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PENCIL LEAD AND THE ART OF MAKING
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Pencil Company, New York, N. Y., a corpora-
tion of DelawareNo Drawing. Application September 10, 1934,
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15 Claims. (Cl. 120—83)

My present invention relates to the art of pencil leads, more especially to those of the unfired type, ordinarily used for colored leads.

Among the objects of the invention are to provide a lead of the above type, superior in writing or marking characteristics, by which even inferior and inexpensive pigments become readily and uniformly distributed on the paper or other writing surface with a minimum of frictional drag, in writing.

Another object is to provide a method for producing a pencil lead of the above type, with the use of substantially conventional apparatus and by a series of steps readily executed without the exercise of a high order of skill.

A feature of the invention is the intimate dispersion throughout the body of the lead, made up essentially of conventional filler, pigment and binder, of waxy ingredients, interspersed intimately and in relatively large proportions by weight.

Where it is attempted merely to impregnate in hot wax, a lead made up wholly of filler, pigment and binder, the wax does not readily penetrate to the interior or core of the lead, especially where case hardened due to extrusion through the die, and since it is the core which chiefly functions as the writing point, the desired uniformity of marking and ease of slippage is not thereby attained.

On the other hand, if wax is incorporated with the batch of filler, pigment and binder, which is extruded through a die in making the lead, the individual particles of the pigment and binder do not become thoroughly coated with wax, and since interstices are readily formed as a result of the escape of water in the drying operation in the hot air furnace, the lead lacks the mechanical strength of a solid structure.

By the present invention, comminuted wax substantially powdery or flour-like in character, is incorporated as an element of the batch or filler, pigment and binder, and after the lead including such ingredients is extruded through the die, the lead thus formed is subjected to an impregnating operation in a molten wax. Preferably, the lead after extrusion is subjected to a drying operation in a furnace through which heated air is circulated and such drying is conducted until the moisture content of the lead is very low, and the hot-wax impregnation operation is conducted only after such drying.

The leads with the wax initially incorporated therein become porous with a multiplicity of minute irregular passages, fissures or interstices therein, formed by the moisture escaping from

the interior of the lead in the drying operation.

According to my invention, the leads previously dried may be placed in a vacuum chamber, to exhaust the air from the minute fissures, or passages in the lead, whereupon the molten wax is admitted and will penetrate these fissures, entering into the innermost recesses of the lead and incidentally partially melting or softening the wax initially incorporated in the lead, thereby to cause a much more intimate admixture of the wax with the harder particles making up the body of the lead.

Regardless whether vacuum is used or not, the lead is preferably kept under the wax for some hours, to assure complete impregnation, whereupon the wax is allowed to cool down to near, but not quite the temperature of hardening, at which temperature the leads which are preferably submerged within a perforated basket are removed from the wax and are permitted to cool in air to room temperature.

It is preferred, prior to submerging the leads in the hot impregnating wax to heat said leads substantially to the temperature of said wax, thus driving out a large part of the air present in the pores of the lead and also to avoid the possibility of chilling the wax.

While it is within the scope of my invention to use the same wax composition both as the initial ingredient of the lead batch and as the impregnating medium, it is preferred to use different waxes, each most suited for its intended purpose.

As an ingredient of the initial batch, it is preferred to use stearic acid, spermaceti, Japan wax, bayberry or a mixture or blend of two or more of such substances. This wax or these waxes are incorporated in finely comminuted form of substantially flour-like consistency, these waxes being of the type that can readily be brought into that state of fine subdivision. The wax used for impregnation is preferably a blend of carnauba wax with either tallow or stearic acid, or Japan wax preferably in equal parts, said blend being found to have the proper characteristics, for impregnating purposes. The molten wax being of a temperature of approximately 180 to 190 degrees F. the pre-heating of the leads is preferably to about said temperature before impregnation.

The base mixture used for the lead or crayon composition comprises a filler such as ground china clay and a pigment such as milori blue ground wet, comminuted, filter pressed and air dried and after admixture with stearic acid, spermaceti, bayberry or other waxy substance there may be intimately admixed therewith a

small proportion of calcium stearate. Thereupon, the binder is added preferably in the form of water soaked agglutinant of etherized cellulose according to the teachings of the copending application of Isidor Chesler, Serial No. 720,573, filed April 14, 1934. The mixture of the batch is now compressed and kneaded by use of a series of appropriate machines for securing a homogeneous intimately mixed and tough dough, which is thereupon filled into cylinders and forced through perforated plates and recompressed. Finally the dough is forced through dies of the proper calibre to produce the rod-like lead product.

The drying operation before the wax impregnation is preferably performed in racks, according to familiar practice, including covering the leads with boards to prevent warping thereof. The leads are first dried at room temperature, then maintained for a week or more in a drying chamber of 120 degrees F. with the application of air in motion until the moisture content of the leads on test is found to be very low, whereupon the leads are cut to size.

In the impregnation set forth, the wax initially introduced into the mix, becomes somewhat softened due to the heat of impregnation, but remains in situ within the lead and becomes blended at the surface of contact with the wax entering in the impregnation process. The leads after impregnation in the wax batch in which they are allowed to cool nearly to the congelation temperature of the wax are removed from the bath and cooled in air. Thereupon the leads are tested for strength, grade and quality and incorporated in the pencil, as by gluing into the usual wooden case.

By the process set forth, the resultant lead has a high proportion of wax or grease incorporated in it, the combination of powdered wax initially introduced, with the wax entering by impregnation being as high as 18 to 20 per cent of the weight of the lead. As a result, the individual particles are quite thoroughly greased, clear into the core of the lead and by reason of the unctuous character of the added waxy ingredients, including the calcium stearate, the lead is so slipping in character, that it takes readily to the paper and uniform pressure will make a uniform line of uniform color and weight. By the process set forth, the product admits of use of relatively inferior pigments with results at least as good as those attained by older processes, even with the use of expensive pigments.

It will thus be seen that there is herein described a method and product in which the several features of this invention are embodied, and which apparatus in service attain the various objects of the invention and are well suited to meet the requirements of practical use.

As many changes could be made in the above construction, and many apparently widely different embodiments of this invention could be made without departing from the scope thereof, it is intended that all matter contained in the above description shall be interpreted as illustrative and not in a limiting sense.

Having thus described my invention, what I claim as new and desire to secure by Letters Patent of the United States is:—

1. The method of preparing a pencil lead which consists in incorporating a comminuted wax with the filler, pigment and binder of the plastic stock of the lead and after forming the lead, subjecting the latter to a bath of molten wax.

2. The method of preparing a pencil lead which consists in admixing filler, pigment and binder, with a comminuted wax, extruding the individual

leads and then subjecting them under heat to an impregnating bath in molten wax.

3. The method of preparing a pencil lead, which consists in intimately admixing filler, pigment and binder with comminuted wax, extruding the lead rods, subjecting the latter to a drying operation and then impregnating the dried leads in molten wax.

4. The method of making an unfired writing lead, which consists in incorporating in the otherwise conventional mix, including a filler, a pigment and a binder, a comminuted wax, then subjecting the lead rods to a drying operation and finally subjecting the dried lead rods to heat, thereby softening the wax incorporated therein and at the same time applying molten wax from the exterior of the lead rod.

5. The method of making a pencil lead of the unfired type, which consists in incorporating with the mixture of filler, pigment and binder, comminuted wax of flour-like consistency, including one or more ingredients of the group made up of stearic acid, Japan wax, spermaceti, and bayberry, and after completing the lead from these ingredients impregnating said lead in a bath of molten wax.

6. The method of making a pencil lead of the unfired type, which consists in incorporating with the mixture of filler, pigment and binder, a comminuted wax of flour-like consistency, including one or more ingredients of the group consisting of stearic acid, Japan wax, spermaceti and bayberry, and after completing the lead from these ingredients, impregnating said lead in a bath of molten wax, said bath comprising a blend of carnauba wax with one or more members of the group consisting of tallow and stearic acid.

7. The method of making a pencil lead of the unfired type, which consists in incorporating with the mixture of filler, pigment and binder, comminuted wax of flour-like consistency including one or more ingredients of the group consisting of stearic acid, Japan wax, spermaceti and bayberry, then drying the leads in circulating heated air until the moisture content thereof has been greatly reduced and finally impregnating said dried lead in a bath of molten wax, said bath comprising a blend of carnauba wax with one or more members of the group, consisting of tallow and stearic acid.

8. The method of making a pencil lead of the unfired type, which consists in incorporating with the mixture of filler, pigment and binder, a comminuted wax, drying the leads until the moisture content thereof has been greatly reduced, preheating the leads to substantially the temperature of a bath of molten impregnating wax and then submerging the leads in said impregnating wax, and removing the impregnated leads from the wax before the latter has hardened.

9. The method of making a pencil lead of the unfired type, which consists in incorporating with the mixture of filler, pigment and binder, a comminuted wax, drying the leads until the moisture content thereof has been greatly reduced, subjecting the leads to vacuum to remove air from the interstices thereof, then impregnating the leads in molten wax after preheating the leads to substantially the temperature of said molten wax.

10. The method of making a pencil lead of the unfired type, which consists in incorporating with the mixture of filler, pigment and binder comminuted wax, drying the leads until the moisture

content thereof has been greatly reduced, and then impregnating the leads in molten wax.

11. An unfired pencil lead comprising filler, pigment and binder, having intimately interspersed therein, a large percentage of wax thoroughly permeating the lead to its core, said wax including particles thereof admixed with the filler, and particles substantially filling minute interstices left in the interior as a consequence of the usual drying operation.

12. An unfired pencil lead comprising filler, pigment and binder having intimately interspersed therein, a large percentage of wax thoroughly permeating the lead to its core, said wax including particles thereof admixed with the filler, and particles substantially filling minute interstices left in the interior as a consequence of the usual drying operation, the exterior of the lead being porous.

13. An unfired pencil lead comprising filler, pigment and binder with admixed wax substan-

tially throughout the body and in the core of the lead and additional wax impregnating interstices formed in the conventional drying of the lead.

14. An unfired lead comprising filler, pigment and binder and wax substantially homogeneously mixed throughout the mass, said lead impregnated with a wax of different composition filling interstices formed in the conventional drying of the lead and substantially bonded to the wax incorporated with the original mixture of the lead.

15. An unfired pencil lead including a filler, a pigment, and a binder, having admixed therewith, a comminuted wax including one or more of the group consisting of stearic acid, Japan wax, spermaceti and bayberry, said lead having those interstices thereof formed in the conventional drying, substantially impregnated in a wax comprising a blend of carnauba wax with one of the group consisting of tallow and stearic acid.

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