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(54) A multi-component writing device and method of manufacturing same

(57) A multicomponent writing device comprises an elongate body (2) which has an outer peripheral surface (3) and is made from a mixture comprising a first base material with writing properties and a second base material dispersed in the first material and having binding properties. The second base material has a greater concentration toward the outer peripheral surface (3) to de-

fine an outer layer (4) that is stably associated with and inseparable from the elongate body (2) and is designed to protect the hands of the user, the elongate body (2) having a substantially pointed first end (5) with a greater concentration of the first base material designed for writing. A method of manufacturing a multicomponent writing device.

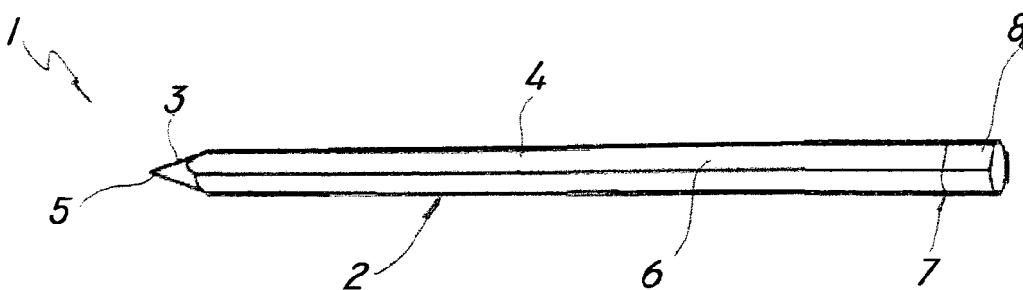


FIG. 1

DescriptionField of the invention

[0001] The present invention generally finds application in the field of writing and drawing tools and particularly relates to a multicomponent writing device.

[0002] The invention also relates to a method of manufacturing such multicomponent writing device.

Background art

[0003] Black and colored pencils and similar writing devices are known to typically comprise a lead having writing properties, encapsulated in a protective enclosure.

[0004] The lead may be made of a mixture comprising graphite as a main material, and additional components, such as waxes, clay and polymer materials.

[0005] For example, JP9118856 discloses a lead obtained from a graphite matrix with a vinyl chloride resin mixed therein. The protective enclosure is generally made of wood or a relatively rigid polymer material.

[0006] For example, EP0325923 discloses a method of manufacturing a pencil, in which the graphite lead is placed within a tube, with a heat-shrink plastic material being later introduced into the tube such that, as the assembly is heated, the plastic material and the lead are joined together.

[0007] Pencils are further known, mainly in the field of artistic drawing, which simply consist of the graphite-based lead and, unlike conventional pencils, have no outer protective enclosure.

[0008] In these pencils, the graphite body is generally covered with a polymeric film, which provides a better grip and prevents graphite powder from depositing on the fingers.

[0009] For example, JP2008189873 discloses a pencil with a writing body composed of a graphite/resin mixture and covered with an EVA membrane to prevent hand contact with the material having writing properties.

[0010] CN2889735 discloses a pencil that is entirely made of graphite, whose writing body is coated with a UV oil finishing layer fixed by UV radiation.

[0011] Nevertheless, in all prior art arrangements the polymer coating only defines a protective sheath applied to the writing body once it has been formed, e.g. by thermoforming.

[0012] Therefore, prior art arrangements require complex and expensive production methods and long operating times, and in addition they do not provide pencils with an adequate structural strength.

[0013] This is because the mixture that forms the writing body, which is mainly made up of compressed graphite powder, has relatively poor mechanical properties, which do not allow the pencil to preserve its integrity when it falls.

[0014] Furthermore, a relatively poor adhesion exists

between the coating and the writing body, due to the lack of chemical affinity between their materials.

[0015] A further important drawback is that these pencils cannot receive an eraser mounted to the non-writing end, such eraser being generally held, in conventional pencils, in a seat defined by a metal ferrule attached to the enclosure by interference fit, as disclosed, for instance, in US 5774931.

10 Disclosure of the invention

[0016] The object of the present invention is to obviate the above drawbacks, by providing a multicomponent writing device that is highly efficient and relatively cost-effective.

[0017] A particular object is to provide a multicomponent writing device that has a protective film stably applied to the writing body.

[0018] Yet another object is to provide a multicomponent writing device that has high mechanical properties, and namely a high strength, to ensure that it will preserve its integrity even when it falls.

[0019] A particular object is to provide a multicomponent writing device that is mostly obtained from recycled materials.

[0020] A further object is to provide a multicomponent writing device that also has an erasing element integrated therewith without affecting its aesthetic profile.

[0021] Another important object of the present invention is to provide a method of manufacturing the above mentioned multicomponent writing device, that is remarkably time-efficient and can provide a device with high structural stability.

[0022] These and other objects as better explained hereafter, are fulfilled by a multicomponent writing device as defined in claim 1.

[0023] Thus, the protective film will be perfectly integrated in the writing body and, in addition, the binding material will also impart high strength to the device and prevent it from breaking when it is accidentally dropped.

[0024] In a further aspect, the invention relates to a method of manufacturing the device, as defined in claim 7.

[0025] Advantageous embodiments of the invention are defined in accordance with the dependent claims.

Brief description of the drawings

[0026] Further features and advantages of the invention will be more apparent upon reading of the detailed description of a preferred, non-exclusive embodiment of the device of the invention, which is described as a non-limiting example with the help of the annexed drawings, in which:

Fig. 1 is a perspective view of a device of the invention;

FIG. 2 is a sectional view of the device of the inven-

tion through a sequence of three distinct steps of its manufacturing process;

FIG. 3 is a first schematic sectional view of a mold for carrying out the method of the invention.

Detailed description of a preferred embodiment

[0027] With reference to the accompanying figures, numeral 1 generally designates a multicomponent writing device of the invention. The device may be a black pencil, like in Fig. 1, a colored pencil or another similar writing tool, which can write on any medium, and particularly on paper of any type and thickness.

[0028] The device 1 basically comprises an elongate body 2 which has an outer peripheral surface 3 and is made from a mixture comprising a first base material with writing properties and a second base material dispersed in the first material and having binding properties.

[0029] According to a peculiar feature of the present invention, the second base material is dispersed in the first base material, with an increasing concentration from the interior to the peripheral surface 3, to define an outer layer 4.

[0030] The outer layer 4 is adapted to substantially entirely encircle the outer peripheral surface 3, while preferably exposing at least one substantially pointed end 5 of the elongate body 2, having a greater concentration of the first base material, and adapted to be used for writing.

[0031] Also, the outer layer 4 provides protection to the hands of a user that contact the outer surface 3 of the elongate body 2.

[0032] Thus, the outer layer 4 is not an element designed to be simply joined and wrapped around the peripheral surface 3 of the writing body 2 and as such distinct and separable therefrom. Conversely, the outer layer 4 is stably associated with the elongate body 2 and cannot be separated therefrom.

[0033] Furthermore, since the second base material is substantially present throughout the whole writing body 2, although with decreasing concentrations towards the inner portions, as schematically shown in the sequence of Fig. 2, it will impart greater cohesion to the first material.

[0034] Thus, the second material helps to improve the mechanical properties of the device 1 and particularly increases its impact and drop resistance.

[0035] In a preferred, non-limiting embodiment of the device 1, the first base material is a powder, e.g. an organic mineral powder.

[0036] Preferably, the first material is graphite powder, which is known to be the most suitable material for writing.

[0037] Graphite may be obtained from any source and using any production method. Nevertheless, in a preferred embodiment, a predetermined graphite amount, preferably above 80% by weight based on the total amount of the first material, may be obtained by recycling graphite powder produced in industrial electrical discharge machining processes.

[0038] Graphite is particularly suitable if the writing device 1 is designed to be used as a black pencil. If the device 1 is designed for use as a colored pencil or the like, the first base material may comprise or be composed of a pigmented powder, of either mineral or synthetic nature.

[0039] Also, the first base material may be selected from earth material, such as clay or the like, or synthetic or natural waxes with other relatively plastic materials, according to the particular type of writing device to be obtained.

[0040] Advantageously, the second base material may be selected from the group comprising polymer materials and its amount in the starting mixture may range from 10% to 30% and be preferably about 20% based on the total weight of the mixture.

[0041] The second base material may be any polymer material, with no particular limitation. Nevertheless, in a preferred embodiment, it may be selected from polyethylenes, such as low density polyethylene (LDPE), which exhibits improved dispersion in graphite powder.

[0042] The writing body 2 may also comprise additional additives, which may be selected from the additives that are typically used in the manufacture of similar devices or in the manufacture of black and colored pencils, such as clay, waxes and other binders, to alter the mechanical properties of the writing body 2, namely hardness, or its writing features, particularly the tone and thickness of the writing mark.

[0043] The writing body 2 may be shaped with the typical substantially cylindrical shape of black and colored pencils, although in the figures herewith it is shown with a substantially flat longitudinal face 6 which is adapted to receive various texts and indications.

[0044] Furthermore, the writing body 2 has a substantially pointed first end 5 and a substantially flat second end 7, opposite to the first end, which may optionally have an erasing element 8 associated therewith, for removing the writing marks produced by the writing body 2 on the writing medium.

[0045] In a particularly advantageous aspect, the erasing element 8 may be made of a third polymer material having chemical affinity or compatibility with the second polymer material.

[0046] Furthermore, the erasing element 8 may be co-molded with the writing body and have a substantially cylindrical shape with an outer profile that follows the outer profile of the writing body, to define an extension thereof, and avoid the use of external anchor means, such as the metal ferrules that are generally used in common pencils.

[0047] In a further aspect, the invention relates to a method of manufacturing the above mentioned multicomponent writing device.

[0048] Fig. 2 shows a cross section of the device 1 through three distinct steps of the manufacturing process.

[0049] The method is characterized in that it comprises

the steps of a) providing a first predetermined amount of a first base material with writing properties and a second predetermined amount of a second material with binding properties, b) providing a mold 9, as schematically shown in Fig. 3, having a specially shaped inner cavity 11 with a peripheral surface 11 heated to a predetermined temperature and c) co-injecting the first and second amounts of the first and second materials into the cavity 10 to obtain a writing body 2 whose shape is complementary to that of the cavity 10.

[0050] Conveniently, the second material has a higher fluidity than the first material, such that it will flow with a higher concentration toward the peripheral surface 11 of the cavity 10 and define an outer layer 4 of the writing body 2 that is stably associated therewith and cannot be separated as a whole from its peripheral surface 3.

[0051] Suitably, the heating temperature of the inner peripheral surface 11 of the cavity 10 may range from 150°C to 300°C and is preferably about 200°C.

[0052] For this purpose, the walls 12 of the mold 9 may be associated with appropriate heating means 13, as schematically shown in this figure, such as electrical resistors, radiant means or the like, with no particular limitation.

[0053] Also, a step of d) mixing the first and second amounts of the first and second materials may be provided upstream from the co-injection step.

[0054] Preferably, the first material is a powder as mentioned above, and the second material is a fluid or semifluid polymer material, for carrying the first material in the co-injection molding process.

[0055] Thus, the different fluidities of the two materials will cause the more fluid material, i.e. the second polymer material that also acts as a binder, to migrate toward the hotter peripheral surface 11 of the cavity 10 and hence to be present with a higher concentration at the periphery 3 of the writing body 2, thereby defining the outer layer 4.

[0056] Of course, the molding times and rates will not allow the entire amount of the second material to reach the periphery, whereby the second material will be dispersed in the first material to act as a binder.

[0057] As mentioned above, the starting mixture may comprise additional additives in minor amounts as compared with the first and second base materials.

[0058] Alternatively, the molding step c) may be carried out by co-injecting the respective amounts of both materials at the same time but separately, i.e. without previously mixing them, because the temperatures in the mold 9 will allow them to mix during the process and cause the second material to be dispersed in the first material and thus act as a binder.

[0059] Regardless of the type of molding process in use, the first powder material will be injected into the mold 9 at a predetermined pressure, sufficient to cause at least partial sintering of the powder and form a writing body with increased compactness. The pressure values will depend on the materials being used, as is known to the skilled person, and will not limit the present invention.

[0060] Also importantly, the method may comprise a step of e) molding the above mentioned erasing element 8 made of at least one third polymer material having chemical compatibility or affinity with the second polymer material, on the writing body 2.

[0061] This additional molding step may either be a co-molding step, to be carried out at the same time as the step of c) co-injecting the first and second materials or immediately after it, or be carried out after removal of the device 1 from the mold 9.

[0062] The method may be complemented by additional device shaping or finishing steps, according to the shape and physical and mechanical characteristics to be imparted to the finished product, which are not described herein as they are within the reach of the skilled person.

[0063] The above disclosure clearly shows that the present invention fulfills the intended objects and particularly meets the requirement of providing a multicomponent writing device having high structural strength, superior aesthetic quality and low environmental impact.

[0064] The device and method of the invention are susceptible to a number of changes or variants, within the inventive concept disclosed in the annexed claims. All the details thereof may be replaced by other technically equivalent parts, and the materials may vary depending on different needs, without departure from the scope of the invention.

[0065] While the device and method have been described with particular reference to the accompanying figures, the numerals referred to in the disclosure and claims are only used for the sake of a better intelligibility of the invention and shall not be intended to limit the claimed scope in any manner.

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Claims

1. A multicomponent writing device comprising an elongate body (2) made from a mixture comprising a first base material with writing properties and a second base material with binding properties, wherein said elongate body (2) has an outer peripheral surface (3) and wherein said second base material is dispersed in said first base material;

characterized in that said second base material has a greater concentration toward said outer peripheral surface (3) to define an outer layer (4) that is stably associated with and inseparable from said elongate body (2) and is designed to protect the hands of a user, said elongate body (2) having a first end (5) that is substantially pointed and has with a greater concentration of said first base material designed for writing.

2. Device as claimed in claim 1, **characterized in that** said first base material is a powder selected from the group comprising organic mineral powders, such as graphite and pigmented mineral powders.

3. Device as claimed in claim 2, **characterized in that** said graphite powder is made of recycled graphite obtained in industrial electrical discharge machining processes.

4. Device as claimed in any of the preceding claims, **characterized in that** said second base material is selected from the group comprising polymer materials and its amount in said starting mixture ranges from 10% to 30% and is preferably about 20% based on the total weight of said mixture. 10

5. Device as claimed in claim 4, **characterized in that** said polymer material is a polyethylene, preferably LDPE. 15

6. Device as claimed in claim 5, **characterized in that** said elongate body (2) has a second end (7) opposite to said first end (5), which is equipped with an erasing element (8), made of at least one third polymer material having chemical compatibility with said second polymer material, and co-molded with said body (2), said erasing element (8) having a cylindrical shape and an outer profile that follows the outer profile of said body (2). 20

7. A method of manufacturing a multicomponent writing device (1) as claimed in one or more of the preceding claims, **characterized in that** it comprises the steps of: 30

a) providing a first predetermined amount of a first base material with writing properties and a second predetermined amount of a second material with binding properties; 35

b) providing a mold (9) having a specially shaped inner cavity (10) with a peripheral surface (11) heated to a predetermined temperature;

c) co-injecting said first and second amounts of the first and second materials into said cavity (10) to obtain an elongate body (2) whose shape is complementary to that of said cavity (10); 40

wherein said first base material is a powder selected from the group comprising organic mineral powders such as graphite and pigmented mineral powders, and said second base material is selected from the group comprising polymer materials, the amount of said second material in said starting mixture ranging from 10% to 30% and being preferably about 20% based on the total weight of said mixture and said second material having a higher fluidity than said first material; and 45

wherein said heating temperature for said peripheral surface (11) of said cavity (10) ranges from 150°C to 300°C and is preferably proximate to 200°C in such a manner to promote migration of said second material toward said peripheral surface (11) of said 50

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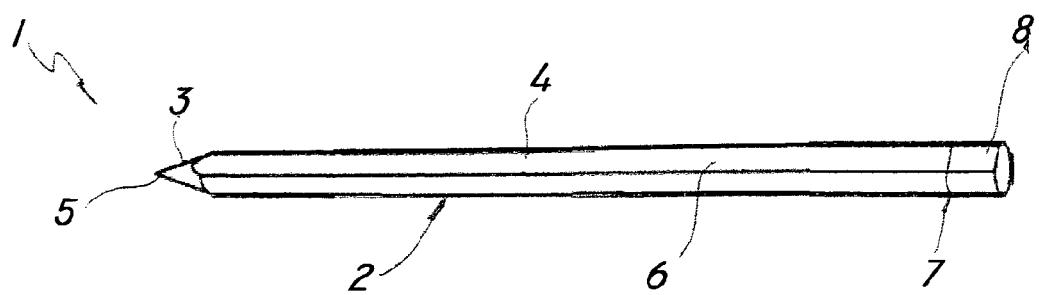


FIG. 1

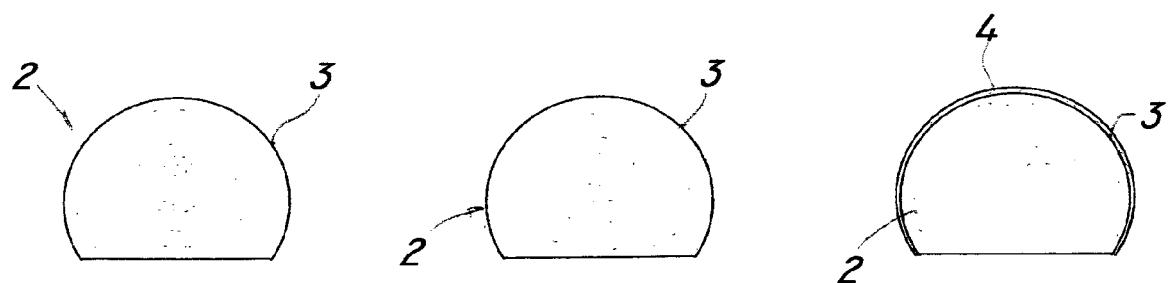


FIG. 2

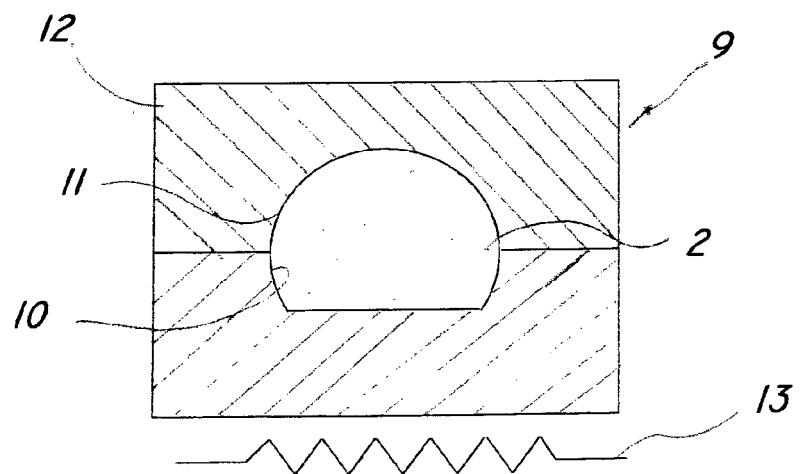


FIG. 3



EUROPEAN SEARCH REPORT

Application Number
EP 13 00 5329

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Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X	US 2006/222443 A1 (SAVAGE EILEEN [US] ET AL) 5 October 2006 (2006-10-05)	1-5,7-9	INV. B43K19/02
Y	* abstract * * paragraphs [0003] - [0009], [0011], [0015] - [0016], [0025], [0027], [0037] - [0038], [0045], [0048], [0055], [0058] * * figures 1-6 *	6	B43K19/16 B43K29/02
X	-----	1-5	
Y	EP 2 053 105 A1 (SAKURA COLOR PROD CORP [JP]) 29 April 2009 (2009-04-29) * abstract * * paragraphs [0002] - [0003], [0007] - [0008], [0011], [0022] *	6	
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A	DE 10 2004 021048 A1 (POLOPLAST GMBH & CO KG LEONDIN [AT]) 24 November 2005 (2005-11-24) * paragraphs [0011], [0028] * * figure 1 *	9	
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The present search report has been drawn up for all claims			
1	Place of search Munich	Date of completion of the search 31 January 2014	Examiner Bellofiore, Vincenzo
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document			
T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document			

**ANNEX TO THE EUROPEAN SEARCH REPORT
ON EUROPEAN PATENT APPLICATION NO.**

EP 13 00 5329

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