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# (54) Improved frozen food packaging

(57) The invention provides a frozen food package comprising:
a. a frozen food item (102);
b. a first web (103) sealing the frozen food item from the exterior environment; and
c. a second web (104) at least partially sealing the first web from the exterior environment;
wherein the first and second webs are transparent to visible light, are aligned thereby to permit the frozen food item to be viewed by a consumer, have a daily water vapour transmission rate less than 300 g/m$^2$ for a 25 micron thick film, are not in thermal contact and define an inter-web space occupied with one or more gases. The invention provides a solution to the tendency with prior art frozen food packaging comprising a transparent web that water vapour condenses and then freezes on the upper and exterior surface of the web thereby obscuring the view of the frozen food item to the consumer.

EP 1 862 398 A1

## Description

**[0001]** This invention relates to improved frozen food packaging and a method for the preparation of food.

**[0002]** Frozen food packaging known in the art comprises a tray having a base and sides, a frozen food item supported on the said tray and a web sealing the frozen food item to the tray, the web being transparent to visible light. The transparent web renders the frozen food packaging more attractive to the consumer and assists the consumer to make their choice of food item when the frozen food packaging is displayed by the distributor in freezers by presenting the frozen food item in a clear and visible format. One problem with the known art in frozen food packaging is that water vapour tends to condense and then freeze on the upper and exterior surface of the web thereby obscuring the view of the frozen food item to the consumer.

**[0003]** The inventors have surprisingly observed that a solution to the aforementioned problem is provided by a second web sealing the first (prior art) web on the tray, wherein the first and second webs are not in thermal contact thereby to define an inter-web space occupied with one or more gases. Without wishing to be bound by theory, it is thought by the inventors that the second web limits the amount of water vapour in the inter-web space which can subsequently condense on the exterior surface of the first web. Furthermore as there is no thermal contact between the first and second webs, the temperature of the second web will tend towards ambient temperature. Thus if the frozen food packaging of the invention is removed from a display freezer by the consumer for closer examination, ambient water vapour will not condense onto the exterior surface of the second web thereby obscuring the view of the frozen food item to the consumer.

## BRIEF DESCRIPTION OF THE INVENTION

**[0004]** Thus in a first aspect of the invention, a frozen food package comprising:

a. a frozen food item;
b. a first web sealing the frozen food item from the exterior environment; and
c. a second web at least partially sealing the first web from the exterior environment;

wherein the first and second webs are transparent to visible light, are aligned thereby to permit the frozen food item to be viewed by a consumer, have a daily water vapour transmission rate less than 300 g/m$^2$ for a 25 micron thick film, are not in thermal contact and define an inter-web space occupied with one or more gases.

**[0005]** Preferably the frozen food package further includes a tray having a base and sides, the tray having a daily water vapour transmission rate less than 300 g/m$^2$ for a 25 micron thick film; wherein the frozen food item is supported on the base of the said tray; the first web seals the frozen food item on the tray; and the second web at least partially seals the first web on the tray. The water vapour transmission rate values provided hereinabove are for room temperature (20 degrees centigrade).

**[0006]** Preferably the daily water vapour transmission rate of the tray and/or first web and/or second web is less than 200, more preferably less than 150, most preferably less than 50 g/m$^2$ for a 25 micron thick film at room temperature (20 degrees centigrade).

**[0007]** The tray and/or first web and/or second web may comprise amorphous polyethylene terephthalate, polypropylene, poly(lactic acid), poly(hydroxyalkanoate) or mixtures thereof. The tray material and/or first web and/or second web may be a laminated material.

**[0008]** The gas pressure between the first web and the frozen food item may be less than one atmosphere. One advantage of this technical feature is that the first web may perform the additional function of securing the frozen food item to the tray thereby to prevent relative movement of the frozen food item and tray and any consequent damage of the frozen food item. Furthermore such an embodiment minimises build-up of water ice on between the first web and frozen food item.

**[0009]** The one or more gases may comprise less than 20gm$^{-3}$, preferably less than 10gm$^{-3}$, most preferably less than 2gm$^{-3}$ water. Preferably one of the one or more gases is air.

**[0010]** The frozen food package may additionally comprise a desiccant within the inter-web space thereby to minimise and maintain at a minimum the volume of water vapour in the inter-web space.

**[0011]** To ease preparation of the frozen food item for consumption, the second web may be removable from the package independently of the first web. Thus the frozen food package may additionally comprise an exterior packaging element comprising the second web, the exterior packaging element at least partially surrounding the frozen food item and first web. One advantage of the use of such an exterior packaging element is the ease of adding advertising print to the surface of the exterior packaging element. Particularly preferred formats of exterior packaging element are a closed box or a sleeve.

**[0012]** To further facilitate preparation of the frozen food item for consumption, the first web may at least partially self-detach when the frozen food packaging, less the second web, is heated to a temperature of at least 60, preferably 80 and most preferably 100 degrees centigrade. This technical feature not only eases access to the frozen food item after heating by the consumer but also permits control of any excess pressure generated within the frozen food packaging during heating by partial venting of any expanding gases residing between the frozen food item and the first web.

**[0013]** The second web may additionally comprise a valve. The valve may be a one-way valve or two-way valve or it may comprise one or more apertures. Inclusion of such a valve permits the pressure within the inter-web

space to equalize with ambient pressure. In the absence of such a valve, should the ambient temperature during sealing of the second web be higher than the temperature of the display freezer, any gases in the inter-web space will contract and the second web will bow inwardly towards the first web. Not only is this unattractive to the consumer but should the first and second webs touch, then thermal contact would be made and ambient water vapour may start to condense onto the exterior surface of the second web. In the absence of such a valve, should the ambient temperature during sealing of the second web be lower than the temperature of the display freezer, any gases in the inter-web space will expand and the second web will bow outwardly away from the first web. Not only is this unattractive to the consumer but the second web may well burst rendering the frozen food package even less attractive and not vendable.

**[0014]** In a second aspect of the invention, a method of preparing food is provided comprising the steps of:

(a) providing a frozen food package as described herein: then
(b) removing the second web; then
(c) heating the frozen food package less the second web; and thereafter
(d) removing the first web.

**[0015]** Preferably the heating step is conducted in a traditional or microwave oven.

## BRIEF DESCRIPTION OF THE DRAWINGS

**[0016]** The invention will now be described in more detail and exemplified with reference to the drawings which show:

Figure 1 a cross-section of a first embodiment of the invention;
Figure 2 a cross-section of a second embodiment of the invention;
Figure 3 a cross-section of a third embodiment of the invention; and
Figure 4 a cross-section of a fourth embodiment of the invention.

## DETAILED DESCRIPTION OF THE INVENTION

**[0017]** The tray and/or first web and/or second web may comprise amorphous polyethylene terephthalate, polypropylene, poly(lactic acid), poly(hydroxyalkanoate) or mixtures thereof. The tray material and/or first web and/or second web may be a laminated material. Typical web thicknesses are in the range 15-50 microns and for the tray 500-1200 microns. Daily water vapour transmission rates are less than 300 g/m$^2$ for a 25 micron thick film at room temperature (20 degrees centigrade).

**[0018]** The water vapour transmission value of a material may be measured according to ASTM F 1249: Standard Test Method for Water Vapour Transmission Rate Through Plastic Film and Sheeting Using a Modulated Infrared Sensor.

**[0019]** In addition, the first and second webs may be coated on one or both surfaces with a low surface energy material such as fatty acid esters (anti-fogging agent). When coated with such a material, any water vapour which does condense on the surface of the first and second webs will not reside in droplet form but spread to form a thin film thus maintaining, to some extent, clarity of view of the frozen food item to the consumer.

**[0020]** Typical frozen food items suitable for the invention include raw meats, peas, spinach, sauces and ready meals.

**[0021]** Food may be prepared from the frozen food packaging of the invention by:

(a) removing the second web; then
(b) heating the frozen food package less the second web; and thereafter
(c) removing the first web.

**[0022]** Heating may be by either conventional or microwave oven.

## EXAMPLES

**[0023]** Figure 1 shows a 500 micron thick amorphous polyethylene terephthalate tray (101) having a base and sides and supporting on its base a frozen food item (102) which comprises a ready meal. The sides of the tray project beyond the height of the frozen food item (102). A first web (103) of 15 micron thick amorphous polyethylene terephthalate extends over the tray and is heat sealed part way up the sides of the tray on first flanges (105) which project radially outwardly from the sides of the tray sealing the frozen food item (102) on the tray (101). The space defined by the first web (103) and the tray (101) is occupied by the frozen food item (102) and ambient air. A second web (104) of 15 micron thick amorphous polyethylene terephthalate extends over the first web and is sealed to second flanges (106) which project radially outwardly from the top of the sides of the tray sealing the first web (103) to the tray (101) thereby defining an inter-web space bounded by the first and second webs. The inter-web space is occupied with air at 70% relative humidity (20 degrees Celsius).

**[0024]** The frozen food package of figure 1 may be produced by the following steps:

a. Place the frozen food item (102) in the centre of the pre-formed tray(101);
b. Pre-cut the first web (103);
c. Using a vacuum system, suck the pre-cut first web (103) out of a magazine sealing it at two or three points to the first flange (105);
d. Heat seal the first web (103) to the first flange (105) in a Proseal Micropak at 200°C and 3 bar for

0.5 seconds;

e. Heat seal the second web (104) to the second flange (106) in the Proseal Micropak at 200°C and 3 bar for 0.5 seconds; and

f. Cut the second flange to size in Proseal Micropak.

**[0025]** Figure 2 shows a 500 micron thick poly(lactic acid) (available from Stanelco Plc) tray (201) having a base and sides and supporting on its base a frozen food item (202) which comprises a ready meal. The sides of the tray project beyond the height of the frozen food item (202). A first web (203) of 15 micron thick poly(lactic acid) is vacuum sealed over the frozen food item (202) and the base of the tray and hence conforms to the shape of the frozen food item (202) and base of the tray and is heat sealed to the circumferential region of the base of the tray sealing the frozen food item (202) on the tray (201). A second web (204) of 15 micron thick poly(lactic acid) extends over the first web and is sealed to flanges (205) which project radially outwardly from the top of the sides of the tray sealing the first web (203) to the tray (201) thereby defining an inter-web space bounded by the first and second webs. The inter-web space is occupied with air at 70% relative humidity (20 degrees Celsius).

**[0026]** The frozen food package of figure 2 may be produced by the following steps:

a) Place the frozen food item (202) in the centre of the pre-formed tray (201);

b) Pre-cut the first web (203);

c) Using a vacuum system, suck the pre-cut first web (203) out of a magazine sealing it at two or three points to the pre-formed tray (201);

d) Evacuate the space between web (203) and pre-formed tray (201);

e) Heat seal the first web (203) to the pre-formed tray (201) at 140°C and 1.4 bar for 0.5 seconds;

f) Heat seal the second web (204) to the flange (205) in a Proseal Micropak at 140°C and 1.4 bar for 0.5 seconds; and

g) Cut the flange to size in a Proseal Micropak.

**[0027]** Figure 3 shows a 500 micron thick poly(lactic acid) (available from Stanelco Plc) tray (301) having a base and sides and supporting on its base a frozen food item (302) which comprises a ready meal The sides of the tray project beyond the height of the frozen food item (302). A first web (303) of 15 micron thick poly(lactic acid) extends over the tray and is heat sealed part way up the sides of the tray on flanges (305) which project radially outwardly from the sides of the tray sealing the frozen food item (302) on the tray (301). The space defined by the first web (303) and the tray (301) is occupied by the frozen food item (302) and ambient air. The tray (301) slides into an exterior packaging element configured as a cardboard sleeve (306) including a second web (304) of 15 micron thick poly(lactic acid) whereby the second web (306) is aligned with the first web (303) thereby permitting a consumer to view the frozen food item. An inter-web space, occupied with ambient air, is defined by the boundaries of the first and second webs, and the sides of the tray. The arrangement of the tray in the sleeve is such as to restrict but not prevent all flow of ambient air (and hence water vapour) into the inter-web space through an aperture, acting as a valve, between the top of the tray and the interior face of the top of the sleeve.

**[0028]** The frozen food package of figure 3 may be produced by the following steps:

a) Place the frozen food item (302) in the centre of the pre-formed tray(301);

b) Pre-cut the first web (303);

c) Using a vacuum system, suck the pre-cut first web (303) out of a magazine sealing it at two or three points to the flange (305);

d) Heat seal the first web (303) to the flange (305) in a Proseal Micropak at 140°C and 1.4 bar for 0.5 seconds;

e) Fold a template of cardboard sleeve (306) over the pre-formed tray (301) and fix with adhesive on the overlap at the base thereby to form a sleeve; and

f) Hold the pre-formed tray (301) in position by folding in cut sections in the cardboard sleave (306).

**[0029]** Figure 4 shows a frozen food item (402) which comprises frozen chicken sealed from the exterior environment by a first web (403) of 15 micron thick amorphous polyethylene terephthalate which is vacuum sealed around the frozen food item (402). Two opposing ends of the vacuum packed frozen food item are packed into two supporting members (401) comprising cardboard thereby to leave a middle portion of the frozen food item visible to the eye of a consumer. The two supporting members (401) and the vacuum packed frozen food item are then sealed by a second web (404) comprising 15 micron thick amorphous polyethylene terephthalate thereby to define an inter-web space bounded by the first and second webs. The inter-web space comprises ambient air.

**[0030]** The frozen food package of figure 4 may be produced by the following steps:

a) Place the frozen food item (402) in the first web (403) and vacuum pack/heat seal using a Henkovac 200 vacuum packer;

b) Place the product of step (a) by hand in pre-formed carboard moudings (401); and

c) Place the product of step (b) in the second web (404) and vacuum pack/heat seal using a Henkovac 200 vacuum packer.

## Claims

**1.** A frozen food package comprising:

a. a frozen food item;
b. a first web sealing the frozen food item from the exterior environment; and
c. a second web at least partially sealing the first web from the exterior environment;

wherein the first and second webs are transparent to visible light, are aligned thereby to permit the frozen food item to be viewed by a consumer, have a daily water vapour transmission rate less than 300 $g/m^2$ for a 25 micron thick film, are not in thermal contact and define an inter-web space occupied with one or more gases.

**2.** A frozen food package according to claim 1 further including a tray having a base and sides, the tray having a daily water vapour transmission rate less than 300 $g/m^2$ for a 25 micron thick film;
wherein the frozen food item is supported on the base of the said tray; the first web seals the frozen food item on the tray; and the second web at least partially seals the first web on the tray.

**3.** A frozen food package according to claim 2 wherein the tray comprises amorphous polyethylene terephthalate, polypropylene, poly(lactic acid), poly(hydroxyalkanoate) or mixtures thereof

**4.** A frozen food package according to any one of the preceding claims wherein the first web and/or second web comprises amorphous polyethylene terephthalate, polypropylene, poly(lactic acid), poly(hydroxyalkanoate) or mixtures thereof

**5.** A frozen food package according to any one of the preceding claims wherein the gas pressure between the first web and the frozen food item is less than one atmosphere.

**6.** A frozen food package according to any one of the preceding claims wherein the one or more gases comprises less than $20gm^{-3}$ water.

**7.** A frozen food package according to any one of the preceding claims wherein one of the one or more gases is air.

**8.** A frozen food package according to any one of the preceding claims additionally comprising a desiccant within the inter-web space.

**9.** A frozen food package according to any one of the preceding claims wherein the second web is removable from the package independently of the first web.

**10.** A frozen food package according to claim 9 additionally comprising an exterior packaging element comprising the second web, the exterior packaging element at least partially surrounding the frozen food item and first web.

**11.** A frozen food package according to claim 10 wherein the exterior packaging element comprises a closed box or a sleeve.

**12.** A frozen food package according to any one of claims 9 to 11 wherein the first web is at least partially self-detachable when heated to a temperature of at least 60 degrees centigrade.

**13.** A frozen food package according to any one of the preceding claims wherein the second web additionally comprises a valve.

**14.** A frozen food package according to claim 13 wherein the valve is a one-way valve or two-way valve.

**15.** A frozen food package according to claim 13 wherein the valve comprises one or more apertures.

**16.** A method of preparing food comprising the steps of:

a. providing a frozen food package according to any one of the preceding claims: then
b. removing the second web; then
c. heating the frozen food package less the second web; and thereafter
d. removing the first web.

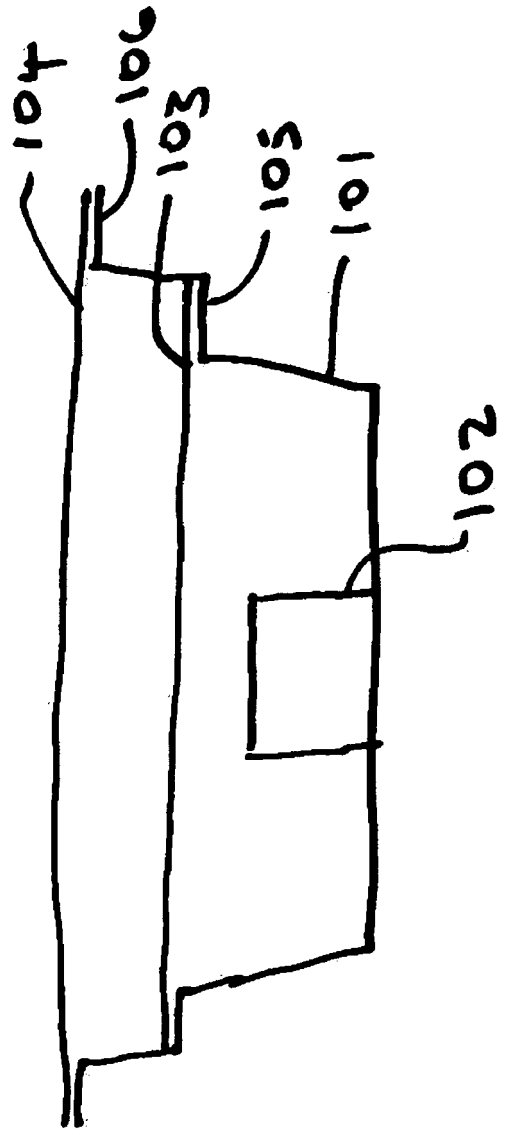


FIGURE 1

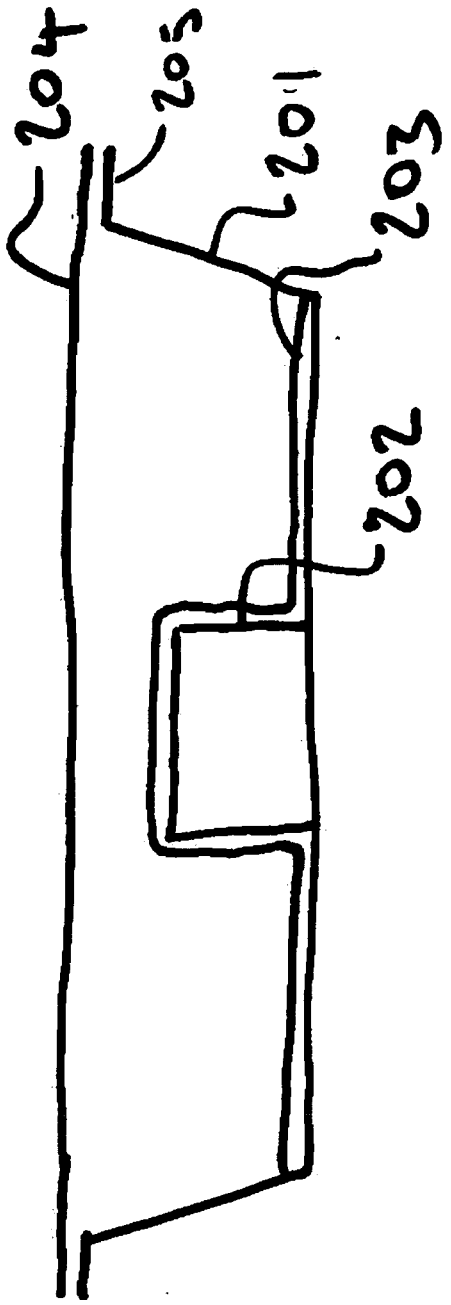


Figure 2

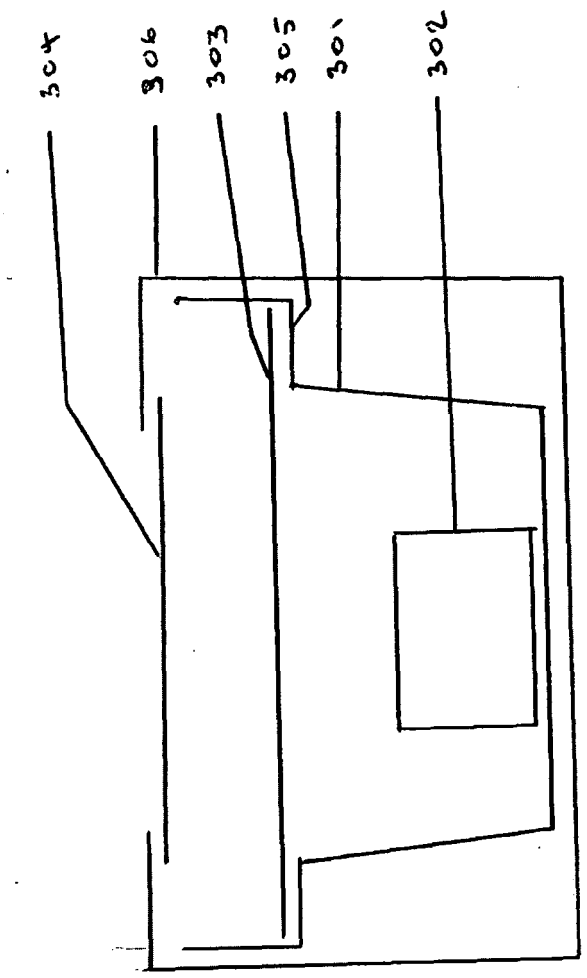


FIGURE 3

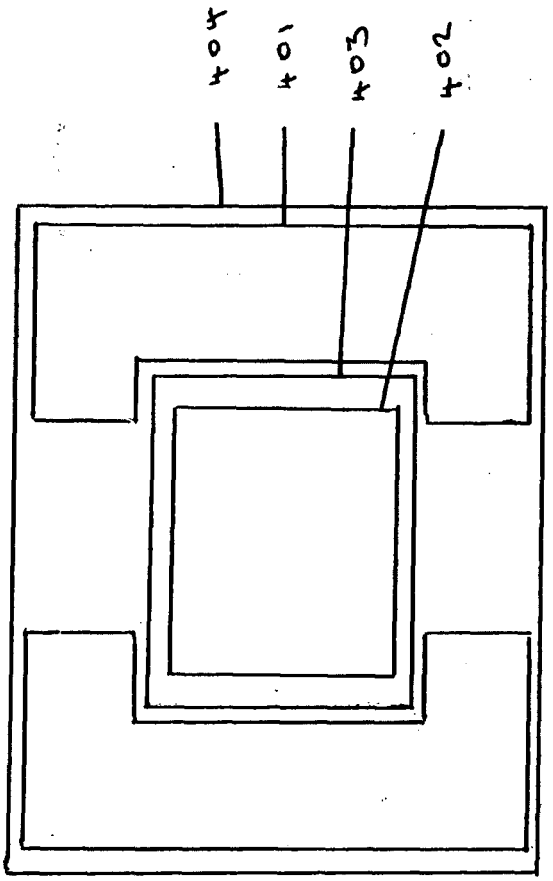


FIGURE 4

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# EUROPEAN SEARCH REPORT

Application Number
EP 06 07 6142

## DOCUMENTS CONSIDERED TO BE RELEVANT

| Category | Citation of document with indication, where appropriate, of relevant passages | Relevant to claim | CLASSIFICATION OF THE APPLICATION (IPC) |
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The present search report has been drawn up for all claims

| Place of search | Date of completion of the search | Examiner |
|---|---|---|
| The Hague | 8 January 2007 | Gino, Christophe |

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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## ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO. EP 06 07 6142

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report. The members are as contained in the European Patent Office EDP file on
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08-01-2007

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