Oct. 16, 1951 F. J. J. J. HENRARD 2,571,573

METALLIC SURFACE FOR BUTTER CHURNS

Filed July 14, 1945

Fig. 1.

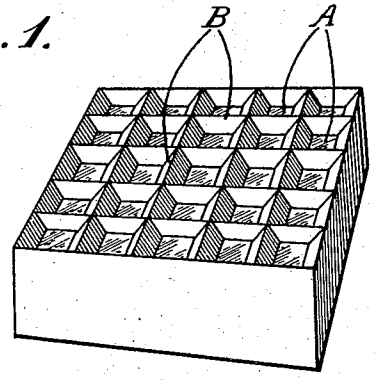


Fig. 2.

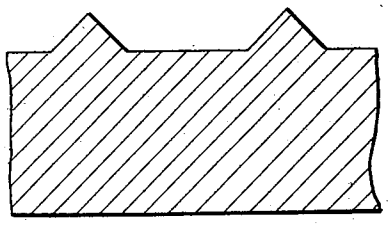


Fig. 3.

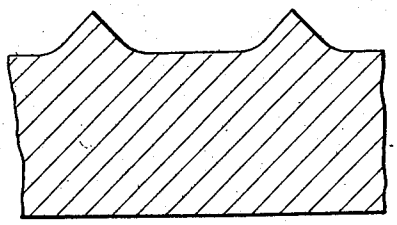
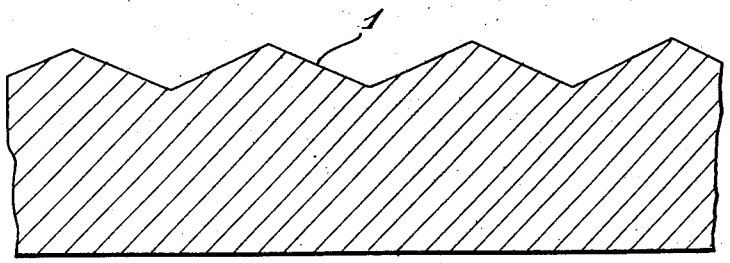


Fig. 4.



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METALLIC SURFACE FOR BUTTER CHURNS

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4 Claims. (Cl. 29—180)

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It is well known that wooden churns or other apparatus for producing or manipulating butter must, when utilised, be made wet in order to prevent the latter from sticking to the apparatus.

When use is made of churns or other apparatus made from smooth metallic sheets, it is next to impossible to make them wet on account of the lack of porosity which otherwise would permit retention of the water. It is also well known that the butter takes more or less the forms of the surfaces with which it enters into contact; in consequence, if the surface is smooth the wetting water will be expelled from the places where the butter enters into contact with the metallic surface.

In order to avoid the water from being expelled, it has been proposed to produce a certain rugosity of the surfaces by means of a sand blast or of an acid etching action. Though the applicant admits that this method has a certain efficacy, he has however observed that the very numerous grains of sand which cannot be directed individually during the operation of sand blasting overlap each other and form in this way quite irregular recesses or cavities, most of which are in mutual communication. It follows therefrom that when the butter enters into contact with such a surface, the water which moistens it, is partly expelled, which interferes with the efficacy of the treatment.

The invention has for its object to remedy this drawback and to create a porosity on the metallic surfaces which enters into contact with butter or any other substance of the same consistency and it consists in the use of means which permit the creation of a metallic surface which not only, is rugous, but which possesses capillary alveoles, separated from each other, so that this surface has rather the characteristics of wood which has always been considered, when being wet, as the best material for making apparatus or utensils intended to enter into contact with butter without any danger of sticking. In the case of wood, the water finds itself, as a matter of fact, in the capillary cavities and can, in consequence, not be expelled from the part entering into contact with the butter.

In the practical embodiment of the invention, the forms and dimensions of the alveoles remain subjected to the laws which govern capillary phenomena. Their depth and their surface are functions of each other and diminish, both of them, in the same ratio, that is to say, if the surface diminishes, the depth also diminishes in order to enable cleaning and sterilization, which

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is the primary object in view when metal is substituted for wood.

Figure 1 shows a plate according to the invention in which the cells of the alveoli have a plane bottom.

Figure 2 is a detail showing a section through any one of the cells of the plate of Figure 1.

Figure 3 is a detail of a section showing a modified form of cell in which the bottoms of the alveoli are rounded rather than plane.

Figure 4 is a detail showing a section of a plate according to the invention in which the shape of the cell is further modified to the form of an inverted pyramid.

The portion A represents the bottom of the alveoles which may be flat, as shown on the drawing, or rounded so as to avoid angles or corners. The portion B shows the protuberances which surround and separate the alveoles, so as to prevent the water from passing from the one to the other at the time of the contact with the butter. On the contrary, this water, which remains confined, forms a cushion between the metal and the butter.

These protuberances or partitions are of triangular or trapezoidal section, but preferably triangular so as to be terminated by a sharp edge in order to reduce the contact between butter and the metal.

As the alveoles, created in this way, are capillary, they hold water back even in vertical position. A sheet thus prepared according to the invention has more chances of remaining wet than a metallic surface made rugous by etching with acids or by sand blasting.

These alveoles may have a square, round, oval or polygonal shape, whilst at the same time respecting the laws that govern capillary phenomena.

To make such a surface, one of the following methods of manufacturing may be utilized: rolling (with a cylinder provided with teeth) knurling or pressing according to the manner which has been adopted for the manufacture of perforated sheets.

In the case of rolling or knurling, one of the cylinders or rollers or one of the knurling tools is provided with bosses or teeth, which represent the hollows of the alveoles. The same must be said for the work with the press, the punches of which also represent the hollows of the alveoles.

It is obvious that for certain utensils other than the churn, the impression of the alveoles may be made on the two faces of the sheet or metallic parts by using the same methods.

According to the invention, means are also resorted to in order to suppress the lustre or the billiancy of the facets of the alveolar metallic surfaces, but without modifying their shape or blunting their edges, consequently without attacking the metal in the depth and in order that the alveolar metallic surfaces acquire the same natural advantages as those of wood.

The obtention of the maximum of efficacy of sheets with alveoles is subject in fact to two conditions:

The first condition to be fulfilled is to create a capillary surface by impressing into the metallic surface capillary alveoles which are separated from each other. The capillary state of the metallic surface obtained in this way can be compared to that of wood, with the exception, however, that the facets of the alveoles preserve their metallic brilliantness which is still different from the dead or lustreless aspect of wood.

The second condition to be fulfilled is to remove the lustre of these alveolar metallic surfaces in order that they acquire the same natural advantages as those of wood.

These means advantageously consist in blowing on the surface by a blast of air under very weak pressure, an impalpable powder constituted, for instance, by clay, alumina or any other substance which has beforehand been dried, finely crushed and screened in order to remove all hard grains.

An important characteristic of embodiment of the process is that the powder is projected on the alveolate sheet of which the lustre has to be taken off with the aid of an air-blast the pressure of which is distinctly inferior to the pressure required for an ordinary sand-jet.

By way of simple example, this pressure of air can be, in the case of the present invention, of the order of 0.5 to 0.8 kg. per cm.^{3} (these pressures being to be considered rather as a maximum) and the screening of the clay, dried beforehand, can be carried out with the aid of a sieve No. 90 (90 x 90 meshes per square inch, which is a maximum size of the clay particles of 0.075 mm. ϕ).

What is desired, is not, as with the method by sand-blast previously known, to eliminate the soft parts of the metal in order to leave the hard parts in place, but really to take off the lustre, that is to say to suppress the brilliancy or the lustre of a metallic surface without scratching it nor creating cavities, which, in the present case, makes it necessary to avoid a modification in "depth" of the surface of the facets of the alveoles and to leave these facets in the smooth and silky state, without metallic brilliancy.

The treatment carried out according to the present invention is also very different as regards the obtained result, because the proceeding in question is so superficial and applies to a so little hollowed metallic surface that it would not be practical if it was not performed on sheets with alveoles. With these latter, the parts from which the luster has been removed escape the frictions due to use, whereas if the operation of removing the luster was applied to a sheet without alveoles, this proceeding would have no practical effect and the fact that the lustre had been removed would be made very quickly illusory in consequence of the use made by the apparatus.

The cavities from which the lustre is removed, protect the facets against any contact or friction due to use and to the employment of cleansing products or agents which would bring back rapidly to the polished metal state a smooth surface without alveoles which would have been dealt with according to the invention.

Another improvement relates to the shape of the alveoles.

Hereinabove either a flat bottom (Figure 2) or a rounded bottom (Figure 3) has been recommended for the alveoles.

Experience shows, however, that it is advantageous to arrange for the facets *f* (Figure 4) to rejoin each other at the bottom of the alveole in such a way that this bottom then presents a shape ending in a point.

This shape requires far less power for the penetration of the punches or of the rolling cylinder.

On the other hand, it is necessary to respect the ratio between the width and the depth of the alveoles in order to take into consideration the conditions of capillarity, whilst at the same time maintaining their possibilities of being cleaned.

That is the reason why the angle of inclination of the facets has been modified.

In Figs. 2 and 3, the alveoles have consequently a pyramidal shape with a square base. This kind of alveoles is obtained generally by rolling because the formation in the rolling cylinder of grooves corresponding to the protuberances existing on the sheets is very easy.

But when the alveoles are produced by punching, the pyramidal shape with hexagonal base is preferred.

This form of embodiment is advantageous because there are always for each cell two protuberances which support the mass of water. This increases the security coefficient which has been used for the determination of the dimensions.

What I claim is:

1. In an apparatus for the production and manipulation of butter, a surface moisture retaining element intended to be initially wetted and maintained in a wetted condition in contact with a butter mass in a churn or the like, comprising a metallic plate having one surface provided with alveoli formed by capillary cells, the walls of adjacent cells converging and intersecting in a line, all the lines being substantially in a common plane whereby the surface of said plane is reduced to a minimum exposed area, the wetting medium being retained in said cells by capillary attraction, said medium connecting adjoining cells across said edges where it is retained by surface tension, whereby the entire surface of the plate is maintained in a wetted condition.

2. A surface moisture retaining element according to claim 1 wherein said alveoli in said metallic member are formed in the shape of an inverted frustum of a pyramid whose base is a square to effect said cells.

3. A surface moisture retaining element according to claim 1, wherein said alveoli in said metallic member are formed in the shape of an inverted pyramid whose apex is at the base of each of the respective cells.

4. A surface moisture retaining element according to claim 1, wherein the entire surface is provided with a fine surface rugosity of a character not normally visible.

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