May 5, 1970 YUKIO HORIE 3,510,227

WRITING INSTRUMENT

Filed March 26, 1968

FIG. 1

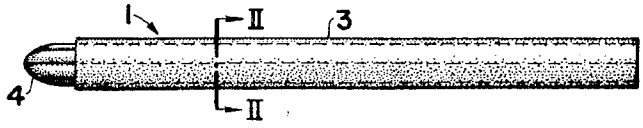


FIG. 2

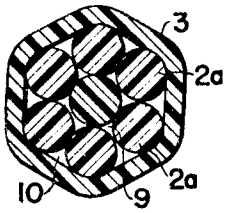


FIG. 3

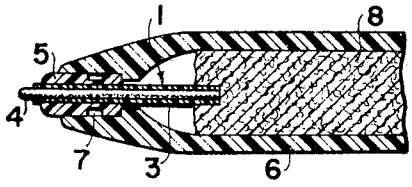


FIG. 4

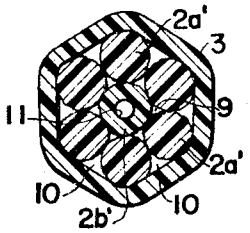


FIG. 5

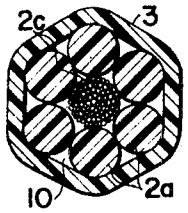


FIG. 7

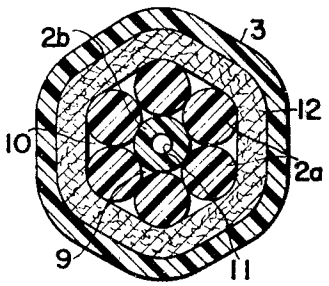
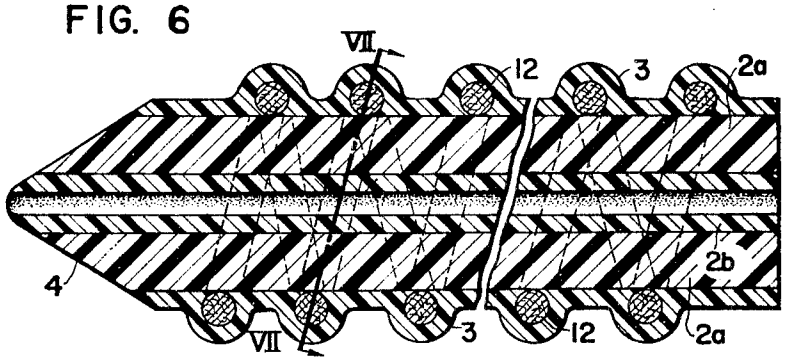


FIG. 6



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WRITING INSTRUMENT

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Int. Cl. B43k 8/00
U.S. Cl. 401—199 2 Claims

ABSTRACT OF THE DISCLOSURE

A marking pen includes a tubular pen body which holds a core having a tip through which the ink flows. A core for a marking pen includes a bunch of rod-like elements or monofilaments. The bunch is tightly held by a film of plastic resin, preferably formed by heat-shrinking the film around the bundle. The bunch may be formed, fasces-like, around a plastic tube or rod. The bundle may alternatively include felt-like material.

DESCRIPTION

This invention relates to writing instruments and more particularly to a pen core for a marking pen.

The major defects of conventional felt marking pens are that it is difficult, with such pens, to write small letters or a fine line and that the fibre core tip of the pen loosens while writing.

These same defects exist in those pen cores constructed from solid bodies of synthetic plastic resin having grooves in their exterior walls. In addition, the grooves, which feed ink from the pen body to the end point (tip) of the pen core, may not be satisfactory because the capillary action is less than with a felt core.

Moreover, in a core made from plastic resin it is difficult to design the grooves (ink passageways) on the circular circumference of the core so that they reach all the way to the tip, because of the lack of strength of the material. Such pens are not able to write in all directions smoothly because a smooth face against the paper is not obtained, when writing in some positions, due to the angle at which the grooves are cut. Thus, the angle of writing and the direction of writing are limited.

Alternatively, there is known a type of cores for marking pens which consist of a bundle of synthetic plastic resin monofilaments. The core is prepared by arranging and joining a number of synthetic resin monofilaments, which provide the same action as the grooves in feeding ink. This type of core avoids the undesirable limitations of writing direction and writing angle. On the other hand, such cores have a plurality of non-uniform clearances between the monofilaments which occur in the lengthwise direction of the pen core.

The monofilament pen core has the disadvantage that a loss of ink is apt to occur in case the pen body is inverted. The ink may flow out or even flood. The results of such loss of ink and flooding is that it is hard to write the letters because the ink hardens at the tip. Moreover, it is difficult to construct pens of this type as it is difficult to insert a plurality of monofilaments into the tube of the pen body.

The main objective of this invention is to provide a pen core for writing small and fine letters, which core is relatively simple and inexpensive to manufacture.

Another objective of this invention is to provide a pen core for writing fine or small letters, which core has less propensity to loss of ink when the pen is inverted so that the quality of its writing is improved.

The pen core according to this invention consists of a plurality of small rod-like molded elements, or plastic resin monofilaments, formed into a linear aligned (parallel) bunch and a thermo shrinkage synthetic plastic resin film in the form of a tube which fastens and secures the circular circumference of the bunch.

The pen cores of the present invention provide (1) abrasion resistance so that they may write for a long period; (2) flexibility which keeps a smooth feeling and provides low rubbing against the paper; and (3) stiffness and proper strength, which are desirable. The plastic resin materials for the small diameter rod-like molded elements, such as polyacetal resin, polyamid resin or polycarbonate resin, provide these desirable qualities.

In addition, metallic materials, such as copper or inorganic materials, may be utilized as proper materials for the rod-like elements. One may arrange the said rod-like elements or monofilaments in the form of circular or non-circular bunches, when viewed in cross-section.

Further, if necessary, the combination of a linear bunch with the said bunch of rod-like elements may be utilized. As in the form of the small diameter rod-like molded elements or monofilaments, the combination core may be, in cross-section, circular or non-circular. It is also possible to use a central core of a tubular hollow body or a solid cylindrical member around which the rod-like elements or monofilaments are bunched.

Moreover, a smooth surface or a roughened surface may be provided by physical treatment and chemical treatment for the monofilaments and small diameter rod-like molded elements.

One may obtain the said small diameter rod-like molded elements or monofilaments by manufacturing methods currently being employed in industry.

It is preferable that the pen core formed from the small diameter rod-like molded elements or monofilaments used for this invention employs elements (monofilaments) having a size in the range of 0.3 to 0.4 mm. in diameter. A pen core for small letters, i.e., letters smaller than 0.3 to 0.4 mm. in size, is not available because it is difficult to write such small letters due to the stiffness of the core material. On the other hand, in the case of using larger size filaments, i.e., larger than 0.3 to 0.4 mm. in size, the core is apt to issue a large amount of ink because the clearances formed in the lengthwise direction enlarges when bunching a plurality of small rod-like bodies or monofilaments. In addition, in the case of such larger cores, a flow and loss of ink occurs when inverting the pen body.

For a better understanding of the invention, as well as further objectives and features thereof, reference is made to the following detailed description to be read in conjunction with the accompanying drawings, in which like figures are represented by like reference numerals.

In the drawings:

FIG. 1 is a side plan outlined view to show the example of the pen core corresponding to the invention;

FIG. 2 is a sectional view as sectioned along with the line II—II in FIG. 1;

FIG. 3 is a part of a side sectional view as cut away to expose the pen core assembled in the pen body;

FIGS. 4 and 5 are sectional views of the pen core corresponding to the said FIG. 2, showing alternative modifications of the core of the present invention;

FIG. 6 is a longitudinal sectional view of a pen core to show still another modification of this invention; and

FIG. 7 is a sectional view cut-away along line VII—VII of FIG. 6.

In FIGS. 1 to 3, which show the first embodiment, the pen core **1** is constructed by bunching seven rods **2***a* which may be plastic molded elements or monofilaments. Each monofilament preferably consists of polyacetal plastic resin of 0.35 mm. in diameter. The bunch of monofilaments is tightly and closely held by means of thermal shrunk tube **3**, of plastic resin film, which stiffens the outer circumference of the bunch. A polyvinyl chloride film is preferable as the material of the heat-shrinkable tube. The bunch is then polished to form the conical shape of the writing tip at the end point **4**.

In order to assemble the pen body, a holder tube **5** (see FIG. 3) is inserted into the pen body **6** and the above-described pen core, with its holder tube **5**, is then screwed into the receiving slits **7** of the pen body **6**.

A rear end in pen core **1** is connected with an ink absorbent material **8** from which a fluid ink is supplied to the writing tip **4** of the pen core through the capillary action of the linear minor clearances in the pen core **1**.

In FIG. 4, showing the second embodiment of this invention, six rod members **2***a'* are roughened on their cylindrical surfaces and are mounted around the circular circumference of a hollow tubular rod body **2***b'*, which is also roughened on its cylindrical surface. The bunch is then tightly and closely held within the thermo-shrinkable vinyl chloride tube **3**.

In this second embodiment, ink passages are formed by the central hole **11** of hollow tubular rod body **2***b* as well as by the clearances **9** and **10**, between the rod-like elements. The ink passages terminate at the central rear end of the writing tip. Moreover, the loss of ink is improved by roughening the surface of hollow rod body **2***b* when compared with the above first embodiment.

The third embodiment of the pen core, shown in FIG. 5, is made by tightening the thermo-shrinkage vinyl chloride tube **3** after surrounding the arranged linear (rod-like) felt-like fibre cluster **2***c* (of 0.4 mm. in the diameter) with six rod-like elements **2***a*. The fibre, for example, cotton fibre, or rayon stable fibre, is available as the preferred fibre materials. The fibre cluster may also be of very thin plastic monofilaments. The preferred smooth feed for ink within the central pen core is obtained in this third embodiment, as well as an improvement in ink loss. It is easy to insert the grouped fibre into the said tube by forming the fibre into a string (for example, by drafting the fibre filaments without relation to its length). The string is then inserted into the tube. Moreover, the prepared fibre unit, in the form of a string, may be further strongly tightened on account of the crimp of the string, by heating in boiled water and other suitable means. Finally, the prepared and grouped fibre units according to this invention will be cut off in the desired length and then treated to form the writing tip at one end. In the above-described method, the arranged and bunched fibre unit may itself be grouped by means of a thermo-shrinkage synthetic resin tube. The preferred smooth feed for ink within the central pen core is obtained in this third embodiment, as well as an improvement in ink loss.

FIGS. 6 and 7 show the fourth embodiment. The pen core **1** is made by mounting six rod-like elements **2***a* on the circumferential surface of a smooth surfaced hollow tubular rod body **11**. Then the exterior surface of the bunch containing rod member **2***a* is surrounded in the form of a helical spiral by means of one or more flexible elements **12** which are linear (string-like) felt-like fibres.

The entire bunch, including the spiral string-like elements **12**, is then covered by thermo-shrinkable vinyl chloride tube **3** which is shrunk tightened closely around the bunch. The tip **4** is then ground to a point to form the desired writing tip **4** at one end of the prepared pen core **1**.

According to this invention, if necessary, as shown in FIGS. 6 and 7, the circumference of a plurality of the prepared and arranged monofilaments is tightened in the helical (spiral) form by the linear fibre. As the result of this arrangement, firstly a narrow clearance of monofilament is formed along with the lengthwise direction; secondly it is easy to position the thermo-shrinkage synthetic resin tube; thirdly the lowering of ink is avoided by the prepared linear fibre.

In the various embodiments, above-described, of the present invention, the numbers of monofilaments and small diameter rod-like molded elements may be relatively freely selected. It is preferable that the number to form the bunch is seven rod-like bodies, including six rod-like elements surrounding a single rod-like centered body.

The important effect of avoiding the limited direction of writing and the limitation of the writing angle is accomplished by centering a rod-like body of hollow section and by forming clearances in the lengthwise direction or by bunching two or three rod-like bodies and monofilaments at the central portion. The lowering of the flow of fluid ink when inverting the pen body will be sufficiently avoided by the capillary action of the plurality of clearances along the lengthwise direction which are obtained by bunching a plurality of monofilaments, or the same sized small rod-like molded elements.

Moreover, the desired capillary action is obtained by using roughened monofilaments.

If, alternatively to the present invention, one were to employ intertwisted monofilaments and the intertwisted monofilament cluster was bunched without further treatment, the capillary action of a narrow space formed in the lengthwise direction of monofilament would not be obtained. But even if some capillary action were obtained, it would not be of sufficient capillary action.

In the present invention, a high pushing and writing pressure may be given to the writing tips to remove the end of the thermo-shrinkage synthetic resin tube, so that the various modifications of the small rod-like molded body or monofilaments may be prepared quite freely. Accordingly, if the strong pushing pressure is given to the writing tip, it will be also able to write a fat letter. If desired, an ink may be drawn by pushing and enlarging the tip, at some time, in the case of skipping.

While I have shown only the preferred forms of my invention, it should be understood that various changes or modifications may be made within the scope of the appended claims without departing from the spirit of the invention.

What is claimed is:

1. In a marking pen including a pen body adapted to hold an ink supply, a pen core comprising a plurality of small rod-like elements providing clearances therebetween for feeding ink and being arranged parallel and close together along the lengthwise direction of said elements; each of the said rod-like elements being in the range of 0.3 mm. to 0.4 mm. in diameter; a thermo-shrunk plastic resin film tube bunching the outer circumferences of said elements equally with a tightening force and forming other clearances for feeding ink along the lengthwise direction of said elements; and in which core a conical writing tip is formed at one end of the said pen core, wherein the said plurality of elements is wound around with a string-like elongated fibre bunch having capillary action and said shrunk film tube covers said fibre bunch.

2. A pen core as claimed in claim **1** wherein the fibre bunch is wound in the form of a helical spiral.

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U.S. Cl. X.R.

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