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DEVELOPER REAGENTS, METHOD OF AND MEANS FOR UTILIZING THE SAME

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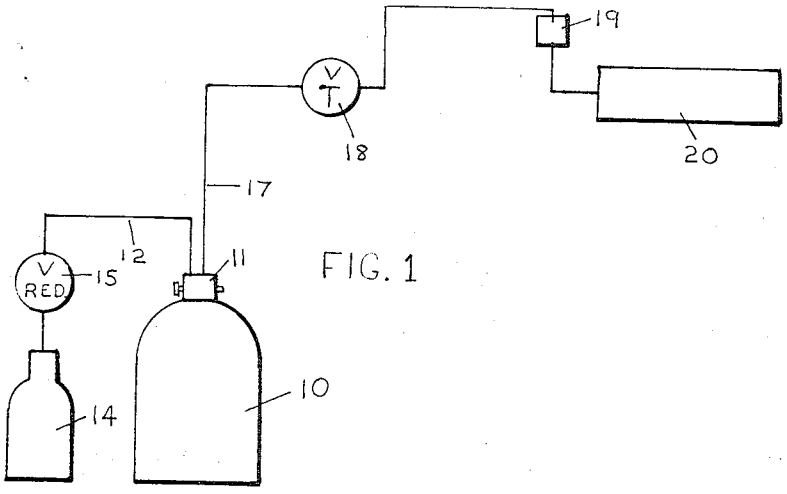


FIG. 1

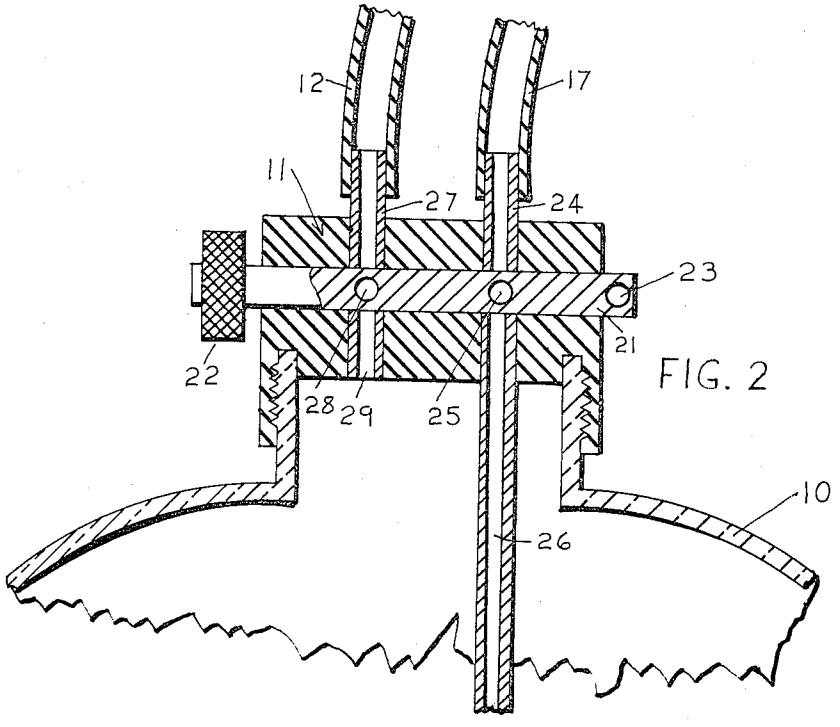


FIG. 2

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DEVELOPER REAGENTS, METHOD OF AND MEANS FOR UTILIZING THE SAME

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This invention relates to developer reagents used for the development of light sensitized prints, as in a blueprint machine and similar apparatus, in which the exposed negative is subjected to a vaporized developer as distinct from wet processes and contact development. It will, of course, be understood that certain of the novel features of the herein disclosed developing reagent, as well as the method steps disclosed, and the apparatus set forth, may have wide applicability in fields other than the processing of blueprints. While the inventive concept may thus be widely employed, the inventions are herein set forth, by way of example, in connection with present day conventional multiple print developing machines, it being understood that similar reagents, method steps and apparatus for comparable processes, may utilize the present fundamental principles.

Blue print machines of the character above referred to conventionally utilize as a developing medium, vapors produced from ammonium hydroxide NH_4OH. Conventionally, the liquid ammonium hydroxide is 26 degrees Baumé at 60 degrees Fahrenheit temperature. Such liquid ammonium hydroxide is pumped from a suitable source to an evaporating pan in the machine where the liquid is vaporized under suitable heat control to provide the appropriate vapor environment of a vapor chamber above the evaporating pan to which the exposed print is subjected for development. With such apparatus, great difficulty is experienced in maintaining the appropriate and consistent operation of the pump, whereby the flow of developer fluid to the vaporization pan is uniformly synchronized with the operation of the machine to ensure an adequate yet not excessive flow of the developer. Further difficulties are experienced in achieving and maintaining an appropriate temperature in the vapor chamber above the vaporizing pan and/or the temperature of the liquid whereby appropriate vaporization takes place. Further, under poorly controlled and hence fluctuating temperature conditions, frequently below the optimum, the conventional 26 degree Baumé NH_4OH, will not suffice for the consistent production of uniformly clear and accurate prints.

The present invention has among its primary objects to provide an improved reagent for use in the conventional vaporizing chamber of the present day blueprint machine, or the like, whereby increased sensitivity of the print is achieved to ensure sharp, accurate and repeatedly consistant development. The improved reagent of the present invention may also include a solvent by which the fixtures for supplying the reagent, as well as the vaporizing pan and associated equipment, may be maintained in a condition free from undue residual deposits of materials which may otherwise deleteriously affect the development. The reagent of the present invention is also distinguished from that heretofore used in

that the ammonium hydroxide may be 27, 28 or 29 degrees Baumé at 60 degrees Fahrenheit, whereby rapid and consistent evaporation to ensure the adequate vapor content is ensured. The reagent of the present invention is also distinct from the common ammonium hydroxide now used, in that the hydroxide is subjected to contact with nitrogen gas which may be absorbed in the hydroxide liquid to increase the speed and efficiency of the developing reaction. The novel apparatus of the present invention includes a pressurized supply of ammonium hydroxide the pressurization of which provides for the flow thereof past a manually adjustable metering valve and through a visual drip gauge, whereby the operator may readily see the rate of flow, and thence under the applied pressure, to the vaporizing pan. Thus, the arrangement avoids the use of pumps and the difficulties inherent in the use of mechanical pumps for supplying the reagent. With respect to such apparatus, the invention contemplates the use of nitrogen gas as a pressurizing fluid over the surface of the ammonium hydroxide, whereby such gas not only provides the propulsion required for delivering the liquid to the vaporization pan of the apparatus, but by which the nitrogen may be absorbed to advantageously affect the character of the developing reaction. The method of the present invention, includes the steps of pressurizing, preferably with nitrogen gas, the surface of the ammonium hydroxide for delivering the same through a meter gauge and past a drip sight gauge to the evaporating pan of a conventional developing apparatus.

Numerous other objects, features and advantages of the present invention will be apparent from a consideration of the following specification, taken in conjunction with the accompanying drawings, in which:

FIG. 1 is a diagrammatic view, illustrating the preferred arrangement of the means for supplying a developer reagent to a developing machine, and

FIG. 2 is a fragmentary sectional view illustrating a valved cap for the ammonium hydroxide container, whereby ammonium hydroxide of a high degree Baumé may be safely handled and may be controllably fed to the developing machine under gaseous pressure, preferably nitrogen.

Referring now to FIGURE 1 of the drawings, the schematic illustration of a preferred arrangement for supplying the developing reagent, includes a developer container, such as a jar, can, tank, or like receptacle **10** for the liquid ammonium hydroxide. In the present form of the invention, the container **10** is preferably of 35 lb. bursting strength polyethylene, and is illustrated as having a restricted and externally threaded neck to which is applied a valved cap **11**. For pressurizing the surface of liquid developer reagent within the container **10**, there is provided a pressure supply tube **12**, which communicates, preferably under valve control as in FIGURE 2, with the upper area of the container **10**. From the cap **11** the tube **12** extends to a gas pressure container **14**, preferably under individual valve control, as indicated at **15**. In the preferred form of the invention, the pressurizing gas is nitrogen. Under pressure the liquid developer is delivered through a discharge tube **17**, preferably extending well below the normal liquid level of the container and opening at a point adjacent the bottom

thereof. From the container 10, the reagent is delivered through the tube 17 to a manually adjustable metering valve 18 and thence through a visual sight or drip gauge 19 to the evaporator pan 20 of the developing machine. Thus, the metering valve 18 may be set to control the delivery, and the observation of that delivery may be made from the sight glass 19, so that by adjusting the metering valve to the speed of operation of the developing machine an adequate supply of liquid developing reagent may be maintained in the pan 20 without use of pumps and the therein attendant problems.

The developing reagent of the present invention, which is to be delivered to the vaporizing pan of the developing machine, is ammonium hydroxide, NH_4OH, which may include a solvent and/or have included therein, by way of mixture solution, chemical combination or occlusion, free nitrogen. It is of course recognized that 26 degree Baumé ammonium hydroxide at 60 degrees Fahrenheit has long been recognized as a standard developing reagent to be supplied in liquid form to the vaporizing pan of the developing machine. Since such 26 degree Baumé ammonium hydroxide has a vaporization point sufficiently low to be safely handled under normal ambient room temperatures without deleterious effect on the operators, special equipment and sealed containers are not required. Under ideal circumstances and operating conditions of the machine with localized application of heat at the evaporation pan, satisfactory development takes place when the sensitized print is subjected to the vaporized reagent. However, it has been found that consistently superior prints may be secured by the use of ammonium hydroxide of 27, 28, or 29 degrees Baumé. Since ammonium hydroxide of such high Baumé is more readily volatilized, low temperatures of the evaporation pan and fluctuation of its temperature, will not preclude adequate development of the print with such ammonium hydroxide.

The present invention therefore includes as a new developing reagent, ammonium hydroxide of a range from 27 to 29 degrees Baumé. Heretofore, such reagent has not been attempted since the higher degree of volatilization has precluded free and unhampered use of such material in open containers. The method of the present invention, however, provides for the convenient use of closed receptacles which may be sealed in low temperature chambers of the distributors of the material, and from which they may be delivered sealed, and under valve control for pressurized closed circuit delivery to the evaporation pan.

The invention also embraces the use of nitrogen gas as a fortifying material, which has been found to materially enhance the activities of the ammonium hydroxide vapor in its developing effect. Such nitrogen gas may be introduced into the ammonium hydroxide of 27, 28 or 29 degrees Baumé in the cold room of the distributor's plant by mechanical mixture, such as by bubbling of the nitrogen gas through the liquid ammonium hydroxide to form a mixture solution, chemical combination or occlusion. However, it has been found effective for enhancing the developing characteristics to merely subject the surface of the ammonium hydroxide to nitrogen gas under pressure in a sealed container. In the present method, such nitrogen pressure is also effective as a propulsion means for delivering the liquid ammonium hydroxide from the sealed container in a closed circuit to the evaporation pan of the developing apparatus.

With respect to the addition of nitrogen to the ammonium hydroxide, it is understood that the reagent of the present invention preferably contemplates the use of an ammonium hydroxide of Baumé a degree greater than 26. However, it is understood that the invention also embraces the use of 26 degree Baumé ammonium hydroxide which has been subjected to nitrogen gas. Thus, in its broadest aspects, one of the reagents of the present invention may be defined as liquid ammonium hydroxide having been subjected to contact with nitrogen gas, and thus ammonium hydroxide which has mixed, occluded or chemically associated therewith, as by solution or otherwise, additional nitrogen.

The reagent of the present invention also distinguishes from the simple 26 degree Baumé ammonium hydroxide heretofore used, or ammonium hydroxide of higher Baumé degree, by the inclusion of solvent whereby the delivery tubes and the evaporation pan of the developing apparatus are maintained free of adhering sediment and may be readily cleaned and/or maintained in optimum operating condition. The preferred solvent of the present invention is an alcohol, preferably a high proof alcohol such as methanol of 12 degrees Baumé. The alcohol may be added to ammonium hydroxide by mechanical mixture thereto in a proportion of not more than one part alcohol to 12 parts ammonium hydroxide by volume. Thus, the present invention contemplates as a developer reagent, ammonium hydroxide from 26 to 29 degrees Baumé with the addition of the alcohol solvent in an appropriate proportion. A preferred form of the reagent, however, is an ammonium hydroxide of higher Baumé, as from 27 to 29 degrees, which includes a solvent. In its more specific form, the invention contemplates a higher degree Baumé ammonium hydroxide containing alcohol and nitrogen.

The method step of the present primary inventive concept may be broadly set forth as including the pressurized delivery of ammonium hydroxide in a closed delivery path from its container to the evaporation pan of the developing machine. More specifically, however, the invention, as to the method, includes a step of subjecting a high Baumé degree ammonium hydroxide liquid to a surface pressure of nitrogen gas by which the liquid is propelled from the container through a closed circuit including a metering valve in a sight gauge and thence to the evaporation pan of a developer.

From the foregoing, it will be seen that the present invention is threefold, including a new developer reagent of improved reacting qualities with respect to exposed negatives by way of increased volatility. A novel feature of the present invention may be the addition of nitrogen and/or a solvent such as alcohol, it being understood that the invention as to the reagent, includes the novel use of additional nitrogen and/or a solvent, though a conventional low degree Baumé ammonium hydroxide is employed. Secondly, the invention includes a novel apparatus, including a combination of one or more elements such as pressurized container metering pump and sight glass. Thirdly, the invention includes the method of supplying developer reagent to a developer pan by pressurizing the developer supply, and more particularly the use of nitrogen gas pressure over the surface of ammonium hydroxide.

It will, of course, be understood that in the practice of the invention in all of its aspects, as outlined above, numerous changes, modifications and the full use of equivalents may be resorted to without departure from the spirit or scope thereof as outlined in the appended claims.

I claim:

1. The process of developing diazotype reproductions which comprises exposing the surface of an exposed light-sensitive diazo sheet to the vapor of a developing solution comprising a mixture of an ammonium hydroxide of a Baumé degree above 26 degrees and methanol.

2. The process of developing diazotype reproductions as defined in claim 1, wherein the concentration of the ammonium hydroxide in said developing solution is within the range Baumé 27°–29°.

3. The process of developing diazotype reproductions as defined in claim 1, wherein said solution comprises a mixture of approximately 1 part methanol to 12 parts ammonium hydroxide.

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