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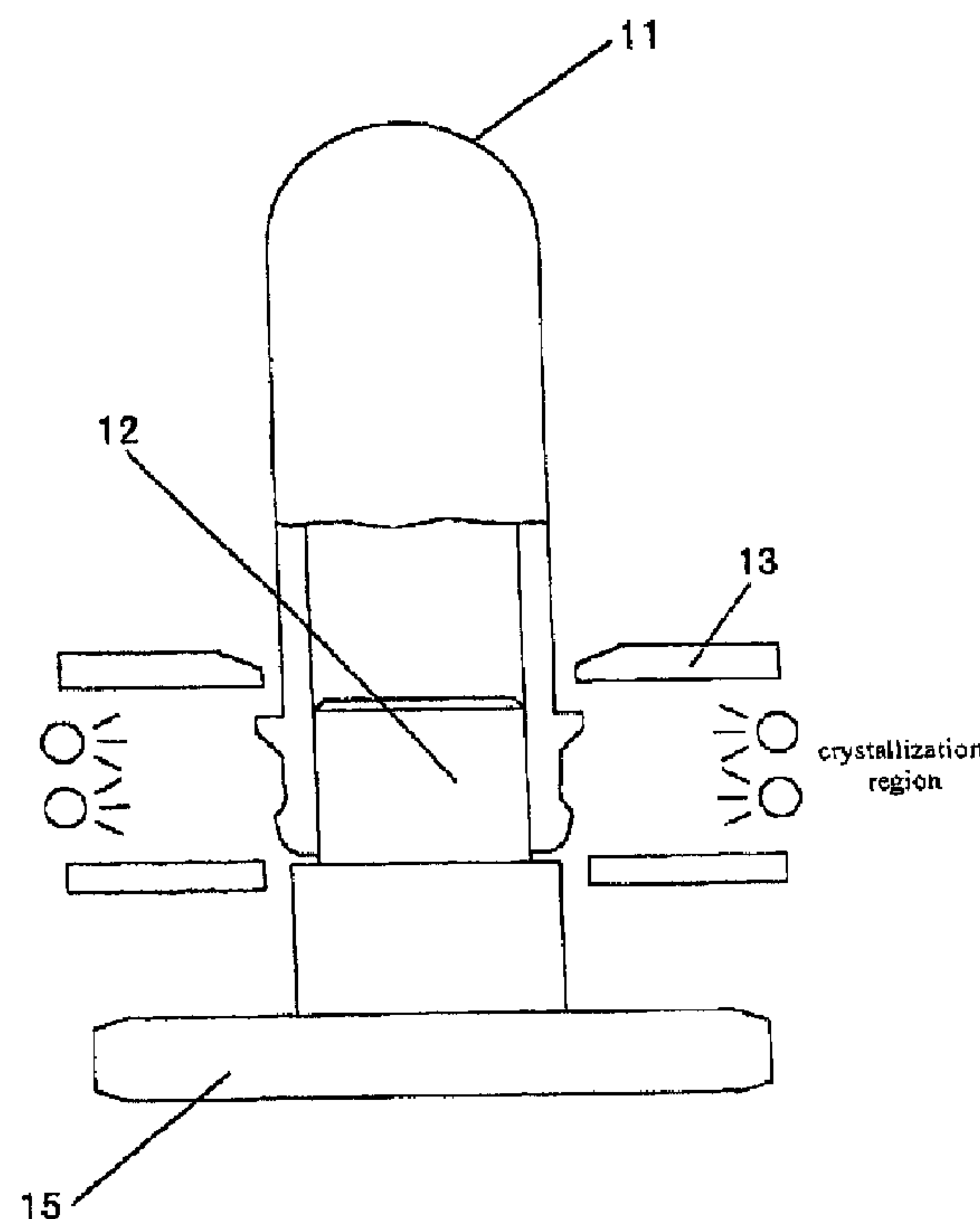
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(54) Titre : GOULOT CRISTALLISE DE BOUTEILLE A BIERE EN POLYESTER AINSI QUE METHODE DE
FABRICATION DE CET ARTICLE

(54) Title: CRYSTALLIZED BOTTLENECK OF POLYESTER BEER BOTTLE AND MANUFACTURING METHOD FOR
THE SAME



(57) Abrégé/Abstract:

A crystallized bottleneck of polyester beer bottle, in which the crystallized bottleneck is smooth and has a crystallized length of 0.5-35 mm at the bottleneck portion. To manufacture the crystallized bottleneck, an uncrystallized blank of the bottle is air-conditioned and a crystallizer is preheated. A bunker is loaded with the uncrystallized blank, which is delivered to a blank horse's head, then a bottleneck portion of uncrystallized blank is sent into a crystallizer to be heated and crystallized; concurrently the uncrystallized portion is controlled to be unaffected by the hot environment. The polyester bottle blank having a crystallized bottleneck portion is discharged through output blank horse's head and is cooled shaped. The invention features enhanced heat-durability and form-stability, so that the polyester beer bottle exhibits excellent pressure-tightness of beer contained therein.

ABSTRACT

A crystallized bottleneck of polyester beer bottle, in which the crystallized bottleneck is smooth and has a crystallized length of 0.5-35 mm at the bottleneck portion. To manufacture the crystallized bottleneck, an uncrystallized blank of the bottle is air-conditioned and a crystallizer is preheated. A bunker is loaded with the uncrystallized blank, which is delivered to a blank horse's head, then a bottleneck portion of uncrystallized blank is sent into a crystallizer to be heated and crystallized; concurrently the uncrystallized portion is controlled to be unaffected by the hot environment. The polyester bottle blank having a crystallized bottleneck portion is discharged through output blank horse's head and is cooled shaped. The invention features enhanced heat-durability and form-stability, so that the polyester beer bottle exhibits excellent pressure-tightness of beer contained therein.

CRYSTALLIZED BOTTLENECK FOR A POLYESTER BEER BOTTLE AND MANUFACTURING METHOD FOR THE SAME

BACKGROUND OF THE INVENTION

5 1. Field of the Invention

The invention relates to a container for receiving liquid, more specifically, to a crystallized bottleneck for a polyester beer bottle and a manufacturing method for the same.

10 2. Description of the Related Art

Currently used beer bottles are mostly glass bottles, which have a flanged top to the bottleneck for covering and sealing with a cap. However, due to the fragility of the glass bottle, which is dangerous for the user, a plastic bottle is used to replace the glass bottle for filling beer. As is well known, an excellent
15 pressure-tightness is required for bottles filled with effervescent beverages like beer etc,. For example, Chinese Patent application CN971981515.5 discloses a zero oxygen seepage plastic bottle for beer and other use. This is a laminated plastic vessel having improved oxygen seepage resistance. It has a layer containing an oxygen scavenger. The structure and manufacturing process of this
20 plastic beer bottle are both complicated. A specially assigned oligomer chain segment formulation are required, thus the fabrication cost cannot be lowered.

It is also well known that the pressure-tightness of a beer bottleneck is a key point to determining the pressure-tightness of the whole vessel. However the disclosed content in above-mentioned patent application does not describe how to
25 improved effectively the structure and pressure-tightness of beer bottleneck made by a plastic material and does not relate to whether any deformation would occur and effect pressure-tightness for the bottleneck portion after sterilization processing at high-temperature, such as 70°C (Pasteurize), as is experienced for the bottle during a process for filling beer. In fact, the pressure-tightness for the

bottleneck of plastic beer bottle already becomes an urgent key problem to be solved, which directly affects the quality of filled beer, thereby it becomes the key problem for using the plastic bottle in filling beer.

SUMMARY OF THE INVENTION

An object of the invention is to provide a crystallized bottleneck of polyester beer bottle, which would exhibit an excellent pressure-tightness and can hold an initial shape for the polyester beer bottle after sterilization processing at high-temperature is experienced for the bottle.

10 Another object of the invention is to provide a method for manufacturing crystallized bottleneck pressure-tightness, after a sterilization process at high-temperature is experienced for the bottle.

To realize above objects of the invention, the first aspect of the invention provides a crystallized bottleneck of polyester beer bottle, wherein the crystallised bottleneck is unthreaded and smooth (it is not machined with a screw thread), and the crystallised length of the bottleneck portion is in a range of 0.5-35 mm.

20 Another aspect of the present invention is a method for manufacturing a crystallized bottleneck of polyester beer bottle wherein the crystallised bottleneck has a smooth outer surface and a crystallised length in range of 0.5-3.5 mm, comprising the steps as follows:

a blank of a bottle made of polyester material is formed through drying, ejecting the polyester material and shaping it through cooling, then an uncrystallized blank of the bottle is paced for 24-72 hours in air-condition environment:

a crystallizer is preheated two hours or more before crystallizing to the blank of the bottle is started;

30 a bunker is loaded with the uncrystallized blank, which is delivered to a blank horse's head via a conveyor belt, then a bottleneck portion of uncrystallized bottle blank is sent into a crystallizer to heat it at high temperature and crystallize it via an arbour transmission chain; at the same time, the

uncrystallized portion of the blank body is controlled, so that it is not effected by the environment at high temperature;

the polyester bottle blank having a crystallized bottleneck portion is discharged through output blank horse's head and delivered to another conveyor belt to cool and shape it.

Preferably, said crystallized bottleneck of polyester beer bottle installs a flange at its upside, there are a transition curved surface between the flange and a top plane of the bottleneck.

10 Preferably, a flanged ring is provided to said crystallized bottleneck polyester beer bottle, said flanged ring has a plane bottom surface at a proper position spacing from the top flange of the bottleneck. An upper surface of the flanged ring is an acclivitous plane. The acclivitous plane forms an angle of 45° on vertical direction and converges to the outer surface of the bottleneck portion.

The second aspect of the invention provides a manufacturing method for a crystallized bottleneck of polyester beer bottle comprising the steps as follows:

a blank of a bottle made of polyester material is formed through drying, ejecting the polyester material and shaping it through cooling, then the uncrystallized blank of the bottle is placed for 24-72 hours in air-condition environment;

a crystallizer is preheated two hours or more before a crystallization for the blank of the bottle is started;

20 a bunker is loaded with the uncrystallized blank, which is delivered to an blank horse's head via a conveyor belt, then a bottleneck portion of uncrystallized bottle blank is sent into a crystallizer to heat it at high temperature and crystallize it via an arbor transmission chain; at the same time, the uncrystallized portion of the blank body is controlled, so it is not effected by the environment at high temperature;

the polyester bottle blank having a crystallized bottleneck portion is discharged through output blank horse's head and delivered to another conveyor belt to cool and shape it.

30 Preferably, a cooling partition is used to realize that uncrystallized portion of the bottle body is not effected by an environment at high temperature.

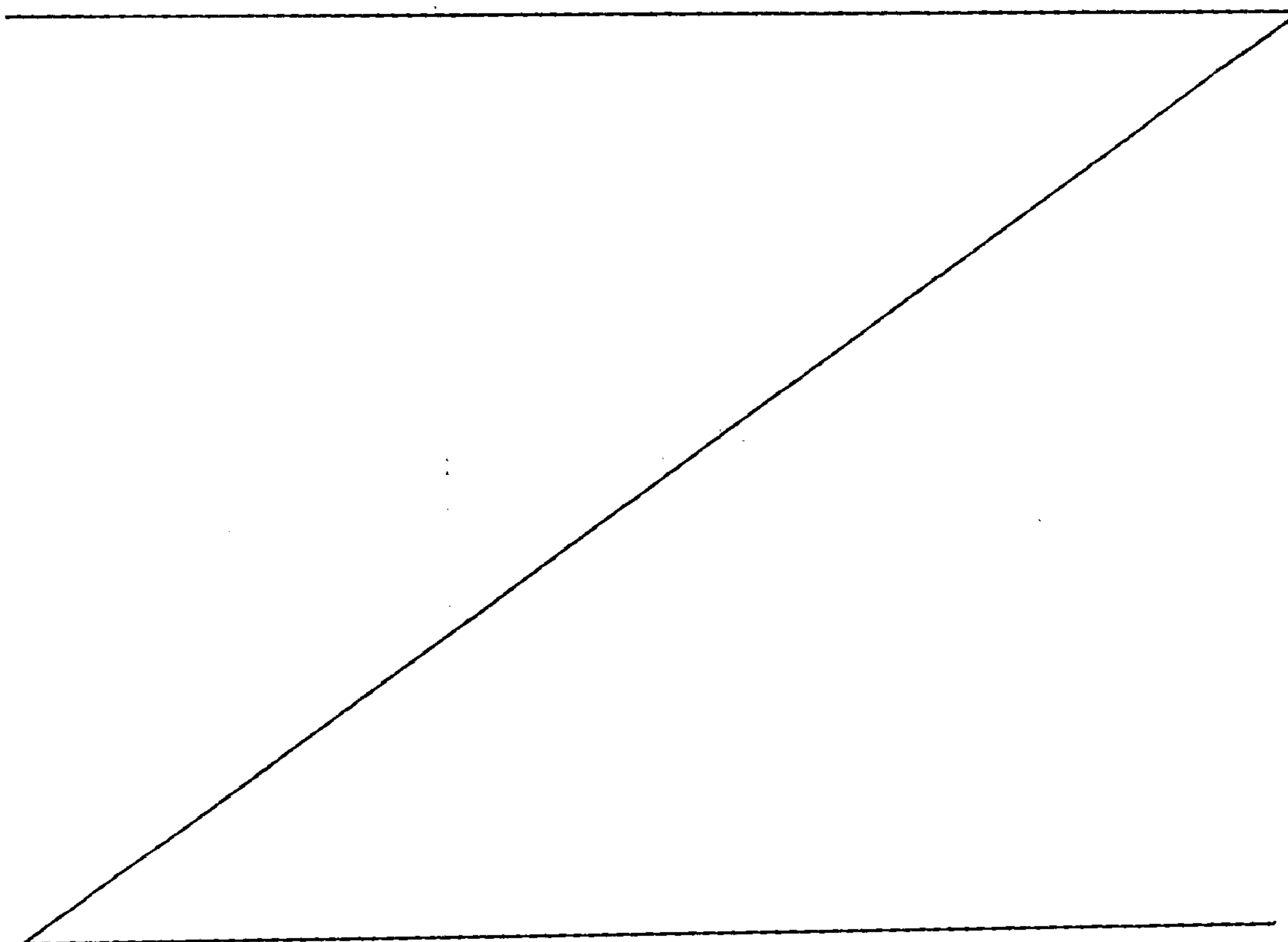
For a person skilled in the relevant field of technology, it is easily understood that a polyester beer bottle having a crystallized bottleneck portion would be obtained, after the polyester bottle blank having a crystallized bottleneck is made with above-mentioned method and is placed for 24 hours, then further it is blown and shaped at heating up by means of blow-and-blow machines.

10 The crystallized bottleneck of the polyester beer bottle and the manufacturing method for the same provided by the invention effectively enhance the heat-durability of the bottleneck of the polyester beer bottle and stability for maintaining the dimension of it, so that the polyester beer bottle exhibits to an excellent pressure-tightness effect, and it is reliable for ensuring the quality of the beer received therein.

According to a third aspect of the invention we provide a bottleneck according to the first aspect of the invention and / or incorporating a bottleneck produced according to the second aspect of the invention.

BRIEF DESCRIPTION OF THE DRAWINGS

Through the detailed description for the embodiments incorporated with the



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attached drawings, the structure, features and advantages of the crystallized bottleneck of the polyester beer bottle of the invention will become more clear, and the manufacturing method of the crystallized bottleneck of the polyester beer bottle will be further described, in which:

5 FIG.1 is a cross section view showing the crystallized bottleneck of a polyester beer bottle in an embodiment of the invention;

FIG.2 shows schematically the crystallized bottleneck of a polyester beer bottle in another embodiment of the invention;

10 FIG.3 is a schematic partially showing an arrangement of the device for crystallizing a bottleneck of a polyester beer bottle;

FIG.4 is a process flow diagram of an embodiment of the method of manufacturing a crystallized bottleneck of a polyester beer bottle in the invention;

FIG.5 is a schematic of the molecular structure of polyethylene terephthalate (PET) material before crystallized it;

15 FIG.6 is a schematic of the molecular structure of PET material when the crystallization is started;

FIG.7 is a schematic of the molecular structure of PET material after the PET material is crystallized at high temperature.

20 DETAILED DESCRIPTION OF PREFERRED EMBODIMENTS

Referring to FIG.1-3 now, the crystallized bottleneck of the polyester beer bottle of the invention is produced by heating and shaping the bottleneck portion at high temperature after an uncrystallized blank is delivering to the crystallizer. The resulting crystallized bottleneck is not machined with a screw thread. The
25 crystallized bottleneck has a length L of 0.5-35mm, preferably 0.5-10mm.

As a preferably embodiment, an illustrative crystallized bottleneck of polyester beer bottle is produced with PET (polyethylene terephthalate) material.

As shown in FIG.1, this is a cross section view showing the crystallized bottleneck of polyester beer bottle in an embodiment of the invention. It can be

seen, in this embodiment, that the crystallized bottleneck of polyester beer bottle is provided with a flanged ring 2 having a plane bottom surface at a proper position spacing from the top flange 1 of the bottleneck.

As shown in FIG.2, it shows schematically a crystallized bottleneck of a polyester beer bottle in another embodiment of the invention. It can be seen, in this embodiment, that the crystallized bottleneck of the polyester beer bottle is provided with a flanged ring 2 having a plane bottom surface at a proper position spacing from the top flange 1 of the bottleneck. An upper surface of the flanged ring 2 is an acclivitous plane. The acclivitous plane forms an angle of 45° to the vertical direction and converges with the outer surface of the bottleneck portion, as shown by a marker B in FIG.2.

As an embodiment, now a technological process for producing a crystallized bottleneck of a polyester beer bottle will be described in association with FIG.3 and FIG.4. In this embodiment, PET material is used.

Preparation

To ensure sufficient crystallization, it is necessary that the uncrystallized blank of the bottle is placed for 24-72 hours in an air-condition environment before a bottle blank is crystallized, then a crystallization process should be started.

On the other hand, it is also necessary that a crystallizer be preheated for two hours or more, before the crystallization for the blank of the bottle is started, so the temperature of the arbors and other parts in the crystallizer become uniform (see FIG.3), thereby an uniform crystallization for the bottleneck portion of PET bottle blank can be ensured.

As is showed in FIG.3, in this embodiment, the bottleneck portion of the PET bottle blank 11 obtained by the above processes is inserted into the arbor 12 of the sprocket wheel 15. At the same time, the crystallized region of the bottleneck is insulated by a cooling partition 13 so that the uncrystallized portion of the body is not effected by an environment at high temperature.

As part of the manufacturing process, the various components in the crystallizer should be kept clean, to prevent dust absorption of the bottle blank due to static electrification during the crystallization.

5 Technological Process

After the uncrystallized blank is loaded into a bunker, the bunker is delivered to a blank horse's head via a conveyor belt, then a bottleneck portion of the uncrystallized bottle blank is sent into a crystallizer to heat it at high temperature and crystallize it via an arbor transmission chain.

10 The polyester bottle blank having a crystallized bottleneck portion is discharged through output blank horse's head and delivered to another conveyor belt to cool and shape it. Finally, a beer bottle blank having a crystallized bottleneck would be obtained.

For a person skilled in the relevant field of technology, it is easily understood, 15 after such bottle blank having a crystallized bottleneck is placed for 24 hours, then further it is blown and shaped at heating up by means of blow-and-blow machines, a PET beer bottle having a crystallized bottleneck would be obtained.

Technological Conditions

20 Before a bunker is loaded with the uncrystallized blank, the temperature of a bottle blank is controlled by an arbor temperature controller and the temperature of bottle blank typically is controlled in a range of 120-150°C. After the uncrystallized bottleneck portion of the bottle blank is fed into the crystallizer, the temperature of the bottle blank is controlled by a bottleneck temperature controller and the 25 temperature of the bottle blank typically is controlled in a range of 130-170°C. In crystallization, the crystallization temperature should be adjusted according to the operation speed of the crystallizer. Generally, the faster the operation speed of the crystallizer, the higher the required crystallization temperature. For example, when the operation speed for crystallizing the portion of the bottle blank is in a range of

7500-10,000 blanks per hour, i.e. the crystallization time required for each bottle blank is in a range of 90-120sec, corresponding crystallization temperature is in a range of 130-170°C.

When the bottle blank is crystallized in the crystallizer, in order to prevent influence to the crystallization of the bottle blank by high temperature, the body portion of the bottle blank is put under indirect cooling, while the cooling partition is cooled with cooling water and the temperature of cooling water is controlled in a range of 15-18°C. At the same time, said uncrystallized body portion of bottle blank is always outside of said crystallizer.

Analysis for Molecular Structure

Before and after crystallizing to the bottleneck portion of the PET beer bottle, the arrangement for the molecular structure of PET material would exhibit obvious difference. The original molecular structure of PET material is an amorphous state in disorder under normal temperature, as showed in FIG.5. After a crystallization is implemented at high temperature, said molecular structure shall become regular and ordered, as showed in FIGs.6 and 7.

Comparison for the Performance Before and After Crystallization

The performance of PET bottleneck would exhibit obvious difference before and after crystallization. A comparison result is in table 1 overleaf:

Table 1

PET bottle blank before crystallization	PET bottle blank after crystallization
a transparent state (normal temperature) vitrification point: 67°C density: 1.33g/cm ³ relatively poor mechanical behaviour preferable extension at break	non-transparent ivory-white vitrification point: 81°C density: 1.455g/cm ³ excellent mechanical behaviour the higher crystallinity, the better the thermal stability harder hardness

CLAIMS

1. A method for manufacturing a crystallized bottleneck of polyester beer bottle wherein the crystallised bottleneck has a smooth outer surface and a crystallised length in range of 0.5-3.5 mm, comprising the steps as follows:

a blank of a bottle made of polyester material is formed through drying, ejecting the polyester material and shaping it through cooling, then an uncrystallized blank of the bottle is paced for 24-72 hours in air-condition environment:

10 a crystallizer is preheated two hours or more before crystallizing to the blank of the bottle is started;

a bunker is loaded with the uncrystallized blank, which is delivered to a blank horse's head via a conveyor belt, then a bottleneck portion of uncrystallized bottle blank is sent into a crystallizer to heat it at high temperature and crystallize it via an arbour transmission chain; at the same time, the uncrystallized portion of the blank body is controlled, so that it is not effected by the environment at high temperature;

20 the polyester bottle blank having a crystallized bottleneck portion is discharged through output blank horse's head and delivered to another conveyor belt to cool and shape it.

2. A method according to claim 1, wherein before a bunker is loaded with the uncrystallized blank, the temperature of bottle blank is controlled by an arbour temperature controller; after the uncrystallized bottleneck portion of the bottle blank is fed into the crystallizer, the temperature of the bottle blank is controlled by a bottleneck temperature controller.

3. A method according to claim 2, wherein when a bunker is loaded with the uncrystallized blank, the temperature of bottle blank is controlled in a range of 120-150°C.

4. A method according to claim 2, wherein after the uncrystallized bottleneck portion of the bottle blank is fed into the crystallizer, the temperature of the bottle blank is controlled in a range of 130-170°C by a bottleneck temperature controller.

5. A method according to any one of claims 1 to 4, wherein the crystallization time required for each bottle blank is controlled in a range of 90-120 sec.

10 6. A method according to claim 1, wherein when the bottle blank is crystallized in the crystallizer, the body portion of bottle blank is free from the influence of an environment at high temperature using a cooling partition.

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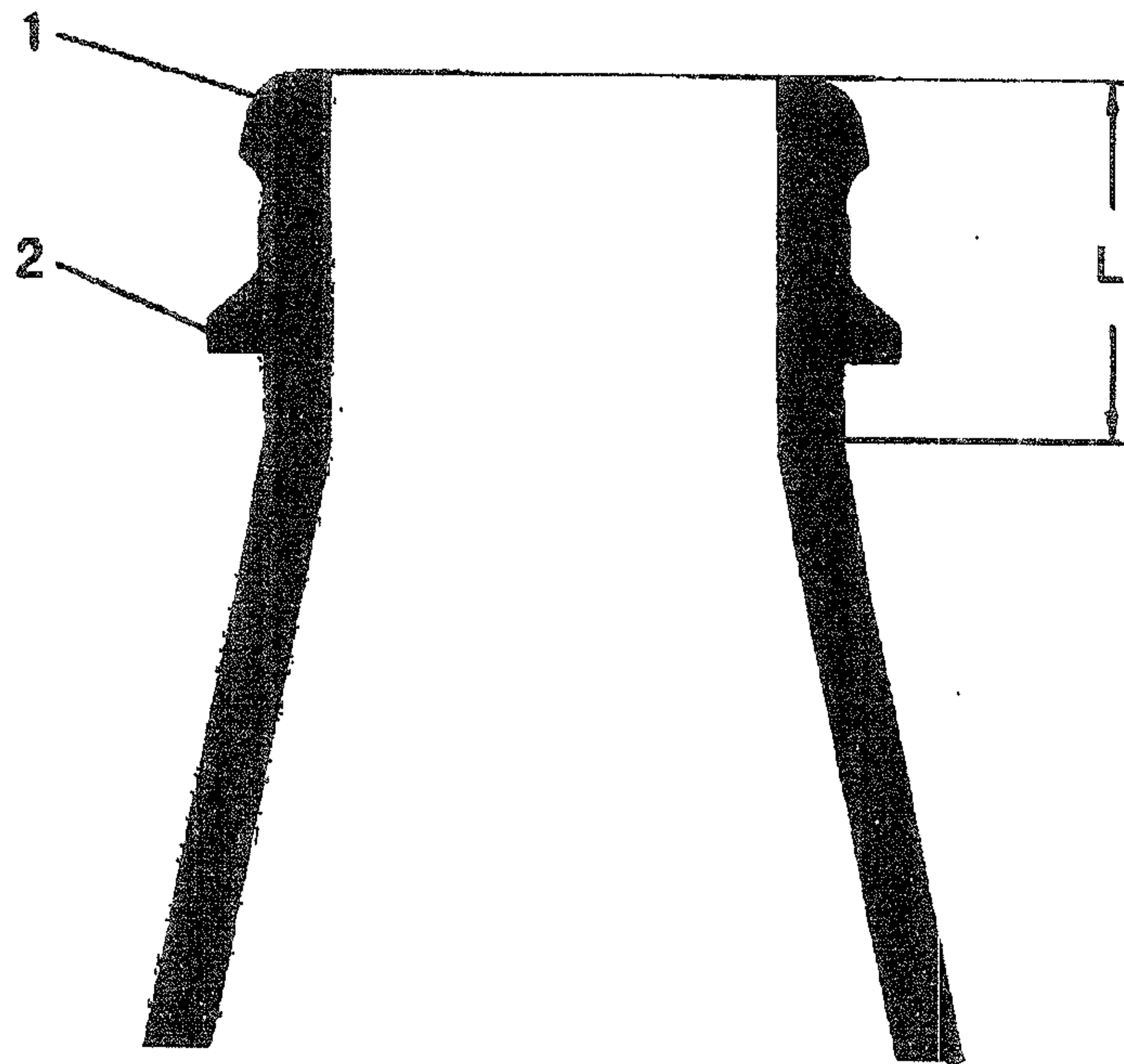


Fig. 1

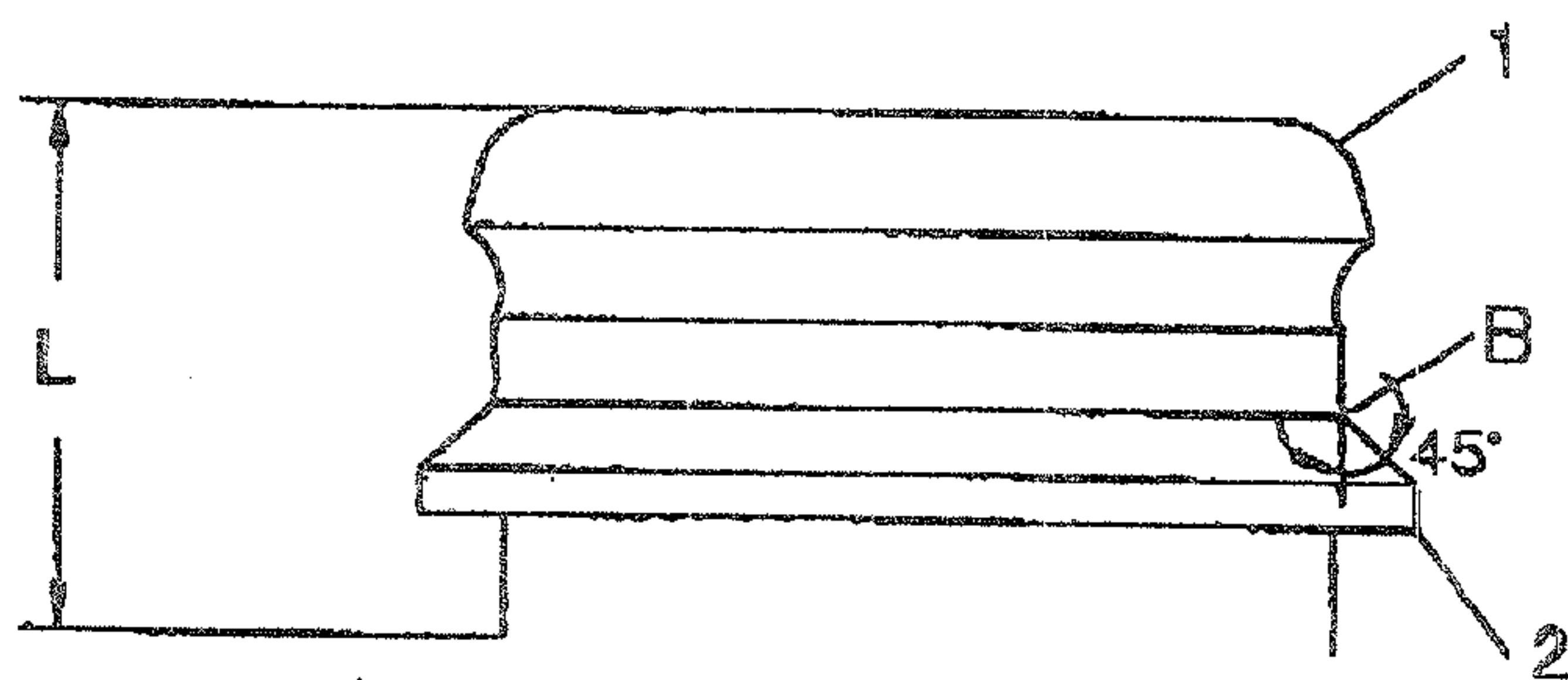


Fig. 2

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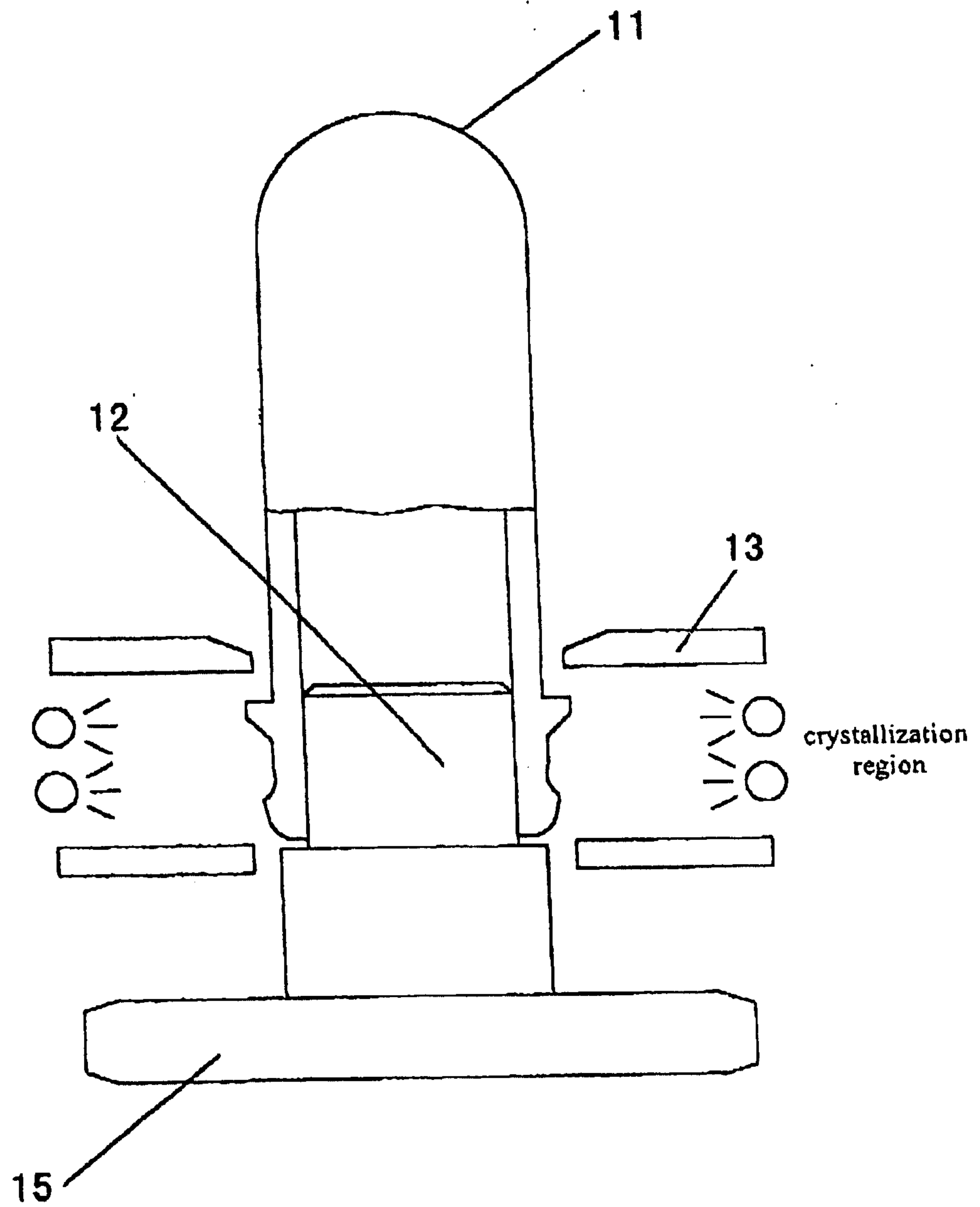


Fig.3

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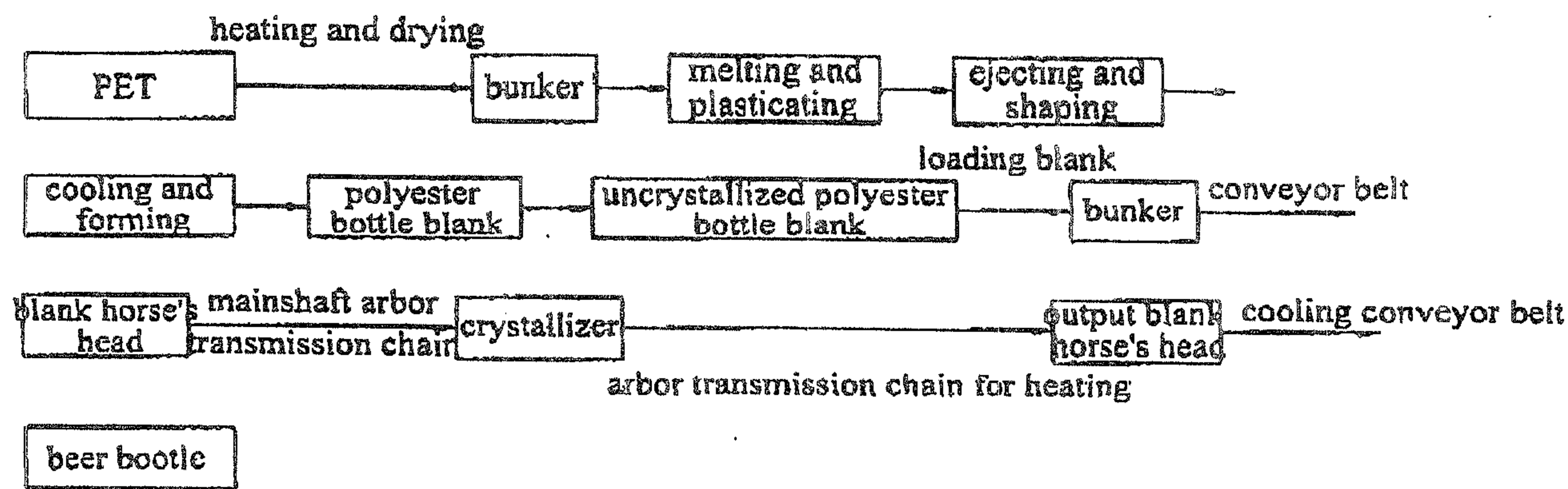


Fig.4

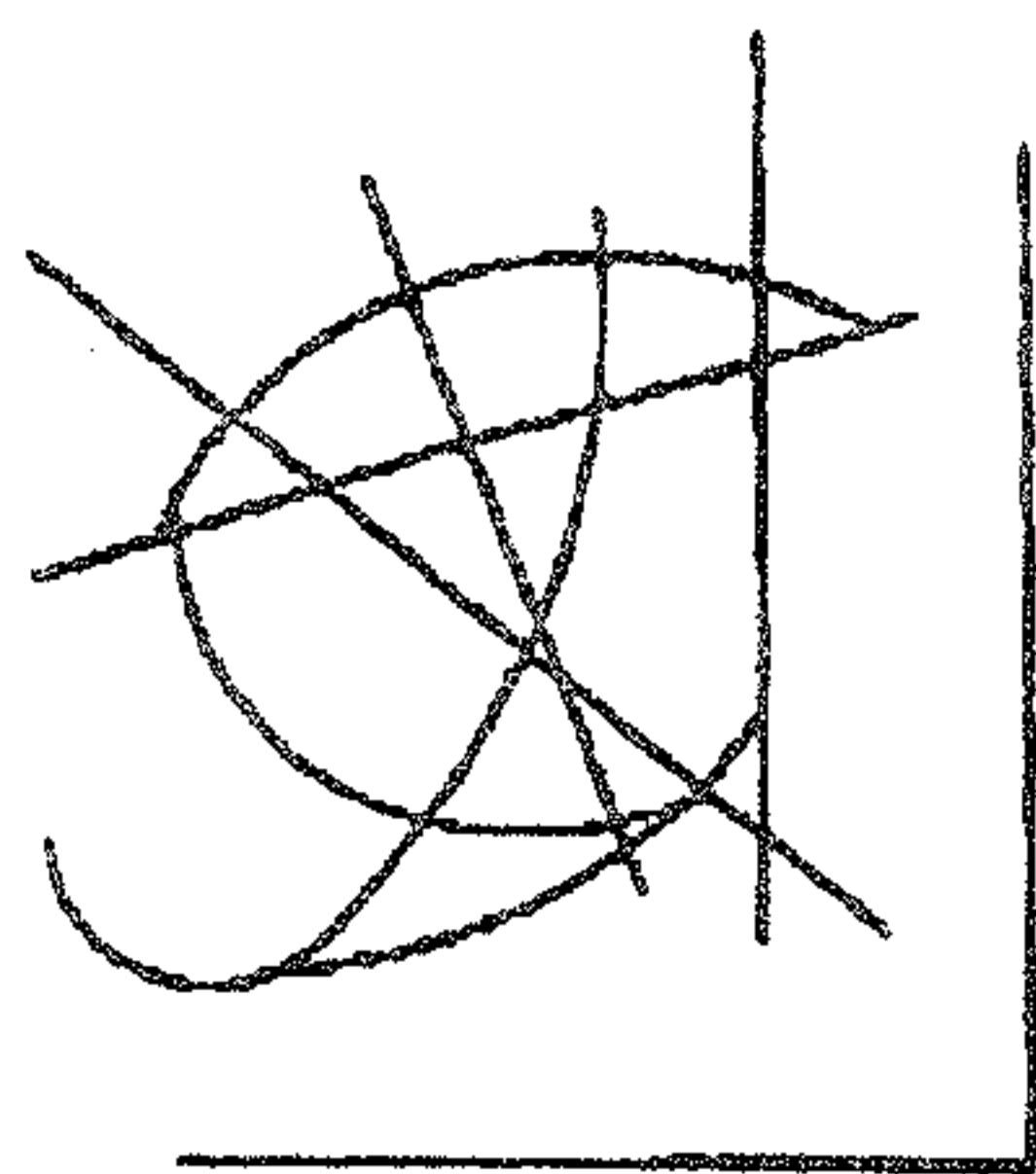


Fig.5

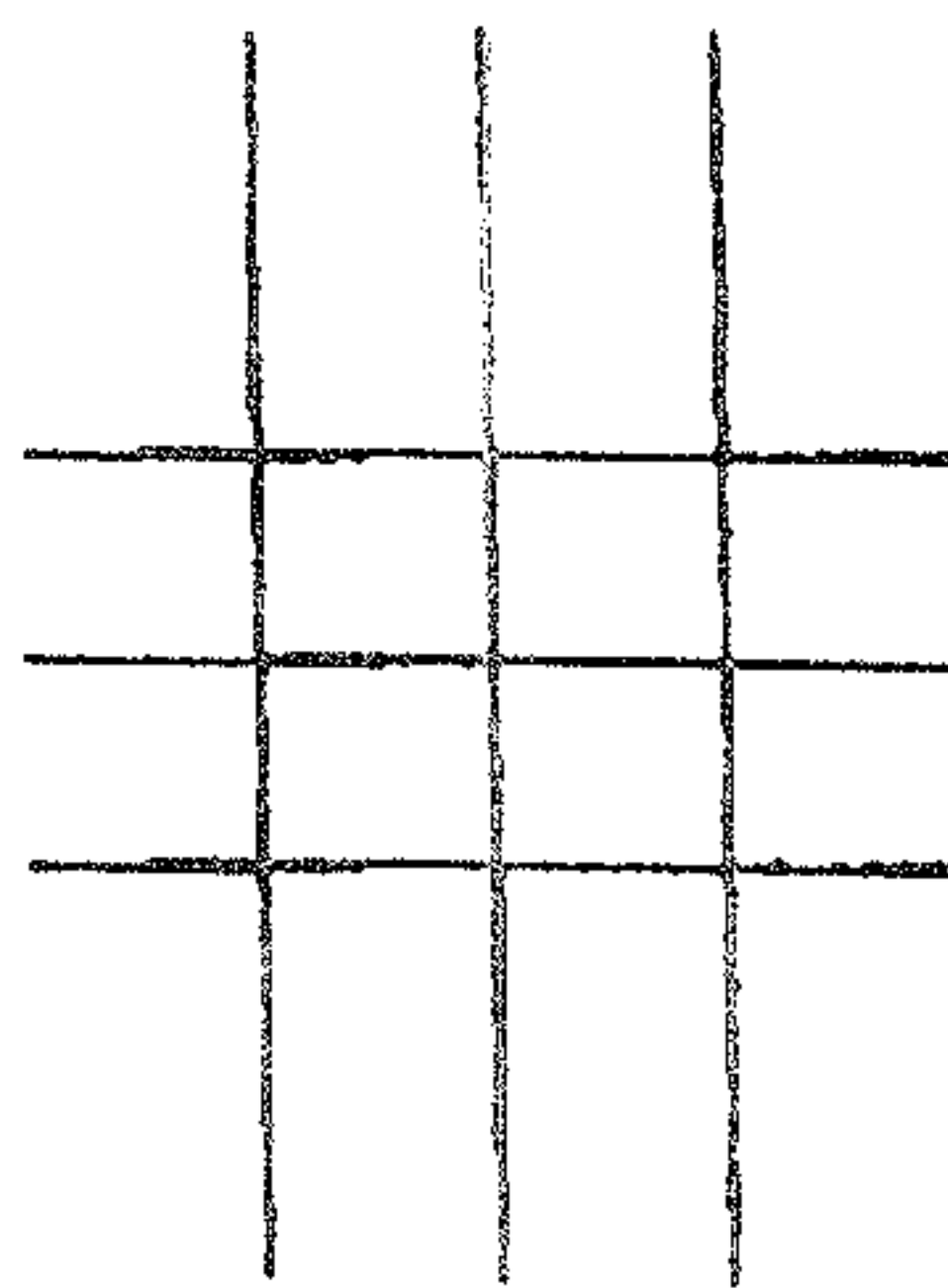


Fig.6

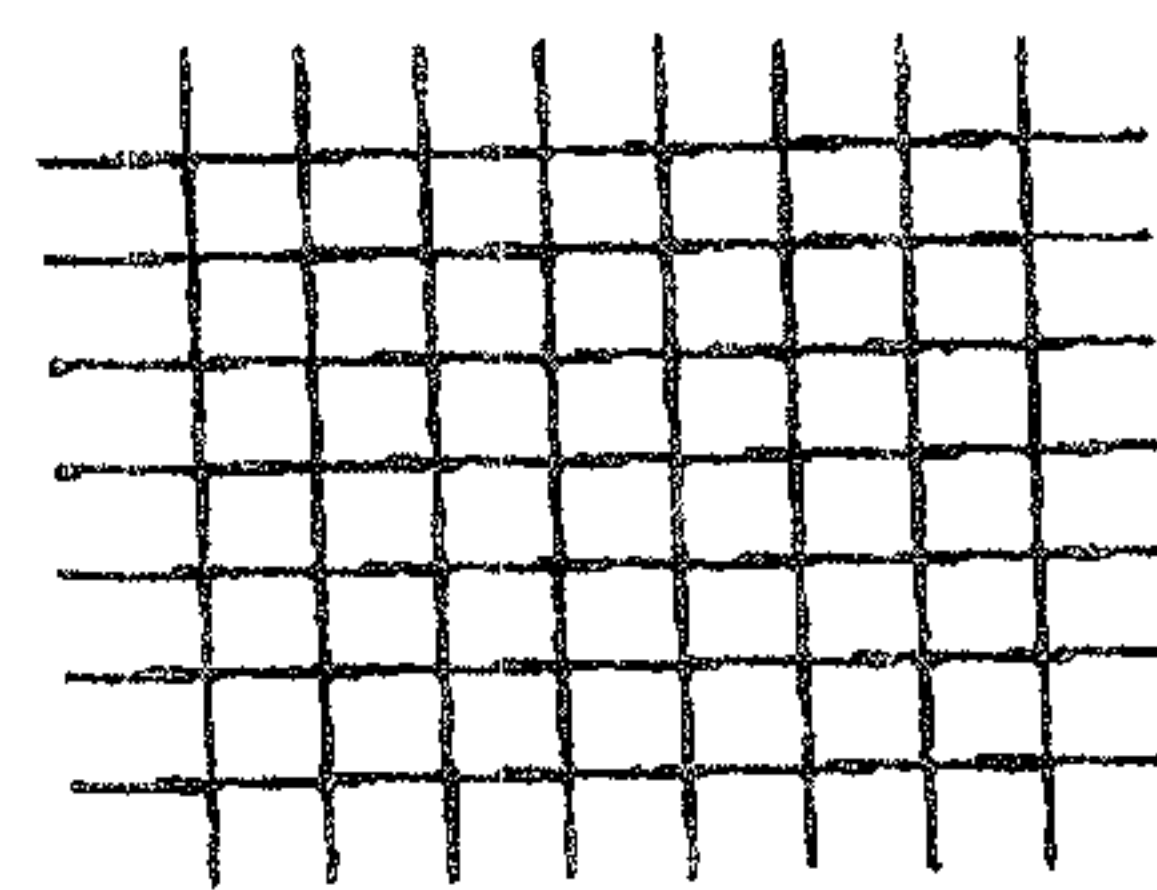


Fig.7

