Abstract: The present invention relates to a process for the production of an eatable product that is cooked and packaged into a plastic material. Another subject matter of the present invention is a product available according to the inventive process.

Title: MEAT PRODUCT COOKED IN A TRAY

Fig. 1
Meat product cooked in a tray

The present invention relates to a process for the production of an eatable product that is cooked and packaged into a plastic material. Another subject matter of the present invention is a product available according to the inventive process.

Eatable products, which are, for example, at least partially, made of minced meat, are nowadays often produced by providing a meat mixture, which is subsequently formed, cooked, cut into adequate pieces and then packaged for example into a tray or other plastic material. This process has the disadvantage, that it is first of all very labour-intensive and secondly that there is a danger of contamination of the product between the process steps of cooking and packaging.

It was therefore the objective of the present invention to provide a process for the production of eatable products that is less labour-intensive and that results in a product that meets higher hygienic standards.

The problem is solved with a process for the production of an eatable product, whereas:
- the product is filled into a tray made from packaging-material-film in a form-fill-seal-packaging machine,
- the a top film is attached to the tray to form a closed package and
- the product is pasteurized and/or sterilized before or after the package is closed.

The pasteurisation can also take place after the product has been filled in the tray but before the package is closed.

It was totally surprising and could not have been expected by a person skilled in the art, that the inventive process is carried out with a minimal amount of human labor and that the resulting products have a higher hygienic standard than products produced according to the conventional process, because it is not contaminated during the slicing or repackaging of already pasteurized products. Furthermore, the appearance of the product in the tray is much better, because the plastic material fits...
tightly around the product. There is no gap between the products and the tray. The
product is much faster pasteurized than with conventional processes.

According to the present invention, an preferably essentially raw or raw eatable
product, is produced and then filled into a tray which is made from a plastic film. This
product can be any eatable product. Preferably the product comprises meat,
especially ground and/or minced meat. Furthermore, it is possible, that the meat
product comprises meat pieces, for example liver pieces, which could be precooked.
The meat product preferably also comprises vegetables, spices and/or herbs. In
another preferred embodiment of the present invention, the product comprises fruit
and/or sugar. Preferably, this product is marmalade or the like. The eatable product
can be also vegetables, preferably as a puree, pasta, cheese and fish.

The filled product prior to pasteurization does not exceed a temperature of 85°C,
preferably 55°C, more preferably 50°C, most preferably 45°C before it is filled into a
tray.

The tray is made preferably from a plastic film, which is preferably deep drawn.
Preferably, the trays are transported along a so called form-fill-seal-packaging
machine (FFS-machine). Preferably these machines operate semi-continuously.

After the product has been filled into the tray, a top film is applied to the tray to form a
closed package. Preferably, the top film is attached to the tray by heat sealing. The
top film can be attached either peelably or not peelably to the tray. Details regarding
the material of the tray and the material of the top film are described in more detail
below.

Prior or after closing of the package, the packaged product is pasteurised and/or
sterilized. This preferably takes place in a continuously operating oven for example a
spiral oven or batch-wise.

During the pasteurisation, preferably a core-temperature of the product of ≥ 75°C is
achieved, i.e. the temperature of the product is everywhere ≥ 75°C. For meat
products a core temperature of more than 80°C, preferably more than 90°C is
desirable. Preferably, the pasteurisation is carried out at temperatures < 100°C preferably < 90°C. The pasteurisation is terminated when a certain core temperature of the products is reached. After the pasteurisation, the pasteurisation value (VP) is preferably > 1400 after 30 minutes of pasteurisation and more preferably > 1800 after 45 minutes.

For the sterilisation, the core temperature is preferably less than 132°C, more preferably 118 - 125°C.

In a preferred embodiment of the present invention steam is applied into the tray prior to its closing. More preferably, the steam is applied to the tray after the product has been filled into the tray. Preferably, the steam temperature is 110°C - 200°C, more preferably 165°C - 190°C and most preferably 175°C - 185°C. Preferably, the steam is applied for 0,5 - 10 sec. more preferably 0,5 - 5 sec. even more preferably 0,5 - 4 sec, before the package is closed. This preferred embodiment of the inventive process has the advantage, that the air is flushed out of the tray before it is closed. Preferably, the steam is dry, so that minimum condensation takes place in the tray. Most preferably the steam condenses after and/or while the package is closed.

Preferably, the steam also has a vacuumizing effect. Thus, a negative pressure, below ambient pressure can be achieved without using means like a vacuum pump.

The pressure of the steam and the steam-nozzle(s) has to be chosen such, that a sufficient amount of steam for flushing and/or vacuumizing can be applied to all trays, which have to be treated during one index of the packaging machine.

In another preferred embodiment, the tray with the filled in product is exposed to such a vacuum, that gas which is present in the product is at least partially removed. Preferably, the vacuum is 700 - 950 mbar, more preferably 750 - 850 mbar. This preferred embodiment of the inventive process has the advantage, that the extension of the product due to the pasteurisation process is reduced and consequently the package is not or less deformed during the pasteurisation process.
Prior to the pasteurisation/sterilisation, the closed package is preferably turned upside down so that the top film faces downwards. This preferred embodiment of the inventive process has the advantage, that the top film does not wrinkle during the pasteurisation process, so that the final product has a better appearance.

In another preferred embodiment, the package is turned by approximately 90° prior to the pasteurisation/sterilisation relative to its orientation during filling and/or sealing. This preferred embodiment of the present invention has the advantage, that the consumer can separate fat from the other product easily.

After the pasteurisation/sterilisation is terminated, the product is preferably cooled to a temperature $< 10^0\text{C}$ preferably $< 8^0\text{C}$. However, the product is not chilled, i. e. the product is not cooled to temperatures $< 0^0\text{C}$.

Preferably the tray for the above mentioned inventively packaged ready to eat food product is thermoformed from a multilayer barrier film which is suitable for thermoforming and sealing especially well on FFS-machines. Due to that it can be processed to multilayer barrier film packaging for perishable food on FFS-machines easily.

Such multilayer film needs to be suitable for pasteurisation/sterilisation in order to produce a ready to eat food product from the relevant (uncooked) food raw materials filled in the thermoformed packaging element (tray), sealed with the lid film and heated to temperatures suitable for pasteurisation/sterilisation.

The multilayer film comprises

1) a basic layer as a surface layer consisting of a thermoplastic polyolefin and/or olefin copolymer
1a) at least one further layer of a homo- and/or copolymer of an olefin
2) a gas barrier layer
3) a sealing layer as the other surface layer of the multilayer film and
4) optionally at least one adhesive layer between layer 1a) and 2), or any further layer adjacent to layer 2, and/or between layer 2) and 3).
The thermoplastic polymer of the basic layer is preferably based on polypropylene and/or a copolymer of propylene. A homopolymer of propylene as well as a propylene/ethylene copolymer and a mixture of both can be used. In a preferred embodiment a propylene-homopolymer of propylene with a melting index of 0.5 to 7, in a particular preferred form of 1.5 to 4.5 g/10min (2.16 kg, 230°C, measured according to ASTM 1238) is used. In another preferred embodiment a propylene/ethylene copolymer with a melting index between 0.5 and 5 g/10min (2.16 kg, 230°C, measured according to ASTM 1238) can be used.

The thickness of the basic layer is preferably < 1.000 µm. In a particular preferred embodiment it ranges from 300 µm 1.000 µm, most preferably 400 µm - 1.000 µm. A basic layer below 300 µm will result in a at least partial destruction of the shape of the tray during pasteurisation/sterilisation.

The layer 1A and optionally any further layer of a thermoplastic polyolefin and/or olefin copolymer arranged between the basic layer and the gas barrier layer is based preferably on polypropylene and/or a copolymer of propylene and ethylene. However, neither the composition of the basic layer and layer 1A and any further layer nor the physical properties of the polymers composing these layer(s) have to be identical. Usually, a layer 1A and the thickness of any further layer is at least half the thickness, preferably 30% or less of the thickness of the base layer.

The gas barrier layer 2) should be especially a barrier for gases like steam, N₂, O₂ barrier and CO₂.

The barrier layer is preferably based on a vinylidene chloridcopolymer with good O₂ characteristics.

More preferably, the barrier film is based on a ethylene/vinyl-alcohol copolymer (EVOH). Such EVOH should contain an ethylene percentage of 32 to 45 mol%. EVOH-copolymers with ethylene percentages of 38 to 45 mol% are preferred. Particularly preferred is an ethylene percentage of 38 mol%. The melting index of the EVOH copolymers should be 1.2-8g/10min (MFI according to ASTM 1238, 230°C).
The thickness of the layer of the EVOH-layer should range from 3 to 20 µm, preferably from 5 to 10 µm. The oxygen permeability should be less than 30, preferably less than 20 (cm³.m².d.bar O₂) at maximum (measured according to DIN 53380).

Ethylene-polymers are preferably used as material for the sealing layer 3). Polyethylene of low density (LDPE), metalocen polyethylene (m-PE), linear polyethylene of low density (LLPE) as well as ethylene-vinyl-acetate copolymers (EVA) can be used. An LDPE with a density in the range of 0.9225 and 0.9335 g/cm³ is preferred. The melting index of the polymers used should be in the range of 0.5 to 8.0 g/10 min (190°C, 2.16 kg, ASTM 1283), preferably between 2 and 5 g/10min. In a similar preferred embodiment an ethylene-vinyl-acetate copolymer with a vinyl-acetate percentage (VAC) of 3 to 10 weight-% is used as sealing material. Polymers with a VAC-contents between 4 and 6 weight-% are preferred.

In a special embodiment, the sealing layer is suitable for peeling. The sealing layer then can comprise of a mixture of LDPE and polybutylene (PB). PB can be with the LDPE in a range of 15 to 30 weight %, preferably in a range of 20 to 28 weight %. The melting index of the PB should lie in the range of 0.3 and 2.0 g/10min (190°C and 2.16 kg, ASTM 1283).

The thickness of the sealing layer should range from 15 to 40 µm, preferably from 20 to 30 µm.

When using a polyethylene as material for the sealing layer, an adhesive agent layer should be used between the barrier layer and the sealing layer: Should VAC be used as sealing layer material, an adhesive agent is advantageous, but not necessarily compelling.

The adhesive agent preferably consists of acid-modified polyolefins, known in the art.

In a special embodiment, the layers of adhesive agent can also be the usual laminating adhesives, which are applied with a coating quantity between 1.5 and 4g/m².
The thickness of the adhesive layer can be in the range from 2 to 6 \( \mu \text{m} \). The range between 2 to 4 \( \mu \text{m} \) is preferred.

Should the multilayer film contain several adhesive layers, these layers can be made of the same or different materials, preferably however from different polymeric materials.

Preferably, an adhesive layer is between the layer 1A or any further layer made of polyolefins and the EVOH-layer and an acid-modified polyolefin adhesive layer between the EVOH-layer and the sealing layer.

It is particularly important for a good thermoformability and for obtaining packaging elements (trays) with sufficient mechanical properties that the basic layer of the multilayer film has a thickness of at least 400 \( \mu \text{m} \).

The two surface layers of the film can contain the usual lubricating agents and anti-blocking agents as i.e. stearic acid amide, alkyl polysiloxane as i.e. polydimethylsiloxane and silicon dioxide. All or individual layers can contain stabilizers of the known kind as additives. Preferably the multilayer film is transparent. However, it can be also colored.

The thermo-forming, preferably deep-drawn trays produced from the multilayer film can be sealed after being filled with known lidding films. As lidding film a multilayered film with the sequence of layers as i.e. PET/PVDC/adhesive/LDPE or a film "TOP GUARD" with the sequence of layers OPP/adhesive/PE/adhesive/EVOH/adhesive/PE can be used, [OPP = orientated polypropylene].

As top or lidding films, films with the structure PET/SiOx/adhesive/LDPE are particularly suitable. The biaxial orientated polyethylene terephthalate (PET) film is coated in a plasma with SiOx in a vacuum chamber. In a following step of the process, a polyethylene film is laminated on this film by means of adhesive. This film is characterized by a particularly good transparency and a high breaking resistance.
A packaging tray sealed with this film shows a particularly good gas barrier ($O_2$ barrier) property.

The sealing layer of the lidding film can be also based on a mixture of LDPE and PB if a peelable sealing between the tray and the lid is required. If a peelable sealing between the two packaging elements is required either the sealing layer of the tray or of the lid is peelable.

The multilayer barrier films can be produced by known processes, preferably by the usual blown film coextrusion - or cast film coextrusion procedure. Preferably the usual blown film coextrusion procedure is applied.

As far as the film should be also printed on, an activation of the surface of the basic layer via corona-or flame pre-treatment should be carried out. The film can also be pre-treated in the plasma. A fluorine pre-treatment is also possible.

Preferably the top-film is attached peelable to the tray, even though the product grows during pasteurisation.

Another subject matter of the present invention is the product available according to the inventive process.

Preferably, the product is a meat product which comprises at least partially minced meat. Preferably, the meat product is a meat pie.

In another preferred embodiment, the product comprises meat pieces preferably liver pieces, which can be pre-cooked.

In another preferred embodiment the product comprises fruit and or sugar. More preferably the product is marmalade.

Preferably the inventive product comprises a gelling material. A gelling material is for example advantageous in meat products for marmalade as a water binding material.
The inventive process is now described according to the figures 1 and 2.

Figure 1 shows one embodiment of the inventive process.

Figure 2 shows a form fill seal packaging machine.

The figure 1 shows one embodiment of the inventive process. First of all a tray 2 is provided for example as a preformed tray in a tray sealer operation or by for example deep drawing a flat film in a form-fill-seal-packaging machine. Subsequently, this tray is filled with the product to a certain level. Conventionally, the product is either liquid or pasty so that it either flows or can be pumped into the tray and is then formed by the tray. Subsequently, steam 5 is applied to the product and then the top film 3 is ceiled on the tray 2 to provide the closed package 4. This closed package 4 is turned upside down and then pasteurised for example in an oven. Prior to the pasteurisation of the package, a singling of the individual packages must be carried out in case that the trays are produced on a form-fill-seal-packaging machine. After the product is pasteurised, the product is solid and it has taken up the form of the tray. The product stays in the tray until it is consumed by the customer and can then be removed from the tray.

Figure 2 shows the form-fill-seal-packaging machine. A bottom film made is rolled off from a bottom film roll 29 and intermittently transported along the packaging machine 1. The packaging machine 1 comprises a forming station 2, a filling station 7, a sealing station 19 and a cutting station 37. The bottom film 8 is heated by a bottom film heating unit 31, which is in the present case a roll, around which the bottom film is wound to a large extent by means of roll 29, which can be also heated. Subsequently the bottom film is transported into the forming station. Alternatively or additionally, there can be additional heating means, for example, heating plates, infrared stations or the like in order to heat the film. However, it is preferred to heat the film uniformly most preferably to a temperature between 160 and 170°C. In the forming station, the tray is formed into the bottom film, which does not move while the forming takes place. The forming station comprises an upper tool 3 and a lower tool 5. The lower tool 5 is located on a lifting table in order to be able to lower and lift the lower tool for as depicted by the double arrow. The upper tool 3 is also shiftable
between a lower and a higher position. The vertical movement of the upper and the lower tool are needed in order to be able to transport the formed trays out of the forming station 2. Preferably, not only one but a multitude of trays, a so-called format, which could, for example, comprise 3x3 trays are produced simultaneously. These trays 6 are transported intermittently along the packaging machine, whereas the transportation is facilitated by two chains which are located on the left hand and right hand side of the packaging machine and which transport the bottom film between them. Each chain comprises clumping means in order to be able to fix the bottom film 8 to the chains. In the filling station 7, each tray is filled with a packaging item. In the present example the packaging item is paté. This paté is inserted into the packages by a filling nozzle. One package can be filled after the other. However, it is also possible to fill the packages row by row. After one row tray has been filled, the filling nozzle moves to the next row and fills the trays until the entire format has been filled. The filling can be done in two or more shots simultaneously. The filling station preferably comprises vibrator means, which vibrate the trays during and/or after the filling in order to equalize the filling level in the trays and in order to eliminate air cavities within the packaging item. In the filling station or after the filling station identification means, in the present example, a camera is located, which inspects whether the filling level in all trays is acceptable. Packages which have a too low or too high filling level and/or packages with a stained rim are identified by camera 33 and afterwards preferably after the sealing station marked and subsequently eliminated out of the production process. It is preferred to fill the packages as high as possible in order to minimize the head space between the rim and the level of the packaging item, so that as little air as possible is in the package after it has been sealed with a lid. The sealing with a lid takes place in the sealing station 19 which also comprises an upper tool 12 and a lower tool 11. Both tools are as depicted by double arrows shiftable from a higher to a lower position and vice versa. Before the sealing, preferably dry steam is injected into the trays in order to remove the air from the packages. In the sealing station, the top-film, from which the lids for the packages are made, can be cut prior or after the sealing. The remaining grid of the top-film is afterwards preferably rolled on a roll.

Subsequently, a cutting station is provided, which especially cuts the produced packages out of the bottom film 8.
The invention is now explained in further detail according to the following example.

In the following examples a "PowerPak" packaging machine has been used to package the raw product. The pasteurisation of the product was carried out in a "FlowCook". Both apparatus are provided by the company CFS B.V.

**Example 1:**

A film with the sequence PP/PP/PP adhesive/EVOH/adhesive/LPE = [C-base D] (40) from CFS with a thickness of 675 µm and a width of 432 mm was formed into trays. These trays were filled with meat product comprising duck liver. The product had a temperature of app. 40°C. Subsequently, the product was exposed to steam with a temperature of 195°C for 3 sec. The steam had a pressure of 2,2 bar. A lid film TOP GUARD from CFS with a thickness of 55 µm and a width of 430 mm was sealed at 190°C for 2 sec to the tray to form a closed package. Subsequently the package was pasteurised at a temperature of 82°C for 30 min until the core of the product reached > 75°C.

**Example 2:**

The film C-base D (40) from CFS mentioned in example 1 with a thickness of 675 µm and a width of 432 mm was formed into trays. These trays were filled with meat product comprising duck liver and yellow fat inlays. The product had a temperature of app. 40°C. Subsequently, the product was exposed to steam with a temperature of 195°C for 3 sec. The steam had a pressure of 2,2 bar. A lid film TOP GUARD from CFS with a thickness of 55 µm and a width of 430 mm was sealed at 190°C for 2 sec to the tray to form a closed package. Subsequently the package was pasteurised at a temperature of 82°C for 30 min until the core of the product reached > 75°C.

**Example 3:**

The film C-base D (40) from CFS mentioned in example 1 with a thickness of 675 µm and a width of 432 mm was formed into trays. These trays were filled with meat
product comprising duck liver. The product had a temperature of app. 40°C. A lid film TOP GUARD from CFS with a thickness of 55 µm and a width of 430 mm was sealed at 190°C for 2 sec to the tray to form a closed package. Subsequently the package was pasteurised at a temperature of 82°C for 30 min until the core of the product reached > 75°C.

Example 4:

The film C-base D (40) from CFS mentioned in example 1 with a thickness of 675 µm and a width of 432 mm was formed into trays. These trays were filled with meat product comprising pork liver and fresh liver on the top and bottom. The product had a temperature of app. 40°C. Subsequently, the product was exposed to steam with a temperature of 195°C for 3.5 sec. The steam had a pressure of 2.7 bar. A lid film TOP GUARD from CFS with a thickness of 55 µm and a width of 430 mm was sealed at 190°C for 2 sec to the tray to form a closed package. Subsequently the package was pasteurised at a temperature of 78°C for 45 min until the core of the product reached > 75°C.

Example 5:

The film C-base D (40) from CFS mentioned in example 1 with a thickness of 675 µm and a width of 432 mm was formed into trays. These trays were filled with meat product comprising pork liver and brown gel inlay. The product had a temperature of app. 40°C. Subsequently, the product was exposed to steam with a temperature of 195°C for 3.5 sec. The steam had a pressure of 4.0 bar. A lid film TOP GUARD from CFS with a thickness of 55 µm and a width of 430 mm was sealed at 190°C for 2 sec to the tray to form a closed package. Subsequently the package was pasteurised at a temperature of 84°C for 30 min until the core of the product reached > 75°C.

Example 6:

The film C-base D (40) from CFS mentioned in example 1 with a thickness of 675 µm and a width of 432 mm was formed into trays. These trays were filled with meat product comprising pork liver and "champignons and herbs. The product had a
temperature of app. 40°C. Subsequently, the product was exposed to steam with a temperature of 195°C for 3,5 sec. The steam had a pressure of 4,0 bar. A lid film TOP GUARD from CFS with a thickness of 55 µm and a width of 430 mm was sealed at 190°C for 2 sec to the tray to form a closed package. Subsequently the package was pasteurised at a temperature of 84°C for 30 min until the core of the product reached > 75°C.

Example 7:

The film C-base D (40) from CFS mentioned in example 1 with a thickness of 675 µm and a width of 432 mm was formed into trays. These trays were filled with meat product comprising liver. The product had a high viscosity and a chunky structure due to large meat pieces. The product had a temperature of app. 40°C. Subsequently, the product was exposed to steam with a temperature of 195°C for 3,5 sec. The steam had a pressure of 4,0 bar. A lid film TOP GUARD from CFS with a thickness of 55 µm and a width of 430 mm was sealed at 190°C for 2 sec to the tray to form a closed package. Subsequently the package was pasteurised at a temperature of 84°C for 30 min until the core of the product reached > 75°C.
Claims:

1. Process for the production of an eatable product, characterized in, that:
   - the product (1) is filled into a tray (2) made from a packaging material-film in a form-fill-seal-packaging machine,
   - the a top film (3) is attached to the tray (2) to form a closed package (4) and
   - the product is pasteurized and/or sterilized before or after the package (4) is closed.

2. Process according to one of the preceding claims, characterized in, that steam is applied into the tray prior to closing, preferably after the product has been filled into the tray.

3. Process according to claim 2, characterized in, that steam has a temperature of 110 - 200°C, preferably 165 - 190°C and more preferably 175 - 185°C.

4. Process according to one of claims 2 - 3, characterized in, that the steam is applied for 0,5 - 10 sec, preferably 0,5 - 5 sec, more preferably 0,75 - 4 sec

5. Process according to one of the preceding claims characterized in, that the product is pasteurized.

6. Process according to one of the preceding claims, characterized in, that during pasteurisation a core temperature of more than 75°C is achieved.

7. Process according to claims 1 - 4, characterized in, that the product is sterilized.

8. Process according to claim 7, characterized in, that during sterilisation a core temperature of less than 132°C, preferably 118 - 125°C is achieved.
9. Process according to one of the preceding claims, characterized in that the pasteurisation/sterilisation is carried out in a continuously operating oven or batch-wise.

10. Process according to one of the preceding claims, characterized in, that the product is chilled.

11. Process according to one of the preceding claims, characterized in, that the product is formed in the tray.

12. Process according to one of the preceding claims characterized in, that the pasteurisation/sterilisation is carried out with the top film facing downwards or the package being turned by approximately 90° relative to its orientation during filling and/or sealing.

13. Process according to one of the preceding claims, characterized in, that the product is a meat product, preferably a pie.

14. Process according to one of the preceding claims, characterized in, that the meat product comprises minced meat.

15. Process according to one of claims 13 or 14, characterized in, that the meat product comprises liver pieces.

16. Process according to one of the preceding claims, characterized in, that the product comprises fruit, vegetables, cheese, pasta, fish and/or sugar.

17. Process according to claim 16, characterized in, that the product is marmalade.

18. Process according to one of the preceding claims, characterized in, that it is continuous or semi-continuous.
19. Process according to one of the preceding claims, characterized in, that the top-film is peelable.

20. Product available according to one of the preceding claims.

21. Product according to claim 20, characterized in, that it is a meat product, preferably a pie.

22. Product according to claim 20 or 21, characterized in, that it comprises liver.

23. Product according to one of the preceding claims, characterized in, that it comprises fruit, vegetables, cheese, pasta, fish and/or sugar.

24. Product according to one of the preceding claims, characterized in, that it comprises a gelling material.
**INTERNATIONAL SEARCH REPORT**

**International application No**
PCT/EP2008/000773

A. CLASSIFICATION OF SUBJECT MATTER

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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)

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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, WPI Data, FSTA, BIOSIS

C. DOCUMENTS CONSIDERED TO BE RELEVANT

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Date of the actual completion of the international search

8 May 2008

Name and mailing address of the ISA

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