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MIXTURE FOR MANUFACTURE OF PENCIL LEADS

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The problem of the present invention is the manufacture of leads for writing and drawing pencils with which letters, figures or the like may be produced on paper or similar material said letters or figures being adapted to be removed, it is true, by mechanical means, but to be reproduced after having been removed.

For producing written matter having a similar property so-called "document-ink" is known containing green vitriol and iron protochloride, both in an aqueous solution, and chlorhydric acid or ferric sulphate chloride dissolved in water, and sulphuric acid. Written matter produced on paper with such ink may be removed, it is true, with an erasing knife or with a suitable rubber, but they appear again if the erased spots on the paper are spread over with a solution of nitrate of silver and the paper is then exposed to the sunlight. Then the written matter appears again readable on a dark ground in consequence of a photochemical process, because the solution of nitrate of silver forms insoluble silver chloride with the chloride ions entered into the paper, said silver chloride being changed into black metallic silver by the action of the light. The same result may be attained by treating the written matter spread over with the solution of nitrate of silver, with a reducing agent, such as hydrosulphite of soda or formaldehyde sodium bisulphite.

However, it was not possible up to now to produce leads for copying pencils the written matter of which is reproducible after having been removed mechanically. The difficulty lies essentially in the fact that the additions of electrolytes destroy the coherence of the lead produced with water-soluble binding means. If, for instance, only a small quantity of an electrolyte such as calcium chloride or sulphuric acid is added to a mass for producing leads for copying pencils the electrolyte would crystallize out if the lead is drying and would destroy the coherence of the lead or at least loosen it in such a degree that the lead loses its writing capacity. Therefore, when manufacturing leads for copying pencils care is usually taken that the aniline dyes used thereto are free of salts.

It has proved that electrolyte salts may be inserted into the mass for producing the leads if binding means are used which are water-insoluble such as water-insoluble artificial materials, fats, waxes, or derivates of cellulose dissolved in polymerizable compounds. The use of such binding means in the manufacture of leads for writing or drawing pencils is known per se,

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but not in combination with the insertion of electrolytes into the mass for the manufacture of leads. Therefore, this use did not result in the production of leads usable for writing purposes the written matter of which is reproducible after having been removed.

The process according to the invention is performed for instance in such a way that beside water-insoluble binding means also electrolytes are added to the mass consisting of writing materials, filling materials, and slide materials and the mass obtained in such a way is pressed to form leads in a manner known per se.

The following constitution of the mass is chosen for instance for the production of leads for copying pencils:

10.00 parts by weight of graphite
5.00 parts by weight of soot
10.00 parts by weight of methylene blue
11.00 parts by weight of talcum powder
23.00 parts by weight of calcium stearate
5.00 parts by weight of stearin
6.00 parts by weight of calcium chloride
29.00 parts by weight of ethyl cellulose
1.00 parts by weight of monomeric vinyl acetate

The calcium chloride is soluble in spirit and may therefore be kneaded into the mass for the leads.

When manufacturing leads the written matter of which is not adapted to be copied the mass is composed for instance in the following way:

15.00 parts by weight of graphite
5.00 parts by weight of soot
10.00 parts by weight of talcum powder
28.00 parts by weight of calcium stearate
3.00 parts by weight of polyethylene oxide
6.00 parts by weight of calcium chloride
5.00 parts by weight of glycerine
29.00 parts by weight of ethyl cellulose
1.00 parts by weight of dibutyl phthalate
25.00 parts by weight of monomethacrylic acid methyl ester

A further example for combining a mass for leads serving for the purpose in question is the following:

10.00 parts by weight of graphite
15.00 parts by weight of soot
10.00 parts by weight of methylene blue
30.00 parts by weight of calcium stearate
5.00 parts by weight of glycerine
5.00 parts by weight of ferric chloride
5.00 parts by weight of ferric sulphate
29.00 parts by weight of benzyl cellulose

1.00 parts by weight of diphenyl chloride
30.00 parts by weight of methacrylic acid methyl ester

However, it is also possible to combine an electrolyte in the sense of the invention with leads which are already formed and burnt i. e. leads for pencils which are usually prepared with molten fats or oils in order to make them fit for writing.

In such cases according to the invention the preparation with fats or oils is substituted by an impregnation with an electrolyte, for instance with calcium chloride dissolved in glycerine. The lead manufactured of graphite and clay is burnt in the usual way and then impregnated with a solution of calcium chloride.

Finally also with dry-pressed leads, so-called fat leads, the purpose of the invention may be obtained by the addition of suitable electrolytes. The leads manufactured in this way have for instance the following constitution:

35.00 parts by weight of soot
20.00 parts by weight of polyethylene oxide
14.00 parts by weight of wax in combs
16.00 parts by weight of carnauba wax
8.00 parts by weight of calcium chloride

As proved by tests according to the invention all electrolytes may be used which sooner or later diffuse into the paper or similar material and are detectable in the written matter by analytic means. An especially approved means in this respect is calcium chloride which has not only electrolytic, but also hygroscopic properties. The diffusing of the electrolyte is favoured by the moisture of the air. It has proved that calcium chloride diffuses relatively quickly into the paper or other writing material and enables the erased written matter to be reproduced already after 24 hours.

The leads for writing or drawing pencils manufactured according to the invention are very well fit for writing and are of high strength, as no crystallizing out of the electrolyte takes place and therefore the coherence of the lead constitution is not weakened. The matter written with such leads is erasable. The removed written matter can again be reproduced or made visible similar to the written matter produced by "document-ink" by spreading with a solution of nitrate of silver and following exposure to the light.

It has proved that the penetration of the electrolyte from the written matter into the paper may be measured with respect to time and quantity. Therefore it is possible to prove the age of the written matter, to perform investigations as usual with written matter produced by "document-ink."

Having thus particularly described the nature of my said invention and the manner in which the same is to be performed what I wish to have covered by Letters Patent is:

1. A mixture for manufacturing lead for writing and drawing pencils consisting of a mass of writing materials, water-insoluble binder and calcium chloride.

2. A mixture for manufacturing lead for writing and drawing pencils consisting of a mass containing approximately:

10 parts by weight of graphite
5 parts by weight of soot
10 parts by weight of methylene blue
11 parts by weight of talcum powder
23 parts by weight of calcium stearate
5 parts by weight of stearin
6 parts by weight of calcium chloride
29 parts by weight of ethyl cellulose
1 part by weight of monomeric vinyl acetate

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