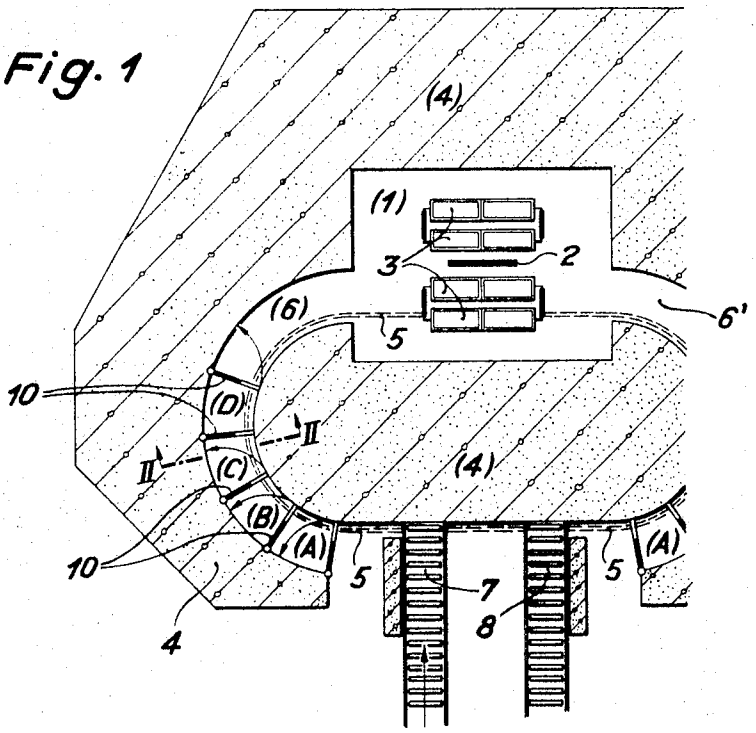
July 8, 1969 A. BRUNNER 3,454,761

IRRADIATION PLANT

Filed April 9, 1965 Sheet 1 of 2

Fig. 1



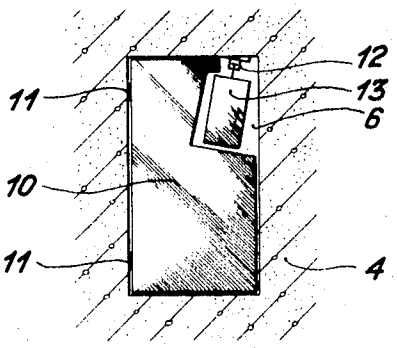


Fig. 2

Inventor:
ALFRED BRUNNER

July 8, 1969 A. BRUNNER 3,454,761

IRRADIATION PLANT

Filed April 9, 1965 Sheet 2 of 2

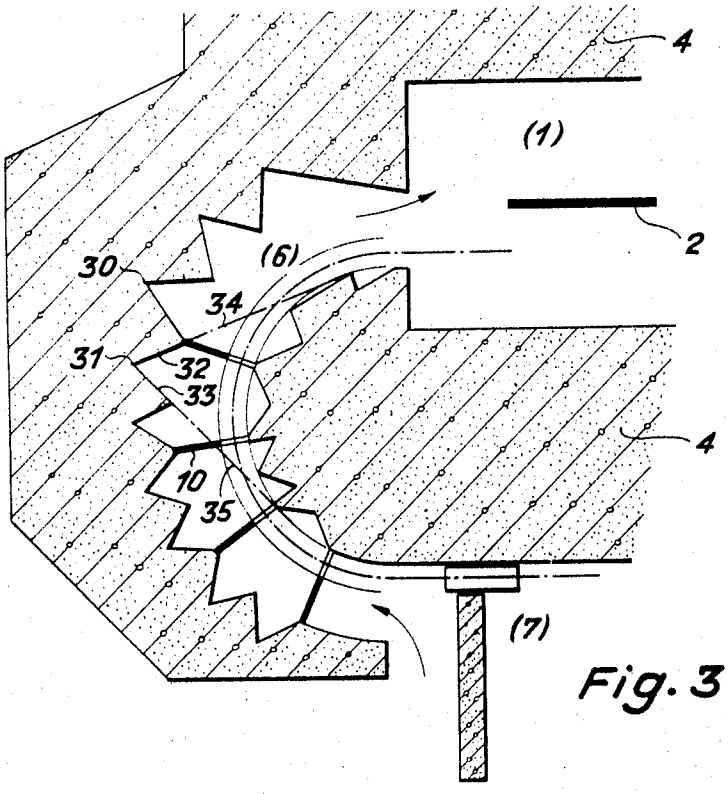


Fig. 3

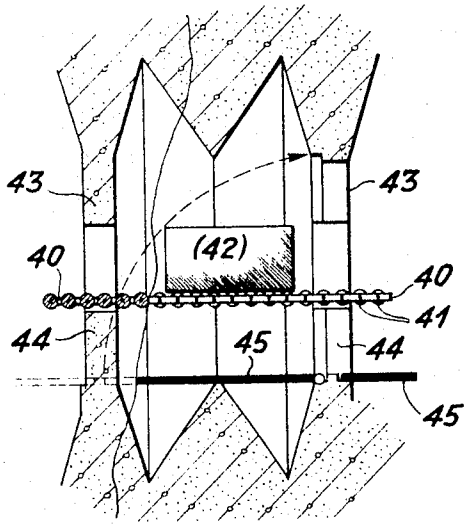


Fig. 4

Inventor:
ALFRED BRUNNER

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IRRADIATION PLANT

Alfred Brunner, Winterthur, Switzerland, assignor to Sulzer Brothers Limited, Winterthur, Switzerland, a corporation of Switzerland

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U.S. Cl. 250—52 19 Claims

ABSTRACT OF THE DISCLOSURE

The passageways of the irradiation plant are oversized to permit entry for repair work. Doors are provided with the passageways to act as shields and have recesses sized to permit conveyance of goods therethrough with a small clearance. The doors are hinged to move against the walls of the passageways to permit access through the passageways.

This invention relates to an irradiation plant comprising a chamber surrounded by thick walls and containing a source of biologically active radiation. The goods to be irradiated are transported in portions into the irradiation chamber and/or are removed therefrom through a bent passageway.

In conventional irradiation plants of the aforedescribed type the passageways are usually of smallest possible cross section and are wound several times to prevent escape of scattered radiation through the passageway. In such conventional arrangements the conveyors for transporting the portions which must be irradiated are very inaccessible and must be partly dismounted for overhaulting and repair. Angular or bent conveyor tracks cause complications increasing first cost and cost of upkeep.

It is the object of the present invention to provide an irradiation plant wherein the aforesaid disadvantages of conventional irradiation arrangements are avoided. According to the invention the average cross sectional area of the passageway containing the conveyor is at least twice as large as is necessary for permitting passage of the goods portions to be irradiated. The passageway according to the invention includes several narrow passes or defiles whose cross sectional areas are reduced to a size just permitting passage of the goods portions. With this arrangement spaces are formed between the narrow passes which spaces are relatively large and receive only little radiation through the narrow passes and can transmit only little radiation.

The aforesaid narrow passes are formed by the same material, for example concrete, which forms the spaces or chambers between the narrow passes. Special advantages, however, are obtained if the narrow passes are formed by relatively thin shields which block off at least 50% of the radiation. Such thin screens or shields can easily be so constructed as to permit removal and make the passageway accessible to a crawling person or to a person moving on a roller coaster. The shields are preferably made of a material which is very dense and radiation absorptive, such as lead or deriched uranium.

If quick access is desired for overhauling the conveyor at a minimum loss of time, the shields or screens are preferably constructed as doors. The passageway may be made so large that it can be used as regular access tunnel to the radiation chamber and that large replacement parts etc. may be transported through the tunnel.

If the passageway is curved or bent in one direction only, the conveyor for which passages must be kept open is preferably placed along the inner, shorter side of the passageway and the hinges of the screen doors are placed at the outer, longer wall of the passageway.

The novel features which are considered characteristic of the invention are set forth with particularity in the appended claims. The invention itself, however, and additional objects and advantages thereof will best be understood from the following description of embodiments thereof when read in connection with the accompanying drawing, wherein:

FIGURE 1 is a schematic plan view of a portion of an irradiation arrangement according to the invention.

FIGURE 2 is a cross sectional, large scale view of the passageway forming part of the arrangement shown in FIGURE 1.

FIGURE 3 is a schematic plan view of a modified passageway according to the invention.

FIGURE 4 is a developed longitudinal section of a further modification of a passageway according to the invention.

Referring more particularly to FIGURES 1 and 2 of the drawing, numeral **1** designates a chamber containing a source **2** of biologically active radiation. Adjacent to the source **2** are an upper and a lower run of a conveyor **3** for exposing batches of the goods to be treated to the radiation emanating from the source **2**. The greater part of the residual radiation is absorbed by thick walls **4** of the chamber **1** so that living beings outside of the chamber are not endangered. The goods to be irradiated are transported, preferably in small packages, by a loop-shaped conveyor **5** through two semicircular passageways **6** and **6'** from a receiving station **7** to the conveyor **3** and therefrom to a discharge station **8**. If desired, the goods, for example potatoes, may be moved in a continuous stream without forming packages.

The passageways **6** and **6'** are divided by doors **10** into sectorlike spaces A, B, C, D. A door **10** is shown in large scale in FIGURE 2. The door may consist of a steel frame, not shown, which is covered by 30 mm. thick sheet lead. The door hangs on hinges **11**. Provisions may be made on the lower edge and on the left side edge of the door to prevent passage of direct radiation.

The part of the door facing the inner side wall of the curved passageway is provided with a recess for accommodating the conveyor **5** and affording passage of the containers **13** for the goods to be irradiated. The conveyor **5** comprises a rail **12** placed at a slight gradient and made fast on the ceiling of the passageway **6**. The portions or batches of the substance to be irradiated are received in containers **13** which hang on the rail **12** and roll thereon due to gravity through the passageway **6** to the conveyor **3** and therefrom through the passageway **6'**. Instead of depending on gravity a positively driven conveyor may be used, for example a travelling chain driven by a motor. In lieu of an overhead arrangement, as shown, a roller conveyor, a belt conveyor, or the like may be used. A single passageway may be provided for supplying the goods to as well as for removing the goods from the conveyor **3** in the treating chamber **1**.

FIGURE 3 illustrates an embodiment of the invention wherein the walls of the passageway are not smooth but are crevassed. The corners **30, 31** of the crevasses and the sidewalls of the crevasses extending therefrom are so arranged that when standing in a corner a minimum of surfaces can be seen between which radiation may be exchanged to any appreciable extent. The side walls **32, 33** of each crevasse extending from a corner **31** face such wall portions of the passageway only which either emit radiation or receive radiation; the side walls of the crevasses should never face wall portions which emit radiation and also wall portions which receive radiation. These requirements are essentially satisfied if the planes wherein

the walls **32**, **33** are located are tangent to the inner side wall of the curved passageway as indicated by the dash-dot lines **34** and **35**.

FIGURE 4 is a developed longitudinal section of a passageway of the type shown in FIGURE 3 wherein, however, the floor and the ceiling are also crevassed. The The depth of the crevasses should be as little as possible so that the exterior of the apparatus takes up as little space as possible. In the embodiment shown in FIGURE 4 a roller conveyor is used wherein rollers **41** are supported between carriers **40**. A container **42** containing goods to be treated rolls on the conveyor.

The screens or shields of the arrangement shown in FIGURE 4 have stationary parts **43** and **44** extending the width of the conveyor and have a movable part **45**. The latter is constructed as a drawbridge or trap door. It is shown in the lowered position, bridging the crevasses in the floor of the passageway. An additional plate may be lockably hinged to the trap door **45** which plate is folded onto the trap door when the trap door is folded up, i.e. in vertical position, and which plate is unfolded to cover the portion of the crevasses which are beneath the conveyor. This facilitates servicing of the conveyor because nothing can fall into the crevasses when the trap door is folded down into the horizontal position.

What is claimed is:

1. A plant for irradiating goods comprising:
wall means forming an irradiation chamber,
a source of radiation in said chamber,
bent passageway means in said wall means connecting said irradiation chamber with the outside of said wall means for affording passage of the goods to be irradiated to and from said irradiation chamber, said bent passageway means including a pair of spaced opposite walls defining a passage for the goods,
conveying means for conveying the goods through said passageway in a predetermined path having a cross-sectional area substantially as great as required for permitting passage of the goods,
a plurality of spaced means projecting from at least one of said walls of said passageway means towards said passage to a point outside of said passage, each pair of adjacent means defining a space therebetween for absorption of radiation emitted from said irradiation chamber.

2. A plant as set forth in claim **1** wherein said means are shields, each shield preventing penetration of at least 50% of the radiation extending into each said bent passageway.

3. A plant as set forth in claim **2** wherein said shields are made of lead.

4. A plant as set forth in claim **2** wherein said shields are made of deriched uranium.

5. A plant as set forth in claim **1** wherein said bent passageway means consists of a pair of spaced semicircular passageways, each semicircular passageway being positioned at an opposite end of said chamber.

6. A plant as set forth in claim **5** wherein said conveying means are placed along the smaller diameter wall of said semicircular passageway means.

7. A plant as set forth in claim **6** wherein said pair of opposite walls defines a smoothly continuous simple bent path.

8. A plant for irradiating goods comprising:
wall means forming an irradiation chamber,
a source of radiation in said chamber,
a pair of spaced bent passageway means in said wall means connecting said irradiation chamber with the outside of said wall means for affording passage of the goods to be irradiated to and from said irradiation chamber, each said bent passageway means including a pair of spaced opposite walls defining a path of a cross-sectional area substantially as great as required for permitting passage of the goods, at least one of said walls having a plurality of crevasses formed therein out of said path, each said crevasse having a pair of opposite sidewalls, the one of the sidewalls of each crevasse nearest an end of said path facing away from said end, and
means for conveying the goods through said path between said opposite walls in each bent passageway means.

9. A plant as set forth in claim **8** wherein each pair of opposite walls define a semicricular passage.

10. A plant as set forth in claim **8** wherein each said sidewall of each crevasse is located in a plane tangent to the opposite wall of said passageway means.

11. A plant as set forth in claim **10** which further comprises a plurality of shields disposed between said walls of said passageway means, each of said shields being mounted between a pair of adjacent crevasses and being disposed across said passageway means, each said shield having a recess therein for accommodating passage of said conveying means therethrough.

12. A plant as set forth in claim **11** wherein each said shield prevents penetration of at least 50% of the radiation emitted thereto.

13. A plant as set forth in claim **10** wherein said passageway means is provided with a ceiling and a floor, at least one of said ceiling and floor being crevassed.

14. A plant for irradiating goods comprising:
wall means forming an irradiation chamber,
a source of radiation in said chamber,
bent passageway means connecting said irradiation chamber with the outside for affording passage of the goods to be irradiated to and from the irradiation chamber,
means for conveying the goods to be irradiated through said passageway means,
the cross sectional area of said passageway means being at least twice as great as the area required for accommodating said conveying means and for permitting passage of the goods,
said passageway means including a plurality of narrow passes formed by shields whose cross sectional area is substantially as great as required for accommodating said conveying means and for permitting passage of the goods, said shields preventing penetration of at least 50% of the radiation extending into said passageway means and being movably connected to said wall means for affording temporary opening of said narrow passes to make the area thereof substantially equal to the cross sectional area of said passageway means.

15. A plant for irradiating goods according to claim **14** wherein said shields are in the form of doors hinged to said wall means.

16. A plant for irradiating goods according to claim **14** wherein said shields are in the form of doors hinged to said wall means to swing on a vertical axis.

17. A plant for irradiating goods according to claim **14** wherein said shields are in the form of doors hinged to said wall means to swing on a horizontal axis.

18. A plant for irradiating goods according to claim **14** wherein the cross sctional area of said passageway means permits walking of a person through said passageway means when said shields are in open position.

19. A plant for irradiating goods according to claim **14** wherein the cross sectional area of said passageway means permits walking of a person through said passageway means to said irradiation chamber when said shields are in open position.

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WILLIAM F. LINDQUIST, *Primary Examiner.*

U.S. Cl. X.R.

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