April 10, 1956 J. B. BARTOW ET AL 2,741,710

DIRECTIVITY CONTROL OF X-RAYS

Original Filed Oct. 5, 1949

FIG. 1.

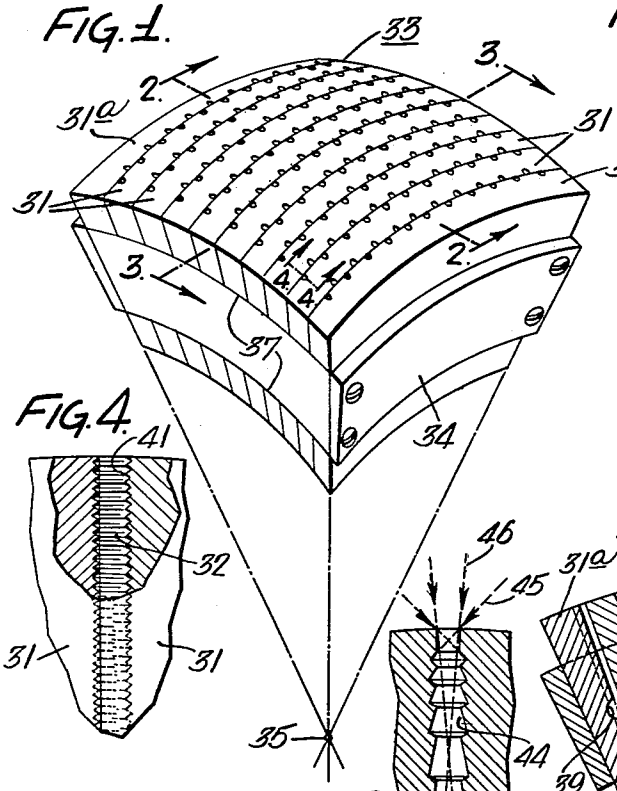


FIG. 9.

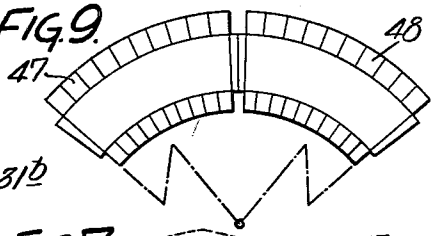


FIG. 7.

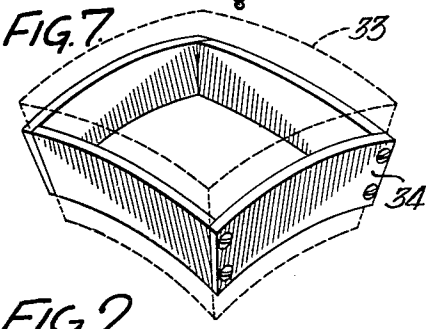
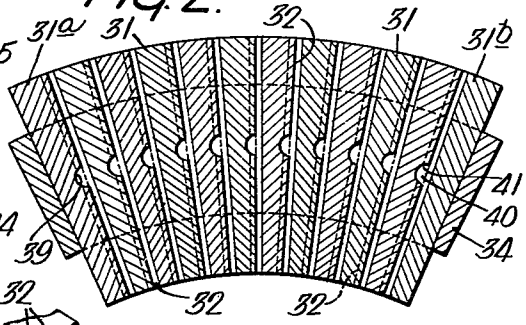


FIG. 4.

FIG. 8.

FIG. 2.



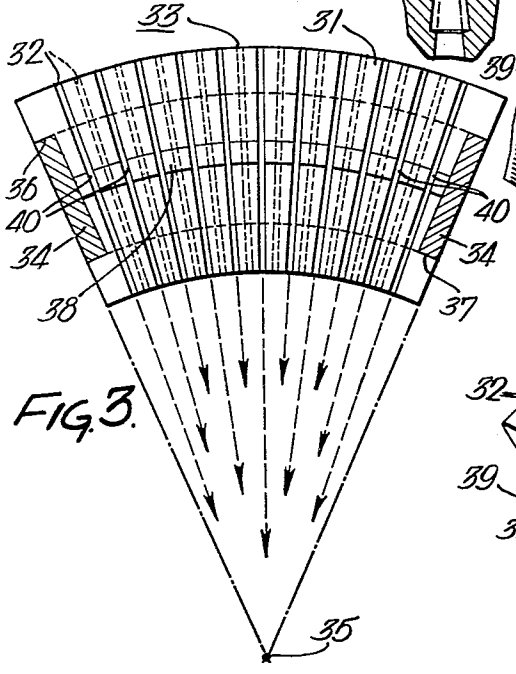


FIG. 3.

FIG. 6.

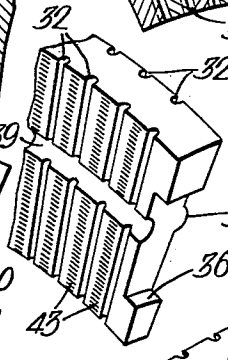
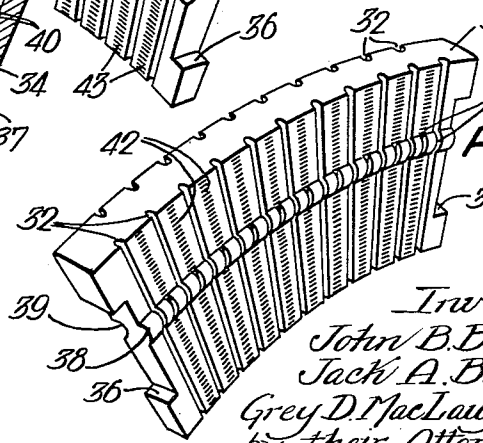


FIG. 5.



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United States Patent Office

2,741,710

Patented Apr. 10, 1956

2,741,710

DIRECTIVITY CONTROL OF X-RAYS

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Original application October 5, 1949, Serial No. 119,734, now Patent No. 2,638,554, dated May 12, 1953. Divided and this application November 7, 1952, Serial No. 319,382

3 Claims. (Cl. 250—105)

This invention relates to directivity control of X-rays and more particularly to a device for transmitting and directing primary rays substantially to the exclusion of secondary rays.

This application is a division of our copending application Serial No. 119,734, filed October 5, 1949 now Pat. No. 2,638,554.

The principal object of this invention is to provide an X-ray directing device which is adapted to control the passage of incident X-rays and to prevent the passage or transmission of secondary X-rays that may be produced within the device due to the incident direct or primary rays striking internal surfaces of the device.

The X-ray directing device provided by this invention is characterized in that it has X-ray transmitting paths, which may be in the form of open passages, within which there are ridges or shoulders so designed that none of the secondary radiation, produced within the device as above mentioned, has access to the exits of said paths.

The invention may be clearly understood from the following detailed description with reference to the accompanying drawing in which a sectionalized X-ray directing device is illustrated embodying the invention.

In the drawing:

Fig. 1 is a perspective view of the X-ray directing device;

Fig. 2 is a section taken along line 2—2 of Fig. 1;

Fig. 3 is a section taken along line 3—3 of Fig. 1;

Fig. 4 is a detailed sectional view taken along line 4—4 of Fig. 1;

Fig. 5 is a perspective view of a section or segment of the illustrated device;

Fig. 6 is a fragmentary perspective view of a section taken from the opposite side;

Fig. 7 is a perspective view of the frame employed to support the sections;

Fig. 8 is a sectional view similar to Fig. 4, showing a preferred form of the trap structure within each transmitting path of the device; and

Fig. 9 is an illustration of a multiple arrangement of X-ray directing devices.

Referring more particularly to the drawing, the X-ray directing device illustrated is composed of a plurality of sections or segments 31 of lead or other suitable material which is non-transmissive to X-rays. As shown in Fig. 1, the complete device is made up by placing and supporting the sections in side-by-side relation. As may be seen in Fig. 5, each section is arcuated lengthwise and is tapered both widthwise and depthwise so that it is actually a section of a sphere. Along each face of the segment there are provided small grooves 32, all of which converge toward a common focal point which coincides with the center of a sphere of which the segment is a section. A plurality of such segments are placed side-by-side, as shown in Fig. 1, to form the complete device 33, and they are held in assembled relation in any suitable manner, as by means of a frame 34 which may be utilized as an assembling frame. As may be seen in Fig. 1, the

grooves of adjacent segments are offset from one another or in staggered relation. It will be noted also that the end segments 31*a* and 31*b* are provided with grooves along their inner faces. The corner edges of the assembled device are convergent toward a point 35, and the passages formed by the grooves are also convergent toward that point. Thus, the assembled device is actually a segment of a sphere whose center is the point 35, and all of the X-ray transmissive passages of the device are convergent toward that point. This is more clearly apparent from the sectional illustration of Fig. 3.

In order to hold the segments firmly within the frame 34, each segment may be provided with recesses 36 and 37 at its ends, as shown in Fig. 5, said recesses being conformed to the sides of the frame 34 so that the segments may be slidably inserted in the frame with the screw-attached end thereof removed.

In order to prevent X-rays from being transmitted through any minute space that may exist between the assembled segments, each segment is provided with a rib 38 on one face and a recess 39 on the other face, as shown in Fig. 5. The ribs and recesses of the segments interfit with one another, as may be seen in Fig. 2. Each rib is provided with slots 40 so as not to interfere with the transmission of X-rays through the convergent passages. This arrangement prevents the existence of any rectilinear path through which X-rays might pass, except the convergent passages of the lens member.

It is inevitable that some of the X-rays entering the passages of the device will strike the internal surfaces of the passages and will cause the production of secondary X-rays. In order to prevent transmission of any such rays, the surfaces of the passage-forming grooves are provided with ridges as shown at 41 in Fig. 4, and the face portions of each segment which cooperate with the grooves of adjacent segments are also provided with ridges as shown at 42 and 43 in Figs. 5 and 6. These ridges may be provided by coining or in any other suitable manner. These ridges provide internal recesses forming traps, and they absorb primary radiation striking them and/or they direct secondary radiation so created away from the exit of the passage.

Preferably, the ridges are shaped as shown at 44 in Fig. 8 to provide shoulders of progressively increasing spacing. X-rays such as represented at 45 which enter the passage at a substantial angle cannot strike the under surface of a shoulder to create secondary radiation, and the upper surface of each shoulder is so constructed or oriented that primary radiation striking this surface either will be absorbed or will produce secondary radiation at such an angle as not to have access to the exit of the passage. Other X-rays, such as represented at 46, which do not strike the shoulders, will pass through the device.

The segmental construction of the device enables multiple assemblage. Since the device is actually a segment of a sphere, a plurality of such devices may be assembled and they will all have a common focus point. Fig. 9 shows two assembled devices 47 and 48 which are simply placed side-by-side. This multiple assemblage may be extended to cover any section of a sphere.

The device may be used in any desired manner such as disclosed in the aforementioned parent application.

While the invention has been illustrated and described as embodied in a particular structure, it is not limited thereto but contemplates such other structural embodiments as may occur to those skilled in the art.

We claim:

1. An X-ray directing device having X-ray transmitting paths but being otherwise non-transmissive to X-rays, and having successive ridges or shoulders along each of said paths to prevent transmission of secondary X-rays.

2. An X-ray directing device having X-ray transmitting

paths but being otherwise non-transmissive to X-rays, and having ridges or shoulders of progressively increasing spacing in said paths to prevent transmission of secondary X-rays.

3. A device for transmitting primary X-rays in predetermined directions substantially to the exclusion of primary X-rays in other directions as well as secondary X-rays produced thereby, said device having rectilinear X-ray transmissive paths of substantial length extending in said predetermined directions but being otherwise non-transmissive to X-rays, and having internal recesses forming traps bounding said paths to intercept primary X-rays in said other directions and to prevent transmission thereof as well as secondary X-rays produced by the interception of the primary X-rays, said recesses providing internal surfaces oriented to intercept the primary X-rays in said other directions while permitting passage of the primary X-rays in said predetermined directions, and also to direct any radiated secondary X-rays produced by said interception away from the exit end of each path.

References Cited in the file of this patent

UNITED STATES PATENTS

2,067,589	Antrim	Jan. 12, 1937
2,320,587	Gieringer et al.	June 1, 1943
2,512,242	De Lassaus St. Genies	June 20, 1950
2,522,522	Krasnow	Sept. 19, 1950
2,617,942	McLachlan	Nov. 11, 1952