Nov. 4, 1952 J. A. TALALAY 2,616,093

APPAREL PAD

Filed Aug. 13, 1947 3 Sheets-Sheet 1

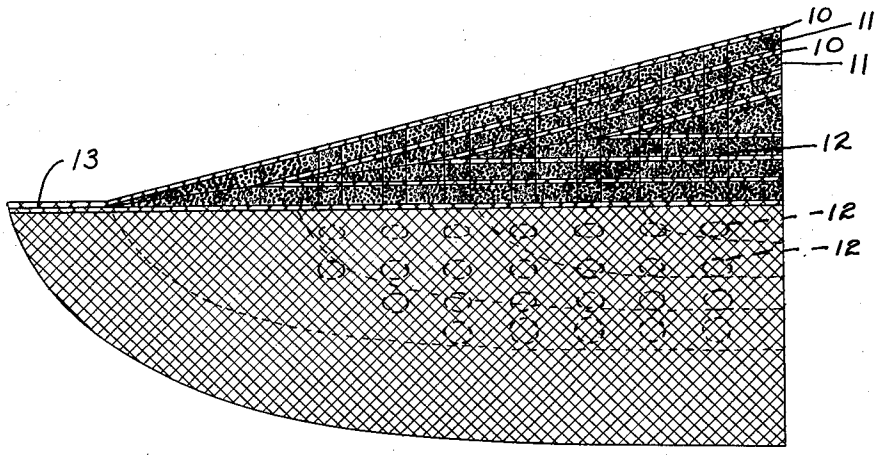

Fig 1

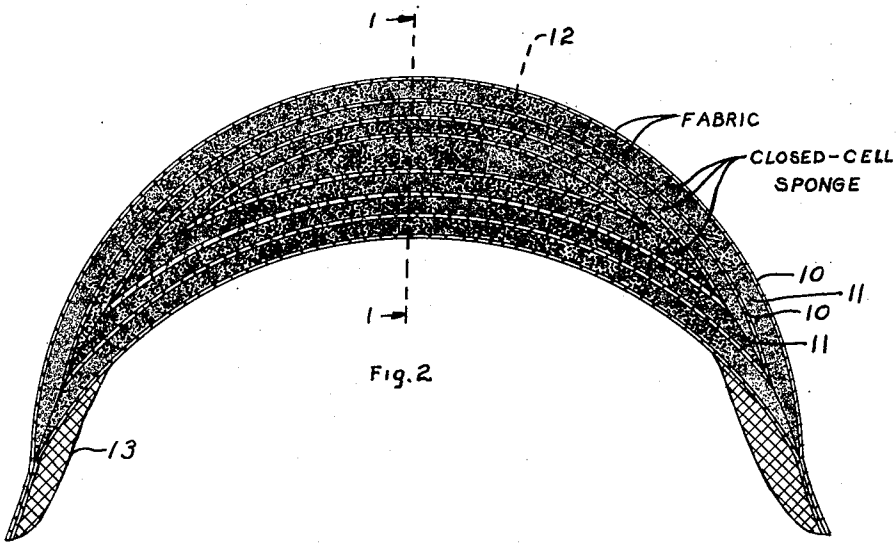

Fig. 2

JOSEPH A. TALALAY
INVENTOR.

BY Willard D. Eakin
ATTORNEY

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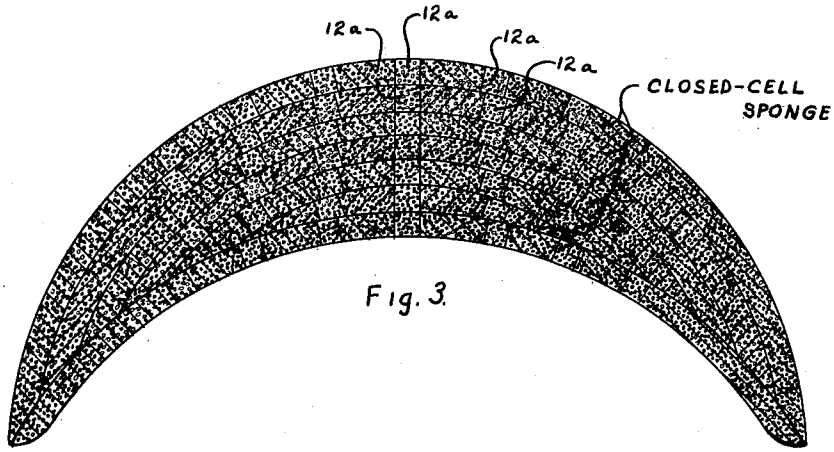

Fig. 3.

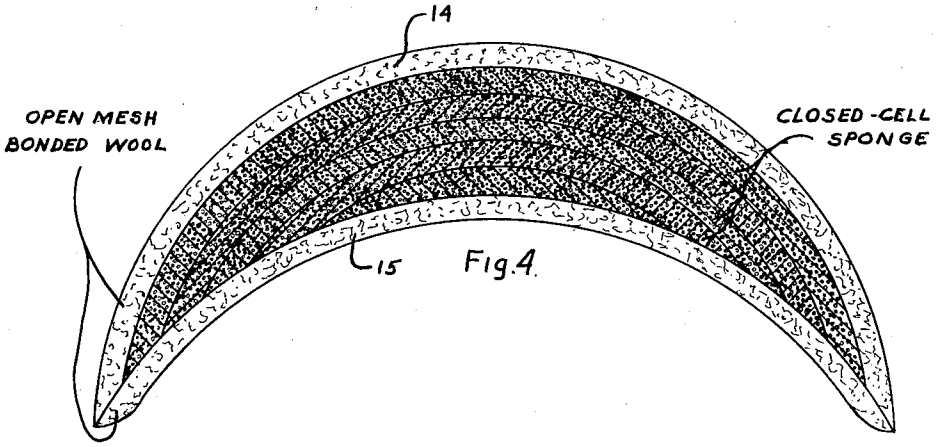

Fig. 4.

JOSEPH. A. TALALAY
INVENTOR.

BY
Willard D. Eakin
ATTORNEY

Nov. 4, 1952 J. A. TALALAY 2,616,093

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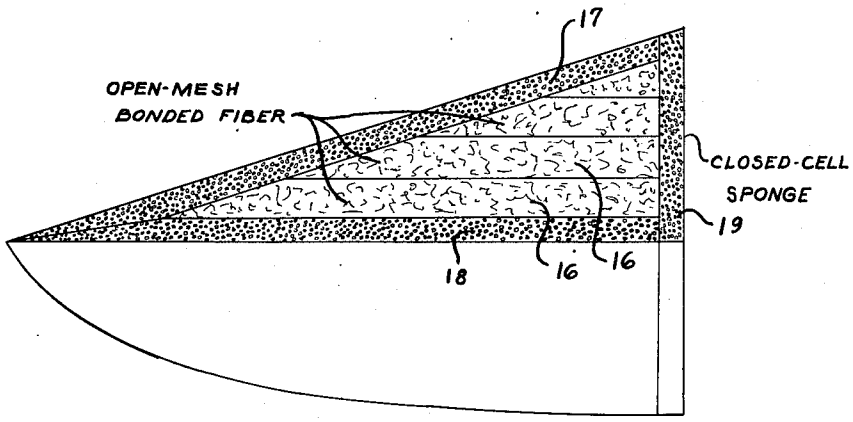

Fig. 5

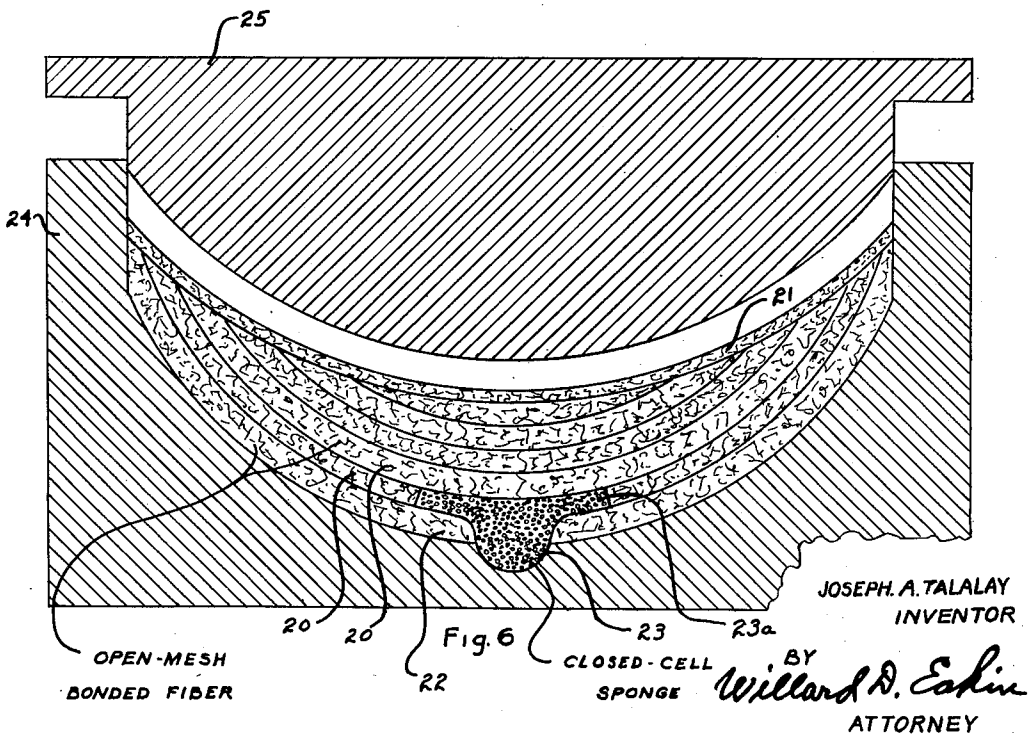

Fig. 6

JOSEPH A. TALALAY
INVENTOR

BY Willard D. Eaton
ATTORNEY

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UNITED STATES PATENT OFFICE

2,616,093

APPAREL PAD

Joseph A. Talalay, New Haven, Conn.

Application August 13, 1947, Serial No. 768,412

9 Claims. (Cl. 2—268)

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This invention relates to pads such as shoulder pads for garments, breast pads, and the like, and to methods of making the same.

Its chief object is to provide a pad having in high degree some or all of the physical characteristics that are generally recognized as being desirable in a shoulder pad or a breast pad and yet adapted to be subjected to many washings or dry-cleaning operations, or to repeated pressing or ironing of the garment of which the pad may be a part, without early deterioration of the pad, either in shape or in quality.

More specific objects, singly and in conjunction with one another, are to provide, in such a pad, softness; resilience; lightness; smoothness of surface; ready adaptability for incorporation in a garment, as by sewing it to fabric or enclosing it within a covering of fabric; water repellent or non-absorbing properties; heat-resistance; resistance to and dimensional stability in solvents of the kind used in dry-cleaning; uniformity of density and of softness; and effective provision for ventilation, as for the evaporation of perspiration. The above objectives, so far as I am aware, have not hitherto been achieved in conjunction with one another in any of the shoulder pads or breast pads of the prior art.

Of the accompanying drawings:

Fig. 1 is a longitudinal middle section, on line 1—1 of Fig. 2, of a shoulder pad embodying and made in accordance with my invention in one of its preferred forms.

Fig. 2 is an elevation of the same, from the right of Fig. 1.

Fig. 3 is a transverse section, taken at the position of ventilating holes, of a shoulder pad illustrating another preferred form of my invention.

Fig. 4 is an elevation of a shoulder pad illustrating another modification.

Fig. 5 is a longitudinal middle section of a shoulder pad illustrating another modification.

Fig. 6 is a middle section of a breast pad and the mold in which it is given its final shape, illustrating still another form of the invention.

The shoulder pad shown in Figs. 1 and 2 comprises layers 11, 11 of a cellular material such as an expanded and vulcanized solvent-resistant synthetic rubber, in which, as produced by known procedures, the cells are individually of closed form and not intercommunicating, such material being adapted to withstand dry-cleaning fluids not only because of the solvent resistant property of the material as such but also because solvent can penetrate into the interior of the article only by diffusion along the devious course through the indirectly extending cell walls.

This effect is especially great when the cells are very small, as will be manifest upon contemplation of the geometry of the matter, assuming a given density.

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An indication of the high degree of impermeability to dry-cleaning fluids that can be obtained in a closed-cell structure of an oil resistant synthetic rubber as compared with open-cell or stereo-reticulate structures is presented by the following example:

Tests were made of samples of the several substances specified, in cellular form, by immersing in commercial dry-cleaning fluid, for two hours, at room temperature, a cylindrical mass of each cellular material about one inch in diameter and about one-half inch thick. The volume was measured before immersion and immediately after removal from the fluid and after the draining off of the surplus fluid.

The results were as follows:

Material:	Percent volume increase
1. Foam made from natural rubber latex	196
2. Foam made from an aqueous dispersion of (neoprene) a polymer of chlorobutadiene	53
3. Foam made from an aqueous dispersion of (Hycar) a nitrile rubber (copolymers of acrylonitrile and butadiene)	33
4. Chemically blown crude rubber sponge	126
5. Chemically blown sponge made of (neoprene) a polymer of chlorobutadiene	77
6. A closed-cell, cellular structure made of (neoprene) a polymer of chlorobutadiene	22
7. A closed cell, cellular structure made of (hycar) a nitrile rubber (copolymers of acrylonitrile and butadiene) less than	1

The cells in materials 1, 2, 3, 4 and 5 are intercommunicating, while the cells in materials 6 and 7 are of a closed-cell form.

The ratios of these figures would of course be even more favorable to the closed-cell structures in the case of briefer immersions such as are employed in dry-cleaning operations.

In the construction of Figs. 1 and 2 the layers of cellular rubber are alternated by and adhered to layers of woven fabric 10, 10. The fabric layers, being porous, permit rapid evaporation of cleaning fluid from them, especially when, as shown, the pad as a whole is formed with a multiplicity of punched through apertures 12, 12 connecting local areas of the fabric with the outer atmosphere. The use of fabric insertions is optional, as shown in Figure 3, where the layers of cellular closed-cell rubber are directly adhered to one another.

Suitably shaped plates of other material such as ebonite can be substituted for the fabric plies.

The use of the fabric or similar layers facilitates the making of the pad. In spite of its

peculiar shape, and without danger of ply-separation, it can be preliminarily built up of a considerable number of pieces of stock of graduated sizes and of appropriate shapes as shown, as in the case of my copending application Ser. No. 677,238, filed June 17, 1946, upon which U. S. Patent No. 2,478,340 issued on August 9, 1949, this procedure being highly advantageous for economy and for uniformity of density, of resilience and of softness throughout the pad.

Also, having good permanency of dimensions, the fabric layers give permanency of shape to the pad as a whole, and the two outer plies of fabric, covering the edges of the inner plies, provide a smooth surface and a good texture for the upper and lower faces of the pad and they can be extended, as shown, beyond the cellular layers, along the curved, thin edge of the pad, to provide a sewing margin 13 for ready incorporation of the pad in a garment. The number of fabric plies can be limited to two, one on each outer surface.

The majority of the known methods for the production of closed-cell, cellular rubber are based on a two-stage process: (1) the rubber is compounded with suitable vulcanizing ingredients, antioxidants, pigments and a blowing agent and "pre-vulcanized" in a mold or frame the volume of which corresponds exactly to the volume of the rubber compound. In this manner the gasifier or blowing agent is caused to decompose but the article, unlike in the method of making chemically blown sponge, is not caused or permitted to expand during cure. When the process of pre-vulcanization is accomplished the mold is opened and the "pre-cured blank" pops out and expands to several times the size of the mold, under the action of the relieved but still confined gas. Due to the fact that the rubber is pre-vulcanized, the expansion of the rubber from the size of the pre-cure mold to the size of the pre-cured blank takes place without rupture of the cell-walls, and without rendering the structure inter-communicating. (2) The second step of the process consists in transferring the blank to a larger, final-cure mold and finally vulcanizing it substantially without further expansion over and above the spontaneous and instantaneous expansion which took place upon release of the blank from the pre-cure mold.

In one form of my invention the cellular layers are cut from such partially vulcanized or pre-vulcanized and expanded material and the individual pieces are then built up, if desired, with the fabric plies, and with the use of a suitable solvent-resistant adhesive, to approximately the final shape of the pad, on a simple form, which can be of wood, cast-iron or aluminum and consequently inexpensive, and the pad as a whole can be given its final shaping and vulcanizing in a suitable mold.

Alternatively the pad can be built up (and the plies adhered to each other with a solvent-resistant cement) from material which has been given the "final cure," and in such case the final molding can be omitted.

For greater softness and adaptability as to shape the plies can be adhered to each other in local areas only, as at the center or at spots along the middle line, and not throughout their extent.

Two of the pads can be built up and mold-vulcanized or otherwise formed as a single unit and then cut apart in the plane of their thicker ends, each half of the unit then being a pad such as is shown in Figs. 1 and 2.

Alternatively the material can be made cellular and partially or fully vulcanized in flat sheet form of considerable thickness and the individual pieces can then be cut from the sheet by splitting and suitably skiving at their margins.

For greater facility and accuracy of skiving, each cellular layer, alone or in association with one or more other layers of the cellular material or of fabric, can be preliminarily frozen and then operated upon while in a frozen condition.

Because of the closed-cell character of the material, the distortion of it, as in ironing or pressing the garment, does not cause the gas within the cells to escape, but only compresses it, and when the distorting force is removed the gas expands and restores the individual cells, and consequently the pad as a whole, to their original shapes.

This effect is especially good when the sponge material is formed by a known procedure such as to leave the cells filled with a gas, such as nitrogen, which is not highly subject to diffusion.

Even though the forming of the ventilating holes 12 by cutting them with a die and punch opens some of the cells at the cut, the adjacent cells remain closed and consequently the cutting does not result in substantially increasing the permeability of the cellular material.

The holes can be die-cut concurrently with the die-cutting of the pieces from a stack of sheets of the stock.

Alternatively the ventilating holes can be formed by mold pins in the mold-vulcanizing of the pad.

The usual compounding ingredients, including reinforcing fibrous materials, can be employed.

The pad shown in Fig. 3 is built up, with the use of a suitable adhesive, of a set of pieces of cellular stock suitably preformed either by cutting and skiving or by molding, and the ventilating holes 12*a*, 12*a*, similarly spaced in all of the plies, provide ventilating passages extending all of the way from the inner face to the outer face of the pad. This pad is adapted to be enclosed within a fabric cover, or to be adhered to fabric-surface layers, for its incorporation in a garment by sewing.

Fig. 4 shows a similar pad without ventilating holes, the pad having ventilating and sewable cover layers 14, 15 of bonded fiber, such as wool, which is of open-mesh form in all of the three dimensions. The inner plies are adapted to resist penetration of solvent as above-described and the open-mesh fiber, bonded with a solvent-resistant substance such as those above mentioned, is adapted to permit solvent to drain and evaporate from it rapidly.

In the pad of Fig. 5 the inner plies 16, 16 are of the bonded fiber and are protected from solvent by covering sheets 17, 18, 19 of the closed-cell sponge material.

This is a desirable type of pad for the utilization of trimmings and scraps of either of the materials, which can be cut into small pieces and in random arrangement treated, as by tumbling, with a suitable adhesive and pressed into sheet form, and preferably vulcanized in such form. Suitably shaped pieces are then made from the sheet and are used preferably for the inner plies 16, 16 of the pad, with the protection of the covering sheets.

In Fig. 6 a breast pad is shown as being made of inner layers 20, 20 of the open-mesh bonded fiber above described and cover layers 21, 22 of the same material, with the exception of a nipple portion 23, which is made of the closed-cell, cel-

lular, solvent-resistant material because the bonded fiber is not so well adapted for detail mold-shaping, and because the cellular material provides more appropriate characteristics.

Preferably the nipple portion **23** is first made cellular and given its shape in a different mold and then built into the structure as shown, the structure first being assembled, with the use of a suitable adhesive, upon a suitably contoured form, and then given, and set in, its final shape by heating and molding it in a mold comprising sections such as the mold sections **24, 25**.

Preferably the nipple member is formed with a relatively wide base portion **23***a* having the same thickness as a ply of the bonded fiber and underlying and thus interlocked with the cover ply **22**, the nipple itself extending through a hole in that ply, as shown.

Each of these embodiments provides a pad having some or all of the desirable characteristics set out in the above statement of objects.

As an alternative to giving the plies their thinned down form at their margins by preliminary mold-shaping or skiving they can be assembled with their full-thickness margins in stepped relation and the steps can be partially or completely smoothed out in the final molding, or they can be filled in by spraying the built up pad with cotton or other flock mixed with a suitable adhesive.

As an adhesive for this purpose, or for bonding the fibers, or for joining the plies of the pad, a good substance is gelatine plasticized with glycerin and hardened with formalin, as it is nonsoluble in water, has a good bonding quality, is resistant to commercial dry-cleaning fluids, and is not unduly affected by heat.

Further modifications are possible without departure from the scope of the invention as defined by the appended claims.

I claim:

1. An apparel pad of concavo-convex shape with its thickness graduated from a relatively thick portion to a thin marginal portion, said pad comprising a closed-cell, cellular body of solvent-resistant rubber and, shaped as a unit therewith, a reticulate body of unwoven fibers, said fibrous body having open-mesh structure in all of the three dimensions and the fibers being bonded to one another at their crossing positions by a solvent-resistant bonding substance.

2. An apparel pad of concavo-convex shape with its thickness graduated from a relatively thick portion to a thin marginal portion, said pad comprising a plurality of layers of a closed-cell, cellular, solvent-resistant, synthetic rubber, and, between at least some of said layers and secured to them, a form-retaining material in sheet form.

3. An apparel pad of concavo-convex shape with its thickness graduated from a relatively thick portion to a thin marginal portion, said pad comprising a closed-cell, cellular body of solvent-resistant, synthetic rubber and, shaped as a unit therewith, a reticulate body of unwoven fibers, said fibrous body having open-mesh structure in all of the three dimensions and the fibers being bonded to one another at their crossing positions by a substance having substantially the bonding and solvent-resistant properties of gelatin plasticized by glycerin and hardened by formalin.

4. An apparel pad of concavo-convex shape with its thickness graduated from a relatively thick portion to a thin marginal portion, said pad comprising a reticulate body of unwoven fibers, said body having open-mesh structure in all of the three dimensions and the fibers being bonded to one another at their crossing positions by a substance having substantially the bonding and solvent-resistant properties of gelatin plasticized by glycerin and hardened by formalin.

5. An apparel pad of concavo-convex shape with its thickness graduated from a relatively thick portion to a thin marginal portion, said pad comprising a body of filler material and, completely enclosing said body, a layer of a closed-cell, cellular, solvent resistant synthetic rubber, said layer consisting essentially of a multiplicity of individually closed, gas-filled, individually gas-retaining, cells.

6. An apparel pad of concavo-convex shape with its thickness graduated from a relatively thick portion to a thin marginal portion, said pad comprising a plurality of layers of a closed-cell, cellular substance having substantially the resilient deformability of vulcanized soft-rubber, and, between said layers and secured to them, a form-retaining material in sheet form.

7. An apparel pad of concavo-convex shape with its thickness graduated from a relatively thick portion to a thin marginal portion, said pad comprising a body of filler material and, secured upon said body, a cover layer of a cellular substance having substantially the resilient deformability of vulcanized soft-rubber, said layer consisting essentially of a multiplicity of individually closed, gas-filled, individually gas-retaining, cells.

8. An apparel pad of concavo-complex shape with its thickness graduated from a relatively thick portion to a thin marginal portion, said pad comprising a closed-cell, cellular substance having substantially the resistant deformability of vulcanized soft-rubber and, adhered thereto, a layer of unwoven fibers having open-mesh structure in all of the three dimensions and having its fibers bonded to one another at their crossing positions.

9. An apparel pad of concavo-convex shape with its thickness graduated from a relatively thick portion to a thin marginal portion, said pad comprising a plurality of laminations of a cellular substance having substantially the resilient deformability of vulcanized soft-rubber, and of graduated sizes, each of said laminations consisting essentially of individually closed, gas-filled, individually gas-retaining, cells.

JOSEPH A. TALALAY.

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