United States Patent [19]

Hulit et al.

[11] **3,801,818**

[45] **Apr. 2, 1974**

[54] **RADIOACTIVE GENERATOR WITH PERMEABLE CLOSURE**

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[73] Assignee: **E. R. Squibb & Sons, Inc.**, Princeton, N.J.

[22] Filed: **Oct. 24, 1972**

[21] Appl. No.: **300,092**

[52] **U.S. Cl.** **250/496**, 128/1.1

[51] **Int. Cl.** **G21h 5/00**

[58] **Field of Search** ..... 250/106 R, 106 T; 23/267 A, 259; 128/1.1, 1.2

[56] **References Cited**

UNITED STATES PATENTS

3,156,532	11/1964	Doering	250/106 T
3,133,196	5/1964	Rochlin	136/89
3,369,121	2/1968	Bruno et al.	250/108 R

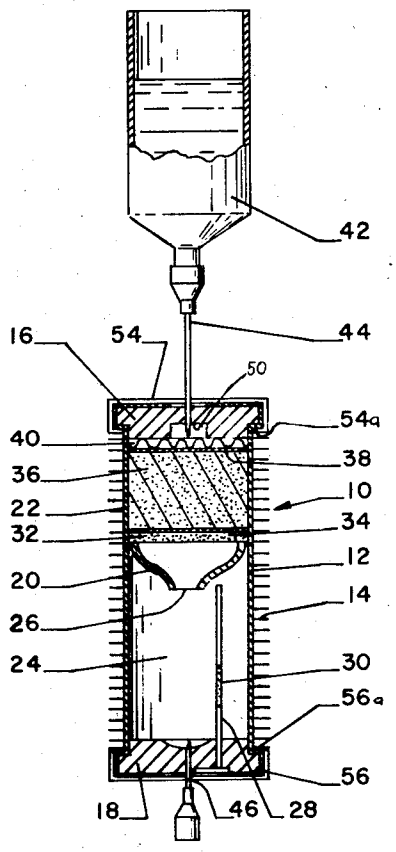
Primary Examiner—Harold A. Dixon

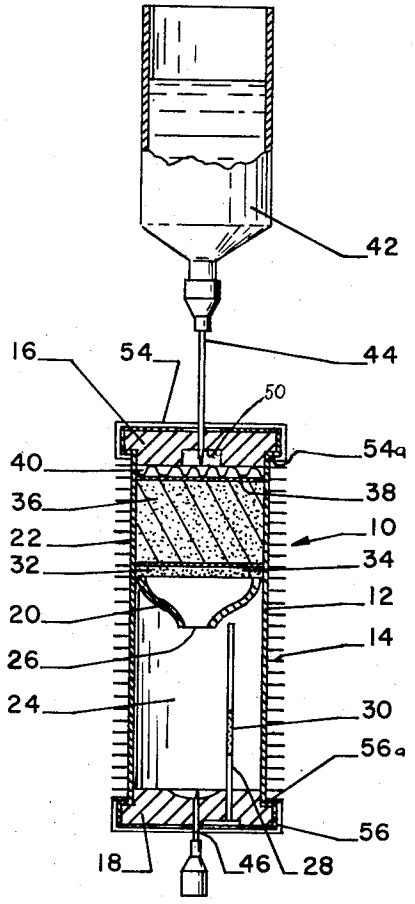
Attorney, Agent, or Firm—Lawrence S. Levinson; Merle J. Smith; John J. Archer

[57] **ABSTRACT**

A radioactive generator has silicone or neoprene closures to vent the gases released during the generation of radioactive eluate. The generator comprises a hollow, generally cylindrical body in which a column of radioactive material is contained, and the ends of which are closed by silicone or neoprene stoppers fabricated from material such as methylvinylpolysiloxane or polychloroprene. The generator can be subjected to sterilizing procedures such as autoclaving and retain its sterile condition, while at the same time gases generated internally may be vented through the closures.

6 Claims, 2 Drawing Figures




42
16
54
44
50
54a
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56a
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FIG. 1

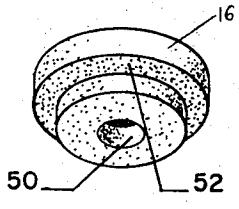
16
50
52

FIG. 2

RADIOACTIVE GENERATOR WITH PERMEABLE CLOSURE

BACKGROUND OF THE INVENTION

The present invention relates to a generator for the production of radioactive eluate, and more specifically a generator having silicone or neoprene closures to permit the venting of gases internally generated.

The use of radioactive isotopes for the diagnosis and treatment of various medical problems is well-known. Generators such as that described in U. S. Pat. No. 3,369,121, Feb. 13, 1968, are widely used in the production of radioactive eluate. These generators are utilized since certain radioactive isotopes have a very short half-life and, consequently, it is necessary for the physician to prepare such isotopes as, and where, they are to be used.

An example of such an isotope is the 99m isotope technetium which is used for the localization of brain tumors. This isotope has a half-life of six hours and is obtained as the daughter product of molybdenum Mo^{99}. It is separated in the form of the pertechnetate-ion from Mo^{99}, absorbed on an alumina column, by elution with dilute hydrochloric acid or saline. At various times during autoclaving, gases may be internally generated. These gases reduce the isotope yield of the generator and, in any event, must be removed for the obtainment of eluate.

Previously, the generators were closed by pierceable rubber stoppers through which a hypodermic needle was inserted to vent the gases. This is a very time-consuming and tedious operation, and since the materials are always undergoing fairly rapid degeneration, the yield of a particular generator can be reduced. The present invention utilizes silicone or neoprene closures which are pervious to the generated gases. At the same time the silicone or neoprene closures may be subjected to any popular sterilizing technique such as autoclaving and resist the inflow of any bacteria. In summary, the silicone or neoprene stoppers are gas pervious yet maintain generator stability.

SUMMARY OF THE INVENTION

It is an object of the present invention to provide a radioactive eluate generator which maintains sterility at all times.

Another object of the present invention is the provision of a radioactive material generator having silicone or neoprene closures which permit the escape of internally generated gases and thus increase the yield of the given generator.

In accordance with the above designs a radioactive eluate generator comprises a hollow body, in which the column of radioactive material is contained. The generator is closed at its two ends by pierceable closures preferably fabricated from materials such as silicone or neoprene and specifically methylvinylpolysiloxane or polychloroprene. The stoppers are pierceable so as to admit solution for the production of the radioactive isotope. The stoppers, however, are sufficiently pervious to vent any and all gases internally generated. Furthermore, the stoppers may be subjected to any preferred sterilizing technique, such as autoclaving, and will effectively maintain sterile conditions at all times.

The above and other objects of the present invention will be apparent as the description continues and when read in conjunction with the annexed drawings.

DESCRIPTION OF THE DRAWINGS

FIG. 1 is a partially cross sectioned view of a preferred embodiment.

FIG. 2 is a perspective view of an individual closure.

DETAILED DESCRIPTION

The present invention is associated with a radioactive material generator similar to that shown and described in U. S. Pat. No. 3,369,121. Briefly, the radioactive material generator comprises a column **10** fabricated from a plastic or similar type material. The column **10** has a shell **12** and is surrounded by a plurality of integral fins **14.**

The column **10** is closed by stoppers **16, 18,** which are pervious to the passage of gas therethrough and may be made from silicone or neoprene, of which more will be described at a subsequent point. Included in column **10** is the curvilinear partition **20** which basically separates it into two parts, the upper part **22** and the lower part **24.** The partition **20** can be integral with the shell **12** or suitably attached thereto, and it tapers from section **22** toward section **24** providing a rather restricted opening **26** at the bottom thereof. The exact dimensions of the partition are unimportant, however, it has been found that it should extend a slight distance below the top of a breather tube **28** which punctures closure **18,** which breather tube permits the interior of section **24** to communicate with the atmosphere. To assure sterility, the breather tube is fitted with a suitable filter material **30** which prevents the flow of bacteria to the interior of the shell **12.**

Positioned at the upper end of the partition **20** is a disc **32,** which must be perforated, and on which rests a filter pad **34.** At the top of filter **34** is a granulated radioactive alumina **36,** and optionally, a cation exchange resin such as Dowex-50 x-8 to prevent the passage of the alumina through the column during elution. The granulated alumina **36** may be retained in place by use of a perforated disc **38** which is held in place by a retaining ring **40.**

In preparing a radioactive solution, eluent is emitted from the eluent container **42** into section **22** via the hypodermic needle **44** which pierces closure **16.** The hypodermic needle **46** withdraws the radioactive solution that has been prepared in section **22** and passed to section **24.**

As shown in FIG. **2** the closures **16, 18** are in the nature of circular plugs with a central depression **50** and a circular flange **52.** The closures are close-fittedly received within compatible openings in the top and bottom of column **10** and are maintained in place by the cover members **54, 56** which are preferably fabricated from ductile metals and which are crimped thereabout; the covers **54, 56** engage the shoulders **54*a*, 56*a*** permanently maintaining the closures **16, 18** in their respective positions in the column.

During the sterilization of the generators, particularly during autoclaving, a substantial quantity of gases are generated in the sections **22, 24.** In the past, a hypodermic needle has been inserted into top closure **16** to vent these gases. This has proved to be a rather inconvenient manner of venting the gases as well as consuming an unusual amount of time. The use of silicone, neoprene or like material, as compared to the prior use of rubber, produces a number of advantages. Silicone or neoprene is sufficiently porous to permit the escape of internally

generated gases without the use of hypodermic needles, in that, the gases merely pass through the closure body. In addition, the silicone or neoprene is easily pierced by hypodermic needles and is essentially completely self-sealing. The particular silicone chosen is preferably one of the organopolysiloxanes, notably methylvinylpolysiloxane, one of the Dow Corning Silastic brand. These closures are useful over a wider temperature range than any other rubber-like material, for instance, they retain their physical properties in a low and high temperature range of −100°F to 500°F and therefore can be autoclaved. The particular neoprene chosen is preferably polychloroprene manufactured by the Tompkins Rubber Co.

The yield of radioactive solution of any given generator is strikingly increased by the use of the silicone or neoprene closures. The radioactive materials involved, have relatively short half-lives and any time wasted venting gases results in an under utilization of the generator. The stoppers, therefore, not only permit the simple venting of the trapped gases and elimination of additional hypodermic needles, but they effectively increase the yield of a given generator.

Many changes may be made in the details of the instant invention without departing from the spirit and scope of the appended claims, which changes are intended to be embraced therewithin.

What is claimed is:

1. In a generator containing a column of sterile elutable radioactive material to be utilized for diagnosis and treatment for medical conditions, said generator of the type which comprises a hollow body closed at its top and bottom by pierceable autoclavable closures and having positioned therein and spaced from the bottom thereof a source of elutable, short-lived radioactive material, whereby a sterile eluate ready for utilization is delivered from the body, the improvement which comprises said autoclavable closures being fabricated from material which is pierceable, and gas pervious permitting the venting directly through said closures of gases formed in the generator, said closures being sufficiently dense to prevent the passage of fluid directly therethrough as well as preventing the inflow of bacteria therethrough.

2. The generator of claim **1** wherein the closures are made from silicone.

3. The generator of claim **1** wherein the closures are permanently affixed to said body to seal said body.

4. The generator of claim **3** wherein the closures are fabricated from methylvinylpolysiloxane.

5. The generator of claim **1** wherein the closures are made from neoprene.

6. The generator of claim **5** wherein the pierceable closures are fabricated from polychloroprene.

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UNITED STATES PATENT OFFICE
CERTIFICATE OF CORRECTION

Patent No. 3,801,818 Dated April 2, 1974

Inventor(s) Harry J. Hulit and Thomas V. Czaplinski

It is certified that error appears in the above-identified patent and that said Letters Patent are hereby corrected as shown below:

Under "Inventors:", "Amboy" should be --South Amboy-- and "Brunswick" should be --North Brunswick--.

Column 1, line 19, --of-- should be inserted before "technetium".

Column 1, line 22, delete the hyphen (-) following "pertechnetate".

Signed and sealed this 30th day of July 1974.

(SEAL)
Attest:

McCOY M. GIBSON, JR.
Attesting Officer

C. MARSHALL DANN
Commissioner of Patents