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S. G. VELONIS ET AL

3,072,914

DISPOSABLE SANITARY GLOVE AND METHOD OF MAKING SAME

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Fig. 1.

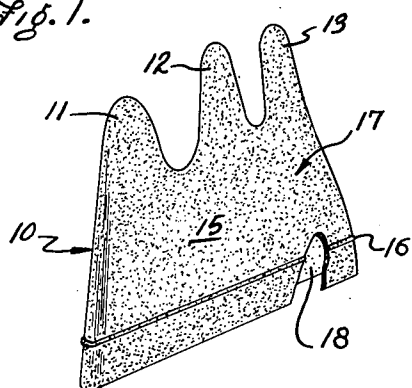


Fig. 2.

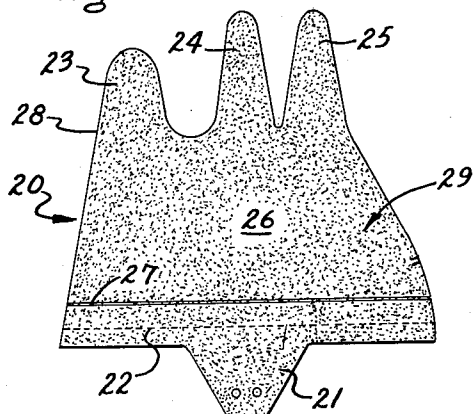


Fig. 3.

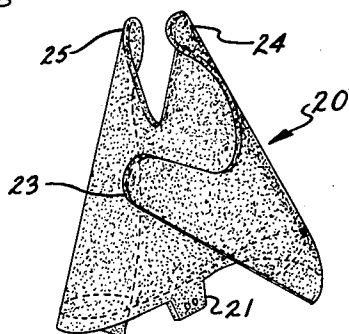


Fig. 4.

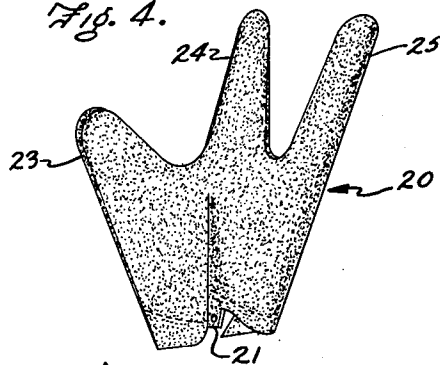


Fig. 5.

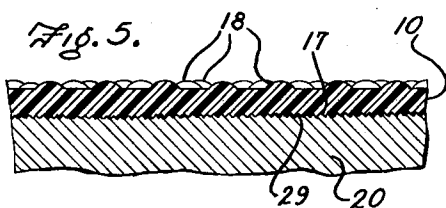


Fig. 6.

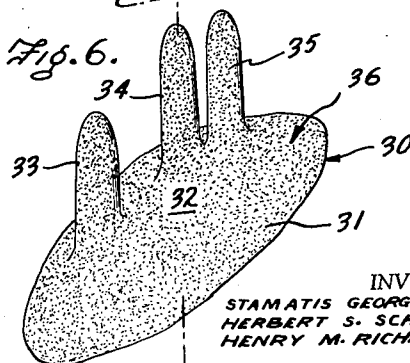
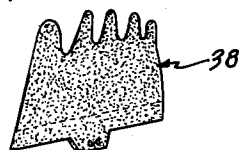


Fig. 7.



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3,072,914 DISPOSABLE SANITARY GLOVE AND METHOD OF MAKING SAME

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10 Claims. (Cl. 2—167)

This invention relates to disposable moisture-proof and otherwise impervious, sanitary gloves.

Physicians, surgeons, nurses and others have need for a disposable glove which can be thrown away or destroyed after a single use, for clinical examination and similar purposes and in general where for sanitary or other reasons direct hand contact is undesirable.

Rubber gloves heretofore used for these purposes are so costly that it is uneconomical to dispose of them after only one use and they must be washed or otherwise cleaned and for clinical use they must be sterilized each time they are used. Furthermore, rubber gloves are relatively thick, reducing tactile sensitivity, and are used with considerable discomfort by individuals who have an allergy sensitivity to rubber or the materials used in its compounding. A relatively tight fit is necessary with rubber gloves if satisfactory tactile properties are to be secured, resulting in a measure of discomfort to the user and some difficulty in putting them on and taking them off.

It is an object of this invention to provide low-cost, lightweight, sterile, disposable gloves. It is a further object to provide gloves which are thin, soft, flexible, non-toxic, non-porous, and which provide a high degree of touch sensitivity through the gloves. It is a still further object of this invention to provide gloves which are non-tacky, which will not block in storage, and which can be pulled on and removed easily.

Other and further objects and advantages of the invention will be made apparent in the disclosures of the accompanying drawing and in the following specification and claims.

Generally stated the above objects are attained by making the glove in a seamless form from a thin film of synthetic resinous material, providing the inner and outer surfaces of the glove with prescribed surface characteristics and so dimensioning the glove that its wrist or cuff portion represents its widest transverse dimension. These and further desirable or essential limitations of form and structure are hereinafter described in detail.

In the accompanying drawing:

FIG. 1 is a generally perspective view of a glove having a thumb and two finger stalls and embodying the invention, parts being broken away;

FIG. 2 is a plan view of a dipping form for producing the glove of FIG. 1;

FIGS. 3 and 4 are generally perspective views showing modifications of the form shape;

FIG. 5 is a fragmentary diagrammatical cross sectional view of the glove film and the surface portion of the form with the dimensions greatly magnified;

FIG. 6 is a generally perspective view of an alternative type of form; and

FIG. 7 is a view on a smaller scale of a five stall dipping form.

Referring to FIG. 1 the glove is, for illustrative purposes, shown as a seamless three fingered glove, as generally indicated at 10, comprising a thumb stall 11, a first or index finger stall 12, a second finger stall 13, and a skirt portion 15.

The glove is formed of a flexible film of fused plas-

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ticized synthetic resin having a relatively fine, overall, uneven outer surface, as generally indicated at 17, and a relatively coarse, overall, uneven inner surface, as generally indicated at 18, with an average film thickness of substantially 2 to 3 mils. The ratio of the peripheral dimension of the free edge of the skirt portion 15 to the distance between that edge and the base of the finger stalls 11—12—13 is between 3 and 5 to 1, preferably and as shown this ratio is approximately 4.6 to 1. Preferably also the outer surface of the glove is provided with an annular rib 16 spaced a short distance from the free edge of the skirt.

The preferred material for the glove is plasticized polyvinyl chloride resin, but will be understood that other resinous compositions of comparable physical properties may be used.

In general the glove is formed by applying a thin coating of a suitable liquid solution, dispersion or latex to a form or mold, drying or fusing the coating, as required, and then stripping the glove inside out from the form or mold.

In carrying out the preferred method of making the glove of the invention and providing the structural features above set forth a dipping form, as generally indicated at 20, is made from a suitable material, such as sheet aluminum of about 1/8 inch thickness having a portion 21 for attaching the form to conventional dipping instrumentalities, and conforming beyond a normal dipping line 22 to the form of the glove generally shown in FIG. 1. The form thus includes portions 23, 24, 25 forming, respectively, the three finger stalls 11, 12 and 13, and portion 26 forming the skirt portion 15. The edges 28 of the form are carefully rounded and a groove 27 provided, adjacent the dip line 22, to form the bead 16 on the skirt of the glove.

To form the fine irregular surface 17 on the outer surface of the glove the surface of the form 20 is first polished and then finely roughened as by caustic etching, vapor blasting, anodizing or by a combination of these procedures or by other suitable methods which do not impart a degree of roughness tending to produce areas of porosity and low strength in the film cast thereon. If the form 20 is made of aluminum a satisfactory etch may be obtained by immersing the polished form in a 5% sodium hydroxide solution for about 15 minutes. This etched or otherwise finely roughened surface of the form is diagrammatically indicated at 29 in FIG. 5.

The form 20 is then dipped in a low viscosity deaerated plastisol, the polyvinyl chloride being dispersed in any of the well known plasticizers used for the purpose. For gloves intended for clinical use the plasticizers should be such as are approved as non-toxic by the Food and Drug Administration. The viscosity of the plastisol should be about 1200 cps. or less, at 20° C. to keep drainage time to a minimum for economic reasons, but higher viscosity up to or somewhat above 3000 cps. can be used by increasing the drain time. Using plastisols the desired coarse irregular overall inner surface 18 of the glove is secured by making the particle size of a minor portion of the granular resin particles in the dispersion of a particle diameter greater than the average thickness of the glove forming film. When the plastisol is to be cast and fused on the form to about a 2 to 3 mil average film thickness the major portion of the dispersed resin particles should be of approximately that diameter or less together with a predetermined minor percentage of particles of about 5 mils in diameter, sufficient in quantity and distribution to provide the coarse, irregular surface 18, where the plastisol is cast and fused to about a 2 to 3 mil average film thickness. Plastisol suitable for the purposes of the invention is commercially available from the Borden Co.

Chemical Division under the trade name Raslac 2336-36C.

The form 20 is dipped in the plastisol to a depth generally indicated by the line 22, representing the desired edge of the skirt of the finished glove, removed from the plastisol and allowed to drain for a period of time sufficient to leave an average thickness of plastisol of 2 to 3 mils on the form. The so-coated form is then heated to a temperature of about 450° F. for a period of 3 to 4 minutes to fuse the dispersed resin of the plastisol and to simultaneously effect the incorporation of the plasticizing dispersion medium into the resin. The form is then cooled to about 100° F. to permit stripping of the glove from the form. Lower or higher fusing temperatures may, of course, be employed for appropriately longer or shorter periods if desired. Since the surface roughening 29 of the form is fine and insufficient to accommodate a substantial flow of the plasticized resin into the surface interstices of the form, the larger particles of resin fuse to impart a relatively coarse characterizing overall roughness to the outer surface of the film on the form, as diagrammatically shown at 18 in FIG. 5. As previously mentioned, the glove is turned inside out as the glove is stripped from the form, thus the outer surface 18 of the film on the form becomes the inner surface of the glove and the surface 17 cast against the etched surface of the form becomes the outer surface of the glove and this relation of the surfaces is preferably maintained in the use of the glove.

The shape and proportions of the glove of the invention and the roughening of the inner and outer surfaces of the glove provide important advantages. The length of the glove is preferably such as to reach to the user's wrist and as is apparent in FIGS. 1 and 2, the finger stalls 11, 12 and 13 flare relatively widely from the tips to the base of the fingers and this flaring is carried to the edge of the skirt 15. This construction results in a relatively loose, drape fit, providing room for housing the metacarpal portion of the hand, and the fourth and fifth fingers pressed lightly against the palm, and makes for easy insertion of the hand into the glove with the thumb and first and second fingers in their proper stalls. This loose fit and in particular the wide flare of the skirt portion furthermore makes for easy removal of the glove after use—one or two quick flicks of the hand and wrist being usually sufficient to remove the glove without assistance from the other hand and the glove may be thus removed directly into a suitable disposal receptacle, a substantial hygienic advantage particularly where the glove has been used for physical examination or surgical purposes. In any event the skirt portion may be thus turned inside out over the fingers and the glove removed without contamination.

The above described inner and outer surface characteristics of the glove make possible the above advantages of the loose or drape fit without sacrifice or tactile sensitivity—tactile sensitivity in fact being enhanced over gloves made of thicker materials frequently used for sanitary glove purposes.

The roughening 18 of the interior surface of the glove approximates that of the skin at the tips of the fingers and when the gloved fingers are pressed against a surface being examined, or an article being grasped, the thin film of the glove is immobilized with respect to the fingers by the cooperating roughness at the interface of the film and fingers, while the roughness 17 of the outer surface prevents unintentional slipping of the outer surface of the glove over the surface being contacted. At the same time the texture 17 of the outer surface is of such minutely fine grain that it feels extremely soft and uniform when applied to a sensitive surface of the body.

In contrast with gloves formed of resilient materials such as rubber, where a stretched, tight fit is in large measure relied on to achieve sensitivity, the localized non-slipping contact through the thin flexible film, rela-

tively loosely drape-fitted over the hand, which characterizes the glove of the invention, provides the desired sensitivity and at the same time is an important factor in securing the added hygienic and economic advantages of a single use article.

In addition to the function played by the described roughened surfaces of the glove such surfaces prevent the undesirable tendency, known as blocking, of the film surfaces to adhere together in packaging and storage of the gloves, and makes unnecessary the resort to dusting with talc or the use of other parting materials to prevent blocking. The described manner of effecting the roughening of the surfaces further minimizes the tendency to the formation of pin holes in the cast film. The gloves may be sterilized, before or after packaging, by means of steam, chemical or other acceptable sterilizing methods.

The bead 16 gives a slight increase in stiffness adjacent the edge of the skirt portion facilitating the flip-off removal of the glove, as above described, but, while preferable, may be omitted.

Without sacrificing the desirable skirt width and length and the resulting drape characteristics, the skirt portion of the glove may, if desired, be given a curved edge, with a saving in glove material and weight, by bending the form about an axis, or axes, inclined from the plane of the form in a direction to reduce the dipping depth of the side portions of the form. For these purposes the form may be bent into the S or fan shape shown respectively in FIGS. 3 and 4, by way of example.

While for most purposes the three stall glove of FIG. 1 is adequate and preferable, the various advantageous constructional features of the invention may be incorporated in a glove having a less or greater number of finger stalls. A dipping form for dipping a glove with a full complement of finger stalls and embodying the invention is shown at 38 in FIG. 7.

While a simple dipping procedure as described is preferred, the material may be sprayed on the forms of FIGS. 2, 3 and 4 if desired.

In FIG. 6 is shown an alternative type of form by which a glove more nearly approximating hand shape may be produced. As shown in FIG. 6 the form, which may be solid or hollow in cross section, comprises a dome shaped body portion 30 which includes a portion 32 on which the skirt portion of the glove is formed, and from which tapering, generally cylindrical stall forming portions 33, 34 and 35 extend, the several portions being dimensioned to provide a glove generally proportioned as previously described. The surface of the form of FIG. 6 is etched, or otherwise finely roughened as indicated at 36, in the manner and for the purposes previously described and the plastisol or other material may be applied thereto by dipping, spraying or pouring. The form of FIG. 6 has the advantage that it may be spun about its central axis, indicated at A, to speed the removal of excess material by a combination of gravity and centrifugal forces.

In forms of the type shown in FIG. 6 the body portion 30 may be flat or domed and may be elliptical or circular in outline. With forms of this type the ratio of the peripheral distance around the edge of the skirt to the distance from the base of the finger stalls to the skirt edge may be as high as 11 to 1, preferably in the range between 9 and 10 to 1.

The glove may also be cast on the inside of a suitably shaped hollow form by a conventional spraying or pouring, pour-out procedure.

While for reasons of simplicity, cost and ease of handling, plastisol is the preferred form of material, the glove may be similarly cast or dipped from solutions or latices of polyvinyl chloride or other suitable resins. Since in these latter forms the resin and plasticizers are either in solution in a common solvent or dispersed in water as a common dispersing agent, the roughening of the inner glove surface cannot be easily effected by variations in the

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particle size of the resin particles. The desired roughening of the inner surface may in such case be obtained by dispersing in the solution or latex suitably sized particles of an inert insoluble granular material such as sand, pumice, thermoset resin particles, or other suitable materials. Such inert granular materials may be dispersed in the plastisol in lieu of the oversized resin particles.

What is claimed is:

1. A seamless disposable sanitary glove formed of flexible, impervious, plasticized polyvinyl chloride film of an average film thickness of 2 to 3 mils and having incorporated and substantially uniformly distributed therein particles of an inert material of a size greater than said average thickness and not substantially exceeding 5 mils.

2. A seamless disposable sanitary glove formed of flexible, impervious, plasticized polyvinyl chloride film of an average film thickness of 2 to 3 mils and having incorporated and substantially uniformly distributed therein particles of polyvinyl chloride of a size greater than said average thickness and not substantially exceeding 5 mils.

3. A seamless disposable sanitary glove formed of flexible, impervious, plasticized polyvinyl chloride film of an average film thickness of 2 to 3 mils and having incorporated and substantially uniformly distributed therein coalesced particles of polyvinyl chloride of a size greater than said average thickness and not substantially exceeding 5 mils, thereby imparting a coarse roughness to the inner surface of the glove, said glove having a plurality of finger receiving stalls and a skirt portion from which the stalls extend, said skirt portion being of a length to reach approximately to the wrist of the wearer and flaring outwardly from the base of the finger stalls to a free edge, the ratio of the peripheral dimension of said edge to the distance between said edge and the base of the stalls being substantially 4.6 to 1 to provide a loosely draped covering for the metacarpal portion of the hand of the wearer, the outer surface of the glove being finely roughened to prevent blocking and, in cooperation with the roughness of the outer surface of the glove, to inhibit movement of the film relative to the fingers and unintentional movement relative to a surface engaged by the outer surface of the glove in use.

4. A glove as in claim 3 and provided on its inner surface adjacent the edge of the skirt portion with a stiffening rib.

5. A glove as in claim 3 the ratio of the peripheral dimension of said edge to the distance between said edge and the base of the stalls being in the range between 9 and 10 to 1.

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6. A sanitary glove formed of a thin, flexible, impervious, synthetic plastic film having a plurality of seamless finger receiving stalls and a generally covered metacarpal receiving chamber of increasing periphery from the base of said stalls to its outer edge, the ratio of the peripheral dimension of said edge to the distance from said edge to the base of said stalls being not less than 3 to 1 and not greater than 11 to 1, the inner and outer surfaces of the glove being finely roughened to prevent blocking and to inhibit movement of the film relative to the fingers of the wearer and unintentional movement relative to a surface engaged by the outer surface of the glove in use.

7. A sanitary glove comprising a film of flexible, impervious, synthetic plastic material having an overall, finely roughened outer surface, said glove including a plurality of seamless finger receiving stalls and a metacarpal receiving portion from which the stalls extend, said film having incorporated therein substantially uniformly distributed particles of said synthetic plastic material of a size greater than the average thickness of said film.

8. A sanitary glove as set forth in claim 7 in which said metacarpal receiving portion is of increasing peripheral size from the base of said stalls to its outer edge.

9. A sanitary glove formed of flexible, impervious, plasticized polyvinyl chloride film having an overall finely roughened surface, said film having incorporated therein substantially uniformly distributed particles of polyvinyl chloride of a size greater than the average thickness of said film, said glove including a plurality of seamless finger-receiving stalls and a metacarpal receiving portion from which the stalls extend.

10. A sanitary glove formed of a flexible, impervious, synthetic plastic film, said film having incorporated therein substantially uniformly distributed particles of inert material of a size greater than the average thickness of the film.

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