

Aug. 8, 1961

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2,995,309

AERATOR

Filed June 20, 1958

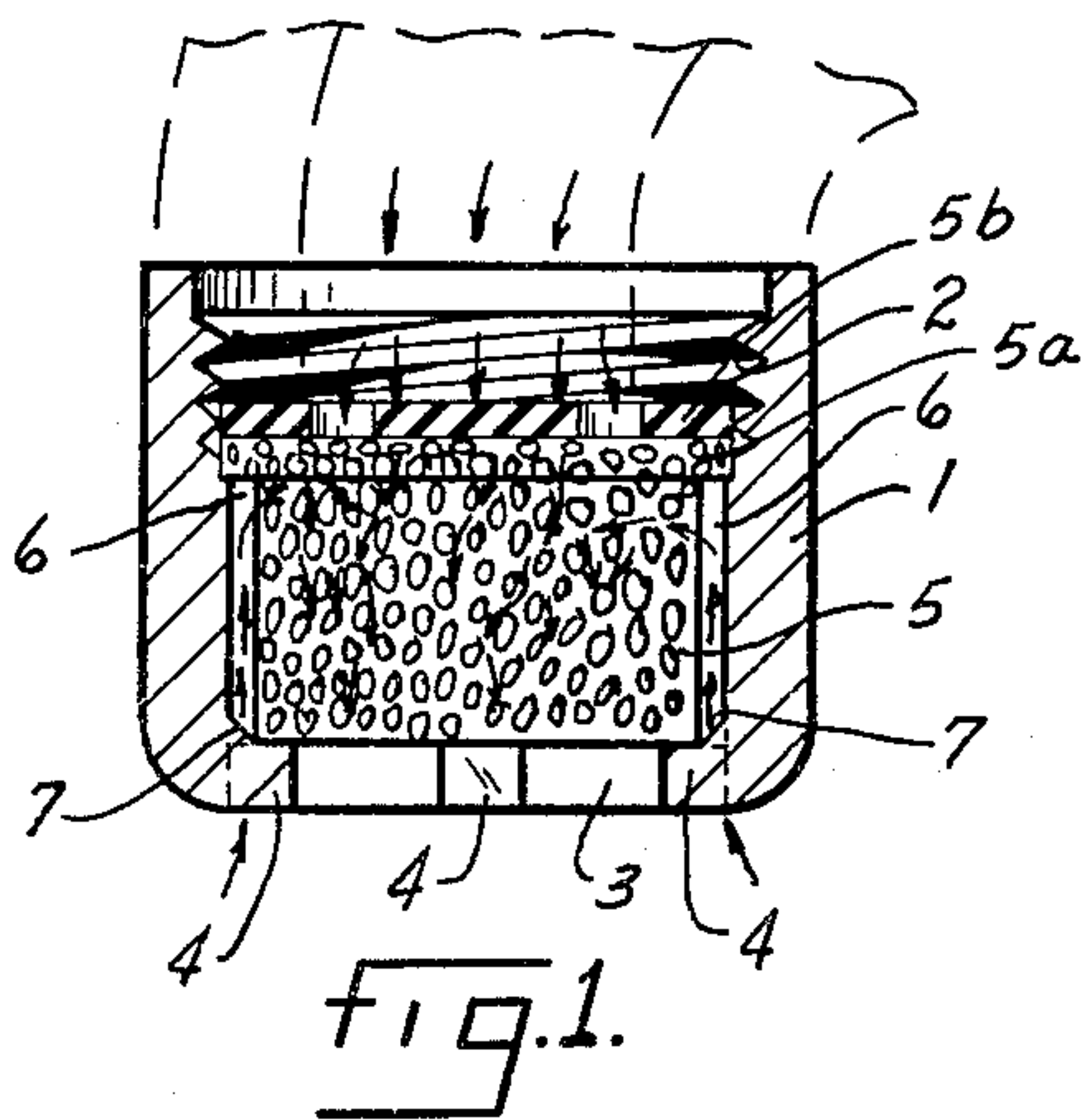


fig. 3.

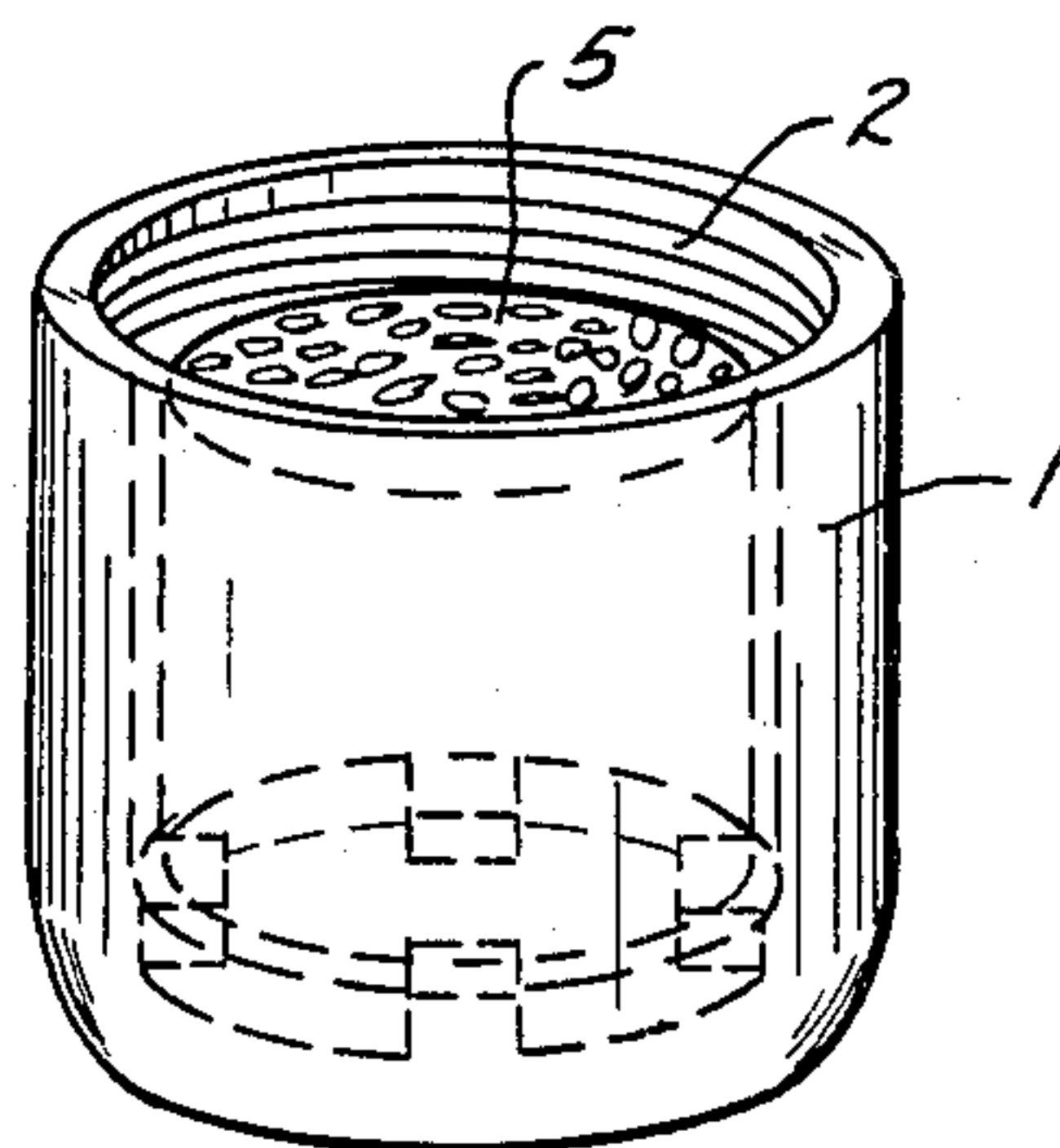
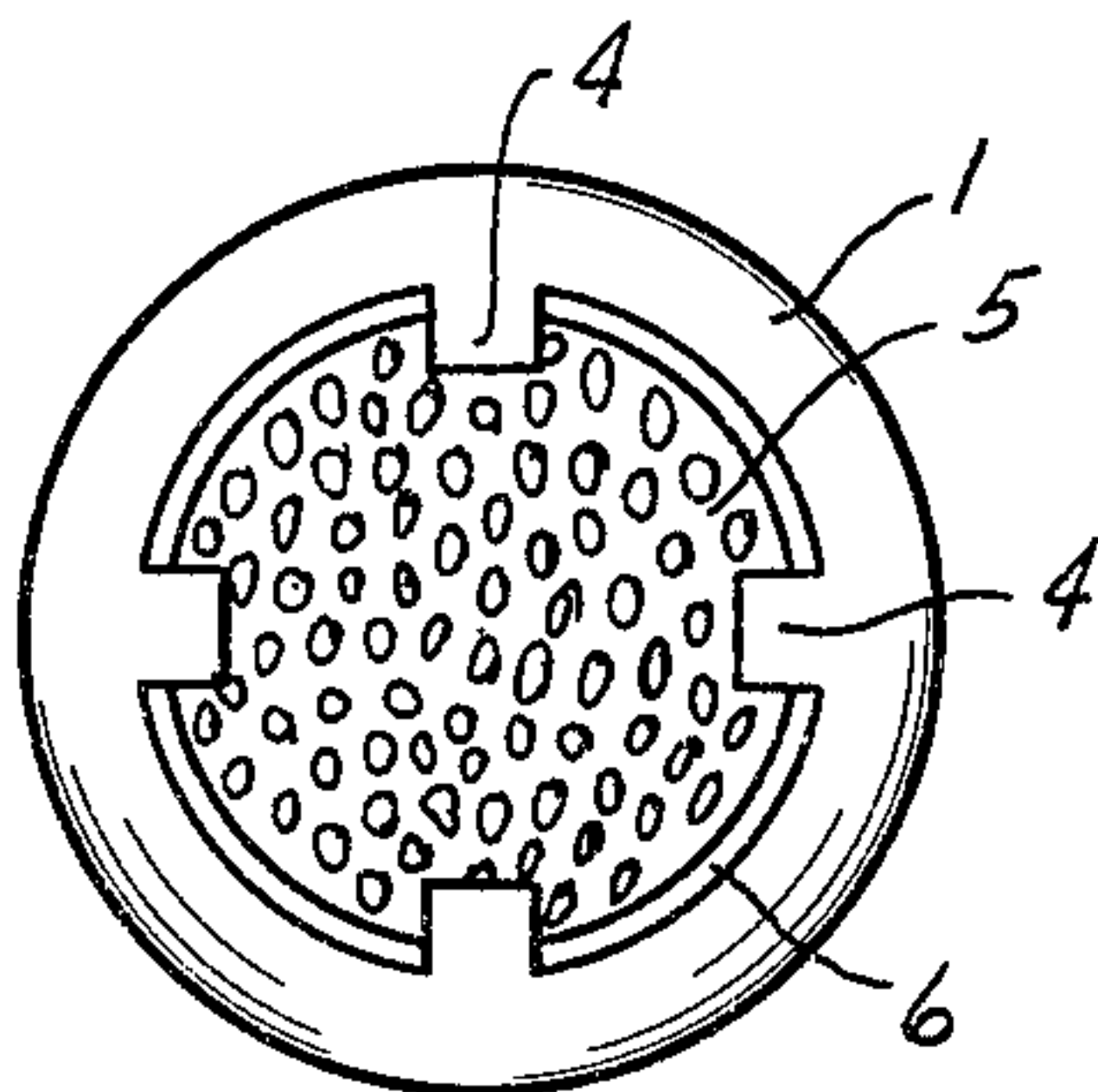
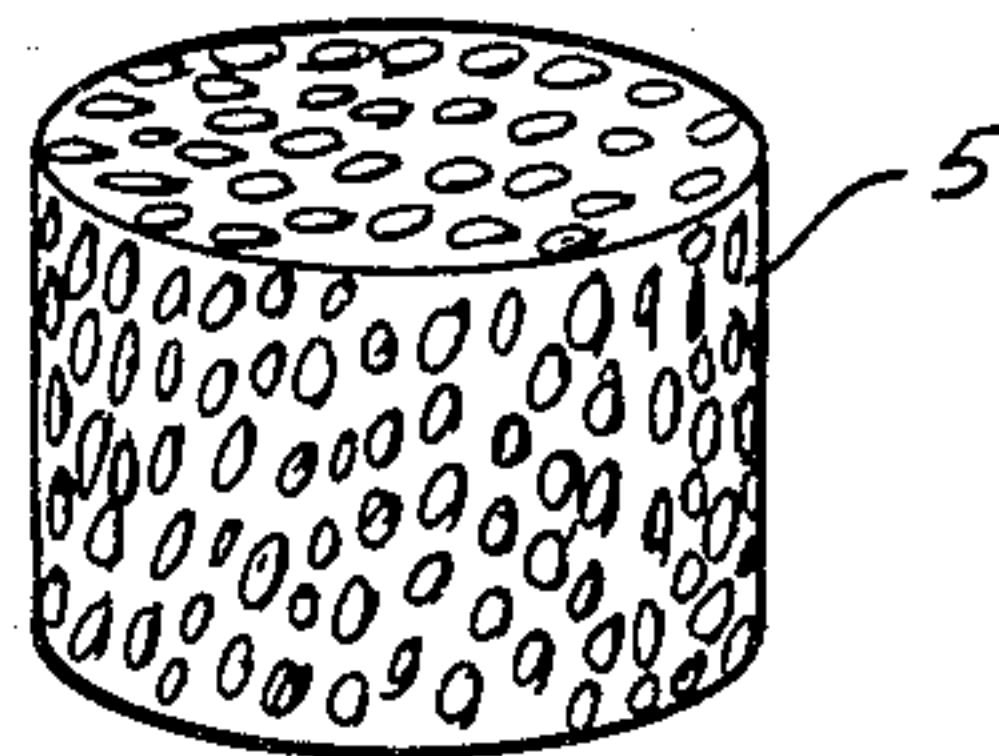


fig. 4.

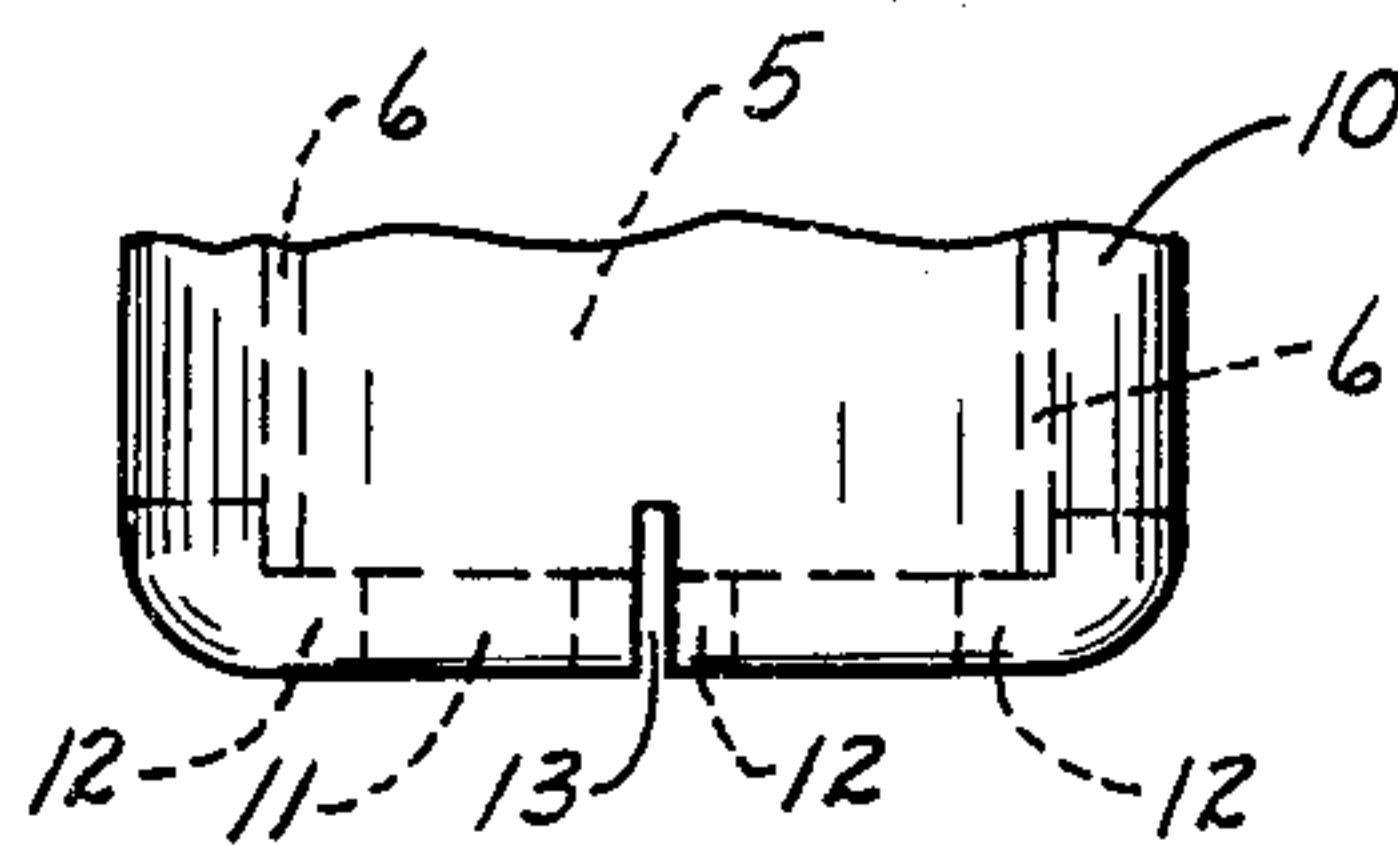
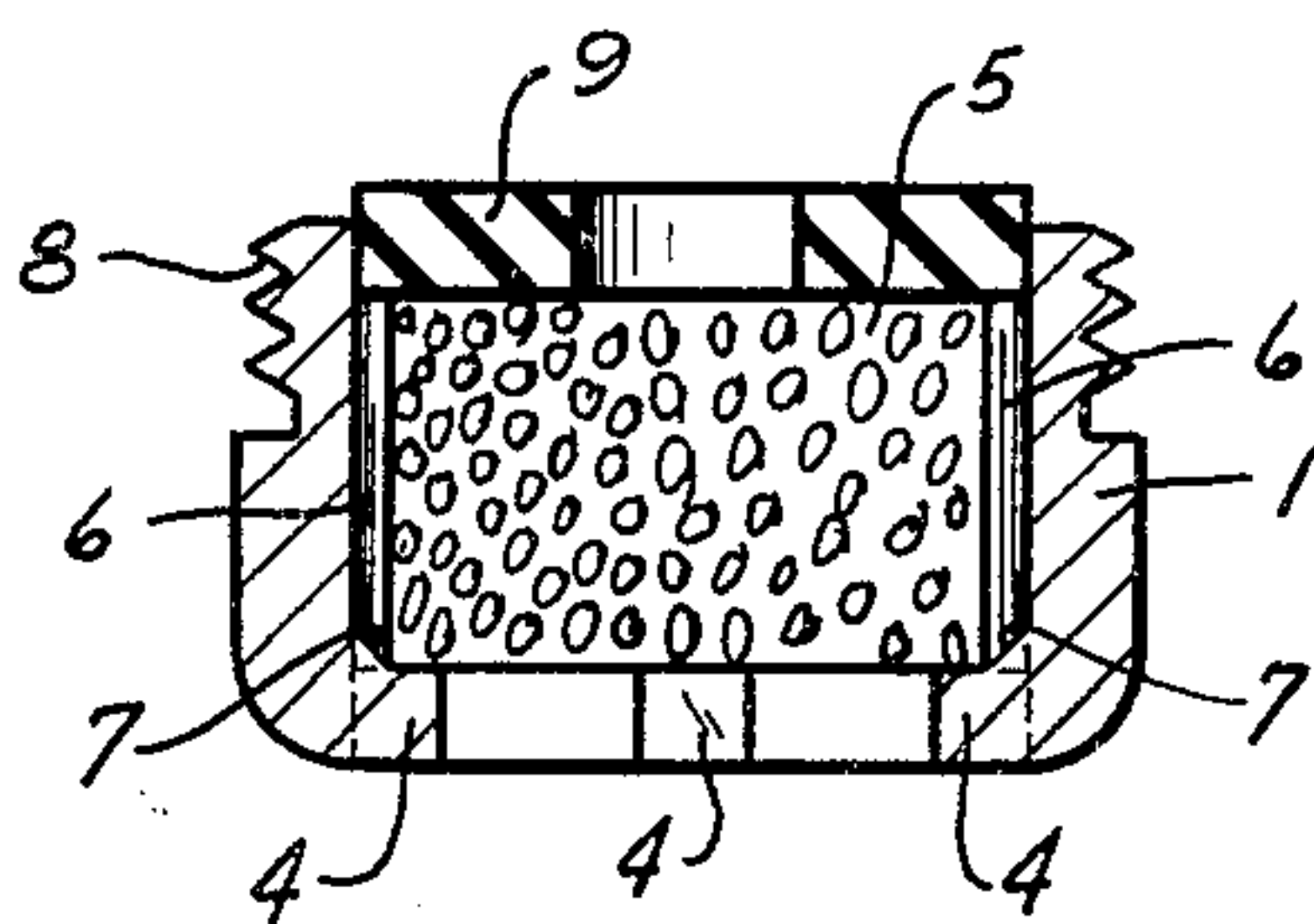
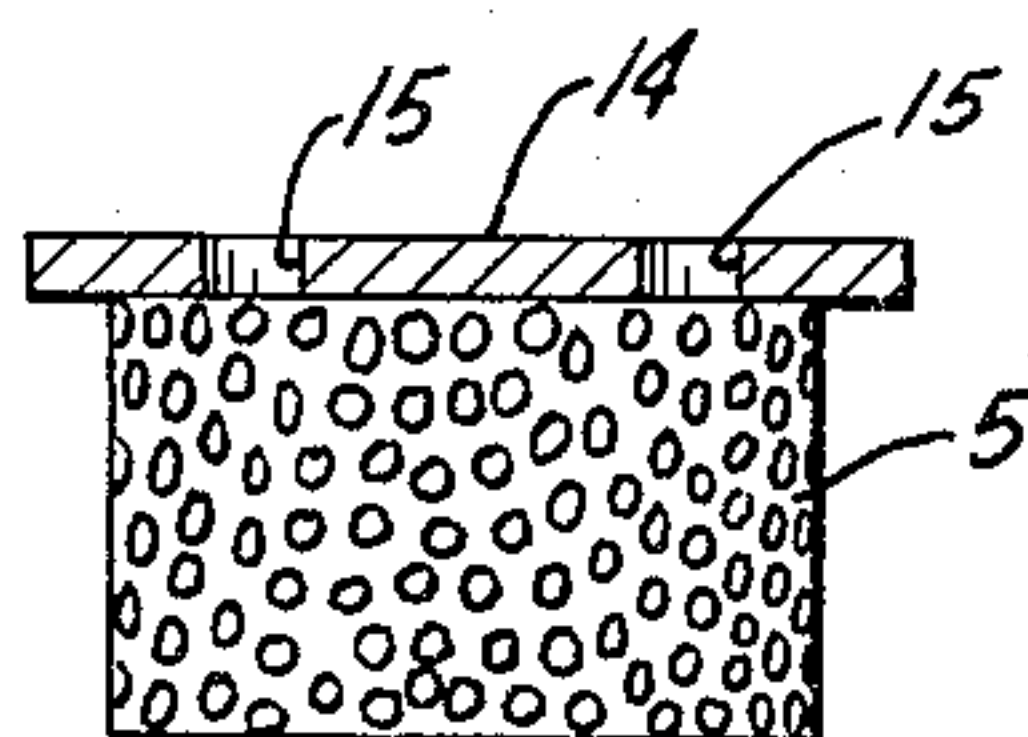


fig. 6.

fig. 5.

fig. 7.



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2,995,309
AERATOR

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Filed June 20, 1958, Ser. No. 743,367

4 Claims. (Cl. 239-432)

This invention relates to an aerator of a type adapted to be associated with a water faucet, or other liquid faucet, and arranged to draw air into the aerator or otherwise to mix the air with a stream of water flowing from a faucet so that the water stream is broken up and mixed and intermingled with air. It has for one object to provide an aerator arranged to accomplish the purpose indicated without the necessity of any external openings other than those through which the stream of water is discharged.

Another object is to provide an aerator so arranged that foreign matter will not enter the faucet or the aerator or the channel or passage through which the stream of water issuing from the faucet is finally discharged.

Other objects will appear from time to time during the course of the specification and claims.

The invention is illustrated more or less diagrammatically in the accompanying drawings wherein:

FIG. 1 is a vertical section through one form of the device of the invention;

FIG. 2 is a bottom view of the device of FIG. 1;

FIG. 3 is an elevation of the aerating core of the device of FIGS. 1 and 2;

FIG. 4 is a perspective view of the device of FIGS. 1 and 2;

FIG. 5 is a vertical section showing a modified form;

FIG. 6 is a partial side elevation showing a further modification; and

FIG. 7 is a partial section showing a modified form of porous member.

Like parts are indicated by like numerals throughout the specification and drawings.

The device generally comprises a shell or hollow housing within which is arranged a porous member through which water may pass, and means for maintaining the porous member out of contact, in part at least, with the inner surface of the shell. In the particular forms shown in FIGS. 1-4, inclusive, 1 is a shell. It is hollow, as indicated, and may be interiorly threaded as at 2. It is provided with an opening 3 in its bottom or downstream end and a plurality of inwardly directed fingers 4 are formed as a part of the shell or attached to the shell.

5 is a porous member which may be formed of synthetic materials, such as now are currently made in the form of synthetic sponges. Air passages or spaces, or air bubbles are formed within such spongelike masses when they are manufactured. Such spongelike members may be made of many different plastics or synthetic materials and they may or may not be flexible or elastic. For the purposes of the present invention they might be compressible and elastic, or they might be substantially rigid, and it is sufficient for the purposes of the present invention that such material, when made in the form shown in the drawings, shall constitute a mass within there is a multiplicity of voids or passages. It is also, of course, requisite that the material shall be insoluble in the water or other fluid which will pass through the aerator. The member 5 may be flanged as at 5a and bonded to a disk 5b which has one or more perforations.

In the several forms of the invention the member 5 is supported on the fingerlike parts 4 within the housing shell and is spaced away from the shell throughout all or the major part of its circumference. As shown, a space or clearance 6 is thus formed about the member 5 and

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between it and the inner face of the wall of the shell 1. In this manner an annular passage of sleeve-like shape is formed between the member 5 and the shell. This is a freely open passage through which air may enter, rising upwardly in an upstream direction.

In order to position the member 5 and to provide the clearance shown, portions 7 may be formed in the shell and they may conveniently be formed in line with the fingers 4. They are shown in FIGS. 1 and 5. Other means may be used to space the member 5 and to preserve the clearance between it and the shell. The invention is not limited to any particular spacing means. For some purposes the spacing means might be omitted entirely. If it were omitted the member 5 might contact the inner surface of the shell at one point or area. Because its diameter is less than that of the external diameter of the shell a substantial clearance would remain between it and the shell about the major part of its circumference. Clearance could also be provided between the shell and the member 5 by giving the member 5 a shape of angular cross section, or otherwise shaping it to provide upstream clearance spaces between it and the shell.

The form of FIG. 5 is substantially the same as that shown in the earlier figures except that the shell 1 is externally threaded as at 8. The other parts of the shell of FIG. 5 are the same as those of FIG. 1 and the same reference numerals are applied to them.

In the form of FIG. 5 a perforated disk 9 is positioned within the shell and on top of the member 5. As shown, it is indicated as being made of rubber or equivalent material. It might also be made of rigid material, such as metal, and the invention is not limited in this respect to the formation of the member 9 of any particular material. Where present the member 9 obviously restricts a portion of the upper surface of the member 5 and thus directs the flow of liquid initially toward and through a single zone of the member 5 and prevents the initial movement of liquid to the outer zones of the member 5.

As shown in FIG. 6, the shell is substantially the same as shown in earlier forms. There is thus a shell 10 with a generally open bottom 11 and a plurality of fingerlike members 12 extending inwardly. The members 12 are thus the equivalent of the members 4 in the earlier figures.

The form of FIG. 6 differs from that of the earlier figures by the addition of one or more slits 13. These may be formed toward the lower portion of the sleeve 10 and may cut through the fingerlike portions 12 or may be formed intermediate the members 12. One or more such cuts 13 may be formed.

In the modification of FIG. 7 the porous member 5 is essentially the same as that shown in the other figures. It is, however, secured to a generally rigid platelike member 14 which has one or more perforations 15 formed through it.

One purpose of the platelike members 5b, 9 and 14 is to provide means for supporting the porous member. The porous member may be wholly or partially supported on the fingerlike parts 4, however if the porous member is flexible or compressible, it may be convenient to support it otherwise. Thus, it may be supported by one form or another of the several platelike members 5b, 9 and 14. These may be of rubber, metal, a combination of them, or of other materials. They are, however, sufficiently rigid to support the porous member and to prevent substantial deformation. In the form of FIG. 1 the porous member 5 is flanged at 5a and the flange itself is supported upon a shoulder formed in the shell 1. The porous member is also, in that case, to some degree supported by the fingers 4.

Where present the platelike member serves as a

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gasket and abuts the faucet or nozzle upon which the aerator is positioned.

In the forms shown in FIGS. 3 and 4 there is present neither the flanged portion 5a nor any platelike member. For some purposes a porous member of this sort will be adequate and will be self-sustaining without the necessity of the platelike members above described.

The porous member may be formed of any suitable material. It may be of plastic; it may be rigid or flexible; it may be of metal, ceramic material, or a combination of materials. The invention is not limited to any particular porous member.

Although an operative form of the device has been shown, the invention is not limited to the particular details shown. Many changes may be made in the form, shape and arrangement of parts without departing from the spirit of the invention.

The use and operation of the invention are as follows:

The device is intended to be placed on the end of a faucet or spout so that the liquid emerging is discharged through the aerator and air is drawn into the emerging stream of liquid so that it is made bubbly and does not emerge as a solid, hard stream but tends to emerge as a bubbly, soft stream and thus violent splashing and other undesired results are avoided. The invention is not limited to the particular type of faucet or spout but may be applied anywhere that such a device is desired. A spout is suggested in dotted lines in FIG. 1. The aerator, when used, will be the last fixture on the downstream end of the line through which the liquid passes.

As shown in FIG. 1, the aerator has been mounted upon a faucet and water running through the faucet follows the course indicated by the arrows along the upper part of the figure. The water comes to the sponge-like construction 5 and is broken up and passes through the voids, bubbles or open spaces in the member 5. In doing so it creates an injector action and air is drawn in from the outside. It passes along the annular space 6 between the member 5 and the inner face of the shell 1. The air cannot, of course, go all the way up into the faucet but is drawn in and then emerges with the liquid and passes out again in the form of bubbles. This action takes place continuously as long as liquid is discharged from the faucet. Arrows are drawn to indicate the upward course of the air through the space 6, and curved and inclined arrows are also drawn to indicate the movement of the air into the member 5 generally through the side walls of the member. The air thus mingles with the water and bubbles of air are entrained with the water moving through the member 5 and they are discharged together through the opening at the bottom of the aerator housing 1. Experience has shown that to some degree the air will be drawn into the generally peripheral areas of the member 5 even though the clearance 6 is missing. While the construction in which the clearance or space 6 is provided appears to be the most satisfactory, it is not essential and the device operates as satisfactorily even though there is no clearance and even though the member 5 fits generally snugly within the housing 1.

The operation of the form of FIG. 5 differs slightly from the operation of the earlier figures because the member 9 which overlies a part of the upper surface of the member 5 is substantially imperforate and hence acts as a diverter to cause the descending liquid to move to the member 5 only through the central perforation in the member 9. Thus the member 9 acts as a diverter or baffle to keep descending liquid from the space 6. Even though the space 6 were omitted, the peripheral zones of the member 5 are shielded from the descending liquid by the member 9 and air is drawn inwardly and upwardly by the descending action of the water. The member 9, as indicated, may be of rubber or of metal, or other suitable material. The thickness or vertical height of the member 5 may be varied. In some

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cases it may be quite thin. In others it may be relatively thick, as shown.

In the form of FIG. 6 the shell or housing 1 is modified by the provision of the slots, cuts or openings 13. They extend, when present, above the upper faces of the fingers 4 and thus they serve as air inlets through which air may move directly to the member 5. This action is in addition to the movement of air through the space 6 upwardly through the peripheral zone of the member 5. The slots or cuts 13 are relatively self-cleaning because they are open from the bottom upwardly and descending water will flow through them to some degree from time to time to wash them clean and to prevent foreign matter from remaining in them.

In general, in the several forms of the invention the construction is such that when water or other liquid flows through the aerator, zones of low pressure are created within the aerator and particularly, although not solely, within the porous member. Since air from the outside has access to these zones of low pressure, it will be drawn into them as the water flows through. Being drawn into the zones of low pressure as the water flows through the air will mix with the water and this mixing will cause the aeration desired. In the form of FIG. 6, in which there are cuts or slots 13, some of the air may enter through the slots and the air may also enter through the open end of the shell 1.

I claim:

1. In combination in an aerator, a hollow housing having an open top and bottom, a unitary, self-sustaining, porous member formed to include a plurality of intercommunicating voids, said member being positioned in the housing, means supporting said member within the housing, and a member positioned upstream of said porous member and supported within the housing, said last named member being positioned upon said porous member and fitting, at its periphery, tightly within the housing and being water impervious in a zone about its periphery and provided with a water passage away from its periphery, said unitary, porous member being positioned within and spaced from said housing to provide an air inlet passage between it and said housing whereby said unitary, porous member defines a mixing zone for air and water.

2. The structure of claim 1 further characterized by inwardly directed supporting means adjacent the bottom of said housing for supporting said unitary, porous member.

3. In combination in an aerator, a hollow housing having an open top and bottom and a single unitary, self-sustaining, porous member positioned within said housing and spaced away from the inner surface of said housing to provide an annular passage between said housing and the exterior of said porous member, means within said housing for supporting said porous member, and a member extending fully across said housing and sealing against the inner surface thereof, said member being positioned above said porous member on the upstream side thereof, said last mentioned member being water impervious adjacent its periphery and provided with a water passage positioned inwardly away from its periphery, said self-sustaining, porous member comprising a mass of synthetic spongelike material including a plurality of intercommunicating voids.

4. In combination in an aerator, a hollow housing having an open bottom and top and a shoulder formed therein intermediate its ends, a unitary, self-sustaining, porous member formed of spongelike material and a water impervious member secured to said porous member and positioned upon said shoulder and forming a peripheral seal with the housing, said water impervious member being provided inwardly away from its periphery with a water passage, said porous member including a plurality of intercommunicating voids and being positioned within said housing and spaced therefrom to pro-

vide a generally annular air space between its outer surface and the inner surface of said housing.

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