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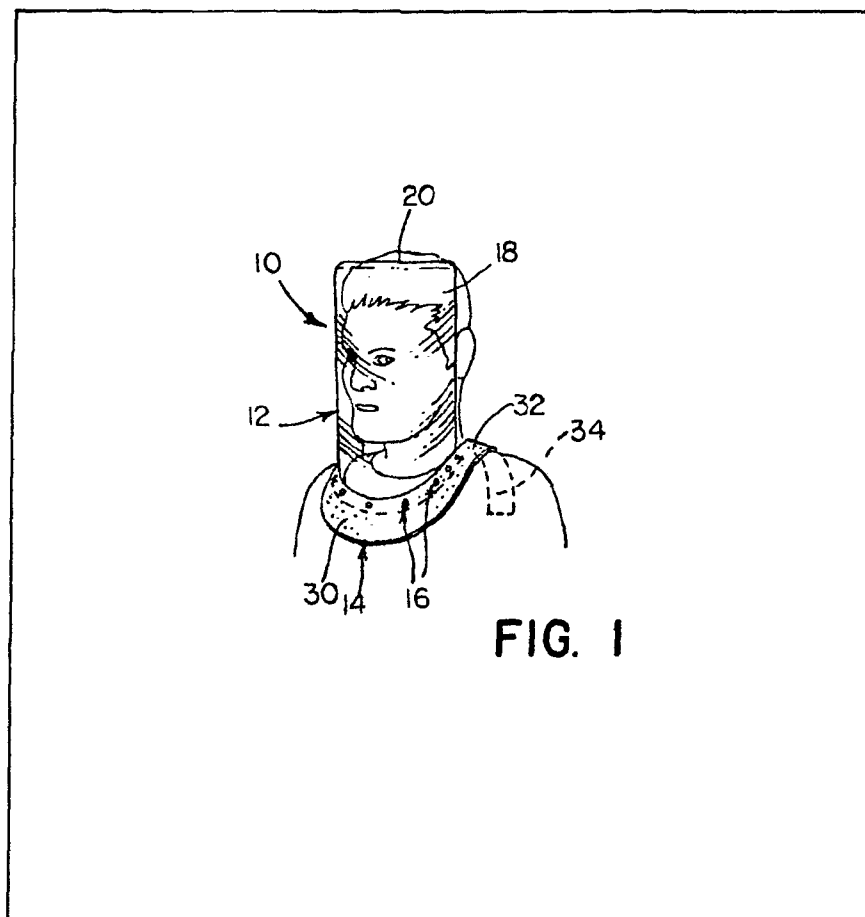
(54) X-ray face mask and chest shield device

(57) A protective face mask is designed to shield an x-ray technician or machine operator primarily from random secondary or scatter x-rays deflected toward his face, head and neck by the table, walls, equipment and other reflecting elements in an x-ray room or chamber.

The face mask and chest shield device can be mounted on a patient's shoulders in reverse attitude to protect the back of a patient's head and neck

from the x-ray beam.

The face mask is relatively or substantially transparent and contains lead in combination with a plastic ionomer or comonomer, which absorbs or resists penetration, to a degree, of the random deflected secondary or scatter x-rays or the x-ray beam through the mask. The face mask is removably attachable to the chest shield for facile application of the device to and support upon the shoulders of the technician or the patient.



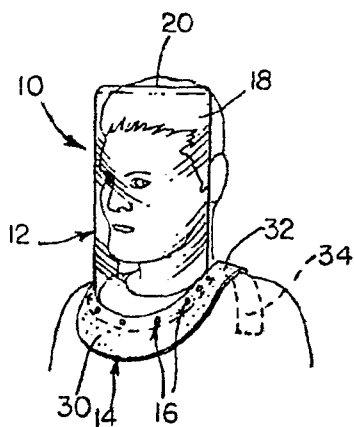


FIG. 1

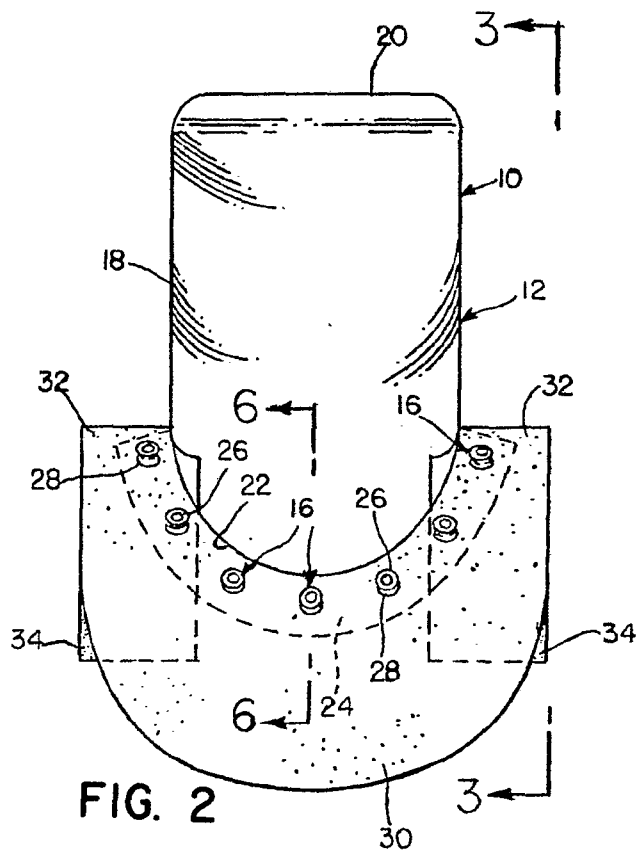


FIG. 2

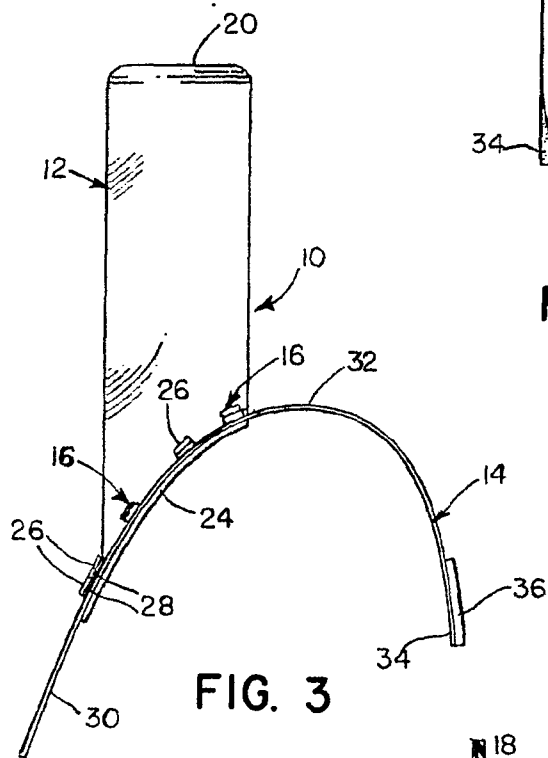


FIG. 3

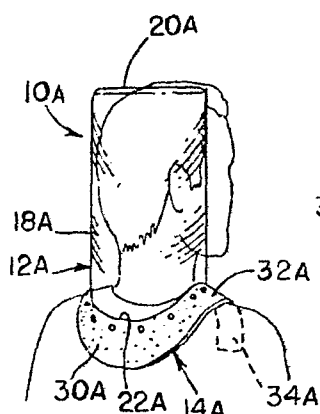


FIG. 5

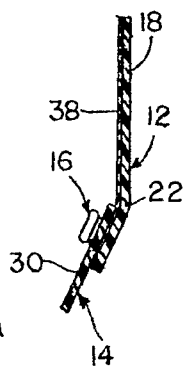


FIG. 6

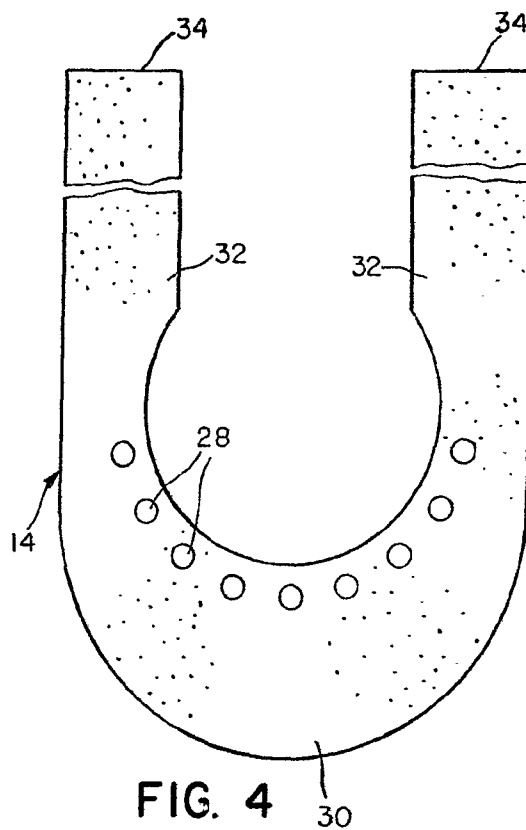


FIG. 4

SPECIFICATION

X-ray face mask and chest shield device

5 It appears that x-ray technicians can become injuriously exposed to an accumulation of random deflected secondary or scatter x-rays over a period of time when they are and work closely or directly adjacent to the body of the object being exposed to the x-ray beam during the x-ray exposure period. 10 Such potential or actual radiation injury is desirably to be avoided. The instant invention was designed to provide protection against such injury.

In taking x-ray images of children and animals, it is 15 difficult to get satisfactory exposures if the child or animal is allowed to remain on the table by itself. It is almost always necessary to hold the child or animal still and substantially motionless during the x-ray exposure period, short as that may be. During this period, the technician wears a rubber or plastic 20 apron and gloves which are filled with or contain a lead shield in one form or another, to absorb or resist the direct and reflected x-ray beam and rays. But heretofore, he has had no protection for his upper chest, face, head and neck from random or 25 secondary x-rays deflected by the walls and equipment in the x-ray chamber or room. This invention was designed to provide such protection to the technician who is directly adjacent the body of the object being exposed to the direct x-ray beam. 30

When a patient is being exposed to an x-ray beam for chest examination, he is usually placed adjacent a wall of the film carrier machine with his chest to the wall, the back of his head and neck facing the projector portion of the x-ray beam equipment. At 35 this time, there is no protection afforded such body portions against direct and indirect exposure of the x-ray beam and deflected rays. This invention provides such protection when the face mask and chest shield device are mounted on the patient in reverse 40 attitude whereby the back of the head, neck and shoulders are shielded from such x-ray beam and secondary rays.

The face mask and chest shield device of this 45 invention comprises two principal components removably attachable together for mounting upon the shoulders of a person in facing or reverse attitude whereby the person's head, face, neck and shoulders are protected from random deflected 50 x-rays or the direct x-ray beam during the x-ray exposure period.

The face mask is preferably made of and comprises a substantially semi-circular or arcuate relatively transparent plate or sheet of plastic material 55 designed to cover the front and sides of the head and neck in one aspect when used by an x-ray technician, and the back and sides of the head and neck in another aspect when used by a patient being exposed to the x-ray beam for chest or upper body 60 study. The tickness of the face mask can be varied, as can the density or proportion of the lead salt contained in the plastic material. The thickness of the

plastic face mask sheet or plate and the proportion of the lead contained therein depends to a very large 65 degree upon the intensity of the x-ray beam directed to the object under examination.

The face mask is preferably made of a plastic material such as, but not limited to, DuPont's "SURLYN" (trademark) material which is a nylon, relatively 70 transparent, lead salt-ionomer compound containing a weight percent of lead up to about 18% to 20%. Higher proportions of lead salt can also be used. Reference is made particularly to DuPont's U.S. Patent No. 3,264,272 for the lead-containing plastic material described in Column 5, lines 27-75 and Column 6, lines 1-4, among others as disclosed therein. Lead (Pb), being a Group IV-A metal, comes within the compass of the patent claims 6 and 22. 75

The chest shield is preferably fabricated of a rubber or plastic sheet material suitably impregnated or filled with a lead material such as lead sheet or film, or with lead particles or salt compound. It need not be transparent. The chest shield is designed for removable attachment to the face mask by suitable 80 fasteners, such as for example snap-type fasteners which are relatively easily engaged and disengaged. 85

The chest shield is provided with a generally circular chest covering web or body portion and a pair of substantially parallel shoulder straps extending from 90 each end of the body portion. These shoulder straps may be weighted or unweighted depending upon their flexibility and retention characteristics when placed upon the technician's or patient's shoulders.

A principal object of the invention is to provide a 95 radiation protective device for an x-ray technician when in closely adjacent proximity to an object being exposed to an x-ray beam from exposure of his face, head, neck, and upper chest to random secondary or scatter x-rays deflected from equipment in 100 or walls of an x-ray chamber or room, during the x-ray exposure period.

Another principal object of the invention is to provide a protective device for a patient being exposed to an x-ray beam for chest or upper torso study or 105 investigation from direct exposure to the back or sides of his head, face, neck and shoulders, during the x-ray exposure period.

Another object of the invention is to provide a relatively stable radiation protective device removably mountable upon the shoulders of the x-ray technician or patient, which comprises a substantially 110 transparent face mask and removably attachable chest shield made of material which substantially absorbs or resists the transmission of random deflected x-rays or x-ray beams, so as to protect such person from an accumulation, over a period of time, of injurious radiation. 115

These and other objects and advantages of the invention will become more apparent by reference 120 to the following detailed specification to be read in context with the attendant drawings.

Figure 1 is a perspective view of the face mask and chest shield device mounted upon the shoulders of a person, such for example as an x-ray technician, to

protect him from random deflected secondary x-rays.

Figure 2 is a front elevational view taken substantially on the line 2-2 of Figure 1.

5 Figure 3 is a side elevational view taken substantially on the line 3-3 of Figure 2.

Figure 4 is a top plan view of the chest shield portion of the device illustrated in Figure 1.

10 Figure 5 is a view similar to Figure 1, showing the face mask and chest shield device mounted reversely upon the shoulders of a patient being subject to a chest or upper torso study or examination, for protection against direct x-ray beam exposure to the back and sides of his head, neck and shoulders.

15 Figure 6 is a vertical sectional view taken substantially on the line 6-6 of Figure 2.

Although the disclosure made herein is substantially detailed to enable those skilled in the art to practice the invention, the physical embodiments herein described are merely exemplifications of structures which are considered functionally useful or suitable for embodiment in other specific structures. The scope of the invention is defined in the claims appended hereto.

25 As shown particularly in the several views of the drawing sheet, in general, the radiation protective device 10 comprises a face mask 12 and a chest shield 14 removably attachable together by suitable fasteners 16, such for example as the two-piece snap-type.

The face mask 12 is made of a substantially transparent lead containing ionomer, such for example DuPont de Nemour's "SURLYM" material containing a lead salt according to U.S. Patent No. 3,264,272, containing up to about 18% to 20% or more by weight of a lead salt according to the disclosure and claims 6 and/or 22 of said patent. The radiation absorption capabilities of the lead salt containing ionomer are designed to provide the radiation protection that the x-ray technician requires, when handling a small child or animal on the table during its exposure to the direct x-ray beam, against secondary radiation or soft or scatter rays which may be deflected toward his face, head and/or neck.

45 In all these operations, the technician wears a radiation protective apron which covers his chest, torso and legs. The apron is or may be of the style and construction disclosed in Maine U.S. Patent No. 3,093,829 for Protective Apron Construction, or of any other suitable style and construction. The face mask and chest shield device 10 of this invention is used in addition to such apron structure.

The face mask 12 comprises a relatively clear transparent body portion 18 of semi-circular, somewhat partially cylindrical, or arcuate form having an upper margin 20 and a lower arcuate margin 22 which terminates in an outwardly projecting lateral flange 24 of circular or arcuate form provided with a plurality of fastener members 26 adapted to be removably secured to complementary fastener members 28 mounted upon or attached to the chest shield 14.

The face mask 18, made of the above-described lead containing SURLYN material, is designed to protect the front and sides of the head and neck,

extending rearwardly to a line beyond the temples of the wearer. The body portion may be of any suitable thickness adequate to provide protection against the secondary radiation shielding for which the invention was created.

70 The chest shield 14 comprises a lead filled or lead-containing opaque rubber or plastic body or sheet of material having the fastener members 28 affixed thereto in a pattern in register with the fastener members 26 affixed to the face mask flange 24. The medial web or body portion 30 is generally circular or arcuate and terminates at each lateral end in shoulder straps 32, 32 which are generally parallel to each other and of a length suitable to rest upon the shoulders and somewhat down upon the back of the wearer. The distal ends, 34, 34 of the straps 32, 32 may be provided with lead weights 36, 36 or other suitable weights to balance the load applied by the face mask 12 and the chest shield 14 directed forwardly.

85 Figure 5 is an illustration of the device 10 being used in reverse fashion, as for example by a patient who is being x-rayed for chest study and examination. In such event, the patient wears no apron but only the device 10 which is now positioned upon his shoulders with the shoulder strap ends 34a, 34a directed forwardly and the body portion 30a of the bib shield 14a resting adjacent or just below the back of his neck. The face mask 12a now shields the back and rear sides of the patient's head and neck to protect him against direct beam, as well as secondary radiation x-rays.

90 A modification of the face mask 12 (Figure 6) involves its lamination with a physically protective outer layer 38 of a clear transparent film such as DuPont's "MYLAR" (RTM) material which comprises a polyester resin made by the condensation of a terephthalic acid and ethylene glycol.

105 The tough MYLAR (RTM) layer is preferably laminated or adhered to the entire facing surface of the face mask SURLYN material by a suitable adhesive or other means to provide a physically protective layer against scratching of the outer surface of the face mask. Such scratching or abrasive effects, applied physically, could well interfere with the clarity or transparency of the face mask. It would be desirable to avoid such deleterious conditions by use of an outer MYLAR layer or by other suitable coating.

115 Another advantage of the device 10 resides in the fact that the face mask 12 is made of a plastic material which is far less frangible than a lead-containing glass which is much heavier and more fragile than the lead-containing SURLYN plastic. If the plastic face mask is covered by an adhered MYLAR (RTM) laminate layer, it is further reinforced against breakage.

CLAIMS

120 1. A device for shielding and protecting a person against secondary or scatter radiation to his face, head and neck and to be worn on the shoulders of such person, characterized by a face mask of a relatively clear substantially transparent lead containing material and having a facing side and lateral rearwardly extending portions covering the front and

sides of the wearer's face, head and neck, said face mask having upper and lower margins, a chest shield of a lead-containing rubber or plastic sheet material having a medial web portion having an upper margin generally conforming to the contour and configuration of said face mask lower margin, to lie upon the wearer's chest closely adjacent and below said face mask, and shoulder straps extending from the ends of said web portion in a generally parallel attitude so as to lie upon the wearer's shoulders and the upper portion of his back, and means removably securing said chest shield adjacent its web portion upper margin to said face mask at the latter's lower margin to form a unitary device.

2. A device for shielding and protecting a person against secondary or scatter radiation to his face, head and neck, and including a face mask and chest shield in combination, the chest shield being designed to support said face mask upon the shoulders of such person, characterized by a face mask of a relatively clear substantially transparent lead-containing material and having a facing side and lateral rearwardly extending portions covering the front and sides of the wearer's face, head and neck, said face mask having upper and lower margins.

3. An improved device for shielding and protecting a person against direct beam x-ray radiation to the back of his head and neck, and to be worn on the shoulders of such person, wherein the improvement comprises

a head and neck mask of a relatively clear substantially transparent lead-containing material and having

a facing side and lateral rearwardly extending portions covering the back and sides of the wearer's head and neck, said head and neck mask having upper and lower margins,

a bib shield of a lead-containing rubber or plastic sheet material having

a medial web portion having an upper margin generally conforming to the contour and configuration of said head and neck mask lower margin, to lie upon the wearer's upper back adjacent his neck, and shoulder straps extending from the ends of

said web portion in a generally parallel attitude so as to lie upon the wearer's shoulders adjacent the upper portion of his chest,

and means removably securing said bib shield adjacent its web portion upper margin to said head and neck mask at the latter's lower margin to form a unitary device.

4. In an improved device for shielding and protecting a person against direct x-ray beam radiation to the back and sides of his head and neck, said device comprising a head and neck mask and bib shield portions in combination, the bib shield being designed to support said head and neck mask upon the shoulders of such person, wherein the improvement comprises

a head and neck mask of lead-containing radiation absorbing material and having

a facing side and lateral forwardly extending portions covering the back and sides of the wearer's head and neck, said mask having upper and lower margins.

5. A device according to any one of claims 1 to 4, characterized in that the mask is integrally formed of a radiation shielding, lead-containing ionomer plastic material.

6. A device according to claim 5, characterized in that the mask facing side is generally arcuate in transverse cross-section and in that the lateral rearwardly extending portions are generally planar.

7. A device according to claim 5 or 6, characterized in that the plastic material contains up to about 18% to 20% of a lead salt, by weight percent.

8. A device according to any of claims 5 to 7, characterized in that the mask terminates at its lower margin in an outwardly projecting lateral flange extending forwardly and laterally and is provided with fastening means affixed to said flange removably attachable to said shield.

9. A device according to claim 8, characterized in that the chest shield is provided adjacent its arcuate upper margin with fastening means removably attachable to said fastening means affixed to said face mask lateral flange.

10. A device according to any preceding claim, characterized in that the mask is integrally formed of a provided adjacent their distal ends with weights affixed thereto, to maintain said device upon the shoulders of the wearer.

11. A device substantially as herein described with reference to, and as shown in, the accompanying drawings.

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