Title: AN INTERMEDIATE PRIMER COAT

Abstract: The present invention relates to an intermediate primer coat, which enhances the adhesion of polymer coatings on to elastomeric rubber articles such as rubber gloves, condoms, catheters, finger cots and balloons. The key feature of the process is the use of the intermediate primer coat, which is applied to the elastomeric article, followed by application of the desired polymer coating for the article.
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AN INTERMEDIATE PRIMER COAT

FIELD OF THE INVENTION

The present invention relates to an intermediate primer coat which enhances the adhesion of a coating polymer on to elastomeric rubber articles.

BACKGROUND ART

The concept of using coatings for flexible rubber articles has been utilised almost since the first rubber articles were produced over the last century. The early coating materials used for rubber articles comprised of applied powders, such as talc, calcium carbonate, various types of cornstarch or other mineral powders, as a means of lubricating the rubber surface, especially on the interior donning surface of articles such as gloves, in order to facilitate easy donning. These powders have undesirable side effects, in particular for hygiene and medical reasons, in the case of medical gloves and other medical items.

In the last 20 years or so, other materials or processes have been used in order to produce powder-free elastomeric articles. One popular process is to use chlorine, in the case of rubber articles, where the rubber contains free unsaturated double bonds, as is the case with natural rubber or any synthetic co-polymer of butadiene.
In recent years, there has been a move away from the use of powder, for a number of medical reasons and so alternative coating methods have been employed. A popular method is that of chlorination of the rubber surface, which is possible in the case of polymers having unsaturated double bonds in the structure, as is the case for natural rubber and the synthetic co-polymers of butadiene. Chlorine reacts with these rubbers to form a fairly lubricious surface, but unfortunately the chlorination has a detrimental effect on the properties of the rubber, especially after prolonged aging.

The current popular process is to coat the surfaces of gloves with polymers which have low friction between the surface of the rubber and the wearers hands and also low friction between adjacent surfaces, so as to avoid the sticking of internal or external surfaces of the gloves, which would otherwise impair the donning and dispensing of rubber gloves. The most commonly applied polymers are acrylic polymers and polyurethane polymers, or mixtures of the two, but any other polymeric material can be utilised. The polymer to be applied to glove surfaces may be in the form of an aqueous dispersion or solution or a non-aqueous dispersion or solution, as long as it is applied in a liquid carrier. The polymer or polymer mixtures, in a liquid form, after being applied to the rubber surface is dried to remove or partially remove the liquid carrier, which leaves dry or partially dry polymer on the rubber surface, as a coating and the polymer may be present as a continuous thin film or as a uniformly applied non-continuous coating, similar to that of a powder coating.
More recently, coatings have been developed which are based on polymeric materials, analogous to the paint coatings, which have been developed for all types of substrates including masonry, wood, metal, plastics and rubbers.

European Patents No. 0 105 613, 0 113 526, 0 199 318 and 0 198 514 and US Patents No. 4,482,577, 4,499,154, 4,548,844 and 4,575,476 disclose the use of a hydrogel polymer, which is bonded on to the donning surface of a rubber article such as a surgeon’s glove. These patents describe the use of various copolymers of hydroxyethylmethacrylate, which are treated with various surfactants and these are used as coating materials. Such hydrogel coatings on gloves are claimed to substantially improve the lubricity of the layer with respect to damp skin. A key common concept in these patents is the use of strong acids to prime the rubber surface prior to application of the solution of polymer coating.

European Patent No. 0 368 456 describes the use of a bi-layer glove, which is designed to give a visual indication in the event of the glove being damaged. Another such layered glove is described in US Patent No. 5,020,162 in which gloves have two layers, which are able to slide relatively, so as to improve the feel of thick plastic gloves.

US Patent No. 5,272,771 discloses the use of a particular type of polymer blend, which is claimed to give good adhesion to the inner surface of rubber gloves. The blend comprises of a blend of an ionic polyurethane dispersion and an acrylic latex or dispersion of larger particle size than the polyurethane material. The strong ionic nature of the polyurethane particles is claimed
to provide strong bonding to the base rubber of the glove. This type of blend gave micro-rough surfaces which contained clusters of particles of about 80μm in diameter.

US Patent No. 5,570,475 describes polymers based on copolymers of a maleic ester and either vinyl alkyl ether or alkylenes. These materials are used primarily for coating surgeon’s gloves, which may be made from natural or synthetic rubber. In this patent, it is claimed that adhesion is sufficient so that any “primer” for the rubber is not necessary. Also disclosed is the use of a cationic surfactant system, in this case cetyl pyridinium chloride, which is preferred as a combination with an anionic fatty acid material. The use of such cationic surfactant systems to promote easier damp-hand donning has been well publicised over the last 30 years.
SUMMARY OF THE INVENTION

Accordingly there is provided an intermediate primer coat, the intermediate primer coat contains a proportion of the polymer used in the polymer coat and a proportion of the elastomeric polymer used for the dipped elastomeric polymer article, either as a latex, dispersion or solution form, wherein the intermediate primer coat is used to enhance the adhesion of a layer of the polymer coat on to a layer of the dipped elastomeric polymer article.

There is also provided a process for producing a dipped elastomeric polymer article which comprises a layer of a polymer coat, a layer of a dipped elastomeric polymer article and a layer of an intermediate primer coat, wherein the intermediate primer coat contains a proportion of a polymer coat and a proportion of dipped elastomeric polymer article, either as a latex, dispersion or solution form and wherein the intermediate primer coat is used to enhance the adhesion of a layer of the polymer coat on to a layer of the dipped elastomeric polymer article, the process comprising the steps of (a) cleaning of the polymer article formers, (b) drying the cleaned formers at a temperature of above 60°C, (c) cooling the formers to a temperature of below 100°C, (d) dipping the dry formers into a powdered coagulant or a powder-free coagulant at a temperature in the range of 40 to 80°C, (e) drying the coagulant coated former at a temperature of below 100°C, (f) cooling the coagulant coated former at a temperature below of 60°C, (g) dipping the coagulant coated former into a latex compound which is maintained at a temperature in the range of 15 to 35°C, (h) partially drying the latex coated compound on the former at a temperature in the range of 50 to 120°C, (i) applying the intermediate primer coating material on to the latex compound coated article on the former, (j) drying the intermediate primer coating on
the rubber film at a temperature in the range of 60 to 120°C, (k) leaching the dry composite film from (j) at a temperature in the range of 40 to 80°C, (l) drying the film from (k) is at a temperature in the range of 60 to 120°C, (m) dipping the dry film from (l) into an aqueous acrylic containing polymer dispersion at a temperature in the range of 15 to 35°C, (n) curing the coated rubber article on the former at a temperature in the range of 80 to 150°C, (o) stripping the coated rubber articles from the formers and (p) drying the coated rubber articles.

Further, there is also provided a dipped elastomeric polymer article, the article comprises a layer of a polymer coat, a layer of a dipped elastomeric polymer article and a layer of an intermediate primer coat, wherein the intermediate primer coat contains a proportion of the polymer used for the a polymer coat and a proportion of the elastomeric polymer used for the dipped elastomeric polymer article, either as a latex, dispersion or solution form and wherein the intermediate primer coat is used to enhance the adhesion of a layer of the polymer coat on to a layer of the dipped elastomeric polymer article.

The present invention consists of certain novel features and a combination of parts hereinafter fully described and illustrated in the accompanying photomicrographs and particularly pointed out in the appended claims; it being understood that various changes in the details may be without departing from the scope of the invention or sacrificing any of the advantages of the present invention.
BRIEF DESCRIPTION OF THE PHOTOMICROGRAPHS.

For the purpose of facilitating an understanding of the invention, there is illustrated in the accompanying photomicrographs the preferred embodiments thereof from an inspection of which when considered in connection with the following description, the invention, its construction and operation and many of its advantages would be readily understood and appreciated.

Figure 1 is a scanning electronmicrograph (at a magnification of x 35) of the control coating of acrylic polymer on to the natural rubber glove surface, which has no primer layer;

Figure 2 is a scanning electronmicrograph (at a magnification of x 35) of the polymer coating according to the preferred embodiments of the invention, wherein the intermediate primer coating comprises 90% natural rubber and 10% acrylic polymer;

Figure 3 is a scanning electronmicrograph (at a magnification of x 35) of the polymer coating according to the preferred embodiments of the invention, wherein the intermediate primer coating comprises 80% natural rubber and 20% acrylic polymer.
DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

The present invention relates to an intermediate primer coat, which enhances the adhesion of coating polymers on to elastomeric rubber articles. Hereinafter, this specification will describe the intermediate primer coat according to the preferred embodiments and by referring to the accompanying photomicrographs. However, it is to be understood that limiting the description to the preferred embodiments of the invention and with reference to the accompanying photomicrographs is merely to facilitate discussion of the present invention and it is envisioned that those skilled in the art may devise various modifications and equivalents without departing from the scope of the appended claims.

All matter requires bonding between molecules in order that a given material, whether elemental or a combination of elements, can appear as a solid or liquid. The same applies to polymeric materials such as elastomeric polymers, thermoplastic polymers or any known polymer, whether naturally occurring or synthetically produced. For polymers these cohesive forces may be ionic in nature, or as is more common, the cohesive forces are known as Van der Waals forces, which are forces of attraction between molecules of the same structure or similar polarity.

The present invention also utilises the normal physico-chemical bonding due to Van der Waals forces of attraction. It has been determined during the course of researches conducted by the present inventors that better adhesion of a coating polymer, which is essentially different from that of the elastomeric polymer article to which the coating is applied will occur if an intermediate primer coating is applied. The intermediate primer coat ensures good adhesion of
the polymer coating to the elastomeric rubber article. Key to this good adhesion is the use of a blend of the polymer latex used to make the article, together with the aqueous polymer used in the final coating material.

The key feature of the present invention is the use of an intermediate primer coat, which comprises essentially of a liquid blend, aqueous or non-aqueous, of the coating polymer and the elastomeric polymer used to make the article which is applied to the elastomeric rubber articles such as rubber gloves, condoms or balloons, followed by application of the desired polymeric coating for the article. The desired polymeric coating may consist of any aqueous based polymer latex, polymer solution, polymer latex blend, formulated polymer latex dispersion or any blend of the aforesaid polymer systems.

The process exploits the physico-chemical affinity of the base elastomeric material to itself and likewise the polymer used in the coating to itself. Also, the blend of two or more different polymers contributes to micro roughening of the surface, which also improves adhesion of the applied polymer coating.

In the case of elastomeric rubber articles, such as rubber gloves, the coatings are designed to reduce friction between the wearer’s hands, whether the hands are moist or dry, and this facilitates easier donning. Also, it is usual for such coatings to improve the comfort for the wearer.
The relative proportions of each of the two polymers may be in the range 5 to 95% of either and also, other polymers may be incorporated into the formulation of the intermediate primer coating layer. To illustrate this concept, below are just a few examples, in outline, of the types of possible primer systems:

a) A natural rubber article, such as a medical glove, on to which an intermediate primer coating consisting of a liquid blend of natural rubber latex, a synthetic acrylic polymer latex and other additives to ensure compatibility. The final coating of the acrylic polymer containing dispersion is then applied to the primer layer to achieve good adhesion.

b) A synthetic rubber article, such as a glove made from acrylonitrile-butadiene rubber, on to which an intermediate primer coating consisting of a liquid blend of acrylonitrile-butadiene latex, a synthetic acrylic polymer latex and other additives to ensure compatibility. The final coating of the acrylic polymer containing dispersion is then applied to the primer layer to achieve good adhesion.

c) A natural rubber article, such as a medical glove, on to which an intermediate primer coating consisting of a liquid blend of natural rubber latex, a synthetic polyurethane polymer dispersion and other additives to ensure compatibility. The final coating of the polyurethane polymer containing dispersion is then applied to the primer layer to achieve good adhesion.

d) A synthetic rubber article, such as a glove made from acrylonitrile-butadiene latex, on to which is applied an intermediate primer coating consisting of a liquid blend of acrylonitrile-butadiene latex, a synthetic polyurethane polymer dispersion and other additives to ensure compatibility. The final coating of the polyurethane polymer containing dispersion is then applied to the primer layer to achieve good adhesion.
In the above examples, it is possible to apply the concept to blends of any of the above. It is also possible to utilise this concept of a single applied polymer coating, in which the applied coating polymer contains a proportion of latex or dispersion of the substrate polymer. The types of polymer coatings may be ones which are designed to reduce the dry friction of the surface of the rubber article or also those coatings which are designed to reduce the friction of the surface of the rubber article and damp or wet contacting surfaces, such as a hand, in the case of rubber gloves.

There are many other possible materials which can be used for both the rubber article, such as polychloroprene, polyurethane, styrene butadiene rubbers and block copolymers of styrene, butadiene, isoprene, etc. and similarly for the intermediate primer coating and polymer coating.

In the case of natural rubber articles, the composition of the intermediate primer coating may contain from 10 to 90% of natural rubber, which may be present as raw rubber latex, pre-vulcanised rubber latex, compounded rubber latex or any blend of these 3 types. The polymer used for the outer coating layer may be derived from other polymers in addition to acrylic types and these include polyurethane dispersions, acrylonitrile latex, styrene-butadiene, silicone polymers, or any blends of these types. In some cases, blends of various polymers with natural rubber latex, are not very stable, often due to pH differences, so in these cases, additional surfactant is added to maintain a stable formulated polymer blend for use as the intermediate primer coat.
Similarly for dipped rubber articles made from other polymer latices or dispersions, such as synthetic co-polymers of butadiene, which include acrylonitrile-butadiene latex, acrylic co-polymers of butadiene, chloroprene type latex, polyurethane dispersions, or blends of any of the types mentioned. In these cases, the material used for the intermediate primer coating will be a composition containing a blend of the base material and the material of the outer coating.

In the case of rubber gloves, the most commonly used materials are natural rubber, synthetic co-polymers of butadiene, such as acrylonitrile-butadiene, chloroprene rubbers and acrylic butadiene, synthetic polyisoprene, polyurethane, block copolymers of styrene and butadiene, or any blends of these polymers.

In the case of a polymer coated natural rubber surgeon’s glove, the process may involve a normal chain line dipping process. The process may be as follows:

a) Rubber article formers are cleaned by a combination of liquid cleaning chemicals and mechanical brushing;

b) The clean formers are dried in an oven at a temperature of above 60°C, preferably in the range of 70 to 100°C;

c) The formers are cooled at a temperature of below 100°C, preferably in the range of 50 to 70°C;

d) The dry formers may be dipped into a powdered coagulant or a powder-free coagulant at a temperature in the range of 40 to 80°C, preferably in the range of 50 to 70°C. The coagulant normally contains an aqueous or aqueous/alcohol solution of a calcium salt, such as calcium
nitrate, plus wetting agent, plus a powder, such as calcium carbonate, as a powder release agent, or a powder-free release agent;

e) The coagulant coated former is then dried in an oven at a temperature of below 100°C, preferably in the range of 70 to 100°C;

f) The coagulant coated former is cooled at a temperature of below 60°C, preferably in the range of 40 to 60°C;

g) The coagulant coated former is dipped into the latex compound which is maintained at a temperature of between 15 to 35°C, preferably between 20 to 30°C;

h) The latex coated compound on the former is then partially dried at a temperature in the range of 50 to 120°C, preferably between 80 to 110°C for about 1 minute;

i) The partially dried latex coated former may either pass through leach water at a temperature of between 50 to 90°C, preferably between 50 to 70°C, or may by-pass this leaching stage;

j) The latex compound coated former is then dipped into an intermediate primer coating material, which contains natural rubber latex, pre-vulcanised natural rubber latex, or a natural rubber latex compound, blended with an acrylic latex formulation;

k) The intermediate primer coating on the rubber film is then dried at a temperature in the range of 60 to 120°C, preferably in the range of 80 to 110°C;

l) The dry composite film from (k) is leached in water at a temperature in the range of 40 to 80°C, preferably in the range of 50 to 70°C for about 3 minutes;

m) The film from (l) is then dried at a temperature of between 60 to 120°C, preferably between 80 to 110°C for about 2 minutes;

n) The dry film from (m) is dipped into an aqueous acrylic containing polymer dispersion at a temperature in the range of 15 to 35°C, preferably in the range of 20 to 35°C;
o) The coated rubber article on the former is then cured in an oven at a temperature in the range of 80 to 150°C, preferably in the range of 80 to 120°C;

p) The coated rubber articles are stripped from the formers and are then cyclone dried.

Dipped rubber articles such as gloves from the above process, (a) to (p), may be ready use after stage (p), but in some instances, further improvement to attaining low friction of the polymer layer, especially in the case of damp-hand donning surgeon’s gloves, may be achieved by off-line processing with other polymers and additives.

There are various forms of polymer coating, some are for dry-hand donning, whilst there are some which facilitate both dry and damp-hand donning. Adhesion of the polymer coating has been a technical problem, which can result in flaking of the coating, either during manufacture of the glove or during wearing of the glove. Various techniques, involving roughening of the substrate surface have been employed.

In this invention, the concept of the strong adhesion the base material of the glove, has for itself, analogous to a “welding” process, has been utilised. The invention employs the application of an intermediate primer coat, which must contain a proportion of the base polymer, either as a latex, dispersion or solution form. Another essential component of the intermediate primer coat is that it must contain a proportion of the coating polymer, either as a latex, dispersion or solution form. Consequently, the intermediate primer coat comprises at least of a mixture of the substrate elastomer and the coating polymer and it may or may not contain one or more other components, such as other polymers. The final donning polymer coating is then applied on top of the
intermediate primer coat, so in essence there are two polymer layers applied to the surface of the rubber article.

Such intermediate primer coats have two main features which enhance the function of polymer coatings on gloves:

a) Since the intermediate primer coat contains the same polymer as the substrate, adhesion of the intermediate primer coat to the substrate is good. Likewise, since the intermediate primer coat contains the same polymer as the polymer coating, adhesion of the polymer coating to the intermediate primer coat is good. The net overall effect is that the adhesion of the polymer coating to the glove surface is good.

b) The result of using a mixture of polymers in the intermediate primer coat, creates a micro-rough surface, due to incompatibility of mixtures of polymers, which tend to dry in domains. The micro-rough surface feature reduces the friction of surfaces in contact with the polymer, as there are fewer points of direct contact and this applies to both dry and damp-hand donning coatings. Figures 1 to 3 are scanning electronmicrographs (at a magnification of x 35) taken of a polymer coated surface in which the intermediate primer coat is made up of different proportions of the base polymer and the coating polymer. Particularly, Figure 1 is the control coating which has no primer layer, Figure 2 is a polymer coating, using an intermediate primer coating comprising 90% natural rubber and 10% acrylic polymer, and Figure 3 is of a polymer coating, using an intermediate primer coating comprising 80% natural rubber and 20% acrylic polymer. It is noted that for this particular blend of polymers in the intermediate primer coat, there is an optimal micro-roughening effect at a ratio of
about 80 to 20, of the 2 polymers, natural rubber and acrylic polymer. For other types of substrate rubber and different polymers, the optimal ratio may be different.

For the intermediate primer coat, the two polymers comprising the substrate elastomeric polymer and the polymer used for the donning coating, must be present in the intermediate primer coat. The amount of either of these two polymers can be in the range 5 to 95% of the final dried intermediate primer coat and in addition to this, the intermediate primer coat may contain other polymeric materials to give any desired property.

Below are some examples of types of polymer combinations, which may be used for the intermediate primer coat of polymer coated articles. These examples only serve to demonstrate the wide range of articles and processes which can utilise the concept of an intermediate primer coat in order to achieve good adhesion and desired surface effects for polymer coated rubber articles and, as such, similar systems can utilised by those experienced in the art:

a) A natural rubber article, such as a medical glove, on to which is applied an intermediate primer coating containing a liquid blend of natural rubber latex and a synthetic acrylic polymer latex, with or without other additives, which may include other polymers. The final coating, which is applied on top of the intermediate primer coat, will then contain the same or same type of acrylic polymer latex, used in the intermediate primer coat, with or without any other additives, which may be required for desired surface properties.

b) A natural rubber article, such as a medical glove, on to which is applied an intermediate primer coating containing a liquid blend of natural rubber latex and a synthetic polyurethane
dispersion, with or without other additives, which may include other polymers. The final coating, which is applied on top of the intermediate primer coat, will then contain the same or same type of polyurethane polymer dispersion, used in the intermediate primer coat, with or without any additives, which may be required for desired surface properties.

c) A synthetic rubber article, such as a glove made from acrylonitrile-butadiene rubber, or a blend of acrylonitrile-butadiene rubber with another synthetic polymer, such as chloroprene rubber, on to which is applied an intermediate primer coating. The intermediate primer coating may contain acrylonitrile-butadiene latex and a latex or dispersion of the same type of polymer as the final coating. Alternatively, in the case of a glove made from a blend of acrylonitrile-butadiene and another synthetic polymer, the intermediate primer coat may contain either or both of the polymers used to make the glove, plus the same type of polymer latex or dispersion used in the final polymer coat.

d) A synthetic rubber article, such as a glove made from polychloroprene rubber, or a blend of polychloroprene rubber with another synthetic polymer, such as acrylonitrile-butadiene rubber, on to which is applied an intermediate primer coating. The intermediate primer coating may contain polychloroprene rubber latex and a latex or dispersion of the same type of polymer as the final coating. Alternatively, in the case of a glove made from a blend polychloroprene latex and another synthetic polymer, the intermediate primer coat may contain either or both of the polymers used to make the glove, plus the same type of polymer latex or dispersion used in the final polymer coat.

e) A synthetic rubber article made from an acrylic-butadiene copolymer, or a blend of acrylic-butadiene copolymer with another synthetic polymer, on to which is applied an intermediate primer coating. The intermediate primer coating may contain acrylic-butadiene copolymer
and a latex or dispersion of the same type of polymer used in the final coating. Alternatively, in the case of a glove made from a blend of an acrylic-butadiene copolymer and another synthetic polymer, the intermediate primer coat may contain either or both of the polymers used to make the glove, plus the same type of polymer latex or dispersion used in the final polymer coat.

f) A synthetic rubber article made from synthetic polyisoprene, or a blend with another synthetic copolymer of butadiene, on to which is applied an intermediate primer coating. The intermediate primer coating may contain synthetic polyisoprene and a latex or dispersion of the same type of polymer used in the final coating. Alternatively, in the case of a glove made from a blend of synthetic polyisoprene and another synthetic polymer, the intermediate primer coat may contain either or both of the polymers used to make the glove, plus the same type of polymer latex or dispersion used in the final polymer coat.

g) A synthetic rubber article made from synthetic polyurethane, or a blend with another synthetic polymer, on to which is applied an intermediate primer coating. The intermediate primer coating may contain synthetic polyurethane and a latex or dispersion of the same type of polymer used in the final coating. Alternatively, in the case of a glove made from a blend of synthetic polyurethane and another synthetic polymer, the intermediate primer coat may contain either or both of the polymers used to make the glove, plus the same type of polymer latex or dispersion used in the final polymer coat.

h) A synthetic rubber article made from a synthetic block-copolymer such as styrene-butadiene-styrene (SBS), styrene-ethylene-butadiene-styrene (SEBS), or styrene-isoprene-butadiene-styrene (SIBS), on to which is applied an intermediate primer coating containing a blend of the block co-polymer and the final polymer coating.
EXAMPLE

Following is a description by way of an example of the uses of the intermediate primer coat. However, it is to be understood that the example given in the embodiments of this invention, serve to explain the concept of the invention and it is envisioned that those skilled in the art may devise various modifications and equivalents, without departing from the scope of the appended claims.

Natural rubber gloves have been produced, using an intermediate primer coat containing different proportions of prevulcanised natural rubber latex and the acrylic polymer latex used in the final polymer coating. The ease of donning of gloves made with these polymer coats were assessed by a panel of appropriately experienced persons, using a scale of 1 to 5 for donnability, where 5 is very easy. The results are given in Table 1.

Table 1

<table>
<thead>
<tr>
<th>Composition of Primer layer</th>
<th>Donnability Rating</th>
</tr>
</thead>
<tbody>
<tr>
<td>No intermediate Primer layer</td>
<td>3</td>
</tr>
<tr>
<td>90% Natural Rubber / 10% Acrylic Polymer</td>
<td>4</td>
</tr>
<tr>
<td>85% Natural Rubber / 15% Acrylic Polymer</td>
<td>4.5</td>
</tr>
<tr>
<td>80% natural Rubber / 20% Acrylic Polymer</td>
<td>4.5</td>
</tr>
<tr>
<td>70% Natural Rubber / 30% Acrylic Polymer</td>
<td>4</td>
</tr>
</tbody>
</table>
While in the foregoing specification this invention has been described in relation to certain preferred embodiments thereof, and many details have been set forth for purpose of illustration, it will be apparent to those skilled in the art that the invention is susceptible to additional embodiments and that certain of the details described herein can be varied considerably without departing from the basic principles of the invention.
CLAIMS

1. An intermediate primer coat, the intermediate primer coat contains a proportion of the polymer used in the polymer coat and a proportion of the elastomeric polymer used for the dipped elastomeric polymer article, either as a latex, dispersion or solution form, wherein the intermediate primer coat is used to enhance the adhesion of a layer of the polymer coat on to a layer of the dipped elastomeric polymer article.

2. The intermediate primer coat as claimed in claim 1, wherein the intermediate primer coat must contain a mixture of the substrate elastomer and the coating polymer and may contain other materials.

3. The intermediate primer coat as claimed in claim 2, wherein the intermediate primer coat contains one or more other components, such as other polymers.

4. The intermediate primer coat as claimed in claim 1, wherein the intermediate primer coat is a liquid, aqueous or non-aqueous blend of dispersions of the material used to make the dipped elastomeric polymer article and the polymer used in the polymer coating.

5. The intermediate primer coat as claimed in claim 1, wherein the article is glove, condom, balloon or catheter.
6. A process for producing a dipped elastomeric polymer article which comprises a layer of a polymer coat, a layer of a dipped elastomeric polymer article and a layer of an intermediate primer coat, wherein the intermediate primer coat contains a proportion of a polymer coat and a proportion of dipped elastomeric polymer article, either as a latex, dispersion or solution form and wherein the intermediate primer coat is used to enhance the adhesion of a layer of the polymer coat on to a layer of the dipped elastomeric polymer article, the process comprising the steps of:

a) cleaning of the polymer article formers;

b) drying the cleaned formers at a temperature of above 60°C;

c) cooling the formers to a temperature of below 100°C;

d) dipping the dry formers into a powdered coagulant or a powder-free coagulant at a temperature in the range of 40 to 80°C;

e) drying the coagulant coated former at a temperature of below 100°C;

f) cooling the coagulant coated former at a temperature of below 60°C;

g) dipping the coagulant coated former into a latex compound which is maintained at a temperature in the range of 15 to 35°C;

h) partially drying the latex coated compound on the former at a temperature in the range of 50 to 120°C;

i) applying the intermediate primer coating material on to the latex compound coated article on the former;

j) drying the intermediate primer coating on the rubber film at a temperature in the range of 60 to 120°C;

k) leaching the dry composite film from (j) at a temperature in the range of 40 to 80°C;
l) drying the film from (k) is at a temperature in the range of 60 to 120°C;
m) dipping the dry film from (l) into an aqueous acrylic containing polymer dispersion at a temperature in the range of 15 to 35°C;

n) curing the coated rubber article on the former at a temperature in the range of 80 to 150°C;
o) stripping the coated rubber articles from the formers; and

p) drying the coated rubber articles.

7. The process as claimed in claim 6, wherein the intermediate primer coat is a mixture of the substrate elastomer and the coating polymer.

8. The process as claimed in claim 7, wherein the intermediate primer coat contains one or more other components, such as other polymers.

9. The process as claimed in claim 6, wherein the intermediate primer coat is a liquid blend, aqueous or non-aqueous of a polymer coat and a dipped elastomeric polymer article.

10. The process as claimed in claim 6, wherein the intermediate primer coat is a blend of dispersions of the material used to make the dipped elastomeric polymer article and the polymer used in the polymer coating.

11. The process as claimed in claim 6, wherein the polymer article formers are cleaned by a combination of liquid cleaning chemicals and mechanical brushing in step (a).
12. The process as claimed in claim 6, wherein the dipped elastomeric polymer article is glove, condom, balloon or catheter.

13. A dipped elastomeric polymer article, the article comprises a layer of a polymer coat, a layer of a dipped elastomeric polymer article and a layer of an intermediate primer coat, wherein the intermediate primer coat contains a proportion of the polymer used for the polymer coat and a proportion of the elastomeric polymer used for the dipped elastomeric polymer article, either as a latex, dispersion or solution form and wherein the intermediate primer coat is used to enhance the adhesion of a layer of the polymer coat on to a layer of the dipped elastomeric polymer article.

14. The article as claimed in claim 13, wherein the intermediate primer coat is a mixture of the substrate elastomer and the coating polymer.

15. The article as claimed in claim 14, wherein the intermediate primer coat contains one or more other components, such as other polymers.

16. The article as claimed in claim 13, wherein the intermediate primer coat is a liquid blend, aqueous or non-aqueous of a polymer coat and a dipped elastomeric polymer article.

17. The article as claimed in claim 13, wherein the intermediate primer coat is a blend of dispersions of the material used to make the dipped elastomeric polymer article and the polymer used in the polymer coating.
18. The article as claimed in claim 13, wherein the dipped elastomeric polymer article is glove, condom, balloon or catheter.
Figure 1
INTERNATIONAL SEARCH REPORT

A. CLASSIFICATION OF SUBJECT MATTER

Int. Cl. 7: C09D 107/02, 109/04, 109/06, 109/08, 133/08, 133/10, 175/04; C08J 7/04, 3/26; A61B 19/04; A41D 19/00; A61F 6/04; A61L 31/10; B64B 1/40

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbol):
C09D 107/02, 109/04, 109/06, 109/08, 133/08, 133/10, 175/04; C08J 7/04, 3/26; A61B 19/04; A41D 19/00; A61F 6/04; A61L 31/10; B64B 1/40

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

C. DOCUMENTS CONSIDERED TO BE RELEVANT

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[X] Further documents are listed in the continuation of Box C  [X] See patent family annex

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Date of actual completion of the international search
10 November 2004

Date of mailing of the international search report
16 NOV 2004

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Authorized officer
DR. A TESSEMA
Telephone No: (02) 6283 2271
## INTERNATIONAL SEARCH REPORT

**International application No.**

**PCT/AU2004/001363**

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