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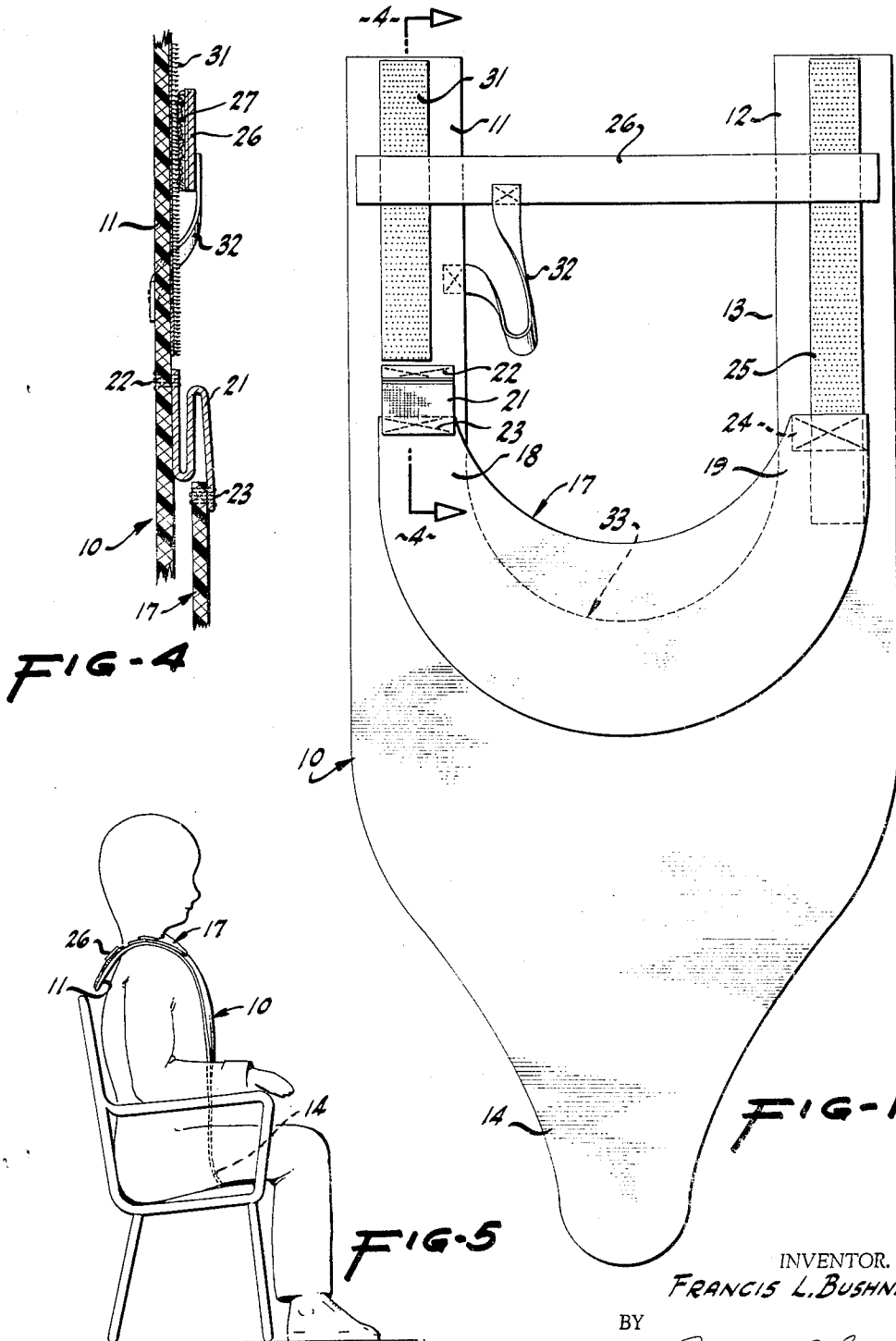
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RADIATION PROTECTIVE APRON

Filed April 19, 1963

2 Sheets-Sheet 1



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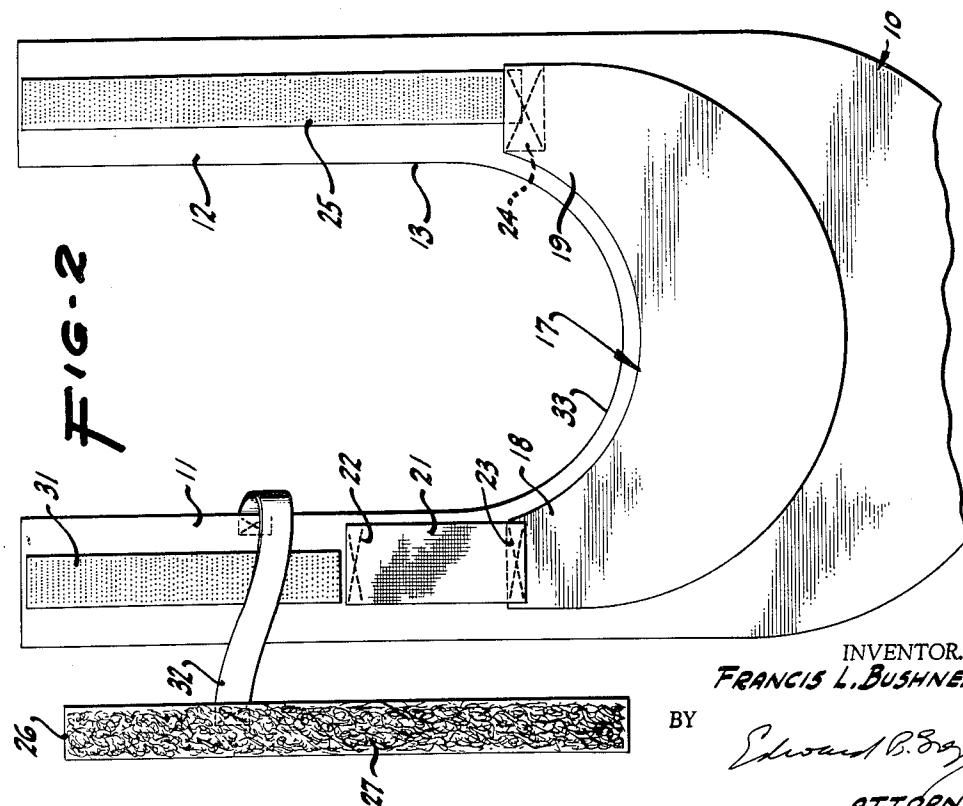
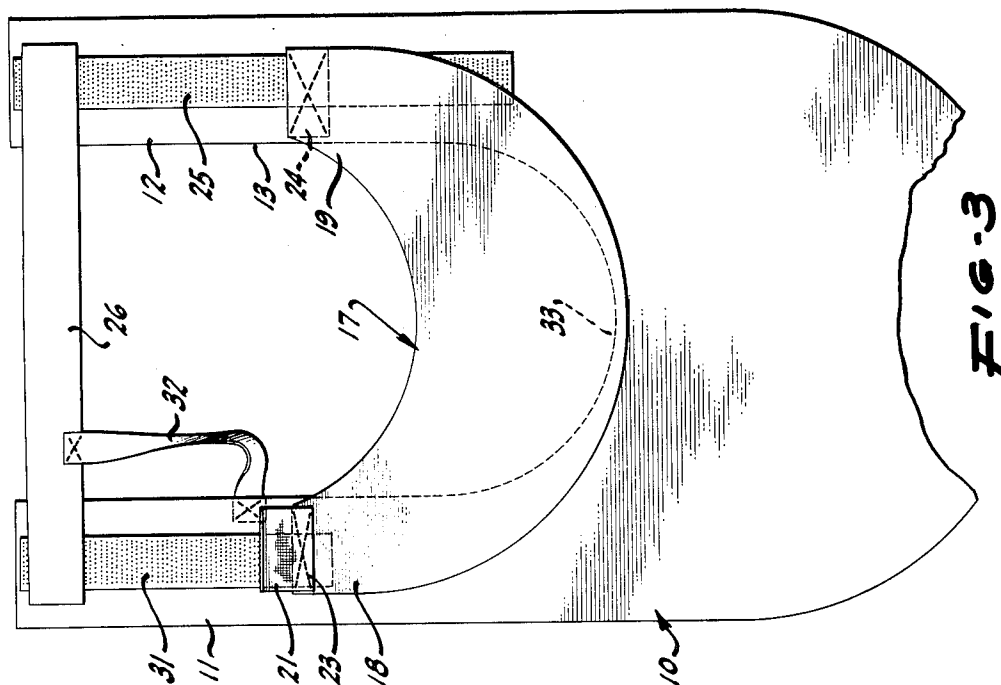
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2 Sheets-Sheet 2



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**RADIATION PROTECTIVE APRON**  
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 2 Claims. (Cl. 2—2)

This invention relates to a protective apron and more particularly to a protective apron for dental roentgenography.

It is known that radiation and in particular X-rays produce some effect on every living cell. It is also known that those cells which do not divide, such as the nerve cells within the brain and also those cells that divide very slowly such as those that make up the muscles and liver, can withstand considerably more radiation than cells which are continually dividing to produce new ones. The cells of the reproductive organs which develop into the eggs or spermatozoa are in the class which are particularly sensitive to X-rays. In addition to the gonads, the various glands including the thyroid, parathyroids, thymus, pancreas, adrenal and suprarenals are very sensitive to X-radiation. It is important, therefore, that all patients subjected to X-rays be protected against such undesirable radiation. The danger is well recognized and some states and communities have enacted codes or statutes requiring that the reproductive organs be protected against stray X-radiation during the course of X-ray examination or treatment.

The use of protective garments which shield against penetration of radiation is well known. Such garments are generally made of a rubber, plastic or like material in which there is incorporated a layer of lead. It will be apparent that such garments are extremely bulky and heavy when made in a very large size. Further such prior art garments are not readily adaptable to patients of different sizes.

An object of this invention is the provision of a protective apron for radiation shielding, which apron is of a minimum size yet is adapted to cover the reproductive organs as well as many of the body glands.

An object of this invention is the provision of a protective apron for protection against X-radiation which apron is readily adjustable for maximum shielding protection of patients of widely, varying sizes.

An object of this invention is the provision of a protective apron for dental roentgenography which is adjustable to accommodate a variety of sizes of child dental patients.

An object of this invention is the provision of a radiation protective garment having a neck opening therein which is adjustably positioned for varying the garment length between the neck opening and the bottom of the garment to accommodate wearers of different size.

These and other objects and advantages of the invention are achieved by means of an apron comprising a sheet of X-ray shielding material formed with a pair of generally parallel extending shoulder straps at one end thereof of which straps, together with the body of the apron, define an elongated slot through which the patient's neck is adapted to extend. The opposite or lower end of the apron body is preferably tapered to provide a groin covering section for radiation protection of the gonads. An auxiliary neck cover is included adjacent the end of the neck slot in the body member, which neck cover is adjustably positioned along the slot to cover a desired portion thereof. Patients of various sizes are readily protected by the apron, with the tapered lower portion of the body covering the reproductive organs and the adjustable neck cover being positioned along the neck slot opening to cover the neck, thereby protecting the thyroid

2

and parathyroid glands thereat. The torso, from the neck to the gonads, of wearers of different size is thereby protected against radiation by an apron of minimum size and bulk.

The invention will be better understood from the following detailed description read in conjunction with the accompanying drawings. In the drawings wherein like reference characters refer to the same parts in the several views:

FIGURE 1 is a front view of an apron construction in accordance with this invention; FIGURES 2 and 3 are similar to FIGURE 1 only showing the adjustable neck cover in different positions to accommodate patients of different sizes; FIGURE 4 is a cross-sectional view taken along lines 4—4 of FIGURE 1; and FIGURE 5 is a side elevational view of a patient shown wearing the protective apron of this invention.

Reference is now made to FIGURES 1 to 3 of the drawings wherein the radiation shielding apron of this invention is shown comprising a sheet of radiation shielding material which includes an elongated body portion 10 and a pair of generally parallel extending shoulder straps 11 and 12 formed integrally therewith. The shoulder straps, together with the body 10, define an elongated longitudinal neck slot designated 13, which extends from the upper end of the sheet. In order to reduce the weight of the apron, the lower end thereof is formed with a tapered groin portion designated 14, adapted to cover the gonads of the patient.

In accordance with this invention an auxiliary neck cover or bib member 17 is included in the construction of the apron, which cover is adapted for closure of the lower end of the slot 13. Although not limited to any particular shape, the illustrated neck cover 17 is of a U-shape and includes upwardly extending arm portions 18 and 19. In the illustrated embodiment of the invention, the arm 18 of the neck cover 17 is fixedly secured to the shoulder strap 11 of the body of the apron by means of a foldable hinge panel 21 which, as seen in FIGURE 4 of the drawings, is secured along one end thereof to the apron as by stitching 22 and along the other end thereof to the neck cover 17 as by stitching 23. Obviously, other suitable means, such as cementing, or the like, may be employed instead of stitching in securing the members together. The end of the other arm 19 of the neck cover 17 is releasably secured to the strap 12 by means of a cooperating securement means 24 and 25, secured by means such as the illustrated stitching, to the neck cover 17 and strap 12, respectively. While any suitable securement means may be used for releasably securing the arm 19 of the bib 17 to the strap 12 of the apron, the securement means preferably comprises strips 24 and 25 of material characterized by their ability to cling to each other when pressed together. Securement means of this material is presently marketed under the trade name of "Velcro," which includes cooperating male and female portions. In the illustrated arrangement the member 25 may comprise, for example, the male portion which includes a plurality of miniature hooks covering the outwardly facing surface thereof, which hooks detachably engage the mating surface of the female portion 24. The female portion comprises a fine mesh material which includes a plurality of loops into which the male hooks extend for engagement therewith. The male and female surfaces, when pressed together will resist separation from normal usage, but may be pulled apart when desired.

With the illustrated construction, the neck cover 17 is adjustably positioned along the neck slot 13 in the apron

to cover or close, varying amounts thereof at the lower end, the side 18 of the neck cover being movable along the shoulder strap 11 by reason of the web hinge member 21 while the side 19 is vertically movable by reason of the detachable securement means 24 and 25. In FIGURE 1 of the drawings the neck cover is shown in an intermediate position, in FIGURE 2 in a lower position, and in FIGURE 3 in an uppermost position closing a maximum portion of the lower end of the slot 13. The hinge member 21 is made of sailcloth, webbing, or other material which is not only pleatable, but which has sufficient rigidity to remain in the folded position. Thus, the hinge panel 21 is sufficiently rigid to retain the folded positions illustrated in FIGURES 1 and 3, for example, without falling to the position illustrated in FIGURE 2, for example, in the use of the apron when the securement means 24 engages the means 25. By fixedly securing the neck cover 17 to the apron through the hinge panel 21, the neck cover cannot become separated therefrom, and possibly lost or misplaced.

The apron is preferably provided with a back strap 26 attachable to the shoulder straps 11 and 12 and adapted to extend across the back of the neck of the wearer in use. The strap 26 is also preferably made of a relatively stiff material such as a webbing or sailcloth and, as seen in FIGURE 4, is covered along one surface thereof with a releaseable securement means 27 secured thereby to any suitable means such as the illustrated stitching. The securement means 27 is of the same type of material as the strip 24 on the neck cover 17 and is adapted to cling to the strip 25 on the shoulder strap 12 when pressed thereagainst. In addition, the shoulder strap 11 is provided with a securement means 31 comprising a strip of the same "Velcro" material as the strip 25, which strip 31 extends from the upper end of the shoulder strap 11 to the flexible hinge member 21, and is secured to the strap 11 by any suitable means such as the illustrated stitching. The back strap 26 is thereby adjustably positioned along the shoulder straps at the securement means 25 and 31, the strap being shown in different positions in FIGURES 1 and 3. To prevent the back strap from becoming lost or misplaced, a connecting strap 32 connects the back strap to the apron, the connecting strap 32 being shown connected at one end thereof to the back strap intermediate the ends thereof and at the other end thereof to the shoulder strap 11. Any suitable means, such as the illustrated stitching, or adhesives or the like may be employed for securing the connecting strap 32 to the back strap and apron.

It will be seen that the shoulder straps 11 and 12 together with the auxiliary neck cover 17 and strap 26 provide a neck encircling opening, which opening is adjustably located along the longitudinal dimension of the apron. The effective length of the apron from the front of the neck opening to the lower edge of the apron is thereby adjustable for radiation shielding of persons of different size.

In dental roentgenography the patient is generally seated as shown in FIGURE 5 of the drawings, and the apron is placed on the patient with the shoulder straps 11 and 12 extending over the shoulders and onto the patient's back. In most cases the portion of the straps on the shoulders and at the back of the patient will provide enough weight to counterbalance the front end of the apron and prevent slipping forward thereof. If, however, the apron tends to slip off the patient's shoulders, the strap 26 is secured to the shoulder straps and extends across the back of the patient's neck, as shown in FIGURE 5, to maintain the apron in position on the patient.

In use, the apron is located on the patient in a manner such that the tapered lower end portion 14 thereof covers the patient's gonads. If the patient has a short torso, the lower end, designated 33, of the slot 13 will abut the patient's neck for protection of the thyroid and parathyroid glands thereat. In this case, the neck cover 17

would not be required for adequate radiation protection and could be left hanging from the hinge flap 21.

With a taller patient the apron is again positioned such that the lower tapered end portion 14 protects the gonads from X-radiation. With this patient, however, the slot 13 will extend down below the neck. For radiation shielding of the neck and glands thereat, the neck cover 17 is positioned across the slot 13, as seen in FIGURE 5. Since the neck cover 17 is adjustably positioned along the slot to cover variable portions thereof in a manner described above, it will be apparent that the effective length of the apron is adjustable for effective radiation shielding of persons of widely varying sizes. The apron is particularly adapted for use with children where maximum shielding with a minimum of weight and bulk is particularly desired.

The apron including the auxiliary neck cover may be made of radiation shielding material of any suitable type. Such materials include, for example, rubber or vinyl plastic compositions impregnated with finely dispersed lead particles, the lead particles providing radiation protection equivalent to a lead sheet having a thickness of at least .25 millimeter. The invention obviously is not limited to the any particular radiation protective material used in the apron, nor to the lead equivalence employed in the sheets. In one apron for child dental roentgenography, an apron 12 inches in width and 27¼ inches long was constructed having a neck slot 4½ inches wide and 12 inches deep from the open top end to the closed bottom end thereof. The invention is, of course, not limited to a garment of such dimensions. Also, although a tapered groin area is provided for convenience in handling to reduce weight and bulk it will be apparent that the apron may be constructed at the lower end thereof in other shapes than that illustrated in the drawings. In addition, other means of attaching the neck cover 17 and back strap 26 to the shoulder straps of the apron may be provided. For example, pressure-sensitive adhesive tapes, snap fastener means, hooks and eyes, and the like, may be employed.

The invention having now been described in accordance with the requirements of the Patent Statutes various other changes and modifications will suggest themselves to those skilled in the art and it is intended that such changes and modifications shall fall within the spirit and scope of the invention as recited in the following claims.

I claim:

1. A radiation shielding apron comprising:

- (a) a body member including (1) a tapered lower portion adapted to fit between the thighs of a seated human patient, (2) a main portion which lies above the tapered portion and is adapted to cover at least a part of the torso of such patient and, (3) a pair of spaced shoulder straps which extend upwardly from the upper edge and opposite sides of said main portion and which are adapted to extend over the shoulders of such patient;
- (b) a cross strap adapted to extend between said shoulder straps;
- (c) adjustable means securing said cross strap to said shoulder straps to hold the body member in the desired position in relation to a seated patient; and
- (d) a bib and means for attaching the bib to said shoulder straps at any of various positions to adjust the effective length of said body portion for patients of different heights;

the tapered lower portion and the main portion of said body member being formed of radiation absorptive material.

2. The apron of claim 1 wherein the adjustable securing means consists at least in part of gripping means which grip one another upon contact and which are separable by a mild pull.

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