

[54] NONAQUEOUS DEVELOPER
COMPOSITION FOR PENETRANT
INSPECTION AND METHOD FOR
EMPLOYING SAME

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[22] Filed: Oct. 4, 1972

[21] Appl. No.: 295,061

[52] U.S. Cl. 250/459, 252/301.2 P

[51] Int. Cl. G01n 21/16

[58] Field of Search 250/71 T;
252/301.2 P

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[57] ABSTRACT

Wet nonaqueous developer composition for use in pen-
etrant inspection of surface flaws in bodies, consisting
essentially of isopropyl alcohol, talc and glycol mono-
butyl ether (butyl Cellosolve). The resulting wet non-
aqueous developer is particularly effective when ap-
plied to a surface following application of a penetrant
composition, particularly a fluorescent penetrant, to
provide bright fluorescent indication of surface flaws
from an unusually wide range of size of such flaws and
cracks, when inspected under fluorescent illumination.

16 Claims, No Drawings

NONAQUEOUS DEVELOPER COMPOSITION FOR PENETRANT INSPECTION AND METHOD FOR EMPLOYING SAME

This invention relates to compositions and procedure for non-destructive testing of bodies composed for example of metal, ceramic or plastic, to detect flaws or cracks in the surface of such bodies, and is particularly concerned with novel wet nonaqueous developer compositions for penetrant inspection of flaws in such bodies, particularly when employed in conjunction with fluorescent penetrants, the developer compositions of the invention being particularly effective in providing bright fluorescent indications from microcracks as well as medium size and gross cracks, and having additional important advantages and superior results in comparison with presently known and commercially available wet developers.

In known penetrant inspection methods for rapid location and evaluation of surface flaws or cracks in test bodies or parts, a penetrant composition containing a dye, e.g., a fluorescent dye, and which will penetrate the openings of the surface cracks or flaws in the part, is applied to the surface of the test body, and the excess penetrant composition is removed from the surface of the body. A developer composition is then applied to this part surface.

There are three general types of developer compositions, namely, dry powder, wet aqueous (water-base), and wet nonaqueous (volatile solvent base) developer compositions. In each case, the developer composition contains a light colored powder, which contrasts with the color of the dye in the penetrant and which acts as a wick or blotter, and causes liquid penetrant containing the dye, e.g., fluorescent dye, which was retained in the cracks or surface flaws, to be drawn up out of the surface defects by capillary action, and to "bleed" through the powder. The part is then exposed to suitable light, such as invisible fluorescigenous light, where the penetrant employed contains a fluorescent dye, and the location of the surface flaws is revealed by the emission of visible light, such as fluorescent visible light, by the penetrant dye which was retained in the cracks or flaws after the penetrant composition was removed from the surface of the part.

In the case of wet developers, particularly of the nonaqueous type, it is known to employ compositions in which a powder such as talc or calcium carbonate is suspended in an organic liquid vehicle such as ethanol or isopropyl alcohol, as disclosed for example in U.S. Pat. Nos. 2,806,959 and 3,108,187. Such developer in the form of an organic solvent containing a suspension of the above inorganic particles is sprayed onto a test part to form a thin liquid film which dries to a uniform powder film or coating upon evaporation of the solvent, e.g. alcohol such as isopropyl alcohol. As pointed out in above U.S. Pat. No. 2,806,959, before evaporating, the alcohol appears to aid in bringing the colored penetrant out of the surface defects into the developing powder. However, the alcohol solvent, such as isopropyl alcohol, evaporates very rapidly following application of the wet developer to the surface of the test part, leaving insufficient time to permit the colored penetrant, especially when present in small cracks or microcracks, to flow to the surface and into the remaining developer powder. As result, conventional wet nonaqueous developers, such as those disclosed in the above-noted patents, are ineffective for detection of a

wide range of sizes of flaws and cracks in a test body, particularly microcracks.

Further, most of the developer compositions of the prior art have the disadvantage that they tend to fluoresce particularly in the blue region, when the surface of the body to which the fluorescent penetrant and developer composition have been applied is inspected under fluorescent light. This is a disadvantage when employing fluorescent penetrants, since it reduces the amount of contrast between the fluorescent penetrant indication and the surrounding area covered by the developer composition, and hence in effect reduces the brightness of fluorescence of the fluorescent dye.

Further, certain of the prior art developer compositions are not compatible with certain metals such as titanium and high nickel alloys which are used particularly in the aerospace industry, because such compositions contain elements or components such as chlorine and sulfur, so that the resulting composition has a low pH when contacted by the liquid penetrant.

Also, some of the prior art compositions are toxic and hence present hazards in handling.

It is accordingly the chief object of the present invention to provide wet nonaqueous developer compositions for penetrant inspection of the surface flaws of bodies, particularly employing fluorescent penetrants, which have excellent sensitivity and resolution for disclosure of minute cracking conditions or microcracks as well as large cracks, and which have other important advantages including ability to provide bright dye indications or fluorescence and sharp contrast between the light emitted from the colored or fluorescent penetrant indicating the location and nature of cracks and imperfections in the body, and the adjacent areas of the part, and which compositions are easily formulated and economical, are readily applied to a part surface as by spraying, are compatible with metals such as aluminum, titanium and steel, and their alloys, and which are essentially nontoxic.

The above objects and advantages are achieved according to the invention by the provision of a wet nonaqueous developer composition for penetrant inspection of surface flaws, which consists essentially of three components, namely, isopropyl alcohol, talc and glycol monobutyl ether. Preferably, such components are employed in certain proportions, as pointed out in detail hereinafter. The nonaqueous developer formulation of the invention has the particularly unique characteristic, provided by the glycol monobutyl ether component, particularly in combination with the talc which is preferably in fine powder form, of providing a path for absorption of colored penetrant from the cracks to the surface and into the developer powder, that is the talc, remaining on the surface of the part, following the rapid evaporation of the isopropyl alcohol solvent vehicle. This results in colored or fluorescent emissions and the location of cracks or flaws of a wide range of sizes, and particularly minute cracks or microcracks.

The wet nonaqueous developer composition of the invention further provides an extremely fine powder coating on the surface of the test part, following evaporation of the isopropyl alcohol solvent, which when viewed under either white or black light (fluorescent) illumination, causes the colored penetrant indications from the cracks or flaws to stand out vividly. The above-noted powder coating also has the advantage of being non-fluorescent under black light (fluorescent)

illumination, causing the fluorescent penetrant to fluoresce brightly in relation and in contrast to the surrounding white powder developer. Further, the non-aqueous developer hereof can be readily applied to the surface of a test part as by spraying, and the resulting developer coating can be readily removed from the surfaces of processed parts following inspection thereof, by simple operations such as by water spraying. Moreover, the nonaqueous developer composition of the invention is essentially neutral, having a pH of the order of about 7, and accordingly is highly compatible with all metals and metal alloys, and the developer composition hereof is essentially nontoxic and is accordingly readily handleable by personnel, and is economical.

The wet nonaqueous developer composition of the invention can be employed to develop indications using both fluorescent penetrants as well as non-fluorescent penetrants, that is penetrants containing a visible dye.

The isopropyl alcohol component of the nonaqueous developer composition is the main solvent vehicle, its primary function being to provide a suspension of the solid particles of the formulation, namely the talc powder. The isopropyl alcohol vehicle has excellent compatibility with the other components of the composition, namely the talc and glycol monobutyl ether, and has the additional advantage of adapting the nonaqueous developer composition hereof for electrostatic spraying operations, which is a highly desirable feature of such nonaqueous developer. Further, isopropyl alcohol is compatible with metals and their alloys, and has the further advantage that it has very little or only very mild dissolving action upon fluorescent penetrant formulations, particularly the preferred fluorescent penetrant described hereinafter, and avoiding total removal of fluorescent penetrant from the cracks during evaporation of the solvent.

It has been found that other aliphatic alcohols such as ethyl, butyl and amyl alcohol, and the like, are unsuitable due to their ineffectiveness in maintaining the fine talc powder employed in the invention composition, in suspension, and many other organic solvents often employed in wet developers, such as chlorinated hydrocarbons, are highly flammable or detrimental to metals or alloys.

The amount of isopropyl alcohol vehicle which can be employed in the nonaqueous developer composition hereof can vary substantially, but generally about 25 to about 80 percent, preferably about 40 to about 75 percent, of isopropyl alcohol, by weight, is employed.

The talc (which is a magnesium sulfate) employed in the nonaqueous developer composition is a fine white powder of small but irregular particle size. A preferred commercially available material suitable for purposes of the invention is that marketed as Desert Talc Mikro 507, by Desert Minerals, Inc. of Los Angeles, Cal. The latter material is a semi-tremolitic-acicular-platey having a particle size distribution ranging from about 15 to less than 1 micron, and is essentially a calcium-magnesium silicate which is totally inert and is completely compatible with metals and alloys. This white powder provides a unique combination of highly irregular particle sizes and shapes, permitting the powder to develop "indications" of substantially any size of cracks present in the test body.

After the isopropyl alcohol of the nonaqueous developer evaporates, a thin layer of the talc is deposited over the surface of the parts being processed, forming

an extremely uniform coating, which has the property of clinging or adhering to the surface of a test part even though the coating may be quite dry. Accordingly, such fine powdery talc coating adheres to almost any type of surface including very fine or polished surfaces such as polished chrome plating. Due to the irregular particle size content of such talc, it functions to form a coating which is deposited in varying size cracks. The talc powder coating which remains following evaporation of the isopropyl alcohol provides a wick for entrapment of dye, e.g., fluorescent, penetrant which exudes from microcracks in the surface to which the developer is applied. It is also noted that the talc has the ability to remain suspended for long periods in the isopropyl alcohol solvent medium, and provides bright dye, e.g. fluorescent indications and has high sensitivity.

The talc component of the composition can be employed in varying proportions, but generally is employed in an amount in the range of about 10 to about 70 percent, preferably about 15 to about 50 percent, by weight of the composition.

An essential and important feature of the invention is the incorporation into the nonaqueous developer, of glycol monobutyl ether (2-butoxy ethanol), commonly known as butyl Cellosolve. This liquid component generally is employed in the invention formulation in minor proportion, but the employment of this component, particularly in conjunction with the talc, substantially improves the developer composition in its ability to provide penetrant indications from very small cracks or microcracks. The glycol component also functions as a stabilizing agent for the suspension of the talc in the isopropyl alcohol solvent medium.

Following application of the nonaqueous developer to a part surface, as previously noted, the isopropyl alcohol rapidly evaporates, forming an essentially dry coating of the talc particles, but containing the minor proportion of glycol monobutyl ether, which is substantially non-volatile under the ambient temperature conditions of general use of the developer in the penetrant inspection process, and hence such glycol ether remains with the talc coating after evaporation of the isopropyl alcohol. The glycol monobutyl ether contained in the talc coating provides a unique surface "treatment" between the talc powder and the surface of the test, e.g., metal, body being inspected. Such glycol monobutyl ether provides a moistened path which is highly compatible with the dye penetrant, to permit same to creep, spread and exude out of the crack and into the powder talc coating, to form indications therein upon inspection under suitable lighting conditions.

It has been found that mono- or dialkyl ethers of ethylene glycol other than the above-noted ethylene glycol monobutyl ether, are not suitable for employment in the nonaqueous developer composition hereof. Thus, many of such other glycol ethers tend to fluoresce in the blue region, which is undesirable, whereas glycol monobutyl ether does not have this characteristic. Further, many of the other glycol ethers are hygroscopic and certain of these materials are also toxic, while some tend to be corrosive to metals and some have an undesirable degree of flammability. On the other hand, glycol monobutyl ether is substantially free of these undesirable characteristics.

As previously noted, only a small amount or minor proportion of glycol monobutyl ether is incorporated

into the composition. Generally, about 0.5 to about 5 percent, preferably about 0.5 to about 3 percent, of the glycol monobutyl ether component is employed. The use of substantial amounts of such glycol ether, for example in amounts substantially in excess of about 5 percent by weight of the composition, is undesirable since such larger amounts offer no further advantage and tend to prevent formation of a substantially dry coating of the talc powder, and maintaining such powdered coating excessively moist, resulting in a spreading of the colored penetrant indications, and a reduction in the sharpness and brightness of such indications upon inspection of the part.

The wet nonaqueous developer composition is readily formulated by mixing together the isopropyl alcohol and glycol monobutyl ether components, and then adding the talc to the solution of the alcohol and glycol components, and agitating the mixture to form a uniform suspension of the fine talc powder, e.g., the above-noted Desert Talc Mikro 507. It has been found that the resulting suspension remains relatively stable over a relatively long period of time. In formulating the nonaqueous developer composition hereof, it is preferred not to add the glycol monobutyl ether component alone to the talc, because the relatively small amount of the glycol ether component employed will tend to be absorbed preferentially by the first particles of the talc with which the glycol ether comes into contact, which has been found undesirable.

Illustrative examples of the nonaqueous developer compositions according to the invention, but not in limitation thereof, are set forth in the table below, the amounts of the respective components being expressed in terms of percent by weight.

Component	Examples (percent by weight)									
	1	2	3	4	5	6	7	8	9	10
Isopropyl alcohol.....	70.5	69	72.5	60	40	30	80	28.2	38	49.2
Talc.....	28.6	28	27.0	38	58.5	67.5	19	70	60	50
Glycol monobutyl ether.....	0.9	3.0	0.5	2	1.5	2.5	1	1.8	2	0.8
Total.....	100.0	100.0	100.0	100	100.0	100.0	100	100.0	100	100.0

Particularly effective wet nonaqueous developer compositions according to the invention, are those of Examples 1, 3, 5 and 7.

The fluorescent penetrant composition which can be employed in conjunction with the novel nonaqueous developer composition of my invention can comprise a fluorescent dye and a liquid vehicle for such dye. Thus the fluorescent penetrant composition can be an oil base, surfactant base, solvent base or water base penetrant composition. The penetrant vehicle should be a liquid which is itself substantially non-fluorescent and having good wetting properties and the ability to penetrate fine surface cracks and imperfections readily. Satisfactory penetrant vehicles include, for example, petroleum solvents, kerosene, a mineral oil or spirit, or mixtures thereof, light fuel oils, and the like. Other solvents include, for example, ketones, esters and organic acids. The penetrant may also contain an emulsifying agent which renders the penetrant composition water-emulsifiable. Such emulsifying agents may be, for example, oil-soluble soaps, detergents, and the like. The amount of fluorescent dye incorporated in the penetrant composition may range from about 0.05 to about 15 percent by weight of such composition.

However, it has been found that the developer composition of the invention is particularly effective when employed in combination with the dye penetrant composition disclosed and claimed in my copending application Ser. No. 220,414, filed Jan. 24, 1972, which is a continuation-in-part of application Ser. No. 68,475, filed Aug. 31, 1970, and which in turn is a continuation of Ser. No. 655,752, filed July 25, 1967. The dye penetrant composition thereof comprises a suitable bleeding fluorescent dye and a stable lactam solvent for said dye, such as gamma-butyrolactam, and particularly N-methyl-2-pyrrolidone. Various types of fluorescent dyes can be employed including for example the dye marketed as Fluorol 7GA as well as other fluorescent dyes such as those marketed as Calcofluor Yellow, Azosol Brilliant Yellow 6GF, Rhodanine B, Rhodanine 6GDN, Calcofluor White RW, Blancophor White AW, Auramine and Eosine G.

The fluorescent penetrant composition according to my above copending application and particularly containing N-methyl-2-pyrrolidone as vehicle, permits rapid cleaning of dye penetrant from the specimen surface by the application of water thereto without the intermediate use of emulsifiers or the like. Also, if desired, a surfactant can be incorporated which functions to more readily remove excess dye together with excess dye vehicle from the surface upon application of water. Such surfactant can be for example a nonionic detergent such as Tergitol nonionic NPX of Union Carbide, which is understood to be a nonyl phenyl polyethylene glycol ether. Further, the penetrant composition of my above copending applications can include a water-insoluble solvent such as isobutyl heptyl ketone. An exemplary improved fluorescent penetrant composition

of my above copending application has the following composition.

EXAMPLE 11

	Parts by Volume
N-methyl-2-pyrrolidone	2 ½
Isobutyl heptyl ketone	7 ½
Tergitol nonionic NPX	5
Tergitol nonionic NP-14	7 ½
Calcofluor White RW	2
Fluorol 7GA	0.66

The wet nonaqueous developer composition hereof can also be employed in conjunction with colored penetrants containing non-fluorescent or daylight type dyes such as azo type dyes, e.g., xyleneazo-beta-naphthol, Mefford No. 322 dye, believed to be o-toluenazoxyxyleneazo-beta-naphthol, and the azo dyes marketed as Oil Red "O" and Sudan Red. These dyes conveniently can be employed where daylight or white light is only available. However, it is preferred to employ fluorescent dyes having greater sensitivity or detectability as result of the high contrast obtained by the fluorescent indications.

In employing my novel nonaqueous developer composition according to the invention, in a colored, e.g., fluorescent, penetrant inspection process, the process

broadly comprises applying to the surface of a specimen or object, a liquid penetrant of any of the above-described types, comprising a dye, e.g. a fluorescent dye, and a liquid vehicle for such dye, removing excess liquid penetrant from the surface while leaving liquid penetrant in any cracks or flaws in the body, applying to the surface a wet nonaqueous developer composition according to the invention, causing evaporation of the isopropyl alcohol therein, and leaving a substantially dry powder, and inspecting the surface of the body under light which is effective to emit dye smears from the dye drawn into the powder composition adjacent the cracks, to thereby locate such cracks. Where a fluorescent penetrant is employed, such inspection of the surface of the body is carried out under "black" or fluorescent light to locate any cracks in the surface as indicated by fluorescent emission from the dye drawn into the developer composition adjacent the cracks.

More particularly, in carrying out such method, if necessary, the part or surface to be inspected first can be suitably prepared as for example by suitably cleaning and drying the specimen.

The liquid, e.g., fluorescent, penetrant is then applied to the test specimen, e.g., by dipping same into a bath of the penetrant, or the penetrant can be poured or sprayed onto the surface of the test specimen. The dye penetrant composition is maintained on the surface of the test body or specimen for a period sufficient to permit the composition to penetrate the cracks and imperfections in the part surface, e.g., for about 1 to about 60 minutes.

The fluorescent penetrant composition is then removed or washed off the surface of the part being tested, without being removed from the openings of the surface cracks or flaws. This can be accomplished by any suitable means such as by wiping with a cloth, or a solvent impregnated cloth, or with water where the penetrant composition has been rendered water emulsifiable by addition thereto of an emulsifying agent. Thus for example the excess colored, e.g., fluorescent penetrant of my above copending application, can be removed from the test specimen by application of a sprayed mixture of air and water.

The novel nonaqueous developer composition of the invention is then applied to the surface of the test specimen. Most conveniently, the nonaqueous developer composition hereof is applied by spraying it over the surface of the part previously contacted by the penetrant. Various methods of spraying can be employed for this purpose, including air spraying, airless spraying by the application of pressure to the developer composition, and electrostatic spraying. Electrostatic spraying involves application of an electrostatic charge to the wet nonaqueous developer which is opposite to an electrostatic charge applied to the specimen, and such electrostatic spraying can be carried out by means of air spraying, airless spraying or a combination thereof. If desired, the non-aqueous developer hereof can alternatively be applied to the part surface by aerosol methods employing suitable propellants for this purpose such as the well-known Freon gas.

Following application of the nonaqueous developer to the part surface, the wet film is allowed to dry, such drying occurring e.g. in about 2 minutes normal air drying to about 5 seconds if hot air blasting is used, and following evaporation of the isopropyl alcohol a thin uniform coating or layer of the remaining talc powder

containing the glycol ether component is formed which is adherent to the surface of the specimen. The powdery developer composition, aided by the presence of the glycol monobutyl ether component, absorbs and entraps the colored, e.g., fluorescent dye, liquid penetrant, contained in the cracks and flaws of the part surface, and forms a dye or fluorescent smear or indication adjacent the crack openings. By employment of the nonaqueous developer combination hereof, as a further feature of the invention when employing a fluorescent penetrant, when the test body is exposed to fluorescent or black light, the contrast between the fluorescent streaks or smears produced by the fluorescent penetrant in the mouth of the cracks and flaws in the test body, and the surrounding background of the white developer powder, is substantially enhanced, producing brilliant fluorescent indications.

After inspection of the part, the developer coating or powder can be readily removed from the part surface by any suitable means such as by brushing, by wiping with a dry cloth or by water spraying.

The following are examples of practice of the invention employing the novel wet nonaqueous developer composition hereof.

EXAMPLE 12

The fluorescent dye penetrant of Example 11 above, according to my above copending application, was applied as by brushing, to a chromium-plated brass test panel containing cracks of wide variation in size including microcracks down to 0.00002 inch in width, closely distributed over its entire surface, and the penetrant was maintained on such surface for about 1 to about 2 minutes. Excess dye penetrant was then removed from the surface of the test part by spraying a mixture of air and water over the panel surface.

Half of the test panel surface to which the dye penetrant was applied was then covered with the wet nonaqueous developer composition of Example 1 above, and the other half of the surface of the test panel to which dye penetrant was applied was covered with a wet nonaqueous developer composition consisting of 71.4 percent isopropyl alcohol and 28.6 percent talc by weight, and containing no glycol monobutyl ether. The developers were permitted to dwell over the test panel for a period of about 2 minutes, until substantially all of the isopropyl alcohol had evaporated and a substantially dry powder coating was formed from both of the developers.

The panel was then placed under black (fluorescent) illumination and the respective half surfaces viewed in such illumination. It was observed that the half side of the panel which had been treated with the nonaqueous developer composition of Example 1 according to the present invention disclosed bright fluorescent indications from numerous readily defined microcracks therein, including the smallest microcracks noted above. Observation of the half side or surface of the panel which had been treated with the above-noted nonaqueous developer containing no glycol monobutyl ether, while able to detect microcracks of medium and relatively large size, was unable to detect fluorescent emissions from the minute microcracks in the surface, and hence such microcracks could not be located.

It is accordingly seen that the wet nonaqueous developer composition of the present invention, and containing as an essential component, glycol monobutyl

ether, provides improved and superior results in its ability to permit detection of a wide range of size of cracks and flaws in a part surface, including minute cracks, whereas substantially the same nonaqueous developer composition containing only isopropyl alcohol and talc, e.g. according to the prior art, and no glycol monobutyl ether, does not permit detection of microcracks, but only cracks and flaws of substantially larger size, and hence is limited in its application for use in detecting only medium and gross cracks.

EXAMPLE 13

The procedure of Example 12 was essentially repeated but employing an aluminum test panel in place of the chromium-plated test panel of Example 12, and employing the wet nonaqueous developer composition of Example 3 in place of the developer of Example 1.

Results similar to those of Example 12 were obtained.

EXAMPLE 14

The procedure of Example 12 was essentially followed, except employing a titanium test panel in place of the chrome-plated panel of Example 12, and employing the wet nonaqueous developer composition of Example 5 in place of the developer composition of Example 1.

Results similar to those of Example 12 were obtained.

EXAMPLE 15

The procedure of Example 12 was again essentially followed, but employing a steel test panel in place of the chrome-plated panel of Example 12, and employing the non-aqueous developer composition of Example 7 in place of the developer of Example 1.

Comparable results were obtained to those of Example 12.

EXAMPLE 16

The procedure of Example 12 was essentially followed, but employing in place of the fluorescent penetrant of Example 12, a red visible penetrant containing the azo dye marketed as Oil Red "O," and the part, following application of the nonaqueous developer composition to the surface thereof and formation of a substantially dry powder coating following evaporation of the isopropyl alcohol, was inspected by visible light.

Results comparable to those of Example 12 were obtained.

The nonaqueous developer composition of the invention, as noted above, can be employed in conjunction with a colored, e.g. fluorescent, penetrant for penetrant inspection of cracks and microcracks as small as 0.00002 inch, or less, wide, and cracks varying widely in size in the surface of bodies of various materials, including, in addition to metals and alloys thereof, such as titanium, steel, copper and aluminum, ceramics, glass, plastics and rubber.

From the foregoing, it is seen that the invention provides a novel wet nonaqueous developer composition for penetrant inspection of flaws in bodies, of improved properties and advantages over known and presently available commercial developers.

While I have described particular embodiments of my invention for the purpose of illustration within the spirit of the invention, it will be understood that the in-

vention is not to be taken as limited except by the scope of the appended claims.

I claim:

1. A wet nonaqueous developer composition for penetrant inspection of surface flaws, which consists essentially of isopropyl alcohol, talc and glycol monobutyl ether.

2. A composition as defined in claim 1, said talc being of particle size ranging from about 15 to less than about 1 micron.

3. A composition as defined in claim 1, employing substantial proportions of said isopropyl alcohol and said talc, and a minor proportion of said glycol monobutyl ether.

4. A composition as defined in claim 3, said glycol monobutyl ether being present in an amount ranging from about 0.5 to about 5 percent by weight.

5. A composition as defined in claim 1, and consisting essentially of about 25 to about 80 percent of said isopropyl alcohol, about 10 to about 70 percent of said talc and about 0.5 to about 5 percent of said glycol monobutyl ether, by weight.

6. A composition as defined in claim 5, said talc being of particle size ranging from about 15 to less than about 1 micron.

7. A composition as defined in claim 1, and consisting essentially of about 40 to about 75 percent of said isopropyl alcohol, about 15 to about 50 percent of said talc and about 0.5 to about 3 percent of said glycol monobutyl ether, by weight.

8. A composition as defined in claim 7, said talc being of particle size ranging from about 15 to less than about 1 micron.

9. A method of detecting surface flaws in the surface of an object which comprises applying to said surface a liquid penetrant comprising a dye and a liquid vehicle for said dye, removing excess liquid penetrant from said surface while leaving liquid penetrant in any cracks therein, applying to said surface a wet nonaqueous developer composition which consists essentially of isopropyl alcohol, talc and glycol monobutyl ether, causing evaporation of said isopropyl alcohol and leaving a substantially dry powder, and inspecting the surface of said body under light which is effective to emit dye smears from said dye drawn into said powder composition adjacent said cracks, to thereby locate said cracks.

10. A method as defined in claim 9, said talc being of particle size ranging from about 15 to less than about 1 micron, and employing substantial proportions of said isopropyl alcohol and said talc, and a minor proportion of said glycol monobutyl ether.

11. A process as defined in claim 9, said developer composition consisting essentially of about 25 to about 80 percent of said isopropyl alcohol, about 10 to about 70 percent of said talc and about 0.5 to about 5 percent of said glycol monobutyl ether, by weight.

12. A method as defined in claim 9, wherein said liquid penetrant contains a fluorescent dye, and said wet nonaqueous developer composition is sprayed on the surface of said body, and following evaporation of said isopropyl alcohol to form said substantially dry powder on said surface, inspecting the surface of said body under fluorescent light to locate any cracks in said surface as indicated by fluorescent emission from said dye drawn into said powder composition adjacent said cracks.

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13. A method as defined in claim 12, wherein said liquid penetrant comprises a fluorescent dye and a stable lactam solvent for said dye.

14. A process as defined in claim 12, said developer composition consisting essentially of about 25 to about 80 percent of said isopropyl alcohol, about 10 to about 70 percent of said talc and about 0.5 to about 5 percent of said glycol monobutyl ether, by weight.

15. A method as defined in claim 12, said developer

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composition consisting essentially of about 40 to about 75 percent of said isopropyl alcohol, about 15 to about 50 percent of said talc and about 0.5 to about 3 percent of said glycol monobutyl ether, by weight.

16. A method as defined in claim 15, said talc in said developer composition being of particle size ranging from about 15 to less than about 1 micron.

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