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DE WITT C. MAINE
PROTECTIVE APRON CONSTRUCTION

3,093,829

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FIG. 1.

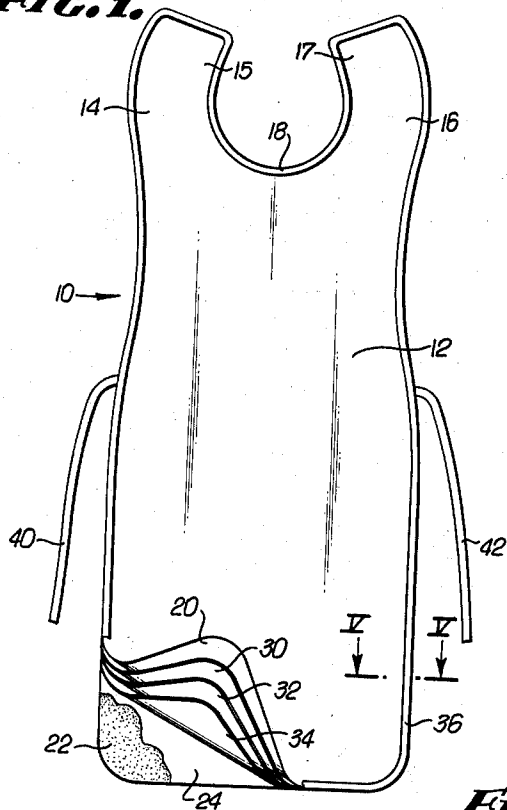


FIG. 2.

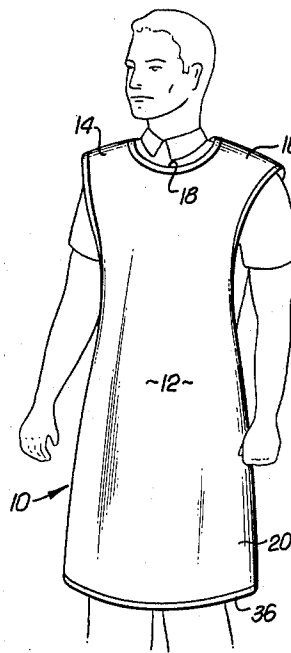


FIG. 5.

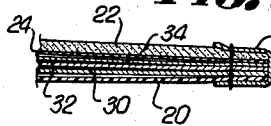


FIG. 4.

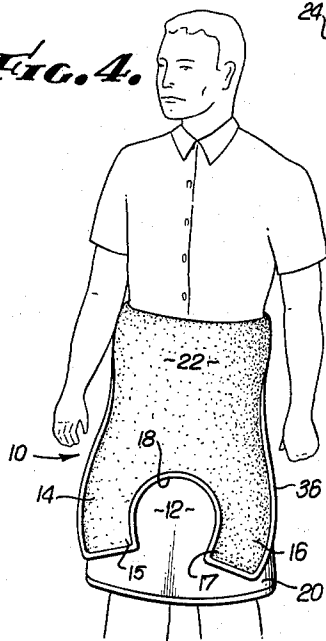
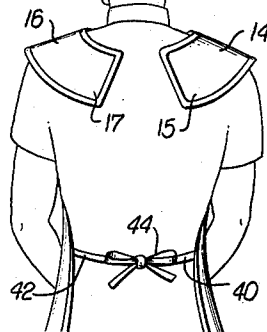


FIG. 3.



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PROTECTIVE APRON CONSTRUCTION
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The present invention relates generally to an article of protective clothing and more particularly describes an apron of novel construction which may be easily and quickly put on or taken off by the wearer.

The apron in accordance with the present invention includes a pliant, flexible multi-layer body of sheet material, the innermost layer being a generally porous, relatively thick sheet of plastic foam material bonded to a supporting sheet of thinner plastic material; an outermost sheet of impervious plastic material; and a selected number of intermediate sheets or plies of lead-impregnated material for shielding the wearer from harmful radiation, all said sheets being of virtually identical size and shape, and being permanently fastened together along their marginal portions by suitable means such as heat sealing reinforced by a fabric strip extending around the sheet edges and stitched in place.

The apron is shaped to provide a generally rectangular front body panel adapted to extend from the wearer's neck and shoulders downwardly to the knees or below, and a pair of laterally spaced back panels or wings extend upwardly and preferably arcuately from the front body panels, adapted to extend across the wearer's shoulders and upper back. The innermost sheet of porous foam plastic material tends to frictionally cling to the wearer's clothing, and this characteristic permits the upper wings to effectively support the weight of the apron by their frictional contact across the wearer's shoulders and upper back. The porous, relatively thick inner layer is further advantageous in permitting air circulation next to the wearer's body.

For some applications a waist tie may be provided, desirably including strips of fabric or the like attached to the body and adapted to be tied behind the wearer's waist in conventional fashion. When the waist tie is used, the present apron affords an additional convenience in that the portion of the apron above the waist, including the upper wings, can be moved forwardly and dropped downwardly when desired, so that the entire weight of the apron is supported by the waist tie. The wearer is thus given greater freedom of movement and comfort, particularly in a hot or humid environment, but the protection of the apron is instantly available by merely raising the upper body portion and wings back to their original positions. No neck band or loop is needed, as in conventional aprons. Also, since the inner sheet or layer of plastic foam material is relatively fireproof, the apron gives a substantial amount of protection against flame, at least for a short period.

A principal advantage of the invention is the flexibility of the apron itself, resulting from the use of a number of separate plies or layers of lead-impregnated material in sheet form. Each ply is preferably no thicker than about 0.020 inch and is therefore flexible so that it will permit the apron as a whole to conform to the body of the wearer. At the same time, virtually any degree of protection from dangerous radiation can be provided by increasing the number of layers used.

Accordingly it is a principal object of the present invention to provide a novel apron construction for protection of the wearer. Additional objects are to provide such a device of multi-ply construction including an inner layer of porous foam plastic material; to provide an apron having the above construction so shaped as to facilitate

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donning and doffing the apron; to provide such an apron affording protection against harmful radiation; and for other purposes as will be understood from a study of the following description of a preferred embodiment of the invention taken in connection with the accompanying drawing in which:

FIG. 1 is a plan or developed view of the apron on a flat surface, with certain of the sheets rolled back or broken away to clarify the multi-ply construction.

FIG. 2 is a front view of the apron on the wearer with the shoulder and back wings supporting the weight of the apron.

FIG. 3 is a rear view of the upper portion of the wearer and apron seen in FIG. 2.

FIG. 4 is a front view of a wearer showing the wings and the upper part of the body panel dropped down from the waist.

FIG. 5 is a fragmentary sectional view taken on line V—V of FIG. 1.

As shown in the drawing, an apron indicated generally at 10 includes a generally rectangular front body panel 12 and, extending upwardly and preferably integrally therefrom, a pair of laterally spaced shoulder and back panels or wings 14 and 16. The latter elements may desirably be generally arcuate as shown, with their respective end portions 15 and 17 relatively closer to one another than remaining portions of the wings and forming neck line 18 therebetween.

The material of the apron includes a number of flexible plies or layers comprising an outer sheet 20 of easily cleaned, tough, wear-resistant material and an inner layer 22 of relatively thick porous material bonded or otherwise laminated to a supporting sheet 24. Sheets 20 and 24 may be of vinyl plastic, outer sheet 20 having a thickness of about 0.010 inch and sheet 24 being somewhat thinner, while the inner layer 22 may be of polyurethane foam plastic of medium density, about two pounds per cubic foot, and having a thickness of about one-quarter inch.

Depending upon the environment in which the apron is intended to be used, there may be provided between sheets 20 and 24 one or more radiation-shielding sheets consisting of lead-impregnated material. In a preferred form, the shielding sheets are of lead-impregnated vinyl, each such sheet being about 0.018 inch thick with an equivalent shielding effect of about 0.12 mm. of lead. In the present exemplary embodiment of the invention three such sheets are shown and are indicated at 30, 32, and 34.

The component layers, except for bonded layers 22 and 24, are held in assembled relation only along their margins by suitable means which may include heat sealing and a fabric binding tape 36 extending around the edges of the sheets and stitched through the several layers as shown in FIG. 5. When desired, as described below, waist tie means may be provided, here shown as including strips 40 and 42 of fabric or the like attached to opposite sides of the body panel at waist level. Although the wings provide sufficient support for the apron by their frictional contact across the wearer's shoulders and upper back, nevertheless under some circumstances the wearer may wish to drop the upper torso section of the body panel, together with its attached wings, for a short time without completely taking off the apron. Here the waist tie means may prove desirable, and the above-mentioned strips 40 and 42 are adapted to be tied behind the wearer's back as in a bow knot 44. When the waist tie strips are so tied, the entire apron above them may be dropped into the position shown in FIG. 4. Thus a wearer such as an X-ray technician, whose duties may involve repeated intermittent exposure to dangerous radiation, may wear the apron equipped with the waist tie means in the above manner, while a person such as a dental patient who will

be so exposed only once can more conveniently dispense with the tie. Although the frictional clinging characteristics of the foam layer 22 assist in causing side marginal positions of the body panel to cling snugly around the sides of the wearer's body, the waist tie further insures that the apron affords protection in these zones.

The apron of the present invention, when it includes lead-impregnated intermediate layers, is particularly useful in working with devices giving off high energy radiation such as X-ray machines. When the intermediate layers are omitted, then the combination of the tough plastic outer layer with the inner layer and its associated supporting layer produces a simple durable apron which can be used in many industrial applications. Such apron can be used with or without weighting means to aid the frictional engagement with the wearer's clothing. For relatively light work, such as in the home or for artistic work, the apron of the present invention may consist of simply back wing panels having an inner layer for frictionally engaging the clothing of the wearer with an outer supporting layer bonded thereto having a suitable, easily cleaned surface. The supporting layer then may extend to form the front body-covering panel. The outer surface of the outermost sheet or layer may be configured as desired, such as a mat surfacing to minimize glare, a decorative pattern or the like. It will be seen that the layers or sheets overlying the bonded sheets 22 and 24 constitute protective means and may in general include as many sheets or layers of suitable physical characteristics appropriate to the function to be served.

The foregoing description and drawing are only illustrative of the present invention and it is not intended that the invention be limited thereto. All substitutions, alterations, and modifications of the present invention which do not depart substantially from the important characteristics defined in the following claims are intended to be embraced thereby.

What is claimed is:

1. A multi-layer pliant apron comprising:
 - (a) a generally rectangular body panel adapted to cover the front of a wearer's body from the neck downwardly to below the waist;
 - (b) a pair of laterally spaced shoulder and back wings formed integrally with the upper portion of the body panel and extending generally upwardly therefrom,

the body panel and wings including a supporting layer of flexible sheet material, protective means including an outer layer of flexible sheet material overlying said supporting layer and joined thereto along marginal edge portions of the two layers, and a layer of porous foam material underlying the wing and upper body panel portions of the supporting layer and being bonded thereto, the porous material layer being of substantially greater thickness than the supporting layer and having a highly frictional inner exposed surface adapted to frictionally cling to a wearer's body or clothing across the shoulders and adjacent portions of the upper chest and back and thereby to support the weight of the apron; and

(c) tie means attached to the body panel approximately at the waist level thereof including flexible strips attached to opposite sides of the body panel and adapted to be knotted behind the wearer's back.

2. The invention as stated in claim 1 wherein said protective means also includes a layer of flexible, radiation-shielding sheet material between said supporting and outer layers.

3. The invention as stated in claim 2 wherein the last-named layer is fastened to the supporting and outer layers along marginal edges thereof.

4. The invention as stated in claim 1 wherein said wings terminate in end portions closer to one another than intermediate portions of the wings.

5. The invention as stated in claim 4 wherein said wings are arcuately shaped.

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