Oct. 4, 1932. P. H. WATKINS 1,881,005

PNEUMATIC FORM FOR GLOVE DIPPING

Filed Oct. 11, 1927

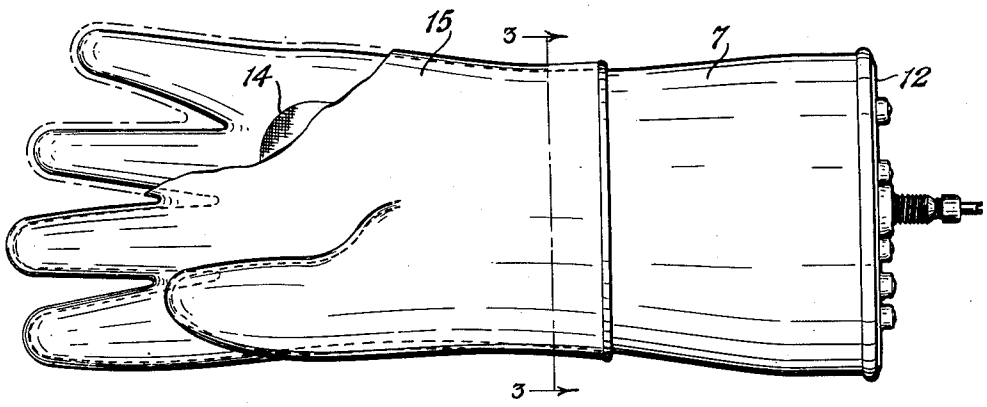


FIG. 1

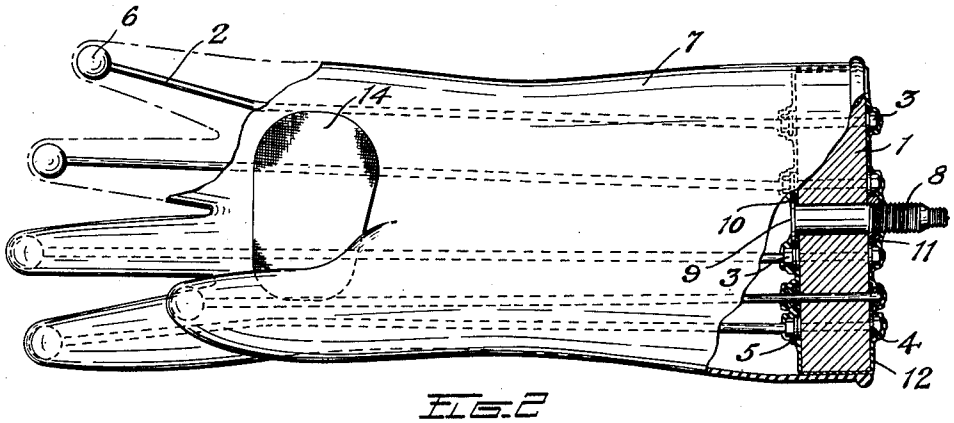


FIG. 2

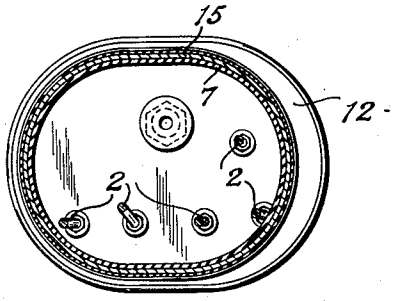


FIG. 3

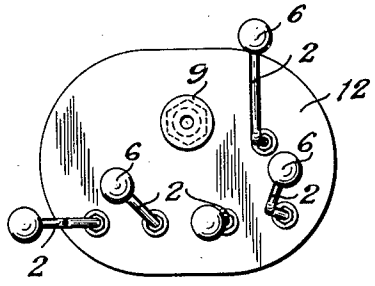


FIG. 4

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UNITED STATES PATENT OFFICE

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PNEUMATIC FORM FOR GLOVE DIPPING

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This invention relates to a method and apparatus for coating articles with rubber. More particularly it relates to a method and apparatus for manufacturing dipped rubber articles inert toward the usual solvents and having a flexible base.

It has been customary to manufacture dipped rubber gloves by dipping a form made of a rigid material such as porcelain into a solution of rubber. The solvent is then evaporated from the coating of rubber upon the form and the glove shaped rubber is vulcanized. These gloves have been suitable for use of surgeons, linemen, etc. Need has been felt for a relatively inexpensive glove which shall have the waterproofing properties of a dipped rubber glove, be resistant to organic solvents, have the strength giving qualities of a glove made of fabric and which can be more readily drawn on and off the hand of the wearer than the usual rubber glove.

It is an object of this invention to provide a dipped rubber glove having a flexible base made of fibrous material. A further object is to provide a rubber article which is resistant to solvents. Another object is to provide an improved process for forming dipped rubber gloves. A further object is to provide an expansible form for filling out the base to remove any wrinkles which may be present in the base. Another object is to provide a form which can be easily inserted into and removed from the base.

For a complete disclosure of the nature and objects of the invention, reference is had to the accompanying drawing in which:

Fig. 1 is a front elevation of the form with a glove in position thereon;

Fig. 2 is a front elevation of the complete form with parts broken away to indicate the frame thereof;

Fig. 3 is a section on the line 3—3 of Fig. 1; and

Fig. 4 is an end view of the skeleton frame support of the form.

In the preferred embodiment of the invention, the base which is to be dipped is made of cotton fabric, although any other fabric or suitable flexible material such as heavy crepe paper can be used. Ordinary fabric cloth is covered with projections of a fine fuzz and in the process of dipping in rubber dispersion, to be later described, the projecting fuzz will take a deposit of the rubber composition with the result that a rough rubber surface is formed on the fabric. The cloth is therefore singed to remove the fuzz.

It is likewise desirable when the fabric base is dipped into the rubber dispersion, that none of the dispersion shall penetrate or strike through to the other side. To aid in preventing this, the fabric is subjected to a proofing operation, this being done preferably before it is cut into blanks for the glove. The proofing operation serves to impregnate the cloth with aluminum stearate. It is accomplished by dipping the cloth in a hot roughly 10% solution of ammonium alum, wringing out the excess solution, dipping in hot approximately 2% ammonium stearate, wringing out the excess, dipping in an ammonium alum, rinsing, wringing out the excess and rinsing in cold water. The fabric is then dried.

The fabric is now cut into blanks and made up into gloves or mittens, or any desired articles which are to constitute a base or backing and be coated with a dispersion of rubber. The fabric glove is placed upon a pneumatic form and is dipped into a rubber dispersion.

The form comprises a block 1 formed of wood, metal or other suitable material from which extends a plurality of rods 2 which are to constitute the supporting frame for the fingers and thumb of the form. The rods 2 are preferably made of flexible material such as steel, aluminum, etc., and are secured to the block 1 by nuts 3 screwed thereon and bearing against metal washers 4 and rubber washers 5. At their outer ends, the rods carry a knob 6 of sufficient size and shape to support the ends of the fingers and thumb without breaking through the same. A rubber glove, preferably a dipped rubber glove 7, is positioned over the frame and is cemented to the block 1 in air tight relation thereto. In cementing the rubber glove to the block, it is desirable to first dip the block in a dispersion of rubber such as latex and then to coat

it with rubber cement, after which the glove is affixed in place. A suitable composition for the rubber cement comprises 10 parts of rubber by weight and 90 parts of benzol by weight. The rubber cement serves to increase the grip of the rubber dispersion on the block 1. In order to inflate and deflate the form, there has been provided a valve stem 8 which passes through the block 1 with the base flange 9 thereof bearing against a rubber washer 10. A nut 11 tightens the valve stem upon the block. The purpose of using rubber washers when securing the rods and valve stem in position, is to make the joints air tight. The step of dipping the block in a dispersion of rubber leaves a layer 12 of rubber composition extending over the block and joints, thereby decreasing the danger of leakage.

This combination of elements constitutes an air tight, flexible, expansible form. Air, water or any suitable material can be inserted through the valve stem to inflate the form. The rods 2 have been disposed sufficiently separated so that the fingers of the form will be spaced apart thus permitting access between the fingers of the form. The glove when inflated has a tendency to bulge outwardly at the palm and back of the form. To offset this tendency, a reinforcement 14 of fabric or other suitable non-yielding material is secured to the palm of the glove or back, or both as desired. This reinforcement can be cemented in place with rubber cement.

Before assembling the fabric backing 15 upon the form, it is desirable to deflate the form, after which the backing can easily be slipped into position thereon. The form is then inflated until it completely fills the backing, which assumes a smooth unwrinkled appearance. The operation of coating the backing with rubber composition can now be undertaken. A latex composition is prepared into which the form and backing is dipped. A suitable composition comprises:

	Parts by weight
Dry rubber (as semi-cured latex containing 40% solids)	100
Zinc oxide	60
Lithopone	40
Ultramarine blue	1/8
Glue	20
Sulphonated castor oil	5
Sulphur	2
Zinc dimethylamine dithiocarbamate	1/2
Sodium silicate	1
Nujol emulsion	25
Nekal	2
Sodium resinate	1 1/2

This composition forms a dispersion of rubber composition in water containing about 55% solids. To this composition should be added sufficient water to make a dispersion containing approximately 45% solids, thereby forming a composition which is suitable for spraying. In place of semi-cured latex, uncured latex or an artificial dispersion of rubber can be used. The zinc oxide, lithopone and ultramarine blue serve as coloring agents. The glue and the sodium silicate function as stabilizers. The sulphonated castor oil gives a smooth surface to the final dipping. The nekal functions as both a stabilizer and a thinning agent, while the sodium resinate serves as a thinning agent. Trisodium phosphate can be substituted for the nekal as desired. The nujol serves as a softening agent and if a dark colored glove is made, a cheaper oil, such as spindle oil, can be substituted therefor. Any soap can be substituted for the sodium resinate, the purpose of which is to aid in corporating the emulsion into the dispersion. In applying the invention to the manufacture of a solvent resistant article a non-soluble soap is preferably substituted for the sodium resinate or the soap is omitted entirely. The glue is of value in the finished article because of its property as a gasoline resistant. It will be understood that the composition can be varied as desired without departing from the spirit of the invention. When constructing an article which is designed to be particularly resistant to organic solvents the compounding ingredients used should preferably be insoluble therein.

The first step in coating the fabric backing is to spray the same with the latex composition. This initial step is desirable for the reason that a thin coating is deposited and the rubber composition does not strike through the fabric. The initial coating is applied in a thin layer and is permitted to dry for a short time, such as ten minutes. A second coating is applied by spraying and the treated glove is allowed to dry for a slightly longer period. If desired, other coatings may be applied by spraying and reinforcement between the fingers is provided for by spraying this part of the glove an additional number of times. The thinly coated glove is then immersed in the latex composition, is removed, and allowed to drain with the fingers projecting downwardly until nearly all of the excess latex has dripped away. The glove is then held in reverse position for a length of time sufficient for the thick drop which has formed at the end of each finger to spread out evenly over the finger. This can complete the dipping operation or, if desired, the treated glove can be dried and again dipped as before.

The step of initially spraying the fabric backing with latex composition to prevent striking through of the composition, can be omitted, if desired, and the initial rubber coatings formed on the backing without striking through in a manner to be now described. Factors affecting the tendency of

the latex composition to strike through the fabric backing comprise the denseness of weave of the fabric, the viscosity of the latex composition, and the hydro-static pressure in the body of latex composition. This pressure varies in different parts of the body of latex composition increasing with the depth. With the latex composition described and using a closely woven backing, it has been found that the backing can be dipped into the composition to a depth of approximately three to six inches without causing a striking through of the backing by the latex composition. Accordingly, the backing is first dipped to a depth of approximately three to six inches below the surface of the liquid, after which the backing is withdrawn and partially, at least, dried. The partially coated backing can be dipped approximately three to six inches more deeply in the latex composition at the next dipping and the progressive dipping can be repeated indefinitely until the entire backing is coated with rubber composition. Repeated dipping of the entirely coated backing into the latex composition effects building up of a layer of rubber composition thereon to the required thickness, as previously described. Latex composition can be sprayed upon the dipped backing if desired in order to provide for local reinforcement of any portion of the article.

The dipped glove is passed through a chamber containing vapors of acetic acid or mixed acetic acid and alcohol in order to coagulate the latex. Alternatively, other methods of coagulating can be employed, such as dipping the glove in a 50% acetic acid solution, or the glove may be dried without using acid.

The rubber coated glove is subjected to vulcanization for approximately one hour at 220° F. under suitable pressure or under such conditions as may be necessary depending upon the particular compound and accelerator used.

In case it is not desired to rubber coat the entire backing, as for example, the wrist portion when the backing has been fabricated into a glove or mitten, it is proposed to secure to the backing by sewing or otherwise at any time prior to the coating operation, a temporary covering of material which the latex composition will not strike through. The material thus temporarily applied covers a localized portion of the backing and prevents access of latex composition thereto. The backing and as much of the temporary covering as is necessary or desirable, can now be coated with rubber composition by spraying, dipping or both, after which the rubber composition adhering to the backing is dried. The rubber coating on the backing can now be coagulated and vulcanized in the manner previously described. The temporary covering is now removed after severing the same or otherwise loosening the covering from the backing. If desired, the temporary covering can be removed prior to the step of vulcanizing the rubber composition. Upon removal of the temporary covering there is left an area of backing which is uncoated by rubber composition, the rubber composition terminating sharply and cleanly at the uncoated area. The uncoated portion of the glove has been maintained perfectly clean in every respect without the exercise of care by the operator.

In order to render the glove more inert towards solvents and to otherwise improve the same, it may be exposed to the action of a halogen such as bromine or chlorine for a length of time sufficient to form a coating of rubber halide on the surface of the glove. For example the glove can be dipped in an approximately 1/10 to 3% solution of bromine in carbon tetrachloride. The excess halogen is removed by washing with water.

By the method as outlined, there has been provided a fabric lined dipped rubber glove in which the rubber composition has the intimate association with the fabric which is secured by dipping in latex. By dipping the fabric backing in latex, the breaks in the fabric and the needle holes, are all coated over with rubber forming a glove which is waterproof. The protecting coating of rubber composition lessens deterioration of the fabric for the reason that it maintains it unaffected by the liquids in which the article may be dipped. The glove can be subjected to comparatively heavy strains without injury thereto by virtue of the strength derived from the fabric base. The glove is inexpensive to manufacture and can be fabricated rapidly and accurately by ordinary sewing. The coating of vulcanized rubber composition derived from a deposit of latex is relatively inert toward the usual rubber solvents, such as gasoline, naphtha, benzol, carbon tetrachloride, and mineral fractions for the reason that the rubber particles have never been broken down in the usual milling operations. When the surface of the glove has been halogenated, it is particularly inert towards solvents. By selection of pigments which are inert toward solvents the resistance of the glove toward solvents has been increased. The glove has a smooth surface and is free from wrinkles. It is suitable for use wherever liquids such as acids must be handled.

While the invention has been described as making use of a dispersion of rubber for coating the backing, suitable rubber solutions can be employed, if desired, and some of the advantages of the invention realized. In place of fabric for the backing or the temporary covering, other supporting materials such as heavy crepe paper can be used. When a smooth finished surface is desired, the fab-

ric used in the backing is preferably calendered prior to the proofing operation. When a rough surface or a surface having a trace of a design is desired, a raised figure at suitable intervals can be formed in the fabric or other backing.

The invention is not restricted to the manufacture of gloves, mittens, or other wearing apparel for the hands, but can be applied to the manufacture of any rubber coated article which is designed to have a reinforcing base. Among such articles may be mentioned shoes, rubber tubing, bathing caps, etc. The invention is particularly applicable to the manufacture of rubber coated fabric which is made into articles designed to be subjected to the action of solvents or their vapors such for example as the breather bag which is used for preventing loss of vapors from oil tanks. These bags can be formed of fabric or other suitable material coated with solvent resistant rubber composition.

Having thus described my invention, what I claim and desire to protect by Letters Patent is:

1. A form for repeatedly making dipped rubber articles comprising a flexible frame, an expansible covering for the frame and means for expanding the covering.

2. A form for making dipped rubber articles of handwear comprising a frame having spaced projections, a glove shaped covering carried by the frame with the fingers and thumb thereof supported and held apart by said projections, and means for expanding the covering.

Signed at New York, county and State of New York, this 6th day of October, 1927.

PARKE H. WATKINS.