

[54] **GAMMA-IRRADIATION APPARATUS FOR GRANULAR MATERIALS OF BIOLOGICAL ORIGIN**

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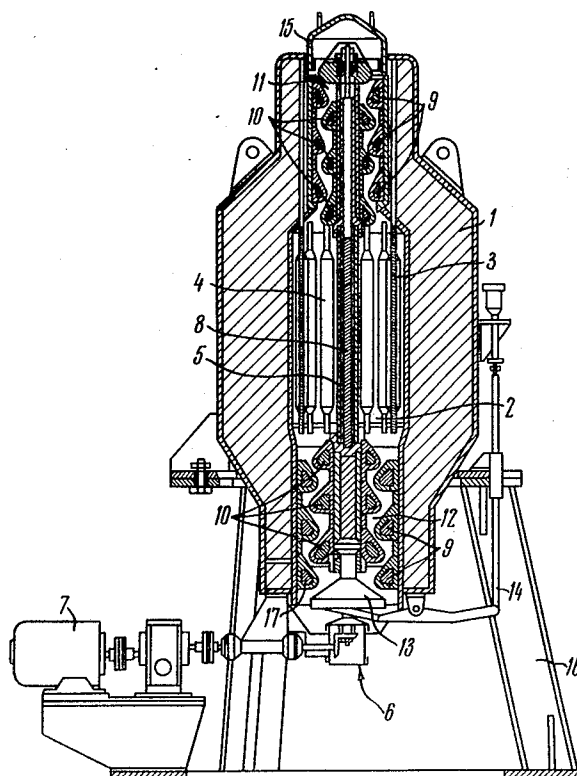
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[57] ABSTRACT

A gamma-irradiation apparatus for granular materials of biological origin, comprising an irradiator and an irradiation chamber located in a shielding enclosure, in which there is a rotating shaft arranged along the longitudinal axis of the apparatus and passing through the center of the chamber and having shielding elements which together with the annular shielding projections of said enclosure form respective inlet and outlet labyrinths.

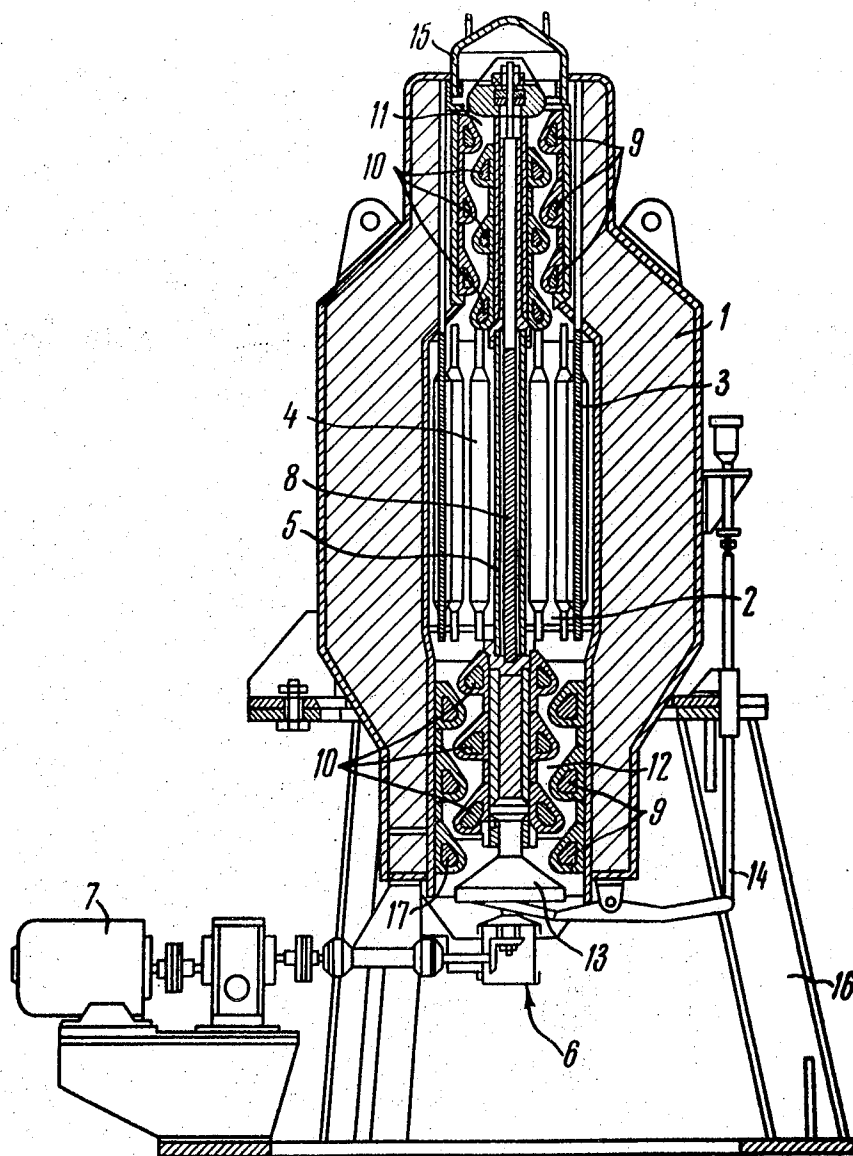
The apparatus is intended for use primarily in farming, to irradiate seeds prior to sowing.

6 Claims, 1 Drawing Figure



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3,740,557



GAMMA-IRRADIATION APPARATUS FOR GRANULAR MATERIALS OF BIOLOGICAL ORIGIN

This invention relates to radio biology, and more specifically to gamma-irradiation apparatus for granular materials of biological origin.

The apparatus is intended primarily for use in farming, to irradiate seeds prior to sowing.

There already exists a gamma-irradiation apparatus for granular materials of biological origin, comprising an irradiator with sources of ionizing radiation, and an irradiation chamber, both placed in a shielding enclosure. The shielding enclosure has an inlet opening through which a container carrying a batch of the material to be irradiated is loaded, and an outlet opening through which the container with the irradiated material is unloaded from the irradiation chamber (see USSR Inventor's Certificate No. 130261, 1959).

A disadvantage of the present apparatus is the low handling capacity because the utilization of radiation is low and also because the material is irradiated in small batches whose size is decided by the capacity of the container, and not continuously.

An object of the present invention is to provide a gamma-irradiation apparatus for granular materials of biological origin which can irradiate materials passing through the irradiation chamber in a continuous stream.

With this and other objects in view, the invention comprises an apparatus wherein, inside the shielding enclosure and along the longitudinal axis of the apparatus there is a rotating shaft passing through the center of the irradiation chamber and fitted with shielding elements at its ends, while near the inlet and outlet openings the shielding enclosure has annular shielding projections which together with the shielding elements of the shaft form respective inlet and outlet labyrinths.

It is preferable that the shaft inside the chamber be made hollow and that an additional radiation source be located inside the shaft.

According to a preferred embodiment, the invention may have the main radiation sources located inside the irradiation chamber, in which case they should have shielding jackets to prevent damage to the material being irradiated.

For control of the rate at which the material being irradiated passes through the irradiation chamber, it is preferably to fit the outlet labyrinth with a tapering damper mounted on the shaft so that it can be moved along the shaft.

It is preferable to provide a stationary damper on the shaft in the outlet labyrinth, and to provide the lower annular shielding projection on the enclosure so that it can be moved along the axis of the labyrinth and form together with the damper an annular outlet opening of the variable cross-section.

It is further preferable to make the shielding elements and the shielding projections tapering in shape.

The invention will be best understood from the following description of a preferred embodiment, when read in connection with the accompanying single FIGURE of drawing which shows a sectional view through a gamma-irradiation apparatus for granular materials of biological origin.

Referring to the drawing, there is shown a gamma-irradiation apparatus which comprises a shielding en-

closure 1 having an inlet and outlet opening. Inside the enclosure there is an irradiation chamber 2. Arranged all the way around the perimeter of the irradiation chamber 2 are radiation sources 3 fitted with shielding jackets 4 to prevent damage to the material being irradiated. Passing through the center of the chamber 2 and along its longitudinal axis is a rotatable shaft 5 carried by bearings. One end of the shaft 5 is coupled by means of bevel-gear transmission 6 to an electric motor 7 which actuates the shaft 5. Within the irradiation chamber 2, the shaft 5 has a hollow portion which holds an additional radiation source 8. Near the inlet and outlet openings, the shielding enclosure 1 has annular shielding projections 9, while the ends of the shaft 5 give support to tapering shielding elements 10 which together with the shielding projections 9 form an inlet labyrinth and an outlet labyrinth, 11 and 12, respectively. The outlet labyrinth 12 has therein a tapering damper 13 mounted on the shaft 5 so that it can be moved axially along the latter. The damper 13 is shifted axially with the aid of a lever mechanism 14. When the apparatus is inoperative, the inlet labyrinth 11 is closed by a cover 15. The entire apparatus is set up on a supporting frame 16.

In another embodiment, the damper 13 is made fast to the shaft 5. In such a case, the lower annular shielding projection 17 is provided on the enclosure 1 so that it can be moved along the axis of the outlet labyrinth 12.

The apparatus disclosed herein operates as follows.

For operation, the apparatus is set up in a vertical position, with the inlet labyrinth 11 at the top. Prior to operation, the cover 15 is removed, and a dispensing hopper is placed above the inlet labyrinth 11.

Using the lever mechanism 14, the damper 13 is set in a position determining the requisite rate of feed of the granular material (seeds) through the irradiation chamber 2. After that, the motor 7 is started, and the shaft 5 is set in rotation. Grain is loaded into the dispensing hopper by means of a suitable conveyor and is fed in a continuous stream through the inlet labyrinth 11 into the irradiation chamber 2 holding the radiation sources 3 and 8. As it passes through the chamber 2, grain is given the requisite dose of radiation and leaves the irradiation apparatus through the outlet labyrinth 12 and the annular slot formed by the damper 13 to be dumped onto, say, a belt conveyor transferring the irradiated grain into sacks.

An advantage of the gamma-irradiation apparatus disclosed herein is that it has a high handling capacity because the granular material is irradiated in a continuous stream. Provision of the inlet and outlet labyrinths solves the problem of biological shielding continuously. The use of a combination irradiator, namely, a central radiation source and a number of peripheral sources, provides for uniform irradiation of the material with a minimum number of radiation sources and specified limits of dosage.

The apparatus disclosed herein is compact and convenient to use and may be set up on a mobile support (such as a truck or a trailer), which is very important in the farm applications of the apparatus in outlying farming regions.

What is claimed is:

1. A gamma-irradiation apparatus for granular materials of biological origin, comprising: a vertically disposed elongated shielding enclosure having an inlet

opening at the upper end thereof for granular materials and an outlet opening at the lower end thereof; an irradiator including a plurality of sources of ionizing radiation, annularly disposed within said shielding enclosure; an irradiation chamber located in said shielding enclosure; a shaft carried by bearing means in said shielding enclosure and passing through the center of said irradiation chamber and along the longitudinal axis of said apparatus; shielding elements mounted on the opposite ends of said shaft; annular shielding projections respectively located near the inlet and outlet openings of said shielding enclosure, said shielding elements together with said shielding projections forming an inlet and an outlet labyrinth.

2. A gamma-irradiation apparatus, as claimed in claim 1, in which said shaft inside said irradiation chamber has a hollow portion which holds an additional radiation source.

3. A gamma-irradiation apparatus, as claimed in claim 1, in which said source of ionizing radiation are

arranged inside said irradiation chamber and have shielding jackets to prevent damage to the material being irradiated.

4. A gamma-irradiation apparatus, as claimed in claim 1, in which said outlet labyrinth has a tapering damper mounted on said shaft so as to be movable along said shaft.

5. A gamma-irradiation apparatus, as claimed in claim 1, in which said outlet labyrinth has a damper made fast to said shaft, while said annular shielding projection associated with said outlet opening in said outlet labyrinth is provided on said enclosure so that it can be shifted along the axis of the shaft, forming together with the damper an annular outlet of varying cross-section.

6. A gamma-irradiation unit, as claimed in claim 1, in which said shielding elements are made tapering in shape.

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