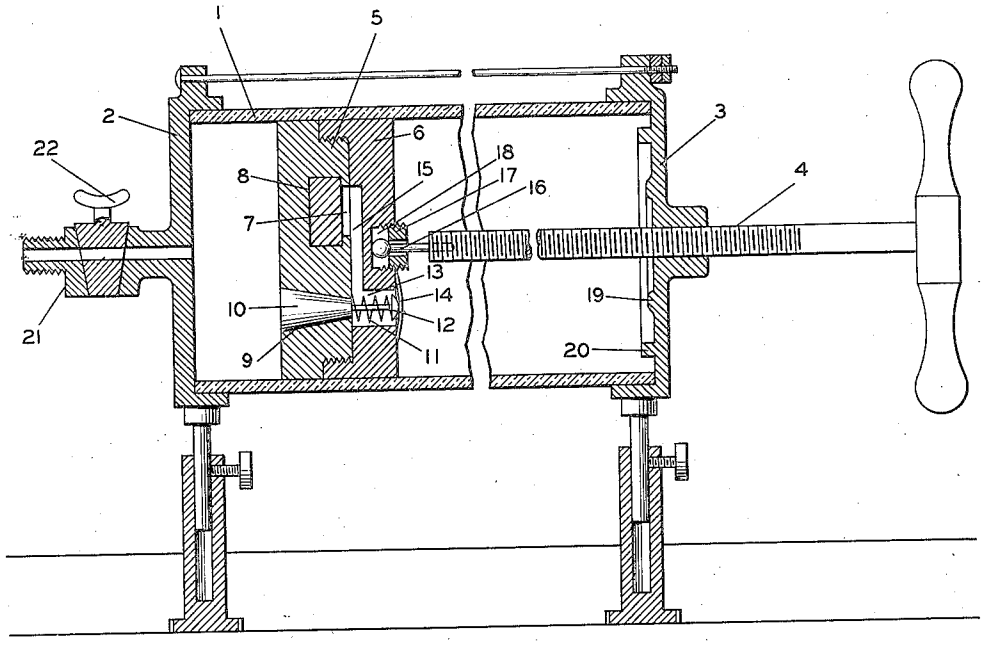
Oct. 6, 1936. E. ROSENBERG ET AL 2,056,370

DEVICE FOR RADIOACTIVE IMPREGNATION OF MATERIALS

Filed Feb. 28, 1936



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Patented Oct. 6, 1936 2,056,370

UNITED STATES PATENT OFFICE

2,056,370

DEVICE FOR RADIOACTIVE IMPREGNATION OF MATERIALS

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Application February 28, 1936, Serial No. 66,250
In Germany January 15, 1935

7 Claims. (Cl. 167—51)

This invention relates to impregnation with radioactive material and more particularly to impregnation with radium emanation.

In the impregnation of materials with radioactive preparations, great care must be taken not only to prevent loss or leakage of the preparation, but also to control just the right quantity of preparation to be used in each impregnation. This is particularly true where the preparation includes radium emanation which is in the nature of a gas. Accordingly it is one of the principal objects of this invention to provide a device of relatively simple construction which is capable of effecting impregnation of materials with radium emanation in accurately controllable amounts and without danger of leakage or loss of the emanation.

Another object of the invention is to provide a device whereby materials may be impregnated with radium emanation under pressure and in an atmosphere consisting substantially entirely of the emanation itself.

A feature of the invention relates to a device for impregnating with radium emanation employing a closed chamber containing the radium or other source of radium emanation, in conjunction with means within the chamber but controllable from without the chamber, for releasing the emanation into contact with the material to be impregnated within the chamber.

Another feature relates to a device for impregnating with radium emanation employing a gas-tight chamber having on the interior a movable piston for creating a vacuum within the chamber together with means for mounting the radium or other source of radium emanation within the chamber in such a manner that the release of the emanation can be controlled by the movement of the piston.

Another feature relates to a device for impregnation with radium emanation employing a gas-tight chamber containing the radium or other source of radium emanation, in conjunction with an improved valve arrangement and a piston for creating a vacuum within the chamber, for admitting a predetermined quantity of emanation when the desired vacuum has been attained, and for forcing the emanation into the material to be impregnated.

A further feature relates to a device which is particularly adapted to the impregnation of such materials as salves, oils, ointments and the like with radium emanation in such a manner that the emanation is forced into the body of the material in the absence of air.

A still further feature relates to the novel organization, arrangement and relative location of parts which go to make up an improved, simple and thoroughly safe device for impregnating salves, oils, ointments and the like with radium emanation.

Other features and advantages not specifically enumerated will be apparent after a consideration of the following detailed descriptions and the appended claims. While the invention will be explained in connection with one particular and typical embodiment, it will be understood that this is done merely for explanatory purposes and not by way of limitation. Accordingly in the drawing there is shown in longitudinal vertical section a device for impregnating materials with radium emanation wherein the source of the radium emanation is contained entirely within the device thus eliminating the employment of an external source of radium emanation and the usual stop-cocks for controlling the admission of the emanation. In general the device comprises a cylinder 1 of glass or other suitable material which is provided with gas tight end closure members 2 and 3, the closure members being held in place by a series of tie rods, only one of which is shown in the drawing. It will be understood of course that any well-known manner of providing a gas-tight union between the members 1, 2 and 3 may be employed. The rear end cap 3 is provided with an internally threaded boss through which passes the correspondingly threaded shaft 4 provided at its outer end with any suitable form of handle. It will be understood that any well-known manner of rendering the chamber gas-tight, while allowing the member 4 to be turned, may be employed.

Coupled to the forward end of shaft 4 is a piston assembly comprising two members 5 and 6 in threaded engagement with each other as shown in the drawing. The member 5 is provided with a recess 7 in which is mounted a quantity of a radioactive material 8 in the form of a radium salt or other radioactive material which is capable of forming radium emanation spontaneously. Member 5 is also provided with a conical valve opening 9 in which is seated a corresponding conical valve plunger 10. The valve is normally maintained closed by means of a spring which abuts at one end against member 5 and at the other end against a button 12 carried by the plunger 10. It will be noted that the member 6 is provided with a passage 13 to receive the spring 11 and button 12, this window being closed by a metal disc or membrane 14 fastened

to the outer face of member 6 in any suitable manner. The inner face of member 6 is provided with a channel in communication with recess 7 and also with the valve opening 9.

While the shaft 4 may be coupled to the piston in any well-known manner preferably the said shaft is provided with a protruding pin 16 carrying a ball 17 at its forward end, this ball being seated in a corresponding internally threaded recess 17 in member 6 and fastened by means of a threaded nut 18. The end cap 3 is provided with a circular flange or ring 19 of such a diameter that when the piston is moved to its extreme left-hand position, the disc 14 is engaged thereby and flexed so as to push the plunger 10 to the left, thus opening the valve and allowing the radium emanation to flow into the passage 13. Preferably another circular flange or ring 20 is provided this flange being of a greater depth than flange 19 and being adapted to engage the outer face of member 6 to limit the extent of opening movement of member 10 thus preventing a possible rupture of membrane 14. For the purpose of admitting the material to be impregnated into the passage 13 there is provided a nozzle 21 which is provided with a suitable stop-cock 22.

The manner of using the device is along the following lines. Assuming the stop-cock 22 is closed and the piston is in its forward position, that is, adjacent the wall 2, then if the shaft 4 is turned to move the piston rearwardly, a vacuum is produced in the passage 13 in front of the piston. It will be noted that the valve spring 11 is sufficiently strong that it prevents the valve plunger 10 being moved prematurely to open position as the piston is moving rearwardly. When the piston is moved to its rearmost position, that is, when the membrane 14 engages ring 20, the valve spring 11 is overcome, allowing the plunger 10 to move to open the valve. At this time the radium emanation which is generated by the preparation 8 is sucked into the passage 13 in front of the piston.

After the radium emanation has thus flowed into the space in front of the piston, the shaft 4 is turned to move the piston forwardly whereupon the valve 10 closes under control of spring 11 so that a new quantity of the radium emanation may be generated and retained on the interior of the piston. The piston is then moved forwardly to a point where size of the passage 13 in front of the piston is about of the order of the volume of salve, ointment or other material that is to be admitted for impregnation. The liquid salve which is supplied to nozzle 21 is sucked into the space 13 when the stop-cock 22 is opened and mixes with the radium emanation in said space. Upon further pressure by the piston the emanation which remains outside the salve can be pressed into the salve.

With the foregoing arrangement, one can not only impregnate liquid salves or ointments with the radium emanation, but also any other desired liquids. Likewise it is also possible, to charge the device through the nozzle 21 with a gas instead of a liquid and the gas will mix with the radium emanation. Furthermore one can also impregnate solid materials such as carbon, paraffin and the like, by threading onto the nozzle 21 a suitable vessel containing the solid material. Thus the vessel with the solid matter to be impregnated therein, is threaded on to the nozzle 21. By moving the piston rearwardly, a vacuum is created in the vessel. Upon further backward movement of the piston, the admission valve 10 is opened as described above, and the radium emanation is admitted by suction in front of the piston and also to the vessel containing the material to be impregnated. Then when the piston is moved forwardly, the radium emanation is forced into the solid material within the vessel.

While one specific embodiment of the invention has been described herein, various changes and modifications may be made therein without departing from the spirit and scope of the invention.

What is claimed is:

1. In a device of the character described, the combination of a gas-tight enclosing chamber, an inlet nozzle for said chamber, a gas-tight valve for said nozzle, a piston movable in said chamber, means external to said chamber for reciprocating said piston to create a suction in front of said piston and through the nozzle, said piston arranged to carry a quantity of radioactive material for generating radium emanation, a valve normally closing off communication between said material and the interior of said chamber, and means automatically responsive to movement of said piston to a predetermined position for opening said valve to allow radium emanation to flow into said chamber.

2. In a device of the character described, the combination of a gas-tight enclosing chamber, an inlet nozzle for said chamber, a gas-tight valve for said nozzle, a piston within said chamber and movable to create a suction in front of said piston and through said nozzle, said piston having means to carry a quantity of radium emanation, a valve movable with said piston and normally cutting off communication between said material and the interior of said chamber, and means within the chamber arranged to engage said valve to open the same when said piston reaches a predetermined point in its movement.

3. In a device of the character described, the combination of a gas-tight cylinder, an inlet nozzle for said cylinder, a gas-tight valve for said nozzle, a piston movable within said cylinder to create a suction in front of said cylinder and through said nozzle, a recess within said cylinder to receive a quantity of material for producing radium emanation, a passage between said recess and the interior of said chamber, a valve controlling said passage, a spring normally pressing said valve to close said passage, a valve stem for said valve and projecting from said piston, and an annular flange on the inner face of the end wall of the cylinder positioned to engage said valve stem to open said passage.

4. In a device of the character described, the combination of a gas-tight cylinder, an inlet nozzle for said cylinder, a gas-tight valve for said nozzle, a piston movable within said cylinder to create a suction in front of said piston and through said nozzle, a recess within said cylinder to receive a quantity of material for producing radium emanation, a passage between said recess and the interior of said cylinder, a valve controlling said passage, a valve stem extending through an opening in said piston, a flexible metal disc closing said opening, and a projection on the end wall of the cylinder positioned to engage said disc to operate said valve to open said passage.

5. In a device for impregnating materials with radium emanation, the combination of an enclosing chamber, a coupling nozzle at one end of the chamber through which said materials are

passed into the chamber, a gas-tight valve for said nozzle, a piston within said chamber and arranged to carry a quantity of radioactive material for generating radium emanation, means operable from the exterior of said chamber to move the piston rearwardly to create at least a partial vacuum in front of the piston, and a valve within said chamber and controlled by the piston to allow the radium emanation to be sucked into the chamber only when the piston is in its rearmost position.

6. In a device for impregnating materials with radium emanation, the combination of a glass cylinder having end caps united to the cylinder in a gas-tight manner, an inlet nozzle communicating with said cylinder, a valve for said nozzle, a piston movable within the cylinder said piston arranged to contain a quantity of radioactive material for generating radium emanation, means to move said piston to create a suction in front of said piston and through said nozzle, a valve for controlling the admission of the radium emanation into the cylinder, a pair of annular flanges on the inner face of one end cap, one of said flanges cooperating with the valve to open the same, and the other acting as a stop to limit the opening movement of the valve.

7. A device according to claim 6 in which the valve is provided with a stem extending through an opening in the piston which opening is closed in a gas-tight manner by a flexible disc, said disc engaging said one of said flanges to move the valve to open position, and the other flange acting to limit the flexure of the disc.

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