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RADIOGRAPHIC DEVICE

Filed May 10, 1955

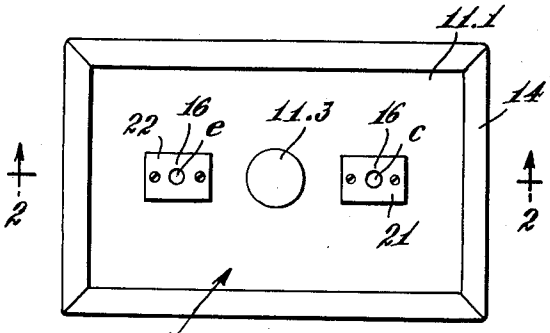


Fig. 1

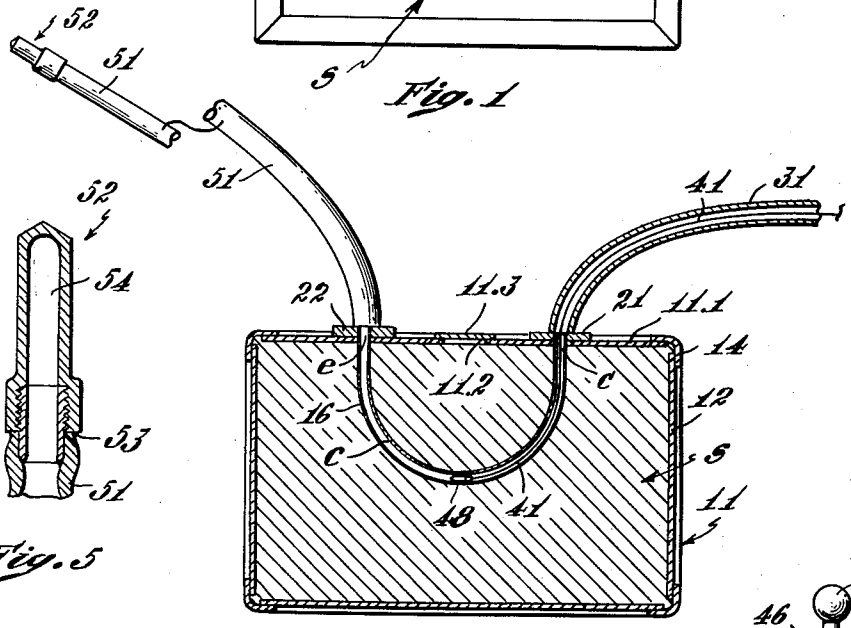


Fig. 5

Fig. 2

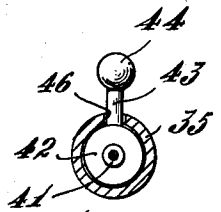


Fig. 4

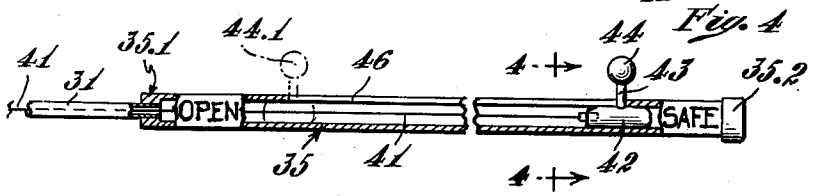


Fig. 3

Inventor
Arthur J. Stevens
by Roberts, Cushman & Grover,
Atty

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RADIOGRAPHIC DEVICE

Arthur J. Stevens, Mansfield, Mass., assignor to Technical Operations Incorporated, Burlington, Mass., a corporation of Delaware

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7 Claims. (Cl. 250—108)

The present invention relates to radiographic devices, particularly to exposure shields and to control and safety devices pertaining thereto.

Some of the main objects of the invention are to provide radiographic equipment that permits the use of strongly radioactive, or other energy emitting sources in routine radiography, including remotely controlled exposures within buildings and radiography where electric power is not available, to provide such equipment that can be easily adapted for specific purposes, and to provide shielding devices which safely protect the radiographer enabling him to handle up to 4,000 millicuries of cobalt 60 which is radiographically equivalent to 6,000 milligrams of radium.

Another object is to provide a device of the above indicated type which permits easy and safe withdrawal, for exposure, of a radioactive source from a shield while the position of the source is indicated by the withdrawal device.

Another object of the invention is to provide a shield for radioactive material which provides with a minimum of shielding mass a maximum of safety and ease of operation.

A further object is to provide a shield with safety devices which permit safe preselection of position for panoramic exposure with a strongly emitting source, easy and safe transportation of the source from a shield to the point of exposure, and easy and safe withdrawal of the source from the point of exposure into the shield.

Additional objects are to provide radiographic exposure equipment, including shielding, and control components, which equipment is ruggedly constructed and especially suited for industrial application permitting the operator to expose the source from a considerable distance or from behind a shielding wall, and to provide a handling unit for exposure devices of the present type which is compact, rugged, easy in operation and eliminating so far as at all possible any danger of breakdown while the source might endanger the operator.

The following brief summary of the invention indicates its nature and substance, for attaining the above objects.

Equipment according to the invention, for confining and manipulating radioactive material, comprises a shielding body that contains a source carrier guide and confinement channel having a control port and an exit port, flexible guide conduit or channel means (such as flexible tubing or hose) extending from at least one of these ports, flexible elongate propelling means (such as wire rope) movable within the guide conduit means and the channel within the shielding body, coupling means for attaching a source (in a carrier or capsule) of radioactive material to that end of the propelling means that is nearest to the confining channel, and further comprises at the other end of the propelling means actuating provisions for shifting the propelling means and hence the coupling within flexible guide means and the confining channel.

The channel within shielding bodies according to the invention is shaped as a tortuous path with end portions having separate and distinct axes in the same or different general directions. In a preferred embodiment, these axes are parallel to each other such as in the case of a generally U-shaped channel. The control and exit port axes can thus be separated for location on one face of the shield, without in any way detracting from the shielding effect, while the operation is facilitated.

For use as a panoramic exposure device, the equipment according to the invention comprises a shielding body with a confining channel having a control port and an exit port, two flexible guide means (such as metal hose) extending from respective ports, flexible elongate propelling means (such as metal cable) that is movable within the channel and both guide means, and coupling means for attaching an energy emitting source to that end of the propelling means that is next to the exit port, for withdrawal of the coupling means within or for its ejection from the confining channel through the exit port; such equipment further comprises actuating means at the other end of the propelling means and at the free end of the guide means which extends from the control port of the confining channel, for shifting the propelling means and hence the coupling means, within the channel and within both flexible guide means, and it also comprises, at the free end of the flexible guide means which extends from the exit port, source positioning means for receiving the radioactive material that is attached to the coupling means.

The following description of a typical embodiment illustrates these and other objects and aspects of novelty of the invention. This description refers to drawings in which

Fig. 1 is a schematic top view of a shield for radiographic devices according to the invention for the purpose of panoramic exposure;

Fig. 2 is a section on lines 2—2 of Fig. 1, and shows in addition a panoramic exposure head and part of the control conduit;

Fig. 3 shows, in section, the remainder of the control conduit which is broken away in Fig. 2, and the control unit in axial section;

Fig. 4 is a section on lines 4—4 of Fig. 3; and

Fig. 5 is an axial section through the exposure head shown in Fig. 2.

A block of shielding material is indicated at S of Figs. 1 and 2. This shielding body consists essentially of a metal container 11 welded together from rolled steel sheets 12 and angle irons 14. In order to facilitate transportation, this housing can be provided with handling means, such as eyes for attaching it to hoisting equipment, or with wheels and handrails for moving it by hand; the drawing does not show such conventional auxiliary provisions.

The shielding block S contains a tortuous path channel C, here in the general shape of a U, which channel is defined by heavy steel tubing 16 that is brazed, welded or otherwise fastened to the top sheet 11.1 of housing 11 which has a hole 11.2. Also secured to the top sheet 11.1, or to both the top sheet and the two ends of the tube 16, are port plates 21 and 22. Figs. 1 and 2 indicate these plates as screwed to the top plate 11.1, with the ends of tube 16 extending therethrough. These plates provide, with the respective openings of tube 16, a control port *c* and an exit port *e*. After assembly of the channel tube 16 with the housing 11, lead is poured into the opening 11.2 and after solidification of the lead without shrinks or voids, the container is closed by welding the cover 11.3 over the opening 11.2, as shown in Fig. 1.

It will be obvious that shielding materials other than lead can be used, that the housing block S proper can take any convenient and advantageous shape, and that the

tortuous path defined by channel C can have forms other than the herein disclosed U-shape, so long as essentially equivalent shielding concomitant with ease of handling is provided.

Brazed or otherwise fastened to the plate 21 of control port c is a control guide 31 made of flexible material, such as metal hose. As indicated in Fig. 3, this flexible guide means is secured, such as by brazing, to the guide end 35.1 of a tubular control unit 35, the other end of which is preferably closed with a cap 35.2 in order to avoid plugging with extraneous bodies. An elongate propelling means, such as a flexible steel wire 41, is inserted into the channel tube 16 and into the hose 31, thus leading into the control tube 35 where it is fastened to a control block 42 (Figs. 3 and 4) which slidingly fits the interior of tube 35 and which has a handle 43 with knob 44 extending through a slot 46 of tube 35. As indicated in Fig. 3, the wire 41 can be moved within the hose 31, the channel C, and the exposing channel to be described below, by moving the slide 42 within the control tube 35. The travel of the propelling wire is limited by the length of the slot 46.

Fastened to port plate 22 is an exposure conduit such as hose 51 (Figs. 1 and 2) which can be of the same material as tube 31. This exposure conduit or guide ends in an exposure head 52, which is also shown in Fig. 5. This head is brazed or otherwise secured at 53 to the end of hose 51 and has a cavity 54 to receive a capsule 48 (Fig. 2) which is fastened to the end of wire 41 and contains the source of radiation. It will now be understood that the distance from the midpoint of channel 16, through the exit side of the channel and through hose 51, to head 52 will be approximately equal to the length of the slot 46 of the control tube 35.

The device is operated as follows:

In safe position of the capsule 48, the knob 44 is located as indicated in Fig. 3. With this position of the knob in the control tube 35, the capsule 48 is in the center of the shielding block S, as indicated in Fig. 2. For exposure, the shield unit is wheeled or otherwise moved to within a convenient distance from the spot where the source is to be used. The exposure head 52 is then positioned in the exact spot where the source will be used for exposure. If the exposure point is inaccessible, the full length of the exposure hose 51 will be utilized but if this point is easily accessible the shield unit 11 can be brought closer and hose 51 will be coiled or otherwise disposed. The control hose 31 with wire 41 is stretched out to bring the location of head 52 into safe distance from the location of control unit 35. The operator then moves the knob 44 towards the open end 35.1 of the tube 35, as indicated in dotted lines at 44.1 of Fig. 3. The capsule 48 will then be located within head 52, and the exposure takes place. When the exposure is finished, the capsule 48 is withdrawn into the safe position shown in Fig. 2, by moving knob 44 to the safe position that is indicated with full lines in Fig. 3. As indicated in Fig. 3, the ends of tube 35 can be marked Open and Safe.

It should be understood that the present disclosure is for the purpose of illustration only and that this invention includes all modifications and equivalents which fall within the scope of the appended claims.

I claim:

1. Equipment for shielding and manipulating a carrier for energy emitting material, comprising: a shielding body containing a curved channel for confining the carrier, said channel having two ports with separate and distinct axes, and being sufficiently wide throughout its length to accommodate the carrier; flexible guide means extending from at least one of said ports; flexible but longitudinally substantially inelastic elongate propelling means movable within said guide means and said channel; coupling means for attaching a carrier to one end of said propelling means for withdrawal with that end into said channel from an exposed position; and at the other end of said propelling means actuating means for freely shifting the propelling means and hence the coupling means in either direction for unattended rest in either one of two predetermined limiting positions corresponding to withdrawal into and expulsion from the channel.

2. Equipment according to claim 1 wherein flexible guide means extend from both ports; further comprising, at the end of the flexible guide means which is opposite said coupling means, means for receiving said carrier.

3. Equipment according to claim 1, wherein flexible guide means extend from one of said ports; further comprising, at the end of said flexible guide means, means for receiving said carrier.

4. Equipment according to claim 1, wherein said actuating means includes a tubular member attached to said guide means that extends from one of said ports and having a longitudinal slot whose ends define said limiting positions, and within said tubular member a slide piece extending through said slot and being attached to said other end of said propelling means.

5. For apparatus of the type described, a shield unit for manipulating a carrier for an energy emitting source, comprising: a block of shielding material; within said block a curved channel for confining the source and being sufficiently wide throughout its length to accommodate the carrier, having an exit port and a control port; flexible hollow guide means for an elongate propelling means at both said control port and said exit port; elongate flexible but longitudinally inelastic propelling means freely movable through said channel and said guide means for attachment to an end thereof of an emitting source; and source receiving means at the end of the flexible guide means at the exit port for receiving the carrier when moved thereinto through said flexible guide means by said propelling means.

6. Equipment for shielding and manipulating a carrier for energy emitting material, comprising: a shielding block containing an essentially U-shaped unobstructed channel for the carrier, terminating at an exit port and at a control port; a flexibly tubular exit guide means extending from said exit port; a flexibly tubular control guide means extending from said control port; an exposure head having a tubular cavity which is at one end open and attached to the free end of said flexible exit guide means and which is closed at the other end; a control unit including a tubular member attached at one end to the free end of said control guide means and having a longitudinal slot; within said tubular member a slide piece extending through said slot; and flexible but longitudinally substantially inelastic wire means being at one end attached to said slide piece and having at the other end means for attaching said carrier, the length of said wire being such that said carrier is safely confined in said channel within said block with said slide piece resting in one extreme position, and said carrier is within said exposure head with said slide piece resting in the other extreme position.

7. Apparatus according to claim 5 comprising a control unit at the end of the flexible guide means at the control port for controlling the motion of said propelling means relative to said channel and said guide means.

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