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(54) **MOLD FOR MAKING TOOL OUT OF ICE**

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(52) **U.S. Cl.**  
CPC ..... **F25C 1/04** (2013.01)

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(57) **ABSTRACT**

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**Related U.S. Application Data**

(60) Provisional application No. 62/061,019, filed on Oct. 7, 2014.

The present invention relates to an elastic mold for holding and freezing a liquid. The mold is constructed of unitary construction and comprises of one or more walls and a base, wherein said one or more walls form a compartment. A plurality of protrusions extend upwards from said base. The liquid held in said elastic is frozen into the shape of a test tube rack.

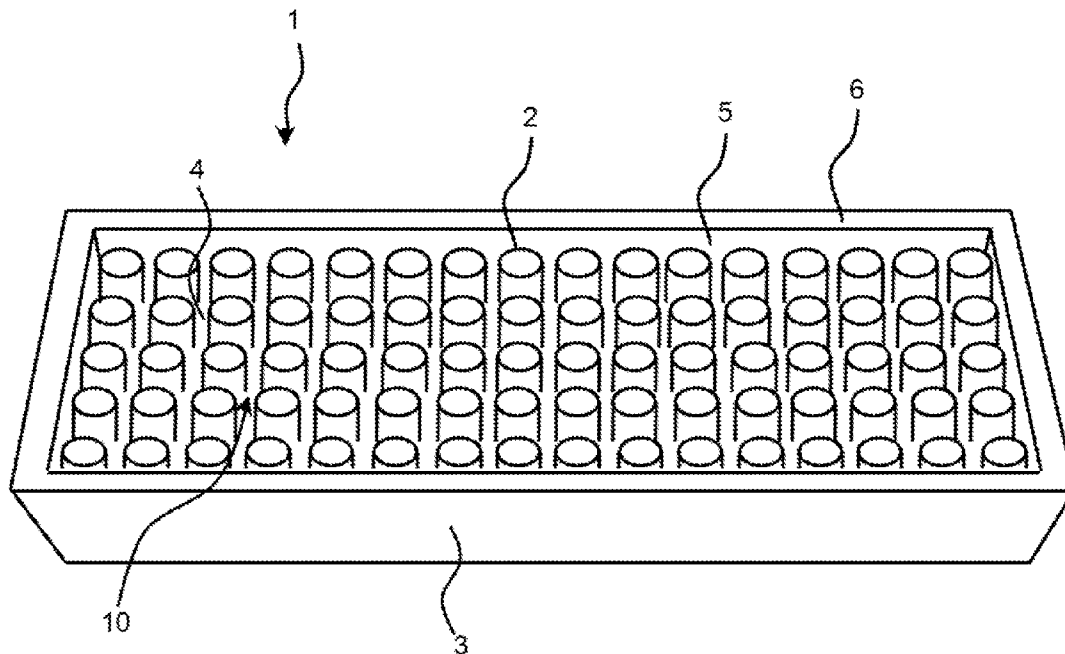


FIG. 1

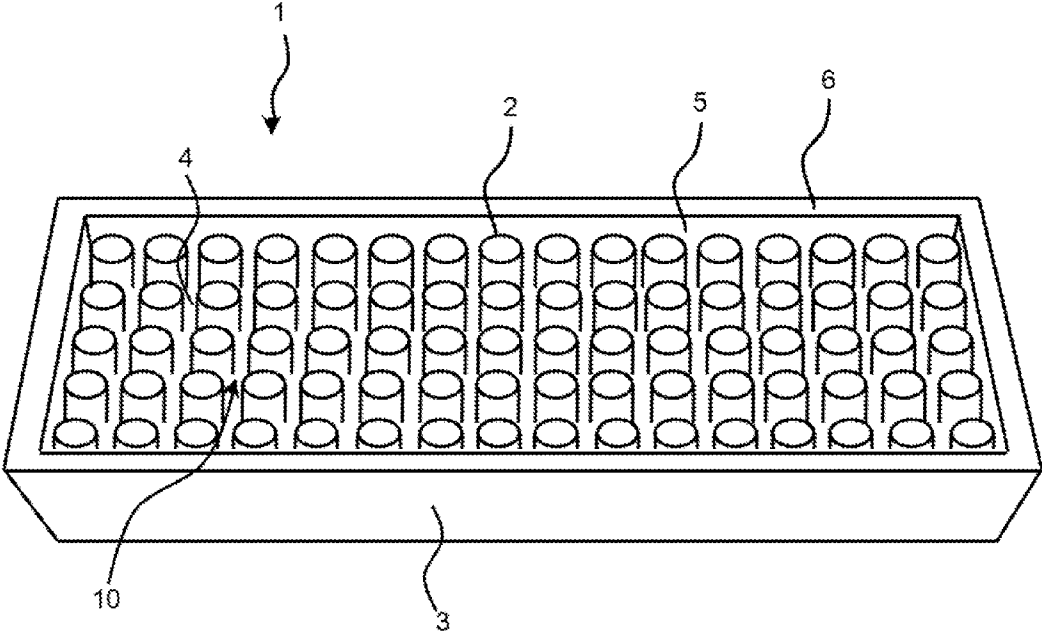
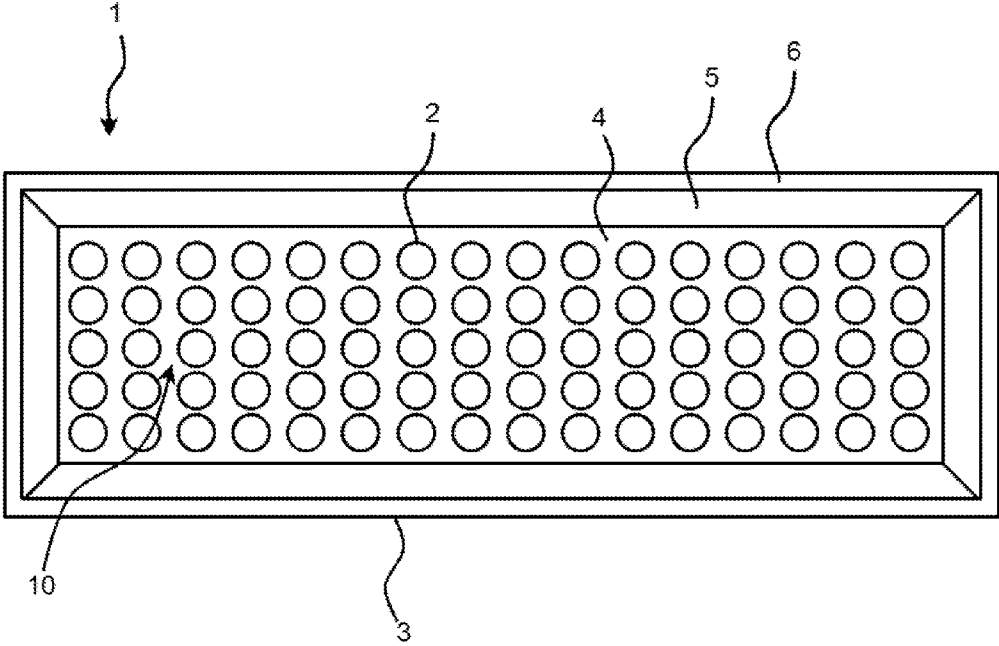


FIG. 2



**FIG. 3**

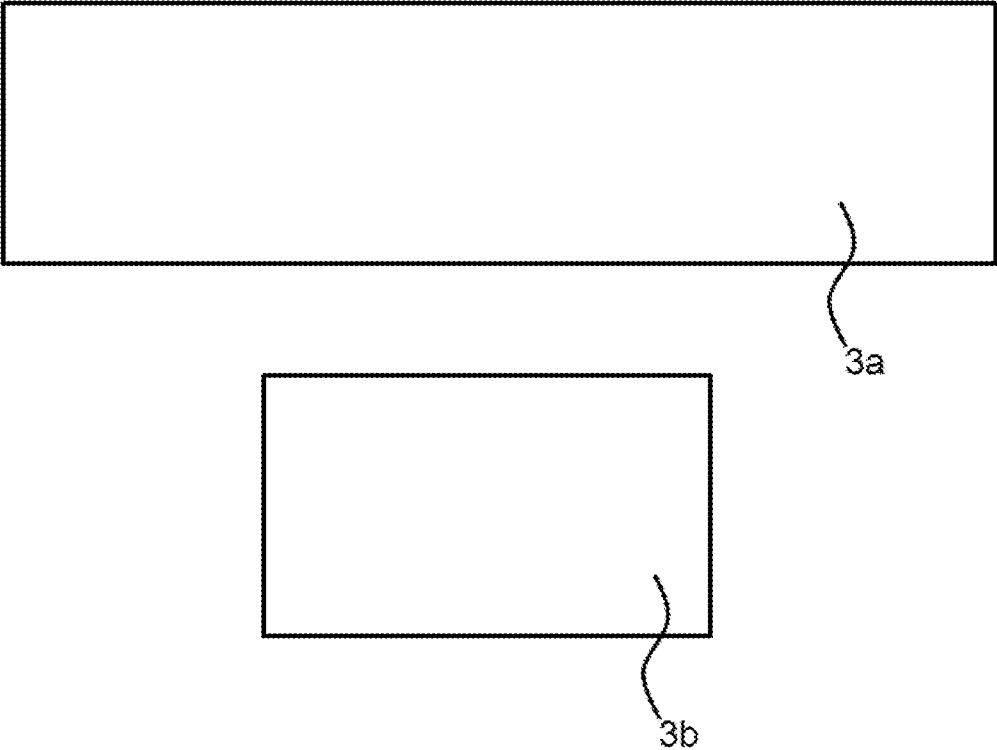


FIG. 4

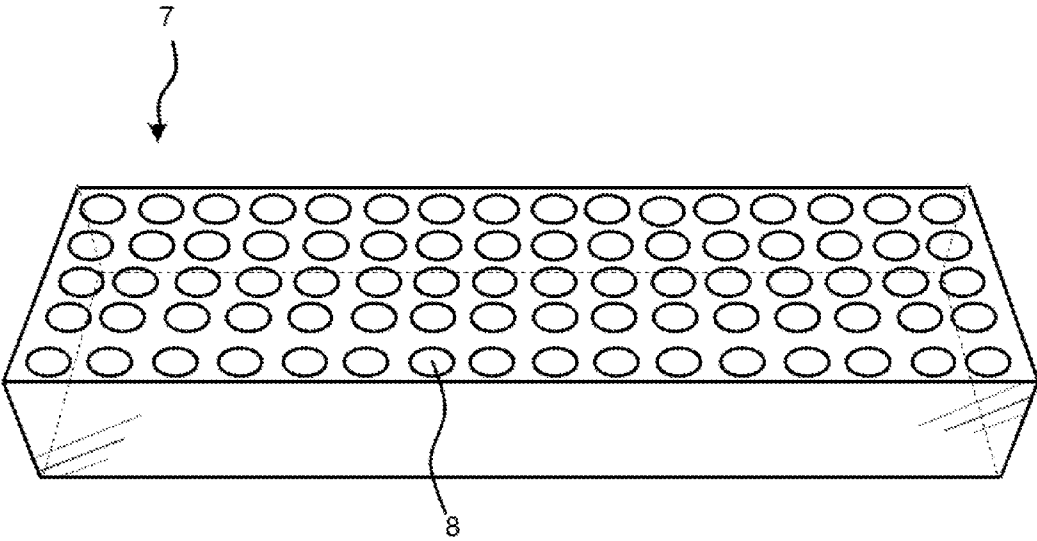


FIG. 5

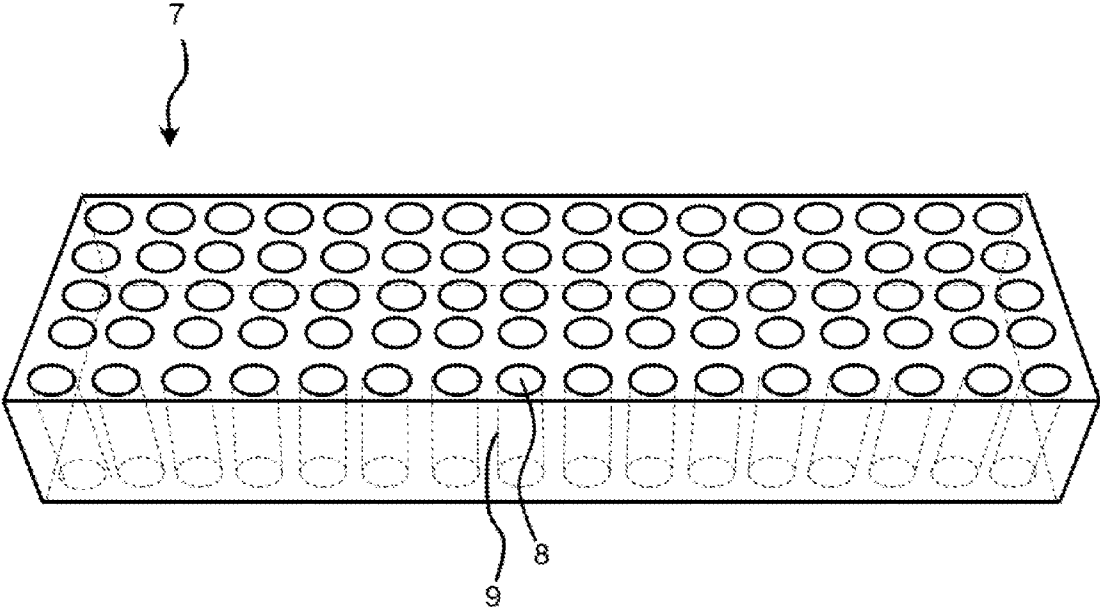


FIG. 6

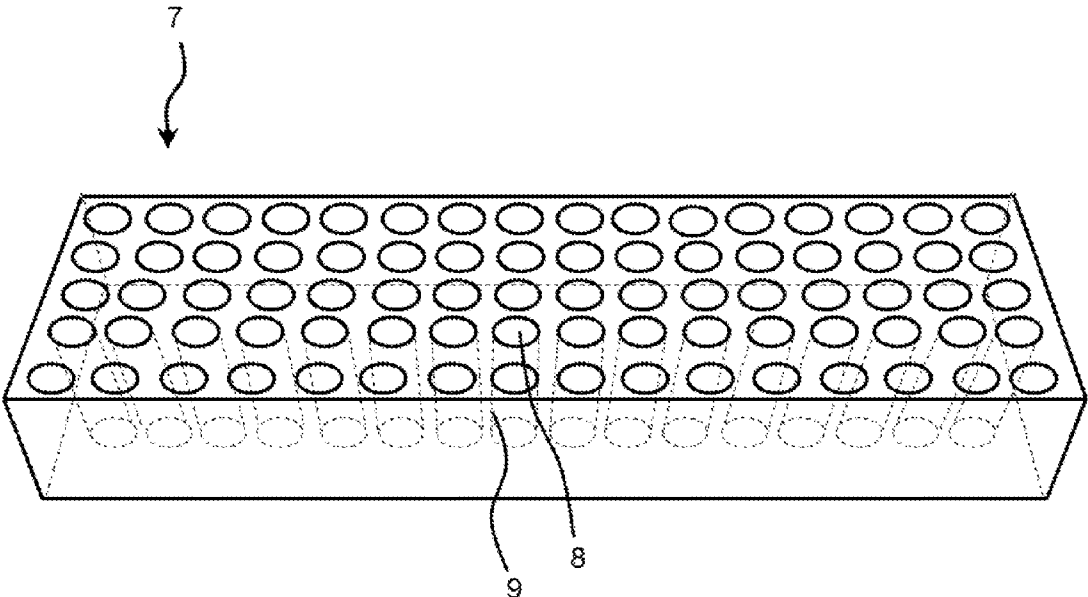


FIG. 7

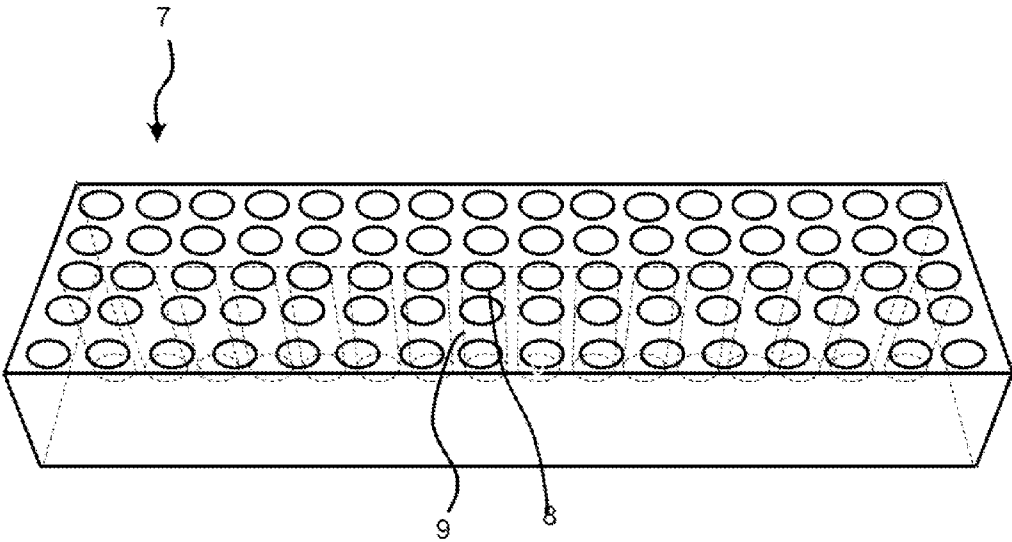


FIG. 8

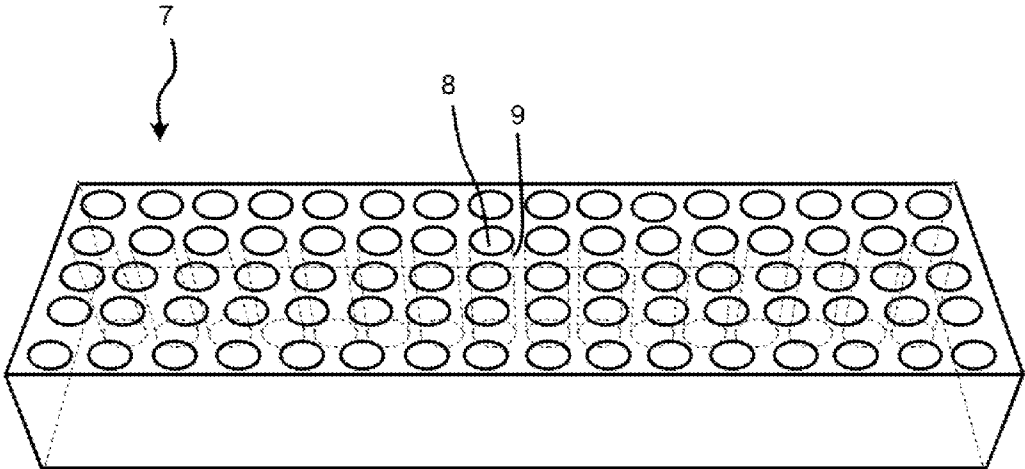


FIG. 9

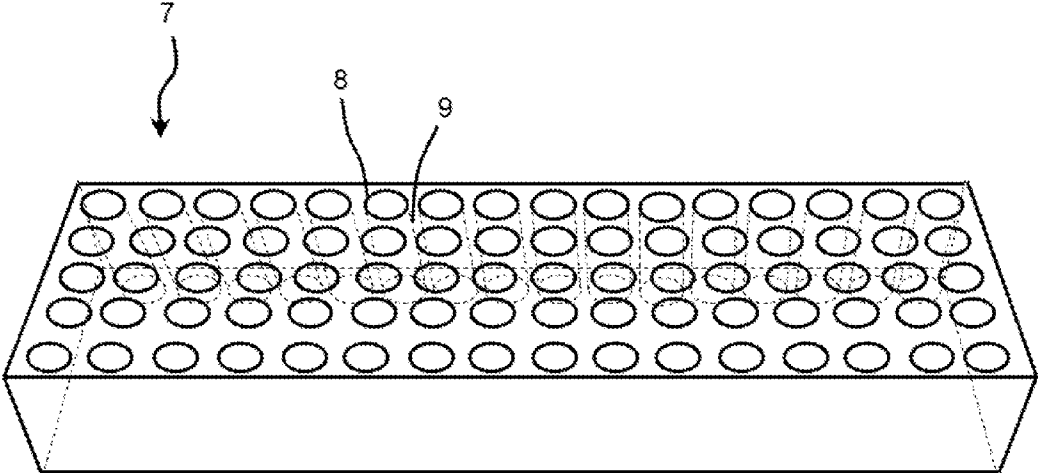


FIG. 10

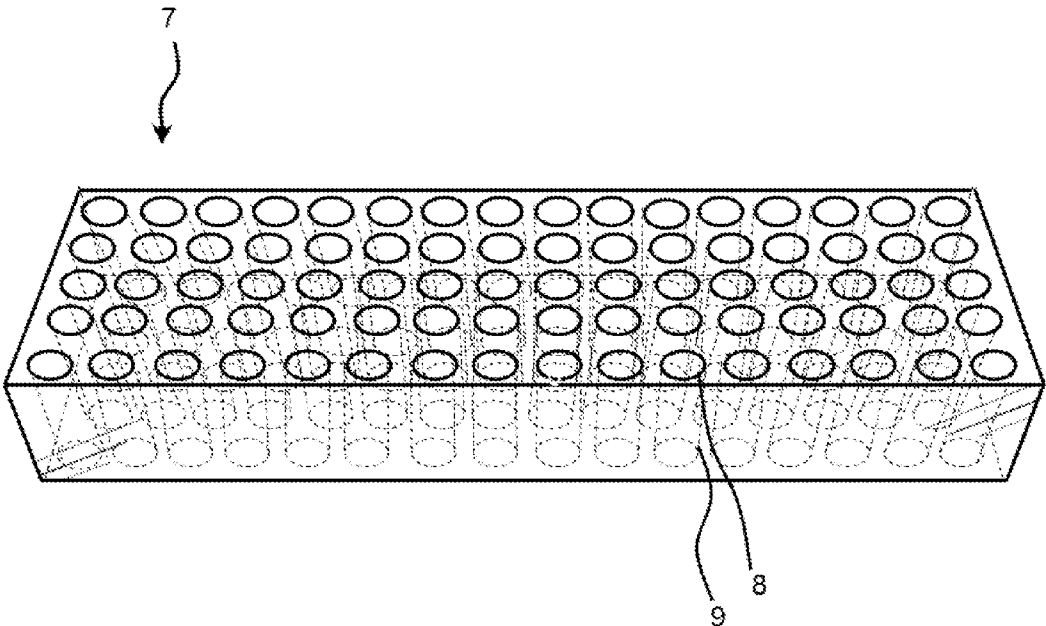
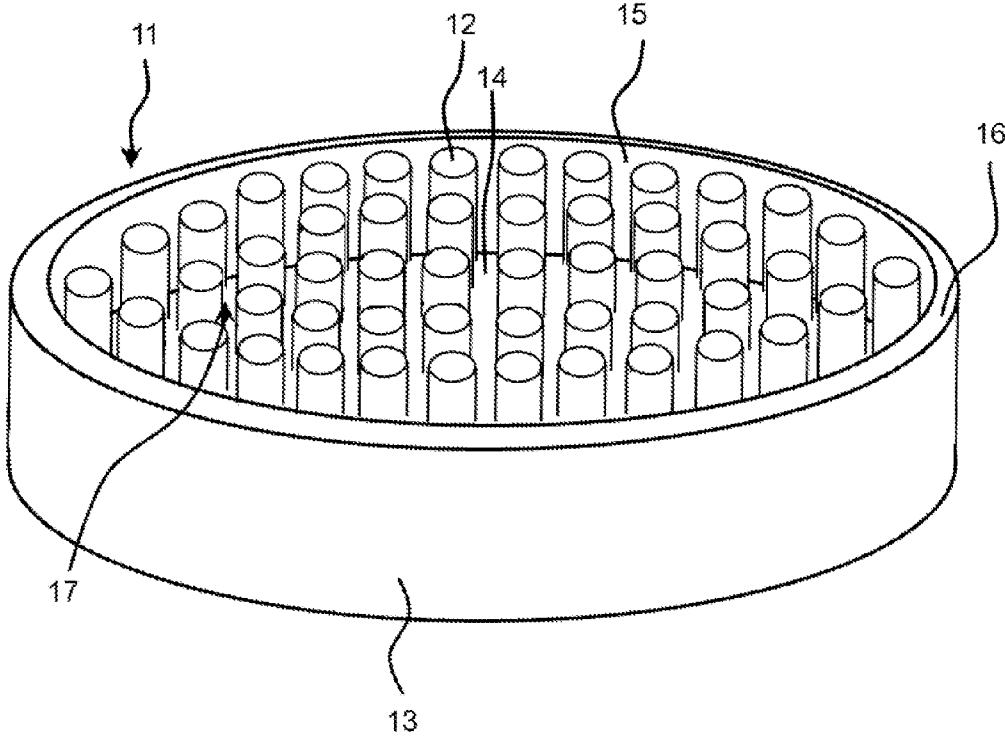


FIG. 11



## MOLD FOR MAKING TOOL OUT OF ICE

### RELATED U.S. APPLICATION DATA

**[0001]** This nonprovisional application claims the benefit of the U.S. provisional application 62/061,019 filed on Oct. 7, 2014. The disclosure of all applications are incorporated by reference in their entirety herein this reference.

### FIELD OF THE INVENTION

**[0002]** The present invention relates to a mold for making a tool out of ice, wherein the tool is a test tube rack. The mold has one or more walls and a base or unitary construction that form a compartment capable of retaining liquid. The mold may be filled with liquid and said mold may be placed inside of a freezer where said liquid is frozen into a shape capable of holding test tubes in an organized manner. The test tube rack made out of ice has a plurality of holes that are of appropriate size for the insertion of test tubes. The ice test tube rack assists a user in maintaining organization of samples when performing scientific experiments while also maintaining samples at a cold temperature.

### GENERAL BACKGROUND OF THE STATE OF ART

**[0003]** When performing research in the field of biological sciences it is of utmost importance to maintain a high level of organization. One of ordinary skill in the art knows that biological research experiments often involve the use of multiple test tubes, thus necessitating a suitable level of organization so as to prevent potential confusion and loss of track of samples held within the test tubes. Maintaining organized samples minimizes mistakes and provides for efficient and successful research.

**[0004]** Biological research experiments often require that samples be maintained at a cold temperature, preferably near freezing. For example, samples containing biological tissues or cells, enzymes, bacteria, viruses or a mixture thereof commonly require to be kept at a low temperature during the entirety or a portion of a particular research experiment. Also, various experimental protocols require that samples be incubated at a cold temperature for a predetermined amount of time. For example, experiments involving specific enzyme reactions, such as ligation reactions performed with T4 DNA Ligase, include an incubation step at 15° C. for four to eight hours or 4° C. for overnight. Another example of an experiment where a low temperature is required are bacterial transformations, which require a 20 to 30 minute 4° C. incubation step, with a subsequent two minute 4° C. incubation step. Antibody labeling protocols, for example antibody labeling of cells for flow cytometry, require several steps where samples are incubated at 4° C. Thus, maintaining biological samples within a cold environment is at times necessary for the preservation of viability and biological activity of a sample, and for the success of an experiment.

**[0005]** When performing research with potentially dangerous pathogens, one of ordinary skill in the art may perform an experiment or a portion of an experiment in a biological safety cabinet. Biological safety cabinets are partially enclosed systems with a ventilated workspace. Biological safety cabinets are kept at sterile or near sterile conditions so as to prevent contamination of the experiment being per-

formed, as well as to prevent a researcher from being exposed to potentially dangerous pathogens that are used within the biological safety cabinet.

**[0006]** Cleaning and decontamination of a biological safety cabinet prior to, at times during, and after performing an experiment within the cabinet is highly important for the success of an experiment as well as for the safety of the researcher and members of the research facility. Cleaning and decontamination of a biological safety cabinet often involves spraying the interior of the cabinet with a disinfectant, such as a 20% ethanol solution, a 10% bleach solution, or a commercially available disinfectant such as CaviCide™.

**[0007]** Any research tool or item placed inside of the biological safety cabinet is also subjected to cleaning with a disinfectant before and after use. Any solid waste generated during an experiment in a biological safety cabinet is often collected in a biohazardous waste trash bag, and is then removed from the cabinet after exterior decontamination of the bag. Liquid waste generated during an experiment performed within a biological safety cabinet is often collected into a bottle or poured into a bucket that has been partially filled with a disinfectant, for example the bucket may be partially filled with a 10% bleach solution. Because various items and research tools used within a biological safety cabinet are often moved from the inside to the outside of the cabinet, proper decontamination of said items is important so as not to expose and endanger personnel to dangerous pathogens used within the cabinet.

**[0008]** Decreasing the number of items that are placed inside of a biological safety cabinet that later have to be disinfected and reused helps minimize exposure to potential pathogens. For example, disposable plastics such as pipet tips and petri dishes are commonly used during research and are used within biological safety cabinets. Following the use of disposable plastics in a biological safety cabinet the items are placed inside a biohazardous waste bag and then properly disposed of. However, there are various items and tools used in biological research that are not disposable, such as pipets and reusable tools. Non disposable items used within a biological safety cabinet require thorough decontamination and cleaning so as not to transfer harmful pathogens outside of the cabinet. Even though necessary decontamination steps are often applied to items removed from a biological safety cabinet, users of said items may be uneasy with regards to the cleanliness of recently removed items. Carelessness and improper decontamination during the removal of items used within a biological safety cabinet may potentially put researchers and laboratory personnel at risk of infection by a harmful pathogen.

**[0009]** Therefore, there is a need for research tools that can be easily and thoroughly decontaminated following their use inside of a biological safety cabinet that are also disposable. The invention as described herein allows a user of ordinary skill in the art to make a test tube rack out of ice that is easily disposable. The test tube rack may be used within a biological safety cabinet to assist a user in organizing samples during an experiment while at the same time keeping samples at a low temperature. After the completion of the experiment, the user may easily dispose of the ice test tube rack by placing the said rack into a liquid waste bucket, wherein the ice test tube rack melts and is then treated as liquid waste.

## BRIEF SUMMARY OF THE INVENTION

**[0010]** While there are various designs of ice cube trays, there are no ice cube trays that have been designed to make ice in the shape of a tool for use in biological research, wherein said tool may hold test tubes. The present invention relates to a mold for making a tool out of ice that is shaped to hold a plurality of test tubes. More particularly, the mold comprises of one or more walls and a base of unitary construction. Preferably the mold is made of an elastic material. The mold is shaped to have a compartment that may be filled with water. The mold with water in the compartment may be placed into an environment capable of freezing liquid, wherein the liquid may be water. The mold has a plurality of equidistant protrusions extending from an upper surface of the base. The protrusions displace said liquid, whereupon placing the kit into a freezer for a time appropriate for freezing the entirety of said liquid, said liquid freezes within the confines of the compartment and around the protrusions. The frozen liquid is removed from the mold creating a test tube rack made out of ice, wherein the test tube rack has a plurality of holes and each hole has a shape capable of accommodating a test tube. Test tubes may be placed within the holes, allowing for proper organization as well as continuous cooling of the test tubes during an experiment.

## BRIEF DESCRIPTION OF THE DRAWINGS

**[0011]** FIG. 1 is a drawing of an angled view of one exemplary mold for making an ice test tube rack.  
**[0012]** FIG. 2 is a drawing of a top view of an exemplary mold for making an ice test tube rack.  
**[0013]** FIG. 3 is a drawing of the side walls of one exemplary mold for making an ice test tube rack.  
**[0014]** FIG. 4 is a drawing of a test tube rack made out of ice.  
**[0015]** FIG. 5 is a drawing of a test tube rack made out of ice.  
**[0016]** FIG. 6 is a drawing of a test tube rack made out of ice.  
**[0017]** FIG. 7 is a drawing of a test tube rack made out of ice.  
**[0018]** FIG. 8 is a drawing of a test tube rack made out of ice.  
**[0019]** FIG. 9 is a drawing of a test tube rack made out of ice.  
**[0020]** FIG. 10 is a drawing of a test tube rack made out of ice.  
**[0021]** FIG. 11 is a drawing of an angled view of one exemplary mold for making an ice test tube rack in the shape of a circle.

## DETAILED DESCRIPTION OF THE INVENTION

**[0022]** The invention is an elastic mold of unitary construction used for making a test tube rack out of ice. The mold may be made out of any elastic or flexible material that is able to confine water and retain elasticity when placed in an environment with temperatures below freezing. For example, the mold may be made out of silicon, synthetic rubber, natural rubber, plastic, polymerized siloxanes, gel, thermoplastic elastomers, foam, or any other polymer, copolymer, or material suitable for holding liquids and capable of withstanding repeated cycles of freezing and thawing.

**[0023]** In a preferred embodiment, as shown in FIG. 1 and FIG. 2, the mold 1 is rectangular and has walls 3 and a base 4

of unitary construction. The walls 6 have an interior surface 5 and an exterior surface 3. The walls 6 and the base 4 form a compartment 10, wherein the compartment 10 is able to retain a liquid.

**[0024]** A plurality of protrusions 2 extend upwards from an upper surface of the base 4. The plurality of protrusions 2 are spaced apart by an appropriate distance to allow for a liquid to flow between adjacent protrusions 2 within the compartment 10. In one embodiment, the protrusions 2 may extend from the upper surface of the base 4 to a height of the mold walls 6. In another embodiment, the plurality of protrusions 2 may extend from the upper surface of the base 4 to below a height of the mold walls 6. In yet another embodiment, the plurality of protrusions 2 may extend from the upper surface of the base 4 to above a height of the mold walls 6. In another embodiment the protrusions 2 may extend from the upper surface of the base 4 to below the height of the mold walls, or to above the height of the mold walls, or to the same height of the mold walls, or to a combination thereof.

**[0025]** The mold may have the form any shape, for example a square, rectangle, circle, triangle, or any other desired shape with any desired dimensions. As shown in FIG. 11, the mold may be a circular mold 11. The circular mold 11 is made of unitary construction and has a circular wall 16 with an exterior surface 13 and an interior surface 15 and a base 14, and said wall 16 and base 14 form an interior compartment 17. The upper surface of the base 14 has a plurality of protrusions 12. A liquid may be poured into the compartment 17, and the mold 11 may then be placed into an environment cold enough to freeze water. The plurality of protrusions 12 displace the liquid so as to freeze the liquid into a structure with a plurality of openings that extend vertically tube wise through the frozen liquid.

**[0026]** The thickness of the walls 6 and 16 of the mold 1 and 11 may be any thickness appropriate to retain a liquid during freezing.

**[0027]** The protrusions 2 and 12 from the upper surface base 4 and 14 may have any size and shape. For example, the protrusions may be cylindrical, rectangular, cone shaped, or any other desired dimension or shape.

**[0028]** The protrusions 2 and 12 extending from the upper surface of the base 4 and 14 of the mold 1 and 11 may have similar shapes and dimensions to a variety of test tubes. For example, but not limited to, 1.5 to 2 ml microcentrifuge tubes that have a diameter between approximately 8 mm and 12 mm and a height of approximately 38 mm to 42 mm, 0.2 ml tubes as those used for polymerase chain reaction as known by one of ordinary skill in the art, 15 ml test tubes with a diameter between approximately 14 mm and 18 mm and a height between approximately 115 mm to 120 mm such as but not limited to Corning® 15 ml centrifuge tubes, 50 ml test tubes with a diameter between approximately 25 mm and 30 mm and a height between approximately 115 mm to 120 mm such as but not limited to a Falcon™ 50 ml tube, test tubes used in flow cytometry and florescence activate cell sorting such as tubes with a diameter between approximately 12 mm to 17 mm and a height between approximately 75 mm to 100 mm, cryogenic tubes of various volumes such as CryoClear™ 1 ml, 2 ml, 3 ml, 4 ml, or 5 ml tubes, or any other test tube shape and dimension as known by one of ordinary skill in the art.

**[0029]** The protrusions 2 and 12 extending from the upper base 4 and 14 of the mold 1 and 11 may have a shape and dimension to displace a liquid, whereupon freezing of said liquid and removal of said frozen liquid 7 from the mold, said

frozen liquid 7 has a shape of a test tube rack (See FIG. 4). The frozen liquid 7 test tube rack has a plurality of openings 8 forming a plurality of tubes 9 that extend vertically through the frozen liquid 7 (See FIG. 5, FIG. 6, FIG. 7, FIG. 8, FIG. 9, and FIG. 10). The openings 8 and tubes 9 may fit one or more varieties of test tubes, for example, but not limited to, 1.5 ml microcentrifuge tubes, 2 ml microcentrifuge tubes, 0.2 ml tubes as those used for polymerase chain reaction, 15 ml or 50 ml test tubes such as a Corning® 15 ml and 50 ml centrifuge tubes or Falcon™ 15 ml or 50 ml tubes, test tubes used in flow cytometry and florescence activate cell sorting, cryogenic tubes of various volumes such as 1 ml, 2 ml, 3 ml, 4 ml, or 5 ml CryoClear™ tubes, or any other test tube as known by one of ordinary skill in the art.

[0030] The plurality of openings 8 may form a plurality of tubes 9 through in the frozen liquid 7, wherein each individual tube 9 is designed to accommodate a single test tube. The tube 9 may be a cylindrical shape and extend vertically through the entirety or a portion of the frozen liquid 7.

[0031] In one preferred embodiment the mold 1 is a rectangular, wherein the length of the rectangle may be approximately 5 and 1/16 inches long, approximately 1 1/2 inches high, and approximately three inches wide. In one preferred embodiment, the interior compartment 10 within the rectangular mold 1 may be approximately 5 and 1/4 inches long, approximately 1 inches high, and approximately 2 and 5/8 inches wide. In one preferred embodiment, the walls 6 of the mold 1 may be between approximately 5/16 and approximately 1/4 of an inch thick. In one preferred embodiment, the protrusions 2 may be cylindrical and have a diameter of approximately 1 5/32 of an inch. In one preferred embodiment there are approximately 96 protrusions 2 of cylindrical shape within the interior compartment 10 formed by the mold walls 6 and base 4.

[0032] In one embodiment the mold 1 may have one or more handles extending from either a top surface of the walls 6 or from one or more exterior side wall 3a and 3b, or a combination thereof. The handles may be used to assist a user of the mold 1 or to carry the mold 1 and place it into a freezer. In another embodiment the mold 1 may have a movable or detachable lid to prevent spilling of liquid from within the interior compartment 10.

[0033] It will be understood from the description in this specification, in which the preferred embodiments of the invention are illustrated by example. It is to be expressly understood, however, that the drawings or figures are for the purpose of illustration and description, and they are not intended as a definition of the limits of the invention.

[0034] While the specification describes particular embodiments of the present invention, those of ordinary skill in the art can devise variations of the present invention without departing from the inventive concept.

I claim:

1. An elastic mold of unitary construction, comprising: one or more walls and a base forming a compartment to contain a liquid, wherein within said compartment a plurality of protrusions extend upwards from an upper surface of said base, and said plurality of protrusions are spaced apart from said one or more walls, and said plurality of protrusions are spaced apart from each other, wherein said liquid can flow between said plurality of protrusions and said one or more walls, and said liquid can flow between adjacent protrusions.

2. The elastic ice mold of claim 1, wherein one or more said plurality of protrusions extend upwards from said upper surface of said base to below a height of said one or more walls, or wherein one or more said plurality of protrusions extend upwards from said upper surface of said base to a height of said one or more walls, or wherein one or more said plurality of protrusions extend upwards from said upper surface of said base to above a height of said walls, or any combination thereof.

3. The elastic ice mold of claim 1, wherein said compartment is a single undivided compartment.

4. The elastic ice mold of claim 1, wherein said compartment is divided into one or more compartments by a dividing wall or multiple dividing walls of unitary construction.

5. The elastic ice mold of claim 1, wherein said plurality of protrusions have a cylindrical, rectangular, square, or cone shape, or any shape consistent with the shape of a test tube, or any combination of said shapes thereof.

6. The elastic ice mold of claim 5, wherein said plurality of protrusions have a shape of a cylinder, and said cylindrical protrusions have a diameter consistent with a diameter of a test tube.

7. The elastic ice mold of claim 1, wherein elastic material is any elastic material suitable for placement into an environment capable of freezing water, and wherein said elastic material retains elasticity below a temperature of negative 70° C.

8. A method of making a test tube rack out of ice, comprising the steps of:

obtaining a mold of unitary construction, wherein said mold has a compartment appropriately shaped to make a test tube rack out of a frozen liquid, filling said compartment with liquid,

placing said mold into a freezing environment at a temperature at or below the freezing point of water,

waiting for said liquid to freeze to a solid state,

removing said mold from said freezing environment,

removing said frozen liquid of a shape of a test tube rack from the mold.

\* \* \* \* \*