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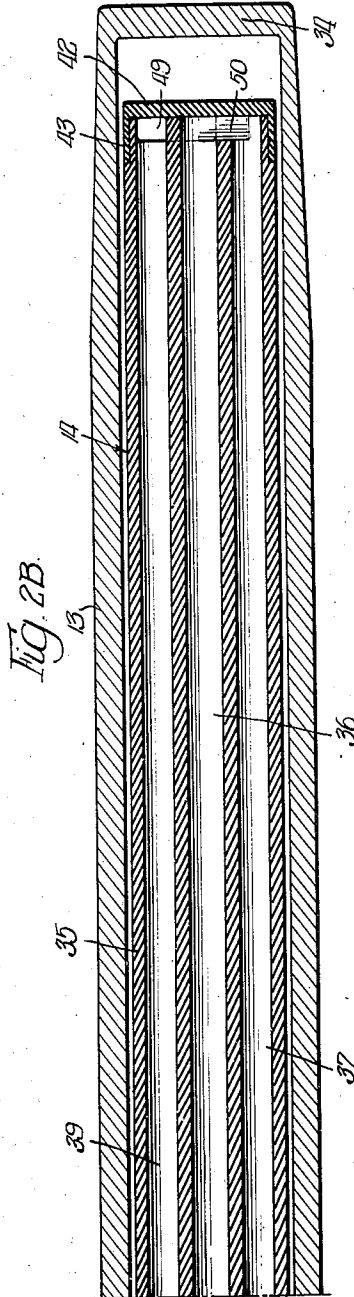
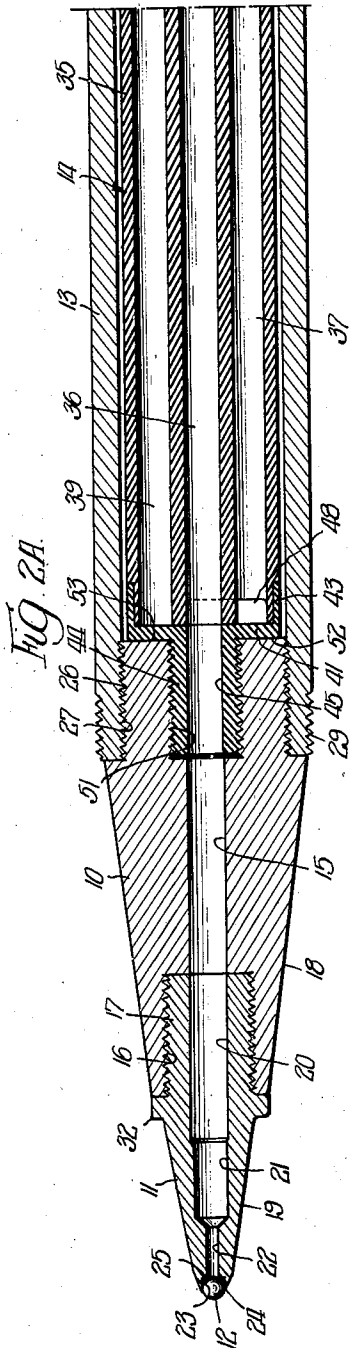
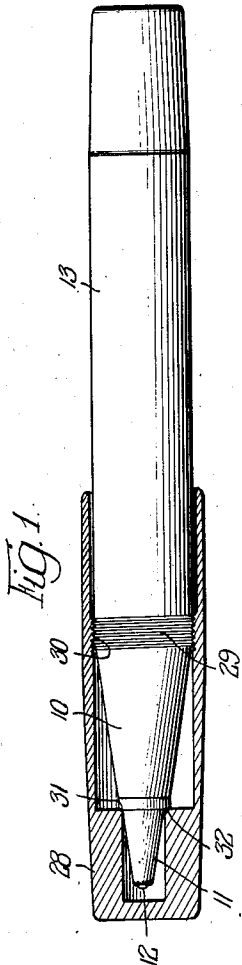
J. C. WAHL

2,427,243

MECHANICAL INK PENCIL

Filed Sept. 11, 1944

3 Sheets-Sheet 1



INVENTOR.

John C. Wahl,

BY

Tomwell, Street, Warden + Butler.  
attys.

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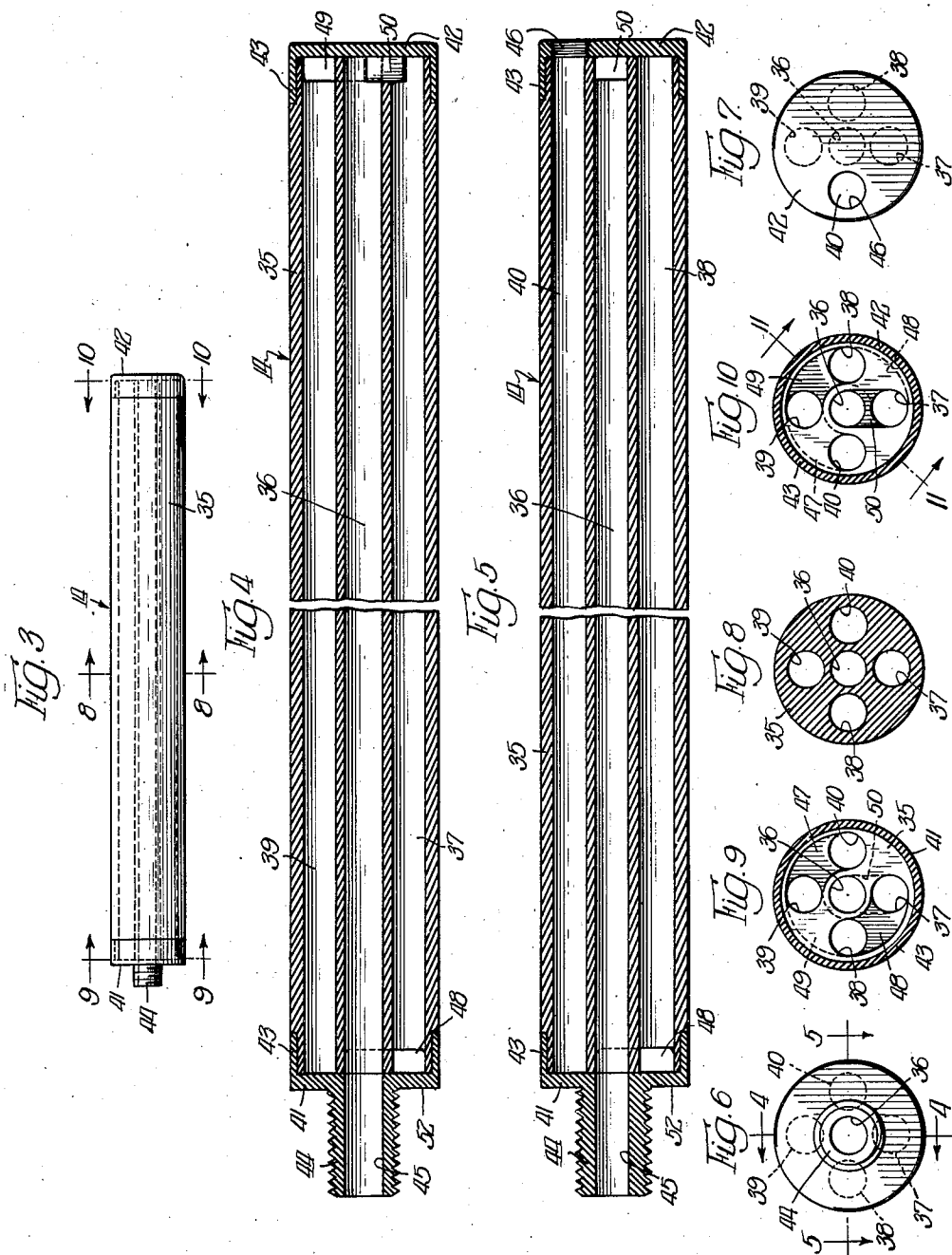
J. C. WAHL

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MECHANICAL INK PENCIL

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INVENTOR.

Johr C. Wahl,

BY

Cromwell, Griest, Warden + Butler.

attys.

Sept. 9, 1947.

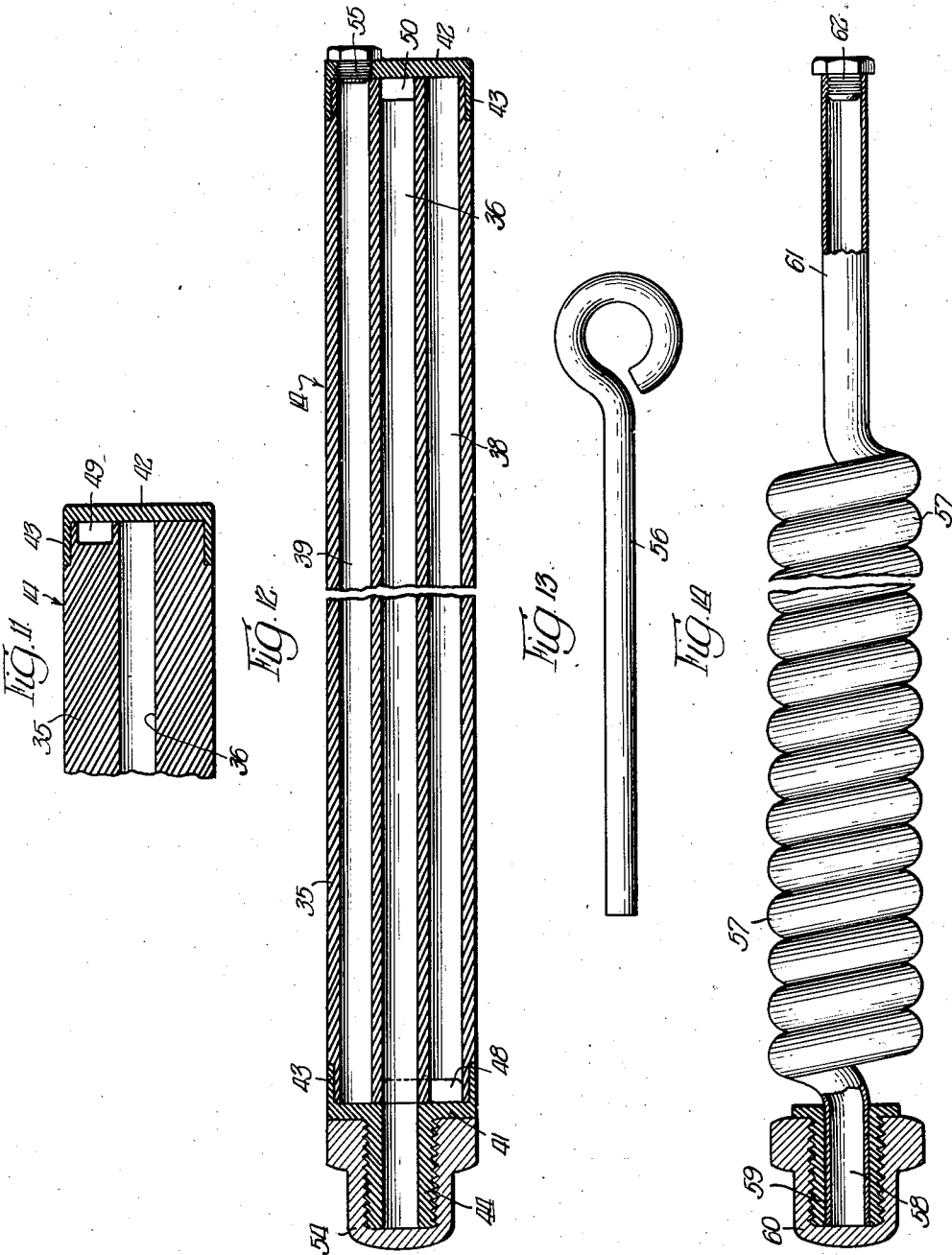
J. C. WAHL

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MECHANICAL INK PENCIL

Filed Sept. 11, 1944

3 Sheets-Sheet 3



INVENTOR.  
*John C. Wahl,*

BY

*Cromwell, Strick, Warden & Butler,*  
*attys.*

# UNITED STATES PATENT OFFICE

2,427,243

## MECHANICAL INK PENCIL

John C. Wahl, Chicago, Ill., assignor to Ever-sharp, Inc., Chicago, Ill., a corporation of Delaware

Application September 11, 1944, Serial No. 553,515

3 Claims. (Cl. 120—42)

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This invention has to do with mechanical ink pencils of the type in which the ink is transferred to the sheet of paper or other material by a small ball which is rotatably mounted in the tip.

One of the objects of the invention is to provide a ball-tipped writing implement of new and improved construction for use with a replaceable ink cartridge, which writing implement will operate efficiently with ink of paste-like consistency fed to the same from the cartridge and will apply the ink to the paper in a smear-proof line of any desired fineness.

Another object is to provide a writing implement of the type described which is inexpensive to manufacture and is composed of a minimum number of parts, which parts are of simple and sturdy design and are easy to assemble and disassemble.

Another object is to provide, for use in such a writing implement, a separate self-contained ink reservoir in the form of a readily replaceable cartridge capable of retaining and feeding sufficient paste type ink to last for a long period of time.

Still another object is to provide a paste type ink reservoir of novel construction which is very cheap to manufacture and upon being emptied can be either refilled or discarded, as desired.

While the foregoing statements are indicative in a general way of the nature of the invention, other more specific objects and advantages will be apparent to those skilled in the art upon a full understanding of the construction, relative arrangement and operation of the several parts constituting the new writing implement.

A few illustrative embodiments of the invention are presented herein, but it will of course be understood that such embodiments have been chosen primarily for the purpose of exemplification and that the invention is susceptible of incorporation in still other structurally modified forms coming equally within the scope of the appended claims.

In the accompanying drawings:

Fig. 1 is a side view of a writing implement constructed in accordance with the invention, with the cap shown in longitudinal section;

Fig. 2A is a longitudinal section through the front portion of the writing implement;

Fig. 2B is a similar section through the remainder of the writing implement;

Fig. 3 is a side view of the replaceable ink cartridge;

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Fig. 4 is a longitudinal section through the cartridge, taken on the line 4—4 of Fig. 6;

Fig. 5 is a similar section, taken on the line 5—5 of Fig. 6;

Fig. 6 is a front end view of the cartridge;

Fig. 7 is a rear end view of the same;

Fig. 8 is a transverse section through the cartridge, taken on the line 8—8 of Fig. 3;

Fig. 9 is another transverse section through the cartridge, taken just rearwardly of the front closure member, on the line 9—9 of Fig. 3;

Fig. 10 is a similar section, taken just forwardly of the rear closure member, on the line 10—10 of Fig. 3;

Fig. 11 is a fragmentary longitudinal section through the cartridge, taken on the line 11—11 of Fig. 10;

Fig. 12 is a longitudinal section which is identical with Fig. 5, but shows the open ends of the ink passages sealed off before use by removable stopper members;

Fig. 13 is a side view of a simple piston-like plunger suitable for use in initially advancing the ink from the reservoir into the bore leading to the ball at the tip; and

Fig. 14 is a partially sectioned side view of a modified form of reservoir.

The writing implement shown in Figs. 1 to 12, inclusive, will first be described. This implement includes primarily a head 10, a tip 11 which contains an ink transferring ball 12, a barrel 13, and a reservoir 14.

The head 10—which is preferably made of light plastic material—is provided with a longitudinally extending bore 15 through which the ink passes in advancing from the reservoir 14 into the tip 11. The front portion of the bore 15 is enlarged in diameter and is interiorly threaded at 16 for the reception of an exteriorly threaded portion 17 of the tip 11. The outer surface 18 of the head 10 is of conical form and tapers forwardly toward the tip 11 to provide a conveniently shaped finger grip, while the outer surface 19 of the tip 11 is also of conical form and tapers forwardly.

The tip 11—which is preferably made of metal—is provided with a longitudinally extending bore 20 which registers with the bore 15 in the head 10. The bore 20 opens forwardly into a bore 21 of reduced diameter, and the bore 21 in turn opens forwardly into a bore 22 of still further reduced diameter. The bore 22—which is of very minute size—opens forwardly into the center of a small socket 23 in which the ball 12 is mounted. The socket 23 opens forwardly and the ball is

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retained in the same in a partially projecting position by a fine inturned annular edge 24. The ball 12 is rotatably mounted within the socket 23 between the edge 24 and an annular shoulder 25 present between the bottom of the socket and the front end of the bore 22. The ink—which is preferably of viscose or paste-like consistency and designed particularly for feeding by capillary action—is fed to the rear surface of the ball 12 from the bore 22. Movement of the writing implement with the ball 12 in contact with the surface to be written upon causes the ball to rotate within the socket 23, transferring the ink from the ball onto such surface in a thin uniform film, much after the fashion of offset printing. The head 10 in addition to mounting the tip 11 provides a rigid support for both the barrel 13 and the reservoir 14.

The outer surface of the rear portion of the head 10 is reduced in diameter and is exteriorly threaded at 26. The front end of the barrel 13 is interiorly threaded at 27 for engagement with the threads on the head, with the outer surface of the barrel disposed substantially flush with the adjoining surface of the head 10. The front end of the barrel 13 is adapted to have a cap 28 sleeved over the same, and is exteriorly threaded at 29 for engagement with threads 30 on the inside of the cap. In the closed position of the cap an annular shoulder 31 on the inside of the same abuts against an annular shoulder 32 on the outside of the tip 11 whereby to provide an air-tight seal for the front end of the tip. The barrel 13 is preferably made of the same material as the head 10 and is closed at its rear end.

The reservoir 14 is of unique construction. It is releasably secured to the rear end of the head 10, independently of both the tip 11 and the barrel 13, in slightly spaced concentric relation to the barrel. The reservoir is a separate self-contained cartridge or filler capable of holding sufficient paste-type ink to last for say six months or a year. Such a cartridge can be either removed and refilled when empty or else discarded and replaced by a new full cartridge, all without disturbing the mounting of the tip 11 within the head 10.

The reservoir 14 consists of a small rod-like member 35 of generally cylindrical shape which contains a number of longitudinally extending capillary-like passages 36, 37, 38, 39 and 40. The member 35 is closed at its ends by cap-like cover members 41 and 42 having rims 43 which are disposed flush with and permanently secured to the member 35. The member 35 can be molded or extruded from hard rubber or other suitable material, and the covers 41 and 42 can be made of the same material and fastened by cement or other means to the ends of the member 35.

The passage 36 is located at the center of the member 35, while the passages 37, 38, 39 and 40 are located in a circle about the passage 36, in spaced parallel relation to both that passage and each other. The front cover member 41 closes off the front ends of all of the passages with the exception of the center passage 36, and is provided with an exteriorly threaded nipple 44 which projects forwardly and contains a bore 45 which registers with the front end of the passage 36. The rear cover member 42 closes off the rear ends of all of the passages with the exception of one of the side passages—namely, the side passage 40—a small hole 46 being provided in the member 42 in register with that passage.

The passages 36, 37, 38, 39 and 40 are connected

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together in series and together form one long tortuous ink retaining and feeding conduit. The connections between the passages consist of two arcuate grooves 47 and 48 formed in the front face of the member 35 between the latter and the inside face of the front cover member 41, and arcuate and radial grooves 49 and 50 formed in the rear face of the member 35 between the latter and the inside face of the rear cover member 42.

The rear end of the bore 15 in the head 10 is threaded at 51, and the nipple 44 is adapted to be screwed into the same into a position in which the front face 52 of the front cover member 41 firmly abuts against the rear face 53 of the head.

All of the passages 36, 37, 38, 39 and 40 in the reservoir are adapted to be initially filled with the ink. As the ink is used up at the ball 12 it works itself forwardly with a capillary-like action in the passages until the latter have been more or less completely emptied.

Starting at the rear open end of the side passage 40, the ink travels forwardly in that passage to the front end of the same, then laterally in the arcuate groove 47 into the front end of the side passage 39, then rearwardly in that passage to the rear end of the same, then laterally in the arcuate groove 49 into the rear end of the side passage 38, then forwardly in that passage to the front end of the same, then laterally in the arcuate groove 48 into the front end of the side passage 37, then rearwardly in that passage to the rear end of the same, then laterally in the radial groove 50 into the rear end of the center passage 36, and then forwardly in that passage, discharging at the front end of the latter through the nipple 44 into the bore 15 in the head 10.

Before the reservoir 14 is inserted in the writing implement the open ends of the passages 36 and 40 are sealed off, a cap 54 or other closure being applied to the nipple 44 and a plug 55 or other closure being applied to the atmospheric vent hole 45. As will be observed, the cap 54 closes off the bore 45 in the nipple at a point flush with the forward extremity of the same, thus allowing the bore 45 to be completely occupied by the ink when the cap is in place and prior to insertion in the writing implement.

When the reservoir is ready to be inserted the cap 54 and plug 55 are removed and discarded. To get the ink to move initially into the bore 15 in the head 10 a piston-like plunger 56 of any suitable construction, furnished with the reservoir, may be pushed into the rear end of the passage 40 far enough to force the ink through the bore 45 up to the ball 12. The reservoir 14 contains all of the ink used in the writing implement—the barrel 13 merely serving as an enclosure for the reservoir.

The passages 36, 37, 38, 39 and 40 are shown as circular in cross section but the same might be of any other shape. The cross sectional area of the passages should be sufficiently small to give a satisfactory capillary feed, while at the same time sufficiently large to hold an adequate supply of ink. The passages in the particular reservoir shown are in the neighborhood of 70 thousandths of an inch, but the same could be made considerably larger or smaller, depending somewhat on the viscosity of the particular ink used. Paste-like ink of about the consistency of the grease ordinarily used in lubricating the chassis of an automobile will give satisfactory results. The ink should be thin

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enough to work forwardly in the passages of the reservoir while not so thin as to seep rearwardly from the open end of the last passage 40.

In Fig. 14 a modified cartridge type reservoir is shown which consists of a fine copper tube 57 wound into a compact helix. The front end 58 of the tube is straightened out for a short distance and is equipped with an exteriorly threaded sleeve 59 which is adapted to be screwed into the threaded rear end of the bore 15 in the head 10. Before use the front end 58 of the tube is closed by a screw cap 60. The rear end 61 of the tube is also straightened out for a distance sufficient to permit the insertion and movement of the priming plunger. The rear end 61, which is left open when the reservoir is in place in the writing implement, is initially closed by a screw plug 62, which plug is adapted to be removed at the same time as the cap 60.

The pen of this invention is similar in some respects to a mechanical pencil, especially as to feel and character of the writing impression and feed and manner of replenishing the writing medium.

I claim:

1. An ink cartridge for insertion in a filled condition in the barrel of a pen shaped writing implement of the rotatable ball type; said cartridge comprising a solid rod-like member of such diameter as to fit slidingly within the barrel, said member being provided with a plurality of longitudinally extending passages and a plurality of cross channels between the ends of certain of said passages, whereby to connect all of said passages in series to form one long ink holding vein in which a supply of viscous ink is adapted to be held, a closure member at the rear end of said member for forming the channels in that end into closed conduits, another closure member at the front end for the same purpose, said front closure member being provided with a forwardly extending nipple of reduced diameter containing an axially extending bore in communication with the front end of the ink feeding vein, which bore terminates at the front end of the nipple, means on the outside of the nipple intermediate the ends of the latter for securing the same in a forwardly adjusted position within the surrounding barrel of the writing implement, and means for venting the rear end of the ink holding vein to the atmosphere.

2. An ink cartridge for insertion in the barrel of a ball point pen, said ink cartridge being provided adjacent its front end with an exteriorly threaded portion for screw threaded engagement within the front end of the barrel of the pen, said cartridge containing a long small diameter bore which extends longitudinally of the cartridge and is adapted to contain a quantity of viscous ink in uninterrupted continuous vein form commencing at the front end of the cartridge, the cross-sectional area of the bore

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being such relative to the flow characteristics of the ink as to prevent the ink from flowing under gravity alone in either direction irrespective of the position of the cartridge when the front end of the bore is closed or connected with the pen, the front end of the bore being flush with the front end of the cartridge and being adapted to be closed off flush before use by a screw cap, and the rear end of the bore being open.

3. A writing implement of the rotatable ball type, comprising a pen-shaped casing and a replaceable ink cartridge within the casing; said casing being provided in its front end with a forwardly opening socket, a writing ball rotatably mounted in the socket, and an axially extending ink bore in communication with the socket, and being provided at the rear end of the bore with a rearwardly opening interiorly threaded recess of larger size than the bore, and a chamber of still larger size into which the recess opens; and said cartridge being provided with an elongated body portion in which a supply of viscous ink is adapted to be held in uninterrupted continuous vein form, which body portion is housed within the chamber of the casing, and a forwardly projecting nipple of reduced size at the front end of the body portion, which nipple is exteriorly threaded for screw threaded engagement with the recess and contains an axially extending ink bore of substantially the same cross-sectional area as the bore in the front end of the casing for uninterrupted endwise communication with the bore.

JOHN C. WAHL.

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