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## AQUEOUS GRAPHITE-POLYVINYL ALCOHOL INK COMPOSITION

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This invention relates to ink and more particularly to a new composition of ink that has characteristics especially useful for certain drafting purposes.

In making paper tracings and other short term records, it is customary to use pencil because pencil lines are erasable and conveniently and quickly made. However, pencil work is subject to certain disadvantages. Prints and other reproductions of pencil tracings are poor in that the lines are light. Also, a pencil compass produces a light line which must be gone over a number of times to obtain a line of sufficient weight. This process tends to emboss the paper so that if the line must be erased, an impression nevertheless remains. A further disadvantage of pencil work is the susceptibility to smudging. These problems may of course be overcome by employing India ink, but this presents the disadvantage of not being readily erasable.

It is therefore a principal object of this invention to provide an improved drafting ink.

Another object of the invention is to provide an ink that will not smudge and is also readily erasable.

A further object of this invention is to provide an ink that will produce lines from which clear and well defined prints can be made.

These and other objects and advantages will become apparent from the following description.

In accordance with the above objects, the ink of the present invention contemplates an aqueous solution including graphite particles of a size of 2 to 5 microns. It is found that when this graphite ink is applied to a writing surface, the graphite particles, due to their flake structure and size, are prevented from penetrating the surface. Since the particles lay on the surface, the lines or other marks may be easily erased. This characteristic is in contradistinction to carbon black which is normally found in drafting inks. The carbon particles being of a much smaller size and not possessing a flake structure tend to flow into the interstices of the paper fibers to a depth that makes erasing extremely difficult in most cases.

A preferred binder is polyvinyl alcohol commercially available from E. I. du Pont de Nemours & Co. under the trade name "Elvanol," and a particularly suitable grade is their Elvanol 50-42. It is found that a dilute water solution wherein the surface tension is within the range of 40 to 65 dynes per cm. provides an ink with a wetting quality permitting proper flow while preventing undue spreading.

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The preferred formula for the ink of the present invention is as follows:

|                        | Grams | Percent by weight |
|------------------------|-------|-------------------|
| Graphite.....          | 10    | 4.76              |
| Polyvinyl Alcohol..... | .25   | .12               |
| Water.....             | 200.0 | 95.12             |

Experiments have shown that each of the above quantities may be varied 20% plus or minus without losing any of the desirable characteristics previously set forth.

Through polyvinyl alcohol yields highly satisfactory results, other water soluble binders may be used in the alternative. For example, methyl cellulose, carboxymethyl cellulose, casein, glue, gum arabic, starch, or shellac solubilized by an alkali such as borax or ammonia are equally well suited as binding materials. When employing one of the alternative binders, the concentration should be very dilute, as in the preferred example, as to come within the range of surface tension hereinabove set forth. If the surface tension happens to fall outside of the desired range it may be adjusted by addition of suitable surface active materials in minute amounts in manner well known in the art. The weak concentration of binder solution in combination with the graphite particles gives the ink the erasable characteristics of pencil.

While the ink of the present invention has been described as particularly adapted for certain drafting purposes, it is readily seen that it is well suited for any purposes where an easily erasable non-smudging ink is desirable.

What is claimed is:

1. A drawing ink comprising graphite particles within the size range of 2 to 5 microns and as a binder therefor a solution of polyvinyl alcohol in water, said ink having the following proportions: 8 to 12 grams graphite, .2 to .3 gram polyvinyl alcohol and 160 to 240 grams water.

2. A drawing ink having the erasable characteristics of pencil comprising graphite particles of a size of 2 to 5 microns and as a binder therefor a polyvinyl alcohol water solution having a surface tension within the range of 40 to 65 dynes per cm., said ink having substantially the following proportions: 10 grams graphite, .25 gram polyvinyl alcohol and 200 grams of water.

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