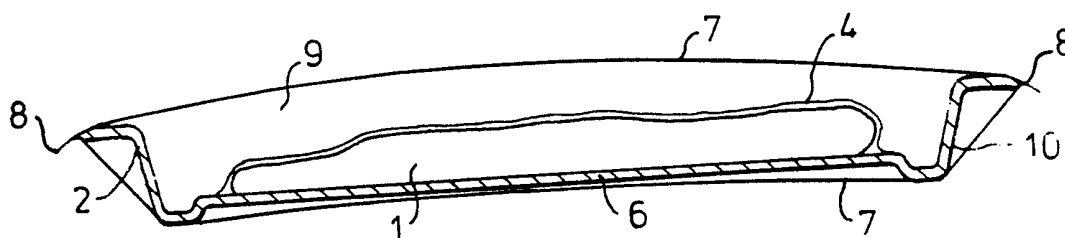


Fig.2.

Fig.1.

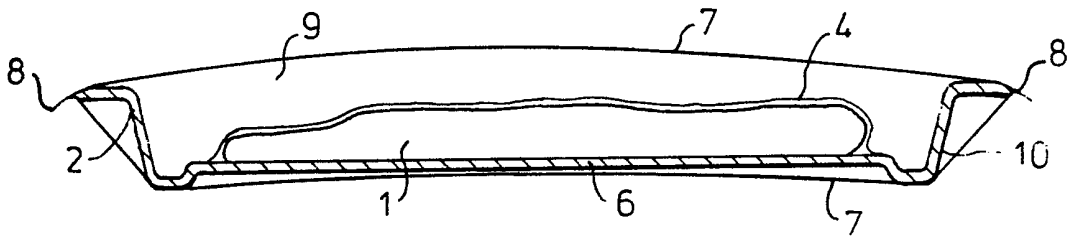
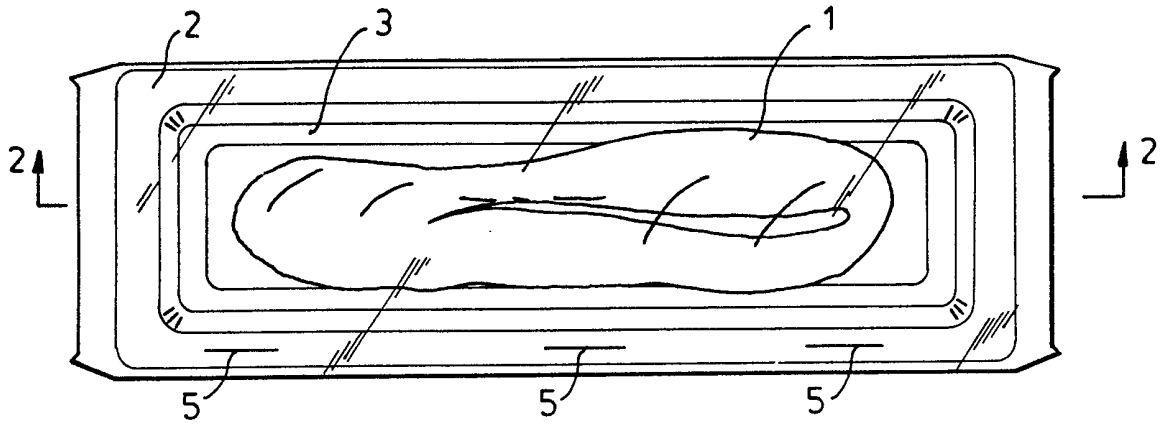


Fig.2.

MODIFIED ATMOSPHERE PACK

The present invention relates to a modified atmosphere pack, principally for food packaging, in which a food whose shelf life is limited when in contact with oxygen
5 can be enhanced by storing it in an atmosphere which has a constituency carefully chosen to maintain the appearance of the food over an extended period.

It is a known problem of meat packaging that when the product is packed under vacuum or in any other oxygen-
10 free environment such as in an inert gas, the meat loses its oxy-myoglobin colour and can become red/purple in appearance, thereby losing its attractiveness to the consumer.

It is an object of the present invention to
15 endeavour to maintain the oxy-myoglobin red colour of fresh red meat while packaging the meat for an extended shelf life of, say, 7 to 10 days.

One form of modified atmosphere pack which has been used for extending the shelf life of meat is that disclosed
20 in EP-A-0292477 and EP-A-0316329 in which a support tray has a meat product placed therein and covered by a gas permeable film by a VSP (vacuum skin pack) process. The pack is completed by the attachment of a sealed closing lid which maintains the space above said VSP-enclosed product filled
25 with either atmospheric air, or nitrogen, or carbon dioxide.

When the pack is ready to be displayed for retailing, the lid can be removed, thereby allowing normal atmospheric air to contact the exterior of the gas permeable VSP, allowing the atmospheric air to permeate into the VSP
30 and to restore the colour of the meat product.

The present invention provides a simplified form of pack which nevertheless enables a modified atmosphere environment to be applied over a pack to preserve its shelf life until such time as it is required to be used. In
35 particular, the pack in accordance with the present

invention is to be easier to handle at the point of sale.

Accordingly, the present invention provides a food pack comprising a food product between a support and a semi-permeable (as herein defined) skin covering web attached to the product and the support by a vacuum skin packaging (VSP) process, and a sealed outer enclosure substantially completely surrounding the vacuum skin packed assembly of support, product and covering web and filled with a conditioning atmosphere which has a composition different from that of atmospheric air.

A second aspect of the present invention provides a method a method of packaging a food product, comprising vacuum skin packaging the product on a support using a semi-permeable (as herein defined) web, surrounding the vacuum skin packed assembly of the support and the food product thereon within an outer enclosure of a film which has a lower permeability to gas than said semi-permeable web, and sealing said outer enclosure about but, not to, the vacuum skin packed assembly to maintain it exposed to the modified atmosphere enclosed within said outer enclosure, said modified atmosphere having a composition other than that of atmospheric air.

In order that the present invention may more readily be understood the following description is given, merely by way of example, reference being made to the accompanying drawings, in which:-

FIGURE 1 is a top plan view of a pack in accordance with the present invention; and

FIGURE 2 is a transverse sectional view taken on the line 2-2 of Figure 1.

Figure 1 shows a meat product 1 placed on a thermoformed tray 2. The tray has a central floor area 6 which is optionally raised to define therearound a channel 3 at the foot of an upstanding rim 10 of the tray. The rim 10 preferably has a height at least as great as that of the product for which the tray 2 is intended.

Figure 2 shows that the meat product 1 is covered with a semi-permeable film 4 by means of a VSP process, preferably in accordance with our GB-A-1307054. With such a VSP covering the juices of the meat are prevented from
5 escaping and causing an unsightly product in the pack.

The film web 4 used for the VSP envelope is preferably the one available from W. R. GRACE & CO.-CONN., and known by the Trade Mark DARFRESH, having a limited permeability to oxygen, carbon dioxide and nitrogen.

10 Although for the purposes of illustration in Figure 2 the VSP web 4 is shown as separate from the product article 1, in practice the VSP process results in the VSP web 4 constituting a skin of the meat product so that there will be intimate contact with the meat product over the
15 whole of the area of the product which is exposed.

The tray 2 is in this case thermoformed from a semi-rigid support web. It may or may not be semi-permeable. For example a gas permeable tray or other support of cardboard or foamed polystyrene may be used,
20 provided it is not too permeable to permit the VSP operation to be carried out. For this purpose it may have a surface layer of semi-permeable or impermeable film thereon. A gas impermeable tray 2 may be used, if required, in which case the optional venting slots 5 shown in Figure 1 may be
25 present in order to ensure that the atmosphere both above and below the central floor area 6 of the tray is of the same composition and pressure.

As indicated above, the VSP web 4 intimately adheres to the surface of the meat product 1, but also
30 adheres intimately to the upper surface of the tray 2, so as to define therewith an envelope which has substantially no gas space around the surface of the meat product 1.

The tray with the VSP-enveloped product thereon is then subjected to a subsequent packaging operation using a
35 horizontal form-fill-seal (HFFS) process in which a modified atmosphere may be introduced into the outer enclosure formed

by a film 7 which is, during the HFFS process, shaped as a tube which is then sealed at its ends 8 in order to define an enclosed gas space 9 retaining the modified atmosphere which may be a mixture of oxygen with carbon dioxide and nitrogen, in proportions which may be tailored to suit the particular meat type constituting the product 1.

By increasing the oxygen content in the gas space 9 over the normal oxygen content of atmospheric air, it is possible to ensure that the semi-permeable VSP web allows sufficient oxygen from the modified gas atmosphere to permeate into the meat product 1 through the semi-permeable VSP web, during the storage and possible transportation of the pack from the production site (for example a slaughter house) to the retail outlet.

Oxygen contents of between 20% and 30% are found to be particularly useful for meat products.

For red meats, it is advantageous for substantially all the rest of the atmosphere to comprise carbon dioxide, with substantially no nitrogen.

For poultry, the residue of the modified atmosphere may comprise a mixture of carbon dioxide and nitrogen with the carbon dioxide amounting to up to 40% of the total. One particularly desirable atmosphere for poultry may comprise 20% oxygen, 40% carbon dioxide and 40% nitrogen.

Increasing the carbon dioxide content has the advantage of inhibiting bacterial growth, although this promotes the release of juices. Since the juices provide a culture medium for bacteria, it is advantageous not to employ too high a carbon dioxide content for those meats which will tend to release juices readily.

In order to achieve adequate exposure of the meat product within the VSP to the oxygen of the modified atmosphere within the external covering web for "blooming" the meat, it is advantageous for the permeability of the VSP web 4 to be at least 1000 cc.O₂/24 hour/atmos./m². Equally, it is felt that if the permeability exceeds 5000 cc.O₂/24

hour/atmos./m² this will give too free an exchange of the oxygen into the product, to cause the oxygen of the modified atmosphere above the VSP web to be consumed too soon for achieving optimum shelf life.

5 Because there is no seal between the outer packaging film 7 of the HFFS enclosure and the rim 10 of the tray 2, the gas space 9 also extends around the underneath of the tray, thereby allowing for slightly more gas volume than would arise if the tray were to form the lower boundary
10 of the gas space 9.

 The film 7 used for the HFFS enclosure is a so-called barrier film which is substantially impermeable to gas and hence ensures that the chosen proportions of the modified atmosphere in the gas space 9 will be varied only
15 as a result of permeation of one or more of the constituents of that atmosphere through the VSP web 4 into the meat product 1, and not by loss to the surrounding atmosphere outside the enclosure 7.

 Finally, in order to improve the appearance of the
20 pack and to make it more readily stackable with other similar such packs for storage and/or transportation purposes, the outer HFFS film 7 is subjected to a heat shrinking operation, causing it to pull taut over both the upper and lower surfaces of the tray 2.

25 A further advantage of carrying out the heat shrinking operation is that this will increase the pressure in the modified atmosphere in the gas space 9 between the VSP web 4 and the film 7 for the outer enclosure, thereby providing a cushion which will prevent the product from
30 being crushed when stacked for storage.

 Furthermore, the increase in pressure in the gas space 9 serves to enhance the efficiency of transfer of the oxygen from the space 9 into the product, through the VSP web 4.

35 The seal at the ends of the HFFS film 7 is a so-called fin seal which involves flattening the tube of the

film 7 and then sealing the flattened area and cutting off the excess using a hot wire knife.

Having thus sealed one end, the chosen modified gas atmosphere mixture is introduced through the still open
5 opposite end until eventually the interior of the tubular HFFS enclosure is charged with the appropriate atmosphere, following which the second end of the tubular enclosure can be sealed in the manner just described, and the pack then subjected to the final heat-shrinking operation to shrink
10 the film 7.

If desired, the introduction of the modified atmosphere to the gas space 9 may involve the extraction of atmospheric air by a vacuum step, followed by introduction of the appropriate conditioning atmosphere.

15 The above-mentioned channel 3 formed in the tray defines a ridge on the underside of the tray, to hold the outer HFFS film 7 clear of the underside of the tray even after the shrinking operation. This ensures that the modified atmosphere within the HFFS pack is able to contact
20 all sides of the VSP pack, in order to allow permeation of the modified atmosphere through the tray where the tray is not of impermeable form.

EXAMPLE

A batch of 50 packages was prepared using the tray
25 configuration illustrated in Figures 1 and 2, with the tray formed of a 240 micron thick laminate based on thermoformable polyvinyl chloride sheet laminated to a coextruded multilayer easy opening sealant. This laminate had a permeability of from 5 to 10 cc O₂/24 hour/atmos./m²
30 at 23°C and at 0% RH.

Some of these trays were then covered, by use of a VSP process, with a covering film which was 100 microns thick and was a seven layer coextruded film containing six different polyolefin resins.

35 Both of these films are available from W. R. GRACE & CO.-CONN. as Darfresh films, the tray material being

identified as VGEV 243X and the VSP covering film identified as ELDX 256. The oxygen permeability of the covering film is 2000 cc O₂/24 hour/atmos./m² at 23°C and at 0% R.H.

The VSP operation was carried out on a VS 44 vacuum skin packaging machine available from W. R. GRACE & CO.-CONN.

The product was a set of 50 beef loin steaks, one packed in each tray.

Both the VSP packs resulting from the above steps, and the remaining stack-carrying trays without the VSP cover film, were then all packaged individually in a pillow packaging which contained a modified atmosphere consisting of 70% O₂, 20% CO₂ and 10% N₂, using a five layer coextruded shrinkable barrier shrink film containing ethylene vinyl alcohol (EVOH) as a gas barrier layer, and having a total thickness of 25 microns. This film is readily available from W. R. GRACE & CO.-CONN. identified as BDF 2001 and has a permeability of 5 cc O₂/24 hour/atmos./m² at 23°C and at 0% RH.

Some other of the non-VSP covered packs were packed, again in the BDF 2001 pillow packaging, but with atmospheric air instead of the modified atmosphere.

The pillow packaging for all of these types of packs was carried out on a Ilapak Delta P machine available from Ilapak 4P, Lugano, Switzerland.

All of these pillow packages were then subjected to a hot air shrink operation to shrink the outer barrier film on to the loaded tray or the VSP pack and thereby to raise the gas pressure within the pillow pack.

The three batches of pillow packs were stored in dark conditions under temperatures of from 0 to +2°C. The packs were checked daily for appearance, colour and odour by an evaluation panel experienced in such a task.

The two types of modified atmosphere packages displayed the normal behaviour expected of such packs in that the colour was bright red until after eight days of

storage, but by the eleventh day of storage discoloured areas were noticeable. The odour of the packs was acceptable until after five days of storage, and then a sour and sweetish odour was noticed, which was considered close to borderline acceptability of the packs. After eleven days of storage, off odours were present. In many samples the product was observed as exhibiting in the centre of the underside a colour behaviour typical of vacuum packaged meat in that it was deep purple in colour, turning to bright red when the meat was exposed to air on opening of the pack.

As expected the air-filled packages displayed unsatisfactory behaviour in that visible discolorations were present after four days of storage, and after the fifth day the samples were heavily discoloured.

The VSP-packed products had a superior appearance in that the meat juices were held in by the VSP covering film, whereas the non-VSP packed modified atmosphere packs showed signs of exudation of juices which gave the pack a less attractive appearance vis-à-vis customer appeal at the point of retail sale.

C L A I M S

1. A food pack comprising a food product between a support and a semi-permeable skin covering web attached to the product and the support by a vacuum skin packaging (VSP) process, and a sealed outer enclosure substantially completely surrounding the vacuum skin packed assembly of support, product and covering web and filled with a conditioning atmosphere which has a composition different from that of atmospheric air.
2. A pack according to claim 1, wherein said outer enclosure has been heat shrunk about said vacuum skin packed assembly.
3. A pack according to claim 1 or claim 2, wherein said outer enclosure is formed of a material having a much lower permeability to gas than does said semi-permeable covering web.
4. A pack according to any one of the preceding claims wherein the support is gas permeable.
5. A pack according to claim 4, wherein the support is a tray of cardboard or of foamed polystyrene.
6. A pack according to any one of the preceding claims, wherein the support is a thermoformed tray having an upstanding rim at least as high as the food product thereon.
7. A pack according to claim 6, and including venting apertures in said support to provide communication between the modified atmosphere on the two sides of the support.
8. A pack according to any one of the preceding claims, wherein the outer enclosure is formed by a horizontal form-fill-seal process involving forming a packaging web into a tubular structure, placing the vacuum skin packed assembly inside the tubular structure and sealing the ends of said tubular structure with the modified atmosphere therewithin.

9. A pack according to any one of the preceding claims, wherein said conditioning atmosphere includes oxygen and/or nitrogen and/or carbon dioxide in proportions different from those in which the same gases are found in
5 atmospheric air.

10. A pack according to any one of claims 1 to 9, wherein the permeability of said semi-permeable skin covering web is from 1000 to 5000 cc.O₂/24 hour/atmos./m².

11. A pack substantially as hereinbefore described
10 with reference to, and as illustrated in, the accompanying drawings.

12. A method of packaging a food product, comprising vacuum skin packaging the product on a support using a semi-permeable web, surrounding the vacuum skin
15 packed assembly of the support and the food product thereon within an outer enclosure of a film which has a lower permeability to gas than said web, and sealing said outer enclosure about but, not to, the vacuum skin packed assembly
20 to maintain it exposed to the modified atmosphere enclosed within said outer enclosure, said modified atmosphere having a composition other than that of atmospheric air.

13. A method according to claim 12, comprising heat shrinking said film of the outer enclosure subsequent to sealing it.

25 14. A method of packaging, substantially as hereinbefore described with reference to the accompanying drawings.