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G. HOLLANDS

3,052,799

RADIATION PROTECTION GARMENT

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Fig. 1

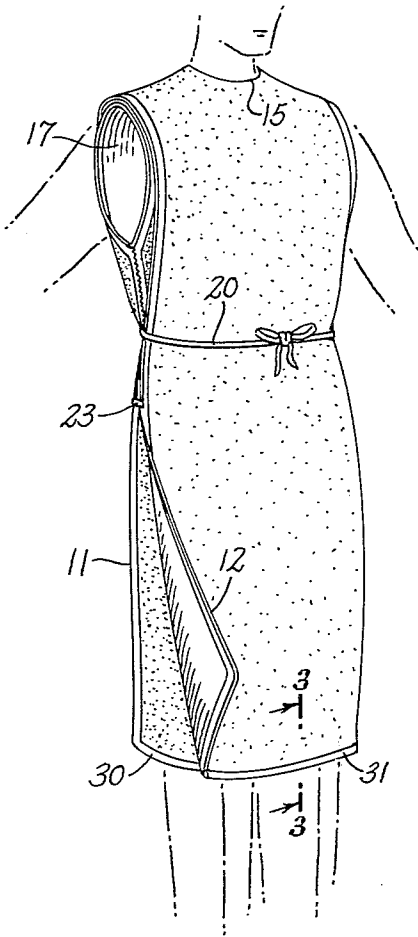


Fig. 2

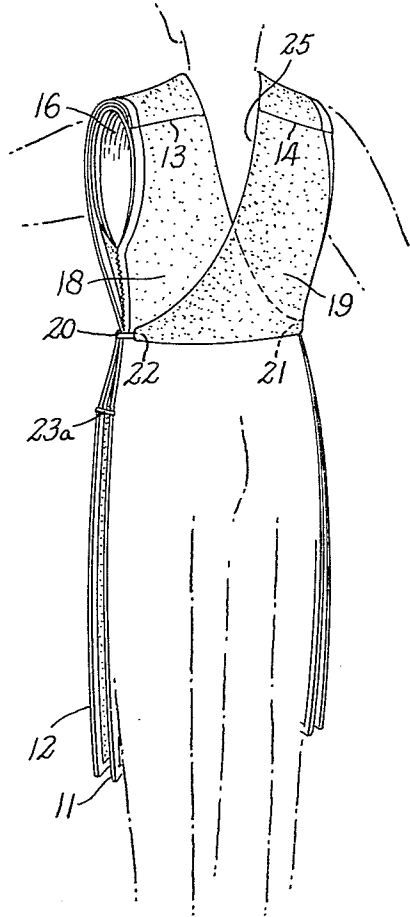
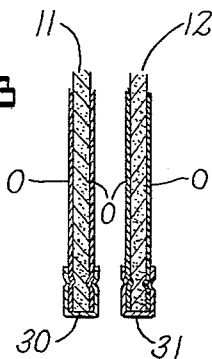


Fig. 3



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RADIATION PROTECTION GARMENT

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1 Claim. (Cl. 250-108)

This invention relates to a radiation protection garment, and more particularly to a radiation protection apron.

Still more particularly, this invention relates to a radiation protection garment of the type used to provide the wearer with a measure of protection from sources of harmful radiation, such as X-ray machines, radioactive isotopes and the like.

Still more particularly, this invention relates to a radiation protection apron of novel construction and having many advantages as compared with radiation protection devices heretofore available.

A problem long unsolved by radiation protection aprons heretofore known was to provide a garment which would, at once, be sufficiently resistant to radiation to afford full protection to the wearer, without unduly hampering the movements of the wearer. As the chief radiation resistant material employed was, and still is, lead and lead containing materials, such garments, to provide adequate protection, must weigh fifteen to twenty pounds and sometimes more.

The availability on the market of lead impregnated plastic materials for use as radiation shields, and, specifically, the employment of a pliable vinyl resinous compound or copolymer of the vinyl compounds as the carrier for lead dispersed within the vinyl compound or vinylite has aided in the production of a protective garment having the necessary radiation resistance and, at the same time, possessing a degree of flexibility consonant with the freedom of motion necessary for the performance of laboratory or other duties.

This invention is directed to an improved apron structure which takes maximum advantage of such lead impregnated plastic sheeting and permits a high degree of flexibility so that the wearer may carry out his normal duties with maximum comfort and minimum impediment of motion.

A further object of this invention is to provide a garment of the type described having maximum resistance to wear and having safety factors not included in shielding garments heretofore known.

Still a further object of this invention is to provide in a garment of the type described, a puncture-resistant nature, whereby the safety of the wearer is protected, since the likelihood of radiation leaks due to punctures or attenuation by stretching of the garment is minimized.

Still further objects of this invention will become apparent from the description of the same hereinafter made.

Reference is now made to the accompanying drawings, forming a part hereof, in which—

FIGURE 1 is a front perspective view of the garment applied to a wearer;

FIGURE 2 is a rear perspective view of the garment applied to a wearer;

FIGURE 3 is a section taken on the lines 3—3 of FIGURE 1.

The garment comprises generally a plurality of layers, preferably two, of radiation shield material. The material preferred for such application is a vinyl compound or copolymer plastic composition impregnated with finely dispersed lead particles, the dispersion being uniformly effected throughout the admixture of vinyl resin copolymer to assure equal protection from radiation throughout the entire layer or sheet of material used.

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The sheets employed have a lead equivalence when tested in accordance with Federal Specification ZZ-A-621 as follows:

Nominal thickness:	Maximum lead equivalent
.030"-----	.25 mm.
.060"-----	.50 mm.
.120"-----	1.00 mm.
Density-----	4.60.
Tensile strength-----	1400 pounds per square inch.

The body portion of the apron is composed of at least two substantially congruent independent layers or panels 11 and 12, of radiation resistant sheet material as heretofore described. The layers 11 and 12 cover substantially the entire front body portion of the wearer from the neck down to a point somewhat below the knees.

The panels 11 and 12 continue over the shoulder portions of the wearer and conjointly terminate at the rear edges adjacent the lines 13 and 14 at the upper back of the body of the wearer behind the shoulders.

The layers 11 and 12 are provided, in addition to the neck encircling yoke portion 15, with armhole openings 16, 17, and with diagonal crossing flap members 18 and 19. A tie string 20 is secured to the apices 21, 22 of the flaps 18, 19, respectively.

The front layers or panels are secured together by a tacking stitch area 23, 23a lying to each side of the body of the wearer and arranged to lie, in the donned position of the garment, slightly below the belt area of the wearer.

It should be noted that the lowermost portions of the panels 11, 12 are independently flexible and substantially unconnected one to the other except at the said tacking stitch areas 23, 23a. Since this tacking stitch area is preferably loosely formed so as not to bind the peripheral edges of the layers together, some lateral movement between the layers is permitted even at the coupled tacking stitch areas, with greater lateral movement of the layers being permitted elsewhere.

The upper torso or trunk covering portions and shoulder covering portions of the panels forming layers 11 and 12 are likewise independently, congruently stacked and, for the most part, unjoined so as to provide for a degree of lateral or surface movement of the layers to each other.

As best seen from FIGURE 2, the flap portions 18 and 19 provide a wide V-cut area 25 behind the neck of the wearer, for purposes which will appear hereafter.

The lead impregnated vinyl resinous compound or vinyl copolymer plastic material is preferably coated on each side by an unfilled or a pure vinyl resinous compound or other overlay (see FIGURE 3). These overlay strata O which are bonded or otherwise secured to the radiation shield materials provide increased resistance to corrosive chemicals, as compared with the vinyl impregnated with lead and, furthermore, present an attractive and wear-resistant coating for the said radiation shield materials.

The peripheral edges of the layers 11 and 12 are edged by U-shaped spaced cap material or piping 30, 31, which piping is preferably electronically sealed or bonded directly to the vinyl overlays O without perforation, but may also be secured thereto by stitching through the U-shaped members and the X-ray impermeable or radiation shield material.

The apron is put on by the wearer by placing the arms through the holes 16, 17, by then crossing the flaps 18, 19, and by tying the draw or tie string 20. It is important to note that unlike the ordinary apron which depends for support upon a yoke closely encircling the rear neck portion of the wear, a large V-shaped gap 25 is provided

by the flaps 18 and 19 adjacent the said rear neck portion area. If a yoke portion closely adjacent the neck portion of the wearer were provided in a garment of the type herein described, the considerable weight of the front portion of such garment would cause the neck encircling yoke to creep or be pulled against the neck of the wearer, thus causing considerable discomfort. Accordingly, the clearance 25 provided adjacent the rear neck area guards against such possibility, the tie string 20 and the flap portions 18 and 19 being relied upon, instead, to assure against slipping of the garment.

By providing separate panels 11 and 12 of a composite X-ray impermeable or radiation shielding strength equal to the shielding strength desired, considerable flexibility and motility advantages are gained as compared with the use of such structure of a single sheet construction even of double thickness, as the ill effects of attenuation of the single sheets are avoided.

A further advantage of the use of the double layered construction herein provided lies in the increased resistance to puncturing of the two layers and consequent increased safety to the wearer.

The U-shaped peripheral trim or edging applied to the layers likewise functions to increase the resistance to wear of the garment as well as augmenting the freedom of movement of the wearer. In the course of pedal activity, considerable relative movement of the two layers forming the apron front is experienced. Such relative movement, particularly where the layers are formed of such heavy material as herein used, would normally be expected greatly to reduce the useful life of the garment since frictional contact of the two layers would ordinarily cause excessive wear. The U-shaped piping or capping parts 30, 31 act to reduce the effects of such wear by spacing the layers 11 and 12 from each other by absorbing, in a large measure, the rubbing or wearing effects between the two layers. Since the U-shaped portions aforesaid provide a relatively limited contact area between the layers, the flexibility advantages provided by using two

layers are preserved to an extent which would not be realized if such U-shaped trim or edging were not provided.

The improved radiation protection garment herein disclosed provides a highly advantageous protector for those working in X-ray or other areas where radiation hazards are present. The multi-layer construction permits the wearer a degree of motility and comfort which is unequalled by other radiation protection garments heretofore available. The novel protector trim arrangement reduces the wearing effect which would normally be expected to be encountered in using a multi-layer construction.

Having thus described the invention and illustrated its use, what is claimed as new and desired to be secured by Letters Patent, is:

A radiation protection apron having a front covering portion comprising inner and outer panels of relatively heavy, flexible radiation resistant materials, said layers being free of connection to each other at any point below the waist portion of said apron, said outer panel below said waist portion being of a width to shield the front body portion of the wearer without substantial encirclement, said inner and outer panels being connected substantially at said waist portion by a slack tacking stitch area whereby said panels will shift relative to each other in the plane of said panels and said outer panel will hang in a generally vertical position without substantial creasing when the wearer bends forwardly.

References Cited in the file of this patent

UNITED STATES PATENTS

2,404,225	Green	July 16, 1946
2,494,664	Lubow	Jan. 17, 1950
2,794,128	Shasky	May 28, 1957

FOREIGN PATENTS

428,033	Great Britain	May 3, 1935
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