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(54) **Procedure for the treatment of the surface of a metal receptacle and receptacle treated according to this procedure.**

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PATENT ABSTRACTS OF JAPAN, vol. 3, no. 79 (C-51), 6 July 1979; & JP-A-54 53 624 (Tokyo Shibaura Denki) 27.04.1979

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Description

The invention relates to a process for reducing the frictional resistance between foodstuffs and the metal in a food receptacle.

Receptacles of metal for the preparation of foodstuffs are usually treated after the formation among others in order to counteract the burning on of foodstuffs onto the receptacle and/or to give a greater hardness to the surface of the receptacle.

For this it is of course known to provide the receptacle with a layer of enamel and it is known to provide especially frying pans on the inside with a coating of non-stick material.

Then enamelling of the receptacle is relatively expensive and, by coating the inside with an enamel, chemical substances from the enamel can be absorbed into the foodstuffs. The layer of enamel is of course relatively scratch proof but with knocking, pieces of the layer can nevertheless easily break off. Furthermore the metallic appearance of the receptacle disappears, which is considered as undesirable by some users. For that reason many users choose for the preparation of foodstuffs receptacles which are not enamelled at all or at least not in the inside.

The use of a non-stick coating does to a great degree prevent the sticking or burning on of the foodstuffs to the receptacle and namely with the overheating of the foodstuffs, but this coating is in practise only to be used on the inside of the receptacle, because it is on the basis of synthetic materials. Furthermore the coating has a relatively slight hardness so that it is easily damaged. Its life is limited. Furthermore particles of the coating can come free in the foodstuffs prepared in the receptacle. Also with such a layer the coated side loses the metallic appearance.

The purpose of the invention is to remedy these disadvantages and to provide a process which, without the disappearance of the metallic appearance, makes it treated surface not only relatively hard and scratch proof, but furthermore also reduces the frictional resistance between foodstuffs and metal and so counteracts the sticking or burning on of foodstuffs.

For this purpose at least a part of the surface of the receptacle is irradiated with a laser beam to obtain a recrystallisation of the surface resulting in a fine grained structure.

A process of this kind, called "quantum process" is known as such. According to this process the crystal lattice on the metal surface is altered with assistance of light energy. The tensile stresses present in the metal surface are replaced by compressive stresses. A fine-grained structure is obtained with rounded off crystals in analogue manner to the forging of metal by a smith but with an

extreme precision.

This procedure is already applied industrially among others for the treatment of drills in order to decrease the corrosion, caused by micro welding with chips, for the treatment of sintered toothed wheels to make them behave like toothed wheels made of cast steel and for the treatment of pressure die-casting matrices in order that they can be filled quicker and qualitatively better.

Also "Patent Abstracts of Japan", vol. 3 no 75, (C-50) 25/4/79 and JP-A-5 452 606 disclose an irradiation of metal surface of drills and cutlery by laser beam. The irradiation permits to improve the cutting properties and life of drills or to improve the corrosion resistance of cutlery.

In a surprising manner it appeared that the application of such process on receptacles for the preparation of foodstuffs improves the properties of these receptacles to a considerable degree without necessitating the use of coatings.

The treated surface becomes not only hard and scratch proof, but the frictional resistance between foodstuffs and metal is reduced and the sticking or burning on of foodstuffs is also prevented.

Through the treatment the microporosity of the surface is moreover decreased so that no bacteria can lodge themselves between the crystals of the metal.

The procedure is applicable to any receptacle for the preparation of foodstuffs such as among others frying pans, sautéing pans, baking plates or griddles, sauce pans or cooking pots and pressure cookers. The procedure is applicable to receptacles of stainless steel as well as ordinary steel, cast iron, copper or aluminium.

The treatment does not alter the metallic appearance. A cast iron pan for example, retains the appearance of cast iron.

In a particular embodiment of the invention at least the inside of the receptacle is subjected to this laser treatment.

With this embodiment the non-stick effect is especially intended which the treatment of the surface on the inside of the receptacle entails.

Other details and advantages will appear from the following description of a procedure for the treatment of the surface of a metal receptacle for the preparation of foodstuffs and of a receptacle treated according to this procedure, according to the invention; this description is only given as an example and does not restrict the invention.

A frying pan of stainless steel 18/10 which in the usual manner was formed by deep stamping, is subjected to a surface treatment as follows.

The inside of the receptacle is cleaned chemically or with the assistance of ultrasonic waves. After an intermediate step which ensures that after-

wards with the laser treatment an even heavy pressure is caused, the actual laser treatment is performed whereby first of all the piece is measured with a laser and subsequently the surface on the inside of the receptacle is covered in many steps with a laser beam from a computer controlled laser.

Through the light energy the metal on the surface is reformed with an extreme precision while a type of recrystallisation is obtained on the surface, which results in a fine-grained structure with rounded off closed crystals. To a certain depth the tensile stresses present are converted into compressive stresses through which the chance of fatigue fracture, initiated by corrosion cracks decreases. The treated surface presents a better resistance to wear and to scratches. The treated surface also has a smaller frictional resistance and especially counteracts to a major degree the sticking or burning on of foodstuffs.

In a variant not only the inside of the receptacle is treated but also the outside where especially the greater hardness and the resistance to scratching of the layer are an advantage.

The treatment changes nothing or little to the appearance and in any case the metallic appearance of the receptacle is retained. No coating is necessary and therefore no materials from a coating can be released into the foodstuffs.

The porosity on the surface decreases through the treatment so that the penetration of foodstuffs or bacteria between the metal crystals is avoided.

The invention is in no way restricted to the embodiment described above and within the scope of the invention many changes can be applied to the described embodiment.

In particular the application of the procedure is not limited to frying pans. It can also be applied to other receptacles for the preparation of foodstuffs such as cooking pots, pressure cookers, sautéing pans etc.

The receptacle which is treated, need not necessarily be manufactured in stainless steel. It can also be manufactured in other metals.

The receptacle need also not necessarily be formed by deep stamping. It can also be manufactured by other customary moulding techniques such as casting.

Claims

1. Process of reducing the frictional resistance between foodstuffs and the metal in a food receptacle, characterised in that at least a part of the surface of the receptacle is irradiated with a laser beam to obtain a recrystallisation of the surface resulting in a fine-grained structure.

2. Process according to claim 1, characterised in that at least the inside of the receptacle is subjected to this laser irradiation.

3. Process according to either one of claims 1 and 2, characterised in that the surface is irradiated in several steps with a laser beam from a computer controlled laser.

4. Process according to either one of claims 1 to 3, characterised in that the surface to be irradiated is first cleaned chemically.

5. Process according to either one of claims 1 to 3, characterised in that the surface to be irradiated is first cleaned by ultrasonic waves.

Patentansprüche

1. Verfahren für die Reduzierung des Reibungswiderstands zwischen Lebensmitteln und dem Metall in einem Lebensmittelbehälter, dadurch gekennzeichnet, daß zumindest ein Teil der Oberfläche des Behälters mit einem Laserstrahl bestrahlt wird, um eine Rekristallisation der Oberfläche zu erreichen, welche in einer feinkörnigen Struktur resultiert.

2. Verfahren nach Anspruch 1, dadurch gekennzeichnet, daß zumindest die Innenseite des Behälters dieser Laserbestrahlung unterworfen wird.

3. Verfahren nach einem der Ansprüche 1 und 2, dadurch gekennzeichnet, daß die Oberfläche in mehreren Schritten mit einem Laserstrahl aus einem computergesteuerten Laser bestrahlt wird.

4. Verfahren nach einem der Ansprüche 1 bis 3, dadurch gekennzeichnet, daß die zu bestrahlende Oberfläche zunächst auf chemischem Weg gereinigt wird.

5. Verfahren nach einem der Ansprüche 1 bis 3, dadurch gekennzeichnet, daß die zu bestrahlende Oberfläche zunächst mit Hilfe von Ultraschallwellen gereinigt wird.

Revendications

1. Procédé consistant à réduire la résistance de frottement entre des produits alimentaires et le métal dans un réceptacle destiné à des aliments, caractérisé en ce qu'au moins une partie de la surface du réceptacle est exposée à un rayon laser pour obtenir une recrystallisation de la surface, donnant lieu à une structure à

grains fins.

2. Procédé selon la revendication 1, caractérisé en ce qu'au moins l'intérieur du réceptacle est soumis à cette radiation laser. 5
3. Procédé selon l'une quelconque des revendications 1 et 2, caractérisé en ce que la surface est exposée en plusieurs étapes à un rayon laser à partir d'un laser commandé par ordinateur. 10
4. Procédé selon l'une quelconque des revendications 1 à 3, caractérisé en ce que la surface qui doit être soumise au rayonnement est d'abord nettoyée par voie chimique. 15
5. Procédé selon l'une quelconque des revendications 1 à 3, caractérisé en ce que la surface qui doit être soumise au rayonnement est d'abord nettoyée à l'intervention d'ondes ultrasoniques. 20

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