

July 14, 1970

KATSUMI OTSUKA

3,520,629

WRITING INSTRUMENTS

Filed Nov. 15, 1968

Fig. 1

Fig. 2

Fig. 4

Fig. 6

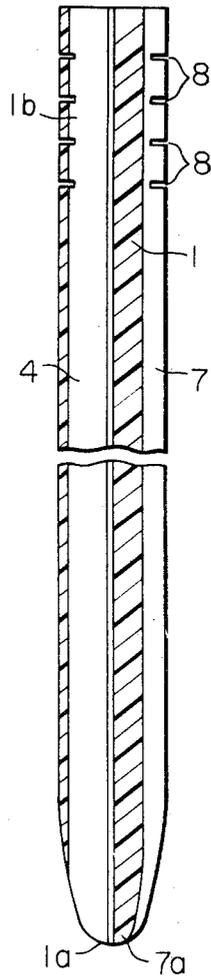
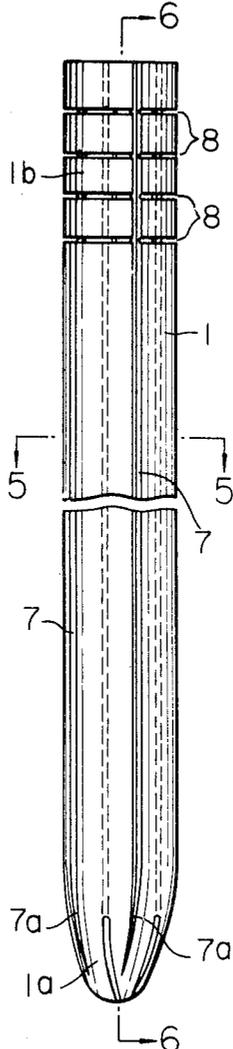
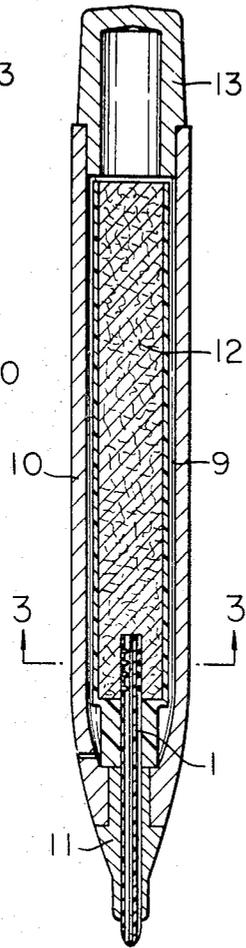
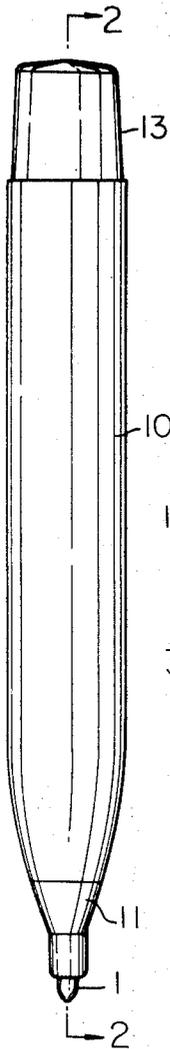
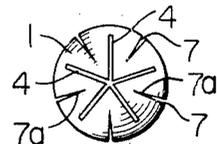
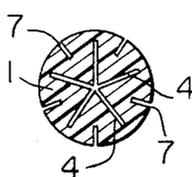
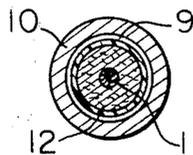


Fig. 3

Fig. 5

Fig. 7



1

2

3,520,629

**WRITING INSTRUMENTS**

Katsumi Otsuka, Funabashi-shi, Japan, assignor to Teibow Company Limited, Hamamatsu-shi, Shizuoka-ken, Japan, a company of Japan

Filed Nov. 15, 1968, Ser. No. 776,132

Claims priority, application Japan, July 18, 1968, 42/50,451

Int. Cl. B43k 1/00, 8/00

U.S. Cl. 401—199

6 Claims

**ABSTRACT OF THE DISCLOSURE**

A writing instrument having an improved writing wick made of synthetic resin materials. Within a casing of the instrument, a rear-end of the wick is engaged with a front-end of an ink reservoir and the front-end of the wick is sharpened to form a tip. With use of the instrument, ink is smoothly introduced from the ink reservoir to the tip through an inner conduit and outer grooves formed through and along the wick. The introduction of ink is attributed to capillary action due to the respective dimensions of the inner conduit and outer grooves. Troubles in writing, such as scratching, are effectively eliminated.

The present invention relates to a writing instrument provided with an improved writing wick, more particularly with an improved writing wick made of synthetic resin materials which concerns an improvement of the writing instrument which was already disclosed in my pending U.S. patent applications Ser. No. 731,787 filed on May 24, 1968 and Ser. No. 747,179 filed on July 24, 1968.

There is a general demand for writing instrument provided with relatively smooth introduction of ink from an ink reservoir to a tip of the writing instrument or to a pen in order to avoid such troubles as scratching during writing. However, there has been no writing instruments on the market which could conform with these requirements in this manner.

A principal object of the present invention is to provide a writing instrument which can eliminate the above-mentioned drawbacks possessed by the traditional writing instruments having a writing wick.

Another object of the present invention is to provide a writing instrument characterized by a writing wick provided with a combined capillary action sufficient to present smooth introduction of ink from the ink reservoir to the tip of the writing wick.

A further object of the present invention is to provide an improved writing instrument provided with a wick primarily made of thermoplastic synthetic resins.

In accordance with the above-described objects of the present invention, the writing instrument of the present invention comprises an ink reservoir housed in a cylindrical casing, a writing wick having improved capillary function, and a holder rigidly secured to one end of the cylindrical casing. The rear-end of the writing wick is inserted into an end portion of the ink reservoir and the tip end portion thereof extends out of a conically-shaped end portion of the holder. The writing wick is provided with an inner capillary ink conduit axially formed throughout, a plurality of longitudinal capillary grooves formed on the peripheral surface thereof, and, alternatively, a plurality of annular grooves or a spiral groove transversely formed at the rear-end portion thereof. The annular grooves or the spiral grooves are provided with a depth sufficient to intersect the outer capillary ink grooves and the outer portion of the inner capillary ink conduit. The inner capillary conduit terminates at the

tip end of the wick, while the outer capillary grooves terminate at the starting position of the tip end of the wick. The tip portion of the wick has a conical shape provided with a sharp point. Further, both the inner capillary conduit and the outer capillary grooves terminate at the rear-end of the wick. The rear-end portion of the writing wick is inserted into the ink reservoir. Therefore, ink contained in the reservoir is introduced into the inner conduit through the terminal of it and the annular grooves or spiral grooves, and into the outer-grooves through the terminal of it, also through the annular grooves or spiral grooves, and then the ink flows towards the tip portion of the wick where the above-described two flows of ink are combined.

Further features and advantages of the present invention will be apparent from the ensuing description, reference being made to the accompanying drawings.

FIG. 1 is a side elevational view of a writing instrument of the present invention,

FIG. 2 is a longitudinal section view of the writing instrument, taken along line 2—2 in FIG. 1,

FIG. 3 is a cross sectional view of the writing instrument, taken along line 3—3 in FIG. 2,

FIG. 4 is a partially omitted, enlarged side elevational view of a writing wick used for the writing instrument shown in FIG. 1,

FIG. 5 is a cross sectional view of the writing wick, taken along line 5—5 in FIG. 4,

FIG. 6 is a longitudinal section view of the writing wick, taken along line 6—6 in FIG. 4,

FIG. 7 is a front view of a tip portion of the writing wick shown in FIG. 4.

Referring to the attached drawings, a writing wick 1 is made of a certain thermoplastic synthetic resin and is provided with an inner capillary conduit 4, formed axially through the writing wick 1. The inner capillary conduit 4 has a star-shaped cross section having final-shaped protuberances herein referred to as legs and the dimension of each leg of the cross section is so thin as to present an effective capillary action for introducing ink through-out (see FIG. 5). For example, it is preferable to use a star-shaped cross section having the thickness of each leg in a range approximately between 0.0008 and 0.0016 inch. The outer capillary grooves 7 are formed on the periphery of the writing wick 1 in a longitudinal arrangement along the axis of the writing wick 1. As described above, both the inner capillary conduit 4 and the outer capillary grooves 7 terminate at the rear-end of the writing wick 1. A tip portion 1a of the writing wick 1 is formed into a conically sharpened shape with a sharp point, which, for example, can be obtained by a grinding operation.

The outer capillary grooves 7 gradually terminate at a starting portion of the tip portion 1a of the writing wick 1, that is, the front termination 7a does not extend to the termination of the tip portion 1a itself as is clearly shown in FIG. 8. A plurality of annular grooves 4 are formed near the rear-end portion 1b of the writing wick 1 with adequate intervening spaces.

Further, the annular grooves 8 are provided with sufficient depth to intersect with the outer capillary grooves 7 and the outer portion of the inner capillary ink conduit 4.

As is shown in FIGS. 2 and 3, the rear-end portion 1b of the writing wick 1 is inserted into an ink reservoir 9 incased in a cylindrical casing 10 while the tip portion 1a of the writing wick 1 extends out of a holder 11 secured to one end of the cylindrical casing 10. The holder 11 having a conically-shaped intermediate portion is rigidly holding the writing wick 1.

The ink reservoir 9 includes a cylindrical fibrous block 12 containing ink. The ink reservoir 9 is inserted into the

cylindrical casing 10 through a rear-end aperture of the casing 10 and the front-end of the ink reservoir 9 engages with the rear-end portion 1b of the wick 1. After completing the insertion of the ink reservoir 9 into the casing 10, a cap 13 is attached to the rear-end of the casing 10 for closing the aperture.

By the above-mentioned engagement of the ink reservoir 9 with the wick 1, ink contained in the ink reservoir 9 is introduced to the inner capillary conduit 4 through the termination of it and the annular grooves 8, and to the outer capillary grooves 7 through the termination of it and the annular grooves 8 because of their capillary actions, respectively.

Consequently, with consumption of ink through the tip portion 1a of the wick 1 due to use of the writing instrument, continuous supply of ink is assured by the flow of ink through the inner capillary conduit 4 and the outer capillary conduit 7 of the wick 1. In this capillary introduction of ink through the paths 4 and 7, both flows of ink combine with one another at the termination 7a of the outer capillary grooves 7. Thus, a smooth supply of ink can be assured throughout the writing operation.

By our repeated tests of the above-mentioned writing wick 1, even in cases of very fine writing, no problem, as scratching, was noticed and a considerably uniform supply of ink was observed. Further, the combination of the thin branches of the inner capillary conduit 4 and the outer capillary grooves 7 together with the annular grooves 8 provide sufficient capillary action of the writing wick 1 of the present invention.

Changing of the ink reservoir 9 after consumption of ink contained therein is performed instantly and simply by substituting a fresh reservoir for the used one contained in the casing 10 in the manner described above.

The above-described characteristic configurations, of the writing instrument, of the present invention, is not only limited in the above-mentioned disclosure and drawings, but any modification having the same function must be considered as in the scope of the present invention.

What is claimed is:

1. In a writing instrument comprising an ink reservoir, a writing wick having a conically shaped sharpened tip and a rear-end engaging said ink reservoir, a cylindrical casing incasing said ink reservoir and partially enclosing said writing wick, a holder rigidly secured to one end of said cylindrical casing, said holder rigidly holding said writing wick, and said conically shaped tip of said writing wick extending outwardly from a sharpened end portion of said holder; an improvement comprising an inner capillary ink conduit formed axially passing through said wick, a plurality of outer longitudinal capillary ink-grooves formed on a peripheral surface of said wick, and means for additionally introducing ink from said ink reservoir to said outer capillary ink-grooves, said introducing means being annularly formed

on said wick at a position adjacent to said rear-end of said wick; said inner capillary ink conduit terminating at an end of said tip portion of said wick; said outer capillary ink-grooves terminating at a starting position of said tip portion; said inner capillary ink conduit and outer capillary ink-grooves terminating at the rear-end of said wick, said additionally introducing ink means intersecting with said outer capillary ink grooves and an outer portion of said inner capillary ink-conduits; whereby, said ink contained in said ink reservoir is introduced from said ink reservoir to said inner capillary ink-conduit and said outer capillary ink-grooves through their terminations, and further additionally introduced to said inner capillary ink-conduit and outer capillary ink-grooves through said additionally introducing ink means, ink flowing smoothly and continuously to said tip of said wick through said inner capillary ink-conduit and outer capillary ink-grooves with consumption of ink due to use of said instrument.

2. A writing instrument according to claim 1, wherein, said inner capillary ink-conduit of said writing wick is provided with a star-shaped cross section having finely-shaped legs.

3. In a writing instrument according to claim 2, wherein each of said legs is of comparatively fine cross section of approximately between 0.0008 and 0.0016 inch.

4. A writing instrument according to claim 1, wherein, said additionally introducing ink means comprises a plurality of annular grooves formed annularly at said rear-end portion of said wick with intervening spaces between adjacent annular grooves and each of said annular grooves has a depth sufficient to intersect with said outer capillary ink-grooves and an outer portion of said inner capillary ink-conduit.

5. A writing instrument according to claim 1, wherein, said additionally introducing ink means comprises a spiral groove provided with a depth sufficient to intersect with said outer capillary ink-grooves and an outer portion of said inner capillary ink-conduit.

6. A writing instrument according to claim 1, wherein said writing wick is made of plastic materials.

#### References Cited

##### UNITED STATES PATENTS

3,338,216	8/1967	Roller	401—265
3,421,823	1/1969	Matsumoto	401—199

##### FOREIGN PATENTS

534,992	1/1922	France.
1,061,218	3/1967	Great Britain.

LAWRENCE CHARLES, Primary Examiner

U.S. Cl. X.R.

401—265