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WRITING ELEMENTS COMPRISING COLLOIDAL THERMOPLASTIC RESIN AND METALLIC SOAP

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The invention relates to improvements in compositions for writing elements and methods of manufacturing writing elements for pencils.

This application is a continuation-in-part of our application Ser. No. 264,070, filed Mar. 11, 1963, now abandoned.

Commercial methods of making writing elements of the crayon, copying and black or graphite lead types are time-consuming, difficult to control from the quality standpoint, and expensive; also, the operations involved do not permit automatic or straight line processing.

Prior to the present invention, the cycle for manufacturing colored leads of the crayon or copying type in accordance with acceptable commercial practice has required approximately two weeks. First, the raw materials in a dry state are mixed together in a mixer such as a Baker-Perkins machine. The dry raw materials for a crayon type pencil generally consist of an insoluble pigment selected for the desired color, a filler or extender such as talc or clay, a metallic soap such as calcium stearate, and a wax or fat. For a copying type of colored lead, a soluble dye is substituted for the pigment. Gum tragacanth or methyl cellulose dissolved or dispersed in water is added to the mixture of dry materials to produce a mucilaginous paste. The materials are mixed until a uniform, wet stiff dough is obtained. The mixing machine is jacketed for steam to heat the contents and to hasten the elimination of water. The stiff, wet dough is removed from the mixer and transferred to a roller mill, generally a heavy two-roll rubber mill, where milling is continued until the moisture content of the mass is suitably correct for extrusion. The moisture content is critical; it must be between 18 and 20 percent. The mass is removed from the roller mill in sheets, and the sheets are broken up to furnish small granules. The resulting granules are then packed into a heavy steel cylinder having an extrusion die fitted into one end. A ram, under pressure, is forced into the opposite end of the cylinder to cause the mass to be extruded through the die. The leads so extruded are then laid onto wood boards as straight as possible and parallel to one another, and are dried on the boards in an air conditioned, low temperature oven. After drying, the leads are cut to pencil length. Some types of colored leads are further impregnated with wax or fats by immersing them into a bath of hot fat or wax for several hours, after which the leads are again dried either by centrifugal action or by placing them in sawdust. Only then are the leads ready for laying in the grooves and glueing to the wood slats.

The described method of making a colored lead of either the crayon or copying type has a number of disadvantages and manufacturing limitations. The moisture or water content of the mass at the extrusion stage is critical and difficult to control. If the moisture content is higher than 20 percent, the leads will shrink and result in writing elements which have an unduly small diameter for the precision cut grooves in the wood slats in which they are placed for glueing, thereby producing loose leads in the finished pencils. If the moisture content is below 18 percent, the finished leads will be too large in diameter. Placement of oversized leads in the grooves of the slats and the application of pressure in the glueing operation,

causes the leads to be crushed and results in defective pencils. Despite the relatively small diameters involved, diameter size within a tolerance better than 0.005" is rarely obtained, even with proper drying at the extrusion stage.

Following extrusion, and during the stage where the leads are laid onto the wood boards and dried, the leads have a tendency to curl and come out crooked. This causes trouble in laying the leads into the grooves of the wood slats, and seriously interferes with efforts to achieve straight line or automatic processing. Drying of the extruded leads in critical. If the drying proceeds too rapidly, the leads will split longitudinally because surface drying proceeds more rapidly than the leads can take.

In view of the limitations and problems briefly referred to above, it has been common practice to add as much as ten (10) percent above the quantity desired for an order or run. Then too, if the leads are impregnated with wax, any defective leads cannot be reworked and the materials, as well as the effort involved, are completely lost.

The commercial manufacture of black or graphite type lead also involves an unduly long manufacturing cycle, critical operations, and presents problems resulting from the lack of uniformity of the finished product. Prior to the present invention, the manufacture of graphite lead required ten operations. First, the graphite and clay are ground in a pebble mill. If a wet process is used, the ground raw materials from the pebble mill are filter pressed and the filter cakes dried. The ground materials are then kneaded and prepared for extrusion. Following extrusion, the leads are dried, after which they are packed into a crucible or sagger, where the leads are vitrified or burned. After vitrification, the leads are cooled in the sagger. On leaving the sagger, the leads are impregnated with a wax or fat, following which the surface wax or fat is removed from the leads by centrifuging or placing the leads in sawdust. The leads so treated then have their surfaces prepared for glueing in the grooved wood slats.

Great care must be exercised in placing the leads in the sagger. If one lead crosses an adjacent lead, leads so crossed come out crooked. Though the temperature in the sagger may be as high as 1800 to 2000° F., depending upon the type of clay used, a variation as small as 10° will cause loss of strength and variation in the desired hardness for the finished lead. The some ten operations involved not only consume a great deal of time, requiring a cycle of manufacture which may last as long as a week, in addition, much equipment is required and is tied up by the cumbersome process.

A primary object of the invention is to provide a composition for a writing or marking element of the crayon, copying or graphite lead type which enables the simplification of the process of making the writing element, the novel composition and process of manufacture to afford an end product of uniform and high quality from the standpoint of strength and writing quality.

In the case of colored lead, the invention enables the elimination of wax as a raw material and as an impregnant for the lead at the stage prior to laying the leads in the grooved wood slats. The elimination of the wax impregnation step also permits elimination of the centrifuging or drying step following impregnation. Whereas, it has been virtually impossible to control diameter size to a finer tolerance than 0.005", the composition and method of the invention afford dimensional control on the order of 0.002". This permits precision glueing of the leads in the grooved wood slats automatically without damage to the lead. In the practice of the invention, moisture content is not critical. Leads are ready for glueing in the grooved wood slats immediately after extrusion and cooling. There is no need for arranging the extruded

leads straight and parallel to one another on boards for drying in an air conditioned atmosphere. Perfectly straight leads are obtained without the care required by conventional methods of manufacture, and as a result, the glueing operation is not dependent upon or tied up awaiting leads which have to be dried. A batch of colored lead can be completed from start to finish within hours and ready for glueing the same day, instead of weeks as required by conventional methods. The scheduling of production is thereby made precise and dependable. The resulting product possesses such a high measure of uniformity from the standpoint of writing quality and strength, that overruns to meet or fill an order are unnecessary; if a given number of leads are scheduled, the raw materials for the run may be precisely measured for the quantity of leads desired without incurring any waste.

In the case of graphite lead, the invention permits the several days of time and labor required to make the product in accordance with conventional commercial procedures to be reduced to but a few hours. Since clay for vitrification purposes is not included in the graphite lead composition of the invention, the critical operation of vitrifying or burning the leads is eliminated. The operation of impregnating the leads with wax or fat following vitrification also is unnecessary. Nevertheless, a lead made in accordance with the invention writes as smoothly and is as strong in point strength and in transverse strength as lead produced by conventional methods. Graphite leads made in accordance with the invention will not soften under extremely high humidity conditions encountered in certain climates. Uniform writing quality is obtained regardless of the ambient atmosphere. This characteristic is particularly desirable for drawing or draftsmen's leads, which may be made in as many as seventeen different degrees of hardness.

A composition for a writing element which furnishes the advantages and improved results referred to above comprises as the essential ingredients thereof a marking material, a metallic soap and a thermoplastic resin having "colloidal particle size," a term which subsequently will be explained. For colored lead, a filler or extender is included.

The term "metallic soap" is used herein in the sense defined on pp. 195, vol. 5, 1950 edition and 573, vol. 12, 1954 edition of the Kirk-Othmer Encyclopedia of Chemical Technology. Metallic soaps contain a metal other than sodium or potassium, and are for the most part alkaline earth or heavy-metal salts of monobasic carboxylic acids of the general formula $(RCOO)_xM$, where M is a metal radical of valence state x and R is an organic radical containing at least 6-7 carbon atoms. While metallic soaps are insoluble in water, the term as herein used includes lithium salts which are moderately soluble. Examples of metallic soaps which are preferred are the stearates, oleates, palmitates, ricinoleates, and laurates of calcium, aluminum (mono-, di-, and tri-), magnesium, zinc, and lithium. Such metallic soaps are preferred because of their non-toxicity.

For colored lead of the crayon type, the marking material is any well known insoluble pigment of the organic or inorganic type or lake or combination thereof selected for the desired color. Examples of organic pigments which may be used are the lithol toners, the toluidines, the benzidines and the naphthols. Inorganic pigments which may be used are the iron blues, iron oxides, titanium dioxide, zinc oxide, zinc sulfide, lithopones, and the earth colors such as sienna, ochres and umbers. The lake dyes or lakes are organic pigments or dyes precipitated on a base such as clay, alumina, barytes, or talc.

The amount of pigment or lake used depends upon the color desired. For pigments of the organic or inorganic type, the amount thereof used in the composition of the invention is preferably in the range of between approximately 5 to 14 percent, by weight, depending upon the color pigment selected. Different pigments have different

specific gravities. For example, for either violet or light green, only 5 percent of pigment is needed. For red, 6 percent pigment may be used consisting of 2 percent Winthrop red, 2 percent of toluidine toner and 2 percent titanium oxide. For dark blue, 12 percent pigment may be used consisting of 10 percent iron blue and 2 percent titanium oxide. For black, 11 percent of the pigment or carbon black may be used, and for a brown color, 14 percent of a suitable brown pigment is used. A conventional filler or extender is used where the marking material is a pigment. A suitably extender such as talc, clay or calcium carbonate in an amount of between approximately 45 to 54 percent, by weight, depending upon the specific gravity of the pigment, is used. Certain toners, such as pure lithol toners, possess such high tintorial value that they may be used in an amount as small as 2 percent. With such small amount of pigment, the amount of extender is increased.

Where the coloring material is supplied by a lake, the organic coloring material or pigment may be as little as 2 percent of a toner precipitated on approximately 68 percent of a base or filler. Thus for a colored lead of the crayon type, the marking material may be present in an amount of between approximately 2 to 14 percent, by weight, with approximately 45 to 68 percent, by weight, of associated filler.

For a copying type of lead, a suitable and usual soluble dye is used in lieu of the pigment. Examples of soluble dyes are eosine, methylene blue, methyl violet and acid green. The amount of soluble dye used depends upon the copying quality desired, the amount of dye being in the range of approximately 1 to 25 percent, by weight, the associated filler being present in the amount of approximately 45 to 69 percent.

For graphite lead, the usual graphite, crystalline, amorphous, or a mixture thereof, constitutes the marking material of the composition of the invention and preferably is present in the range of approximately 70 to 74 percent for a No. 2 grade lead. If desired, a flake graphite may be used, though this form of graphite is more expensive. For a 6B grade lead, the graphite content may be as high as approximately 80 percent and for a 9H grade lead, the graphite content may be as low as 25 percent. No extender is needed for graphite lead made in accordance with the invention. If desired, a small quantity of stabilizer to prevent thermal degradation of the resin ingredient may be included. Examples of stabilizers are alkaline earth metal soaps, resinates, oxides, carbonates or aromatic amines. Such small quantity of stabilizer, on the order of approximately 1 percent, may also be used in the composition for a colored lead. It is not essential, however, because the metallic soap ingredient of the composition also possesses a stabilizer function.

Whereas, in prior art colored lead manufacture, metallic soap has been used, such ingredient has always been used jointly with a wax or fat, either as a raw material, or as an impregnant in the extruded lead. A composition made in accordance with the invention for colored lead does not include a wax or fat as an essential ingredient thereof. In fact, the addition of any appreciable amount of a wax or fat causes a loss in lead strength. In a colored lead in accordance with the invention, a metallic soap, or heavy or alkaline earth metal salt of a fatty acid, adequately furnishes both the desired smoothness for writing quality and serves as a lubricant to enable extrusion through the lead forming die.

In accordance with the invention, a metallic soap constitutes an essential ingredient of the graphite lead composition, and a wax or fat, either as an ingredient of the lead composition or as an impregnant for the extruded lead, is not essential, and, in fact, is excluded. In a graphite lead composition in accordance with the invention, the metallic soap functions to furnish desired smoothness for writing quality and acts as a lubricant in

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the extrusion operation. The thermoplastic resin having colloidal particle size is the binder for the graphite and metallic soap, and the composition consists essentially of only these three ingredients.

By varying the amount of the metallic soap in the colored or graphite lead composition, the desired hardness of the finished lead may be varied to suit. The amount of this ingredient which may be used in the composition may be in the range of between approximately 5 to 30 percent. The specific amount used also depends upon the marking material selected, for as indicated above, marking materials vary in tinctorial value and specific gravity. Calcium stearate is preferred because of its non-toxicity and low cost.

Regarding the thermoplastic resin ingredient of the composition, it has been determined that a solution of a thermoplastic resin, when mixed with a marking material and a metallic soap will not furnish a lead of adequate point or transverse strength. In solution, the resin is so exceedingly ultra-fine or molecular in dimensions that the resin is carried or absorbed into the interstices of the particles of the non-resinous materials with which the resin solution is mixed. As a result, an adequate external adhesive phase cannot be obtained to furnish homogeneity and uniform adherence to one another of the composition's non-resinous particles.

Also, homogeneity and suitable adherence of the non-resinous ingredients for adequate lead strength cannot be obtained when the thermoplastic resin is used in commercially available dry powder or granule form. Even when dispersed in water, the powdered resin particles, because of their excessive size, contact each other and form agglomerates. As a result, in the finished lead there are areas which are resin-rich and resin-poor; the lead has weak areas and writing quality is not adequately smooth.

In a water dispersion of a thermoplastic resin having colloidal particle size, the dispersed, discrete, resin particles vary in size from between approximately 0.01 micron and approximately three microns. The resin particles are separated from each other because they each carry a positive charge and repel one another. When the water dispersion of the resin, with its discrete particles of macromolecular or "colloidal particle size" is intimately mixed with the larger non-resinous particles of the composition, resin is deposited upon the individual non-resinous particles. When the mass of pigment and filler or graphite, and metallic soap having the "colloidal particle size" resin thoroughly distributed therethrough is forced through the extrusion die, with heat, the non-resinous particles are adhered to one another by a continuous network of very thin walled, fused resin. Such cellular or latticed resin structure affords proper distribution and maximum and essential use of the resin binder for uniform and satisfactory strength and writing quality in the finished lead.

Though for satisfactory results, the particale size of the resin ingredient of the composition is critical in the sense that the resin particles must not be of a size in excess of or below "colloidal particle size," resins having colloidal particle size are readily available on the commercial market. A water dispersion of a thermoplastic resin, or a thermoplastic resin having colloidal particle size, is purchaseable as a polyvinyl chloride latex, which is the preferred binder ingredient of the composition of the invention. Other suitable colloidal particle size resins are in available form as a latex of polyvinyl acetate, or an emulsion of polyethylene, an acrylic resin, polystyrene, ethyl cellulose, polypropylene, or a coumarone-indene resin. On a dry or solids basis, the composition of the invention contains approximately 5 to 45 percent of the colloidal particle size thermoplastic resin. Different degrees of hardness may be obtained by varying the amount of resin in the compound.

A preferred composition for a colored lead contains the following listed ingredients, the amounts indicated

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being on a dry weight basis, the composition being processed as hereinafter described:

	Percent
Pigment -----	5-14
Talc -----	45-54
Calcium stearate -----	20
Stabilizer -----	1
Polyvinyl chloride latex (solids) -----	20

The dry particles or powdered pigment, talc, calcium stearate and stabilizer are placed in a mixer of the kneading type. The latex is added to the dry material to form a stiff paste. Additional water may be added to assure complete wetting of all particles. The resulting mixture may be dried by applying heat during the operation of thoroughly and intimately mixing the ingredients. Substantially all the moisture is removed, the resulting moisture content being no more than approximately 1.0 percent. The material is removed from the mixer, and any lumps or large pieces that may be present are broken down to granules if the material is to be extruded directly. If desired, the material from the mixer may be further processed on a heated roller mill for approximately twenty minutes. The sheet coming off the mill is granulated, following which the means of granules is extruded at a temperature of approximately 250° F. The leads, as they issue from the extruder, may be deposited on a travelling belt, where they cool rapidly and straight. The leads are then cut to pencil length, and are ready for glueing to the grooved wood slats.

A preferred composition for a graphite lead contains the following listed ingredients, the amounts indicated being on a dry weight basis, the composition being processed as hereinafter described:

	Percent
Graphite (crystalline) -----	70-74
Calcium stearate -----	10
Stabilizer -----	1
Polyvinyl chloride latex (solids) -----	16-20

The dry ingredients (graphite, calcium stearate, and stabilizer) are placed in a mixer of the kneading type. The latex is added to form a stiff paste. Additional water may be added to assure complete wetting of all particles. After thorough mixing, the mixture may be dried by applying heat during the mixing operation to remove substantially all moisture. A practical maximum water content is approximately 1.0 percent. The mass is removed from the mixer, and any lumps or large pieces may be broken down on a heated roller mill. The sheets are removed from the roller mill and then granulated for feeding into the extruder. The roller mill operation may be omitted if there are no lumps or large pieces in the mixture taken from the mixer. The substantially dry granules of the intimately mixed ingredients are then fed into a heated extruder, and the extruded leads, when cool and cut to length, are ready for casing in the wood sheaths.

A graphite pencil lead made as described above furnishes lead having a point strength of three (3) pounds and better. The transverse strength is twenty-five (25) ounces on a one inch span of lead. Despite the absence of a wax, the writing quality is very good.

A graphite lead having the foregoing composition and processed as described will furnish a lead having a No. 2 hardness. If a lead harder than No. 2 is desired, a powdered thermoplastic resin, for example, polyvinyl butyrate may be added in the mixer after the polyvinyl chloride latex has been added and mixed into the mixture. Where a lead softer than No. 2 is desired, a plasticizer may be added to the mix. The percentage of the metallic soap may be varied to obtain different hardness. Also, the addition of an extender, such as talc or clay, in lieu of an equivalent weight of graphite, serves to increase hardness.

It is believed that the advantages and improved results of writing elements for pencils furnished by the com-

positions and methods of manufacture of the invention will be apparent from the foregoing description of a preferred embodiment of the invention. It will be apparent that various changes may be made without departing from the spirit and scope of the invention as sought to be defined in the following claims.

We claim:

1. A composition for a writing element for pencils, said composition consisting essentially of a substantially water insoluble metallic soap, a thermoplastic resin binder solid at room temperature having colloidal particle size in sufficient amount to furnish an extrudable writing element, and a marking material selected from the group consisting of a graphite, a pigment and a dye, the pigment and the dye having a mineral filler associated therewith.

2. A composition for a colored lead of the crayon type, said composition consisting essentially of a pigment, a mineral filler, a substantially water insoluble metallic soap, and a thermoplastic resin binder solid at room temperature having colloidal particle size in sufficient amount to furnish an extrudable lead.

3. A composition for colored lead of the crayon type, said composition consisting essentially of, by weight, approximately 2 to 14 percent of a pigment, approximately 45 to 68 percent of a mineral filler, approximately 5 to 30 percent of a substantially water insoluble metallic soap, and approximately 5 to 45 percent of a thermoplastic resin binder solid at room temperature having colloidal particle size.

4. A composition as set forth in claim 3, wherein the pigment is present in the amount of approximately 5 to 14 percent and the mineral filler in the amount of approximately 45 to 54 percent.

5. A composition as set forth in claim 3, wherein the pigment is present in an amount of approximately 5 to 14 percent, the mineral filler in an amount of approximately 45 to 54 percent, the substantially water insoluble metallic soap in an amount of approximately 20 percent, and the thermoplastic resin binder solid at room temperature having colloidal particle size in an amount of approximately 20 percent.

6. A composition for a graphite lead, said composition consisting essentially of graphite, a substantially water insoluble metallic soap, and a thermoplastic resin binder solid at room temperature having colloidal particle size in sufficient amount to furnish an extrudable lead.

7. A composition as set forth in claim 6, wherein the graphite is present in an amount of approximately 25 to 80 percent, the substantially water insoluble metallic soap in an amount of approximately 5 to 30 percent and the thermoplastic resin binder solid at room temperature having colloidal particle size in an amount of approximately 5 to 45 percent.

8. A composition as set forth in claim 6, wherein the graphite is present in an amount of approximately 70 to 74 percent, the substantially water insoluble metallic soap in an amount of approximately 10 percent, and the thermoplastic resin binder solid at room temperature having colloidal particle size in an amount of approximately 16 to 20 percent.

9. A composition for a colored lead of the copying type, said composition consisting essentially of a soluble dye, a mineral filler, substantially water insoluble metallic soap and a thermoplastic resin binder solid at room temperature having colloidal particle size in sufficient amount to furnish an extrudable lead.

10. A composition as set forth in claim 9, wherein the ingredients are present in the amounts of, by weight, approximately 1 to 25 percent soluble dye, approximately 45 to 69 percent filler, approximately 5 to 30 percent metallic soap, and approximately 5 to 45 percent thermoplastic resin.

11. A process of making a writing element for pencils comprising providing a composition consisting essentially of a substantially water insoluble metallic soap, a water

dipersion of a thermoplastic resin binder having colloidal particle size, the resin being solid at room temperature and in sufficient amount to furnish an extrudable lead, and a marking material selected from the group consisting of a graphite, a pigment and a dye, the pigment and the dye having a mineral filler associated therewith, intimately mixing the ingredients of said composition, drying the resulting mixture, and extruding the dried mixture to form lead.

12. A process of making a colored lead of the crayon type comprising providing a composition consisting essentially of a pigment, a mineral filler, a substantially water insoluble metallic soap and a water dispersion of a thermoplastic resin binder having colloidal particle size, the resin being solid at room temperature and in sufficient amount to furnish an extrudable lead intimately mixing the ingredients of said composition, drying the resulting mixture, and extruding the dried mixture to form lead.

13. A process as set forth in claim 12, wherein the moisture content of the resulting mixture does not exceed approximately 1.0 percent and the dried mixture which is extruded is granulated.

14. A process of making a colored lead of the crayon type comprising providing a composition consisting essentially of, by weight, approximately 2 to 14 percent of a pigment, approximately 45 to 68 percent of a mineral filler, approximately 5 to 30 percent of a substantially water insoluble metallic soap, and a water dispersion of a thermoplastic resin binder solid at room temperature having colloidal particle size to furnish a composition having a solids resin content of approximately 5 to 45 percent, intimately mixing the ingredients of said composition, drying the resulting mixture so that the moisture content thereof does not exceed approximately 1.0 percent, and extruding the dried mixture to form lead.

15. A process as set forth in claim 14, wherein the pigment is present in an amount of approximately 5 to 14 percent, the mineral filler in an amount of 45 to 54 percent, the substantially water insoluble metallic soap in an amount of approximately 20 percent, and the solids resin content in an amount of approximately 20 percent.

16. A process of making a non-vitrified graphite lead, comprising providing a composition consisting essentially of a graphite, a substantially water insoluble metallic soap, and a water dispersion of a thermoplastic resin binder having colloidal particle size, the resin being solid at room temperature and insufficient amount to furnish and extrudable lead intimately mixing the ingredients of said composition, drying the resulting mixture, and extruding the dried mixture to form lead.

17. A process as set forth in claim 16, wherein the moisture content of the resulting mixture does not exceed approximately 1.0 percent and the dried mixture which is extruded is granulated.

18. A process of making a non-vitrified graphite lead comprising providing a composition consisting essentially of, by weight, approximately 25 to 80 percent graphite, approximately 5 to 30 percent of a substantially water insoluble metallic soap, and a water dispersion of a thermoplastic resin binder solid at room temperature having colloidal particle size to furnish a composition having a solids resin content of approximately 5 to 45 percent, intimately mixing the ingredients of said composition, drying the resulting mixture, and extruding the dried mixture to form lead.

19. A process of making a non-vitrified graphite lead comprising providing a composition consisting essentially of, by weight, approximately 70 to 74 percent graphite, approximately 10 percent of a substantially water insoluble metallic soap, and a water dispersion of a thermoplastic resin binder solid at room temperature having colloidal particle size to furnish a composition having a solids resin content of approximately 16 to 20 percent, intimately mixing the ingredients of said composition,

drying the resulting mixture so that the moisture content thereof does not exceed approximately 1.0 percent, granulating the dried mixture, and extruding the granules of the mixture to form lead.

20. A process of making a colored lead of the copying type comprising providing a composition consisting essentially of a soluble dye, a mineral filler, a substantially water insoluble metallic soap, and a water dispersion of a thermoplastic resin binder having colloidal particle size, the resin being solid at room temperature and in sufficient amount to furnish an extrudable lead intimately mixing the ingredients of said composition, drying the resulting mixture so that the moisture content thereof does not exceed approximately 1.0 percent, and extruding the dried mixture to form lead.

21. A process as set forth in claim 20, wherein the soluble dye is present in an amount of approximately 1 to 25 percent, the mineral filler in an amount of approximately 45 to 69 percent, the substantially water insoluble metallic soap in an amount of approximately 5 to 30 percent, and the solids resin content in an amount of approximately 5 to 45 percent.

22. A composition for a writing element for pencils, said composition consisting essentially of a substantially water insoluble metallic soap, a thermoplastic resin solid at room temperature having colloidal particle size in sufficient amount to furnish an extrudable writing element, the thermoplastic resin being selected from the group consisting of polymers of ethylenically unsaturated monomers and ethyl cellulose, and a marking material selected from the group consisting of a graphite, a pigment and a dye, the pigment and the dye having a mineral filler associated therewith.

23. A composition for a colored lead of the crayon type, said composition consisting essentially of a pigment, a mineral filler, a substantially water insoluble metallic soap, and a thermoplastic resin solid at room temperature having colloidal particle size in sufficient amount to furnish an extrudable lead, the thermoplastic resin being selected from the group consisting of polymers of ethylenically unsaturated monomers and ethyl cellulose.

24. A composition as set forth in claim 23, wherein the ingredients are present in the amounts of, by weight, approximately 2 to 14 percent pigment, approximately 45 to 68 percent mineral filler, approximately 5 to 30 percent substantially water insoluble metallic soap, and approximately 5 to 45 percent thermoplastic resin.

25. A composition for a graphite lead, said composition consisting essentially of a graphite, a substantially water insoluble metallic soap, and a thermoplastic resin solid at room temperature having colloidal particle size in sufficient amount to furnish an extrudable lead, the thermoplastic resin amount being selected from the group consisting of polymers of ethylenically unsaturated monomers and ethyl cellulose.

26. A composition as set forth in claim 25, wherein the ingredients are present in the amounts of, by weight, approximately 25 to 80 percent graphite, approximately 5 to 30 percent substantially water insoluble metallic soap, and approximately 5 to 45 percent thermoplastic resin.

27. A composition for a colored lead of the copying type, said composition consisting essentially of a soluble dye, a mineral filler, a substantially water insoluble metallic soap, and a thermoplastic resin solid at room temperature having colloidal particle size in sufficient amount to furnish an extrudable lead, the thermoplastic resin being selected from the group consisting of polymers of ethylenically unsaturated monomers and ethyl cellulose.

28. A composition as set forth in claim 27, wherein the ingredients are present in the amounts of, by weight, approximately 1 to 25 percent soluble dye, approximately 45 to 69 percent mineral filler, approximately 5 to 30 percent substantially water insoluble metallic soap, and approximately 5 to 45 percent thermoplastic resin.

29. A process of making a writing element for pencils comprising providing a composition consisting essentially of a substantially water insoluble metallic soap, a water dispersion of a thermoplastic resin having colloidal particle size, the resin being solid at room temperature and in sufficient amount to furnish an extrudable lead, the thermoplastic resin being selected from the group consisting of polymers of ethylenically unsaturated monomers and ethyl cellulose, and a marking material selected from the group consisting of a graphite, a pigment and a dye, the pigment and the dye having a mineral filler associated therewith, intimately mixing the ingredients of said composition, drying the resulting mixture, and extruding the dried mixture to form lead.

30. A process of making a colored lead of the crayon type comprising providing a composition consisting essentially of a pigment, a mineral filler, a substantially water insoluble metallic soap, and a water dispersion of a thermoplastic resin having colloidal particle size, the resin being solid at room temperature and insufficient amount to furnish an extrudable lead, the thermoplastic resin being selected from the group consisting of polymers of ethylenically unsaturated monomers and ethyl cellulose, intimately mixing the ingredients of said composition, dry the resulting mixture, and extruding the dried mixture to form lead.

31. A process of making a colored lead of the crayon type comprising providing a composition consisting essentially of, by weight, approximately 2 to 14 percent of a pigment, approximately 45 to 68 percent of a mineral filler, approximately 5 to 30 percent of a substantially water insoluble metallic soap, and a water dispersion of a thermoplastic resin solid at room temperature having colloidal particle size to furnish a composition having a solids resin content of approximately 5 to 45 percent, the thermoplastic resin being selected from the group consisting of polymers of ethylenically unsaturated monomers and ethyl cellulose, intimately mixing the ingredients of said composition, drying the resulting mixture so that the moisture content thereof does not exceed approximately 1.0 percent, and extruding the dried mixture to form lead.

32. A process of making a non-vitrified graphite lead, comprising providing a composition consisting essentially of a graphite, a substantially water insoluble metallic soap, and a water dispersion of a thermoplastic resin having colloidal particle size, the resin being solid at room temperature and in sufficient amount to furnish an extrudable lead, the thermoplastic resin being selected from the group consisting of polymers of ethylenically unsaturated monomers and ethyl cellulose, intimately mixing the ingredients of said composition, drying the resulting mixture, and extruding the dried mixture to form lead.

33. A process of making a non-vitrified graphite lead comprising providing a composition consisting essentially of, by weight, approximately 25 to 80 percent graphite, approximately 5 to 30 percent of a substantially water insoluble metallic soap, and a water dispersion of a thermoplastic resin solid at room temperature having colloidal particle size to furnish a composition having a solids resin content of approximately 5 to 45 percent, the thermoplastic resin being selected from the group consisting of polymers of ethylenically unsaturated monomers and ethyl cellulose, intimately mixing the ingredients of said composition, drying the resulting mixture so that the moisture content thereof does not exceed approximately 1.0 percent, and extruding the dried mixture to form lead.

34. A process of making a colored lead of the copying type comprising providing a composition consisting essentially of a soluble dye, a mineral filler, a substantially water insoluble metallic soap, and a water dispersion of a thermoplastic resin having colloidal particle size, the resin being solid at room temperature and in sufficient amount to furnish an extrudable lead, the thermoplastic

resin being selected from the group consisting of polymers of ethylenically unsaturated monomers and ethyl cellulose, intimately mixing the ingredients of said composition, drying the resulting mixture so that the moisture content thereof does not exceed approximately 1.0 percent, and extruding the dried mixture to form lead.

35. A process as set forth in claim 34, wherein the ingredients are present in the amounts of, by weight, approximately 1 to 25 percent soluble dye, approximately 45 to 69 percent mineral filler, approximately 5 to 30 percent substantially water insoluble metallic soap, and approximately 5 to 45 percent thermoplastic resin.

36. A composition for colored lead of the crayon type, said composition consisting essentially of, by weight, approximately 5 to 14 percent of a pigment, approximately 45 to 54 percent of a mineral filler, approximately 20 percent of calcium stearate, and approximately 20 percent of a polyvinyl chloride solid at room temperature having colloidal particle size.

37. A composition for a graphite lead, said composition consisting essentially of, by weight, approximately 70 to 74 percent graphite, approximately 10 percent calcium stearate, and approximately 16 to 20 percent polyvinyl chloride solid at room temperature having colloidal particle size.

38. A process of making a colored lead of the crayon type comprising providing a composition consisting essentially of, by weight, approximately 5 to 14 percent of a pigment, approximately 45 to 54 percent of a mineral filler, approximately 20 percent of calcium stearate, and a water dispersion of a polyvinyl chloride solid at room temperature having colloidal particle size to furnish a composition having a solids resin content of approximately 20 percent, intimately mixing the ingredients of said composition, drying the resulting mixture so that the moisture content thereof does not exceed approximately 1.0 percent, and extruding the dried mixture to form lead.

39. A process of making a non-vitrified graphite lead comprising providing a composition consisting essentially of, by weight, approximately 70 to 74 percent graphite, approximately 10 percent of calcium stearate, and a water dispersion of a polyvinyl chloride solid at room temperature having colloidal particle size to furnish a composition having a solids resin content of approximately 16 to 20 percent, intimately mixing the ingredients of said composition, drying the resulting mixture so that the moisture content thereof does not exceed approximately 1.0 percent, granulating the dried mixture, and extruding the granules of the mixture to form lead.

40. A process of making a colored lead of the copying type comprising providing a composition consisting essentially of, by weight, approximately 1 to 25 percent of a soluble dye, approximately 45 to 69 percent of a mineral filler, approximately 5 to 30 percent calcium stearate, and a water dispersion of a polyvinyl chloride solid at room temperature having colloidal particle size to furnish a composition having a solids resin content of approximately 5 to 45 percent, intimately mixing the ingredients of said composition, drying the resulting mixture so that the moisture content thereof does not exceed approximately 1.0 percent, and extruding the dried mixture to form lead.

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