

UNITED STATES PATENT OFFICE

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PENCIL AND CRAYON ROD

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5 Claims. (Cl. 106—5)

Among the objects of the present invention are to provide a lead rod of the non-calcined type, which admits of being made in any desired length, shape or color, including also black and white and of any desired hardness or softness, which, even in small diameters has tensile and shearing strength, as well as elasticity of high order, which admits of having incorporated therein waxy or fatty material to determine certain of the writing qualities thereof, the strength and writing qualities of which rod are not adversely affected by the glue used for bonding the same into a conventional wooden case, and which admits of being sharpened to a point like ordinary graphite pencil leads.

Another object is to provide a lead or crayon rod composition having the above properties and which is neither too horny nor too tough, but the ingredients of which, including the binder, wear readily and uniformly with the writing end of the pencil or crayon rod as the latter is consumed in use and which will not powder or harden or otherwise deteriorate with age to such extent as to impair its usefulness.

Another object is to provide a pencil or crayon rod of the above type, in the manufacture of which conventional equipment and processes may be employed.

According to the present invention the crayon ingredients of pigment and filler may be entirely conventional but a novel binder is used which imparts to the crayon or pencil the properties and characteristics indicated in the foregoing statement of objects and more fully set forth herein-after.

According to the invention the said binder is an agglutinant which consists of etherized cellulose including a water soluble adhesive mass having distributed therein portions of such substance that are stringy in structure and relatively insoluble in water. With the use of such binder the stringy elements become oriented longitudinally of the crayon or lead rods as these are prepared in the usual manner by extrusion under hydraulic pressure. The resultant lead or crayon rod as a consequence has not only the inherent strength imparted to it by the adhesive character of the agglutinant but the stringy relatively insoluble particles thereof lend further mechanical strength to the lead or crayon to toughen it so that it may actually be dropped on a hard floor without cracking or breaking and may be bent through a very substantial arc before it will fracture. Yet the stringy elements are not so tough and horny as to interfere with the writing prop-

erties of the lead or crayon but they wear down with the body of the lead as the latter is consumed in writing.

This application is a division of my parent application Serial No. 720,573, filed April 14, 1934, and patented on January 11th, 1938, under No. 2,105,310 in which the agglutinant per se is claimed.

For the present purpose it is sufficient to refer briefly to a typical one of the numerous possible examples of more or less equivalent agglutinants described in the parent case.

The binder which is flocculent when dry may consist largely of dimethyl ethyl ether of cellulose which yields a gummy medium when treated with water in which it is soluble. The ingredient set forth has admixed therewith, other ethers of cellulose, poorer or lacking in the methyl radical and desirably with not less than two ethyl radicals which ethers are substantially insoluble in water and form the stringy ingredient of the binder. Preferably the ingredients are selected in such proportions and the process of their preparation is so conducted in accordance with the technique familiar to those skilled in the art, that the stringy or relatively insoluble ingredients of the binder are from 15 to 25% by weight of said binder.

In the preparation of the pencil or crayon rods the base mixture used for the lead or crayon composition comprises a filler such as ground china clay and a pigment such as English red ground wet, comminuted, filter pressed and air dried, and after admixture with stearic acid and further crushing, is admixed with calcium stearate and still further mixed. Thereupon the binder in desired proportion of water soaked agglutinant is added, together with enough water to bring the mass to the desired consistency or plasticity. Experience has shown that a preferred moisture content, determinable by analysis of a specimen will range around 20 to 25%.

The mixture of the batch is now ground, compressed and kneaded by use of a series of appropriate mills for securing a homogeneous intimately mixed and tough dough, which is thereupon hammered into cylinders and forced through perforated plates and re-compressed. Finally the dough is forced under hydraulic pressure through dies of the proper calibre to produce the rod-like lead product. In this operation the stringy particles in the binder appear to become oriented substantially longitudinally of the rod and are thus intermingled and intermeshed and thereby

materially augment the mechanical strength of the product.

The lead rods are dried in racks, including covering the leads with rubber mats to prevent warping thereof, in a conditioned atmosphere where-
 5 in the relative humidity is automatically maintained around 40, at room temperature. The time of drying or curing varies with the particular kind of lead for periods of from one to eight
 10 weeks or until the moisture content is reduced to less than 3% whereupon the leads are cut to specified lengths.

The rod tightly compacted by the process above set forth develops or has therein minute pores, probably due to the escape therefrom of water
 15 evaporated in the drying operation. Except for some types of rods, such as rods made with water soluble dyes, which are used for copying pencils or the like, as well as rods made for special writing characteristics, the rods are subjected to a
 20 waxing operation now to be set forth. For such purposes, the dried rods after reheating to approximately the temperature of the molten wax to be used in the next step are then immersed for a period of some hours in a mixture of waxes, or
 25 material of a waxy nature, ordinarily equal parts of stearic acid and carnauba wax, preferably at a temperature of 180 to 190 degrees F. The dried rod has sufficient porosity to permit such melted
 30 waxy substances thoroughly to permeate the same, under the conditions of treatment, that is, to substantially fill all voids left in the rods by the evaporation of the water, and to fill the
 35 interstices in the stringy ingredient of the binder, a penetration attainable with much difficulty, if at all, where the lead has a case-hardened imperforate surface. The thorough wax impregna-
 40 tion results in a lead or crayon rod of excellent and uniform writing properties. After cooling, the leads are tested for strength, grade and quality and then preferably glued into the usual
 wooden sheaths.

The lead has tensile and shearing strength considerably greater than that of the best grades
 45 of leads of corresponding size at present on the market, and can be bent through a visible arc before breaking.

Manifestly the invention is not limited in its application to colored crayons or pencils but may
 50 be used for black leads or white leads as well.

As many changes and variations may be made in the above article and many apparently widely different embodiments of this invention may be made without departing from the scope of the
 5 claims, 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 is:

1. A pencil or crayon rod composed of filler, pigment and binder ingredients, said binder including water soluble etherized cellulose pervad-
 10 ing the rod and including also stringy etherized cellulose elements, substantially insoluble in water, wearing flush with the writing end as the rod is consumed in use.

2. A pencil or crayon rod composed of filler, pigment and binder ingredients, said binder including water soluble etherized cellulose pervad-
 20 ing the rod and including also stringy etherized cellulose elements substantially insoluble in water, directed generally longitudinally of the rod and wearing flush with the writing end as the rod
 25 is consumed in use.

3. The combination recited in claim 2 in which the stringy etherized cellulose elements of the binder are from 15 to 25 per cent by weight of
 the binder.

4. A pencil or crayon rod comprising filler, pigment and binder ingredients, said binder including water soluble etherized cellulose dissolved
 30 in water and having stringy particles of etherized cellulose distributed therethrough that are relatively insoluble in water and a waxy substance permeating the rod.

5. A pencil or crayon rod comprising filler, pigment and binder ingredients, said binder including water soluble etherized cellulose as a constituent of the rod and including also small
 40 stringy particles of substantially water insoluble etherized cellulose, said particles being directed generally longitudinally of the rod and wearing flush with the writing or wearing end of the rod
 45 as the same is consumed in use, and a waxy substance permeating the interstices of the rod proper and also of the stringy particles of the binder thereof.

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