Feb. 8, 1966 L. C. HANSEN ETAL 3,233,275

WRITING IMPLEMENT

Filed Sept. 18, 1963 2 Sheets-Sheet 1

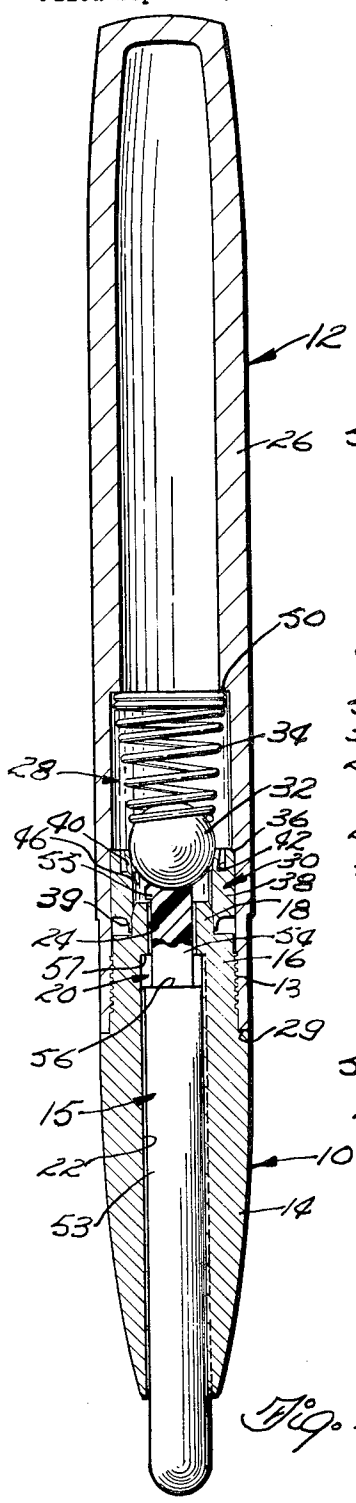


Fig. 1

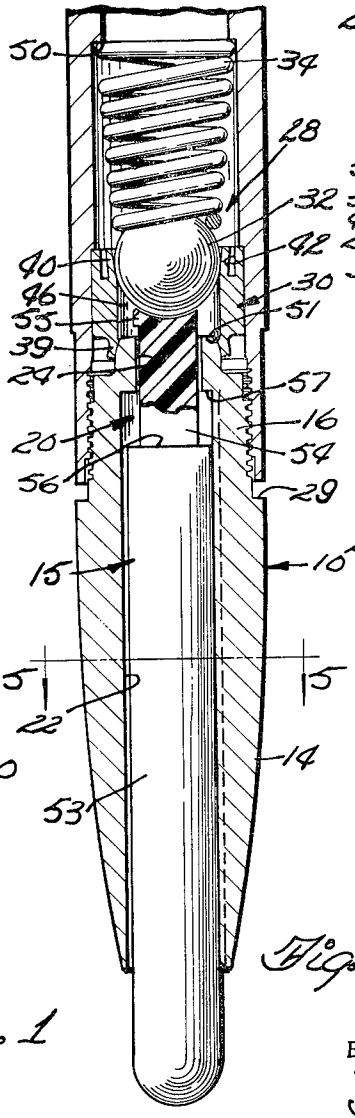


Fig. 2

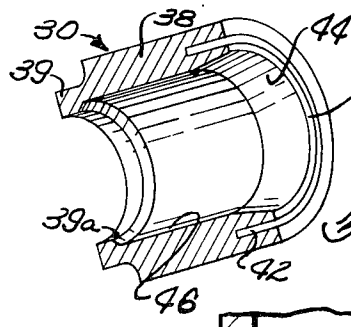


Fig. 4

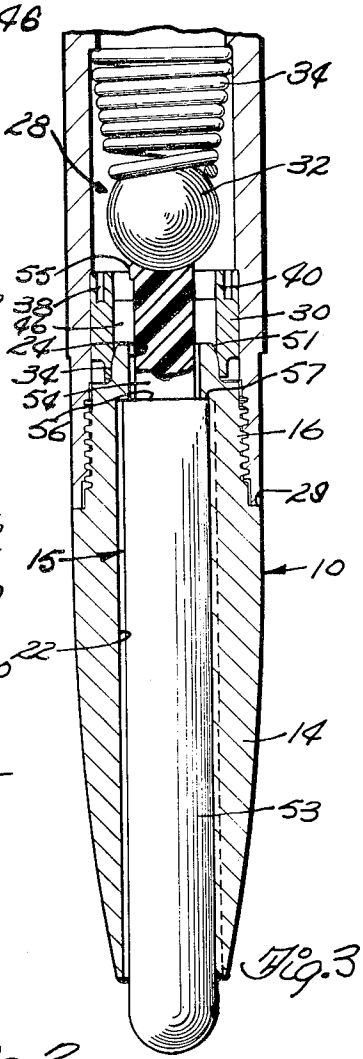


Fig. 3

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Feb. 8, 1966 L. C. HANSEN ETAL 3,233,275

WRITING IMPLEMENT

Filed Sept. 18, 1963 2 Sheets-Sheet 2

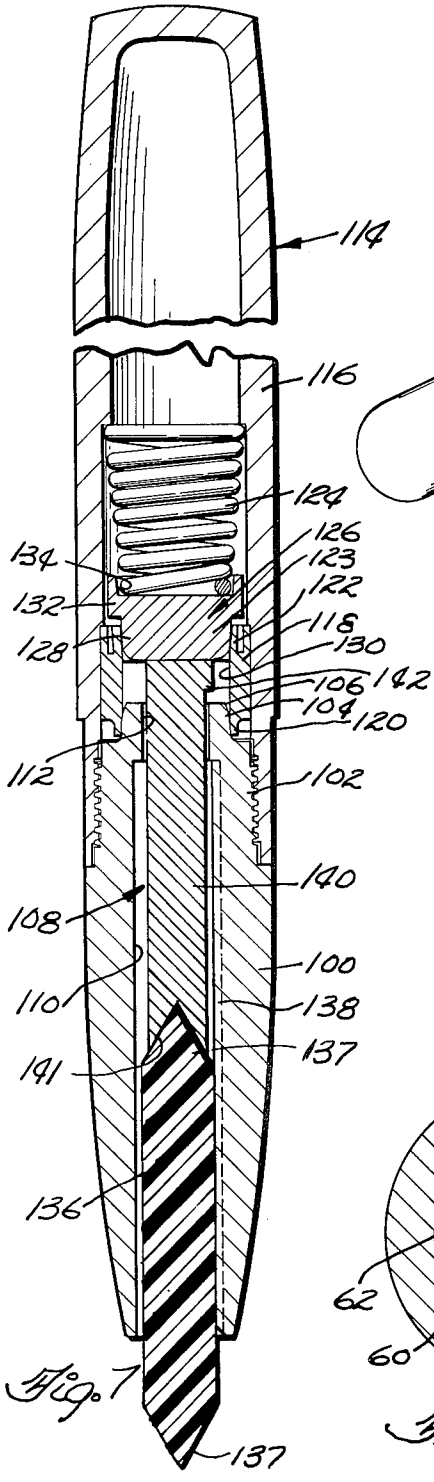


Fig. 7

Fig. 6

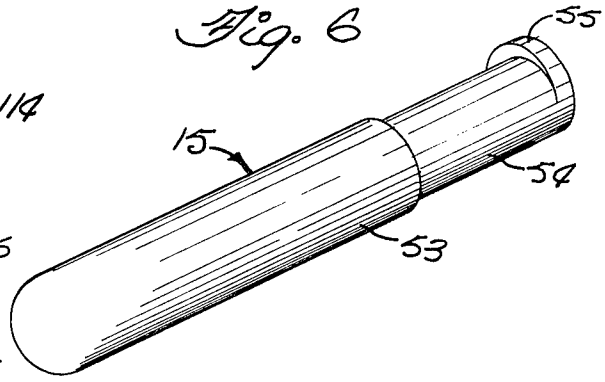
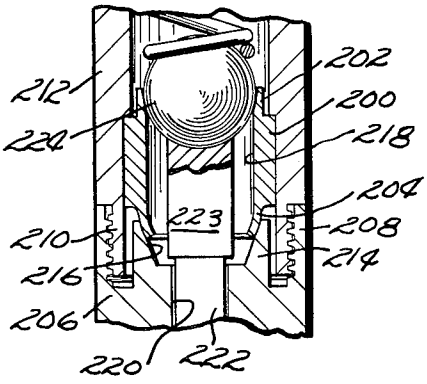


Fig. 8



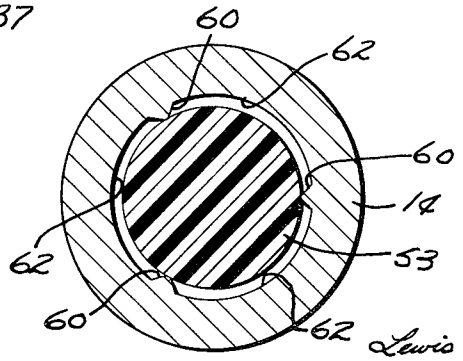


Fig. 5

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United States Patent Office 3,233,275 Patented Feb. 8, 1966

3,233,275

WRITING IMPLEMENT

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Filed Sept. 18, 1963, Ser. No. 309,685
16 Claims. (Cl. 15—563)

This invention relates to writing implements and has special reference to a marking instrument of the type having a valve for controlling the transfer of fluid between the reservoir and a writing tip.

For many years ink marking instruments were relatively large, bulky devices which were expensive and had ink reservoirs that periodically required refilling from a reserve ink supply. These instruments were used almost exclusively by commercial establishments whose required use could justify not only the initial cost of the instrument and a reserve supply of marking ink, but also the mess and inconvenience of refilling.

In recent years, however, disposable marking implements have become increasingly popular not only because of their lower initial cost, but also because they obviate the mess and inconvenience of refilling from a separate supply container. These disposable marking units commonly consist of a can or jar type reservoir containing a prefilled capillary mass and an apertured closure through which an absorbent felt marking tip extends. Since design of these units contemplates disposal of the entire unit when the ink in the reservoir has been exhausted, all parts of the unit are cheaply constructed. Moreover, these units are thus generally bulky, unsuitable for convenient carrying and nonconducive to either proper gripping or good writing.

Accordingly, it is one object of this invention to provide a marking instrument wherein the fluid supply is contained in a pre-filled disposable cartridge.

Another object of this invention is the provision of a marking instrument having an improved reusable writing unit assembly and a pre-filled disposable fluid cartridge.

Still another object of this invention is to provide a marking instrument comprising a reusable writing unit assembly and a replaceable barrel constituting a prefilled ink reservoir, the barrel having a normally closed valve which seals the reservoir when the barrel is detached from the writing unit assembly, and which controls the transfer of fluid between the reservoir and marking tip when the barrel is attached to the writing unit assembly.

A further object of this invention is the provision of an improved connecting seal between a writing unit assembly and a replaceable barrel cartridge in an ink-marking instrument.

An additional object of this invention is the provision of a marking pen comprising two separable sections, one of which carries a valve and constitutes a normally closed disposable ink reservoir, and the other of which carries a marking tip and constitutes a reusable writing unit assembly.

It is another object of this invention to provide an improved means for removably mounting a marking tip for limited axial movement within the gripping section of a writing instrument.

Further objects of this invention will be readily apparent from the following description and claims when taken with the accompanying drawings.

In accordance with the present invention, there is provided a writing or marking implement having a gripping section which is adapted for releasable engagement with a barrel or reservoir section containing a supply of ink. Carried by the reservoir section is a normally closed fluid

control valve comprising a valve seat and a movable valve member. Integral with the valve seat is a forwardly projecting deformable annular flange which slidably and sealably engages a sealing surface provided on the rearward end of the gripping section when the sections are assembled. An axially movable marking tip extends through the gripping section, and when the sections are assembled, the rearward end of the tip engages the movable valve member. Thus the transfer of fluid between the reservoir portion and gripping section may be controlled by manipulation of the tip.

In the drawings:

FIGURE 1 is a broken longitudinal sectional view of one embodiment of a marking instrument constructed according to the present invention, showing the parts as conditioned for writing or storage;

FIGURE 2 is an enlarged longitudinal sectional view of the forward portion of the embodiment of FIGURE 1, showing the relationship of the parts as the reservoir and gripping sections are assembled;

FIGURE 3 is an enlarged longitudinal sectional view of the forward portion of the embodiment of FIGURE 1, showing the parts as conditioned for transferring fluid from the reservoir section to the writing tip in the gripping section;

FIGURE 4 is a longitudinal sectional view in perspective of the valve seat of the embodiment of FIGURE 1;

FIGURE 5 is a cross-sectional view taken on the line 5—5 of FIGURE 2;

FIGURE 6 is a perspective view of the writing tip of the embodiment of FIGURES 1–5;

FIGURE 7 is a broken longitudinal sectional view of a second embodiment of this invention, showing the parts as conditioned for writing or storage; and

FIGURE 8 is a broken longitudinal section of the central portion of a marking instrument showing an additional embodiment of this invention.

Referring now to the embodiment of FIGURES 1–6, and particularly FIGURE 1 thereof, there is illustrated a marking pen having a writing unit assembly **10** and a reservoir unit **12** removably secured together in axial alignment by means such as the internal and external threads **13**. The writing unit assembly includes a gripping section **14** and a marking tip **15**, the gripping section having a generally cylindrical external configuration tapering gradually toward its forward end to provide not only a graceful, pleasing and finished appearance, but to permit unobstructed viewing of the written line and the end of the marking tip. The gripping section includes a rearwardly disposed externally threaded mounting portion **16** of reduced diameter, and a still further reduced collar **18**.

While the gripping section **14**, may be formed of any one of several different materials, preferably it is molded from a plistic such as nylon or polypropylene. The material which is chosen, of course, should be dimensionally stable, resistant to reaction with any of the constituents of the ink to be used in the pen, and capable of providing a lustrous, long-wearing and attractive appearance.

The gripping section **14** is provided with a longitudinally extending aperture **20**, which aperture defines a forward bore **22** and a concentric rearward bore **24** of smaller diameter. Both bores are substantially straight, although it will be understood that there may be a slight taper or a draft for the purpose of permitting convenient withdrawal of the die following the molding operation.

In order to eliminate the inconvenience and mess attendant the filling operation of the usual marking instrument, it is intended that the unit **12** form a convenient, replaceable an disposable reservoir which may be readily attached to and detached from the writing unit assembly.

This reservoir unit **12** includes a barrel section **26**, which is closed at one end and open at the other, and a valve **28** which is mounted in the open end of the barrel. The barrel may be formed of a suitable plastic material, and it is preferred that the forward open end be internally threaded for engagement with the externally threaded mounting portion **16** of the gripping section **14**. As will be noted from the drawings, upon full threaded interengagement of the barrel section **26** and gripping section **14**, the forward end of the barrel will abut a shoulder **29** as defined at the forward end of the reduced mounting portion **16**.

In the usual marking instrument of the non-capillary type, the writing unit assembly includes a valve which is actuatable by the writing tip to serve the single purpose of controlling fluid movement, with the barrel merely comprising a hollow container which is refilled by pouring ink thereinto. Not only is such a filling procedure time-consuming, inconvenient and likely to lead to stained hands and clothing, but it has proven difficult to provide an adequate seal between the barrel and gripping section because of wear occurring as a result of frequent removal of the barrel. In contrast, in the present invention a unique ink-controlling valve **28** is provided within the replaceable barrel section **26** and arranged and constructed to serve a number of purposes. It provides a positive seal with the gripping section upon assembly of the gripping section and barrel while not interfering in any way with such assembly; it forms an effective seal for the contents of the reservoir during shipment and storage without danger of inadvertent dislodgement as a result of handling; it automatically compensates for any wear which may occur in the sealing surface of the gripping section; and it is easily operable during use.

The valve in the illustrated embodiments comprises a valve seat **30**, a movable valve member or plug **32**, and resilient member or spring **34**. The valve seat **30** is preferably in the form of an annular insert which is press-fitted within the open end of the barrel or reservoir section **26** to form a fluid-tight seal therewith. To insure proper positioning of the insert **30**, a shoulder **36** may be provided within the barrel **26**. For reasons which will be clear from the following discussion, the valve seat insert **30** should be formed of a "tough" non-brittle material which is semi-resilient, i.e. relatively rigid or firm, yet of such a nature as to permit at least limited resilient flexure without either rupturing or "relaxing" to any significant degree when subjected to tension for long periods of time. One material which has been found suitable for this purpose is polypropylene.

The insert member **30** includes a body portion **38**, and projecting forwardly from the body portion is an integral first annular flange portion **39** which is concentric with the body portion and is radially spaced from the surrounding barrel wall. As best shown in FIGURE 4, the forwardly projecting flange portion **39** is provided with an annular offset surface **39***a* of somewhat reduced diameter. It is preferred that a second integral annular flange portion **40** be provided, this flange portion projecting rearwardly from the body portion and being concentric with the body and first flange portions **38** and **39**. In the illustrated embodiment, the second flange portion **40** is circumscribed and defined in part by an annular recess **42** in the rearward end of the member **30**. This second flange portion **40** is adapted to resiliently and sealingly engage the movable valve member **32**; and the inner surface **44** of this flange portion preferably flares slightly from the juncture with the body portion **38** as may best be seen in FIGURE 4.

As will be obvious from the drawings, the body portion **38** and concentric flange portions **39** and **40** provide a longitudinal passageway **46** adjacent the open end of the barrel section **26** through which ink may pass from the barrel for direct transfer to the aperture **20** of the gripping section **14**.

The valve member **32** is provided for the purpose of selectively sealing the passageway **46** and thereby interrupting the flow of ink into the gripping section aperture **20**. In the preferred embodiment the valve member **32** consists of a ball or sphere, with the diameter of the ball **32** preferably being about equal to the diameter of the slightly flared inner surface **44** of the second flange **40** at its midpoint. In this way the ball may center itself readily in the flange, and yet it will not pass into the portion of the passageway within the body portion **38**. The ball, of course, should be formed of a metal or plastic which is inert to the constituents of the ink intended for use in the writing instrument, a plastic generally being preferred since this type of material is lighter in weight than many metals and would be less likely to be displaced inadvertently should the implement be subjected to a severe jar, as by being dropped on its closed end.

As poined out previously, the valve seat **30** preferably is formed of a semi-resilient material, not only to insure an adequate seal with the barrel **26**, but to provide limited lateral resilience of the flanges **39** and **40**. Thus, as the ball **32** is urged into engagement with the flange **40**, the flange will deform laterally or radially to insure that the ball is sealed completely even though the ball should not be perfectly spherical. A comparison of the positioning of the flange **40** as between FIGURES 2 and 3 will best illustrate this lateral deformation or expansion of the flange when the ball is seated therein. It will be understood that the amount and character of the expansion of the flange can be varied fairly substantially by the inclination of the tapered surface **44**, the length and thickness of the flange, and the material from which the flange is formed. In fact, depending upon the uniformity of the ball **32** or such other valve member as might be chosen, the flange **40** may be relatively stiff if little deflection thereof is required for sealing.

The spring member **34** is an expansion type coil spring and is disposed within the barrel section **26**. The rearward end of this spring abuts the shoulder **50** provided within the barrel **26**, and the ball **32** is constantly urged by the spring **34** toward seating engagement with the flange **40**.

The collar **18** of the gripping section **14** is provided with a generally frusto-conical external surface **51**, the diameter of which decreases toward the rearward end thereof, i.e. the upper end in the drawings. This frusto-conical sealing surface is sized to permit initial entry of the rearward end of the collar into the flanged forward end of the insert **30**. The sealing surface **51** on the collar will slidably engage the internally offset surface **39***a* of the first flange **39** while the barrel section **26** and gripping section **14** are being screwed together, as may be seen in FIGURE 2. During this assembly of the sections, the collar will continue to move into the annular valve seat insert **30** causing the flange **39** to expand radially and the engagement between the sealing surface **51** on the collar and the offset surface **39***a* of the insert thus will become progressively tighter, thereby insuring an effective seal therebetween even if the surface **51** should be somewhat nonuniform or if it should wear as a result of long usage.

This unique sealing arrangement of a sliding seal between the first flange **39** of the valve seat insert and gripping section collar **18** further insures against any possibility of interference with the convenient assembly of the barrel and gripping section, since it eliminates the necessity of trying to effect seating of an inwardly disposed, fairly compression-resistant seal element simultaneously with the abutment between the forward end of the barrel **26** and the shoulder **29** on the gripping section. As will be understood, the positioning of the valve seat insert **30**, and particularly the flange portion **39** thereof, with respect to the end of the barrel should be such as to provide a slight clearance between the flange and the rearward end of the mounting portion **16** when the

gripping section and barrel section are fully secured together. Thus, to effect this clearance, the distance between the end of the flange portion **39** and the forward end of the barrel section **26** should be greater than the length of the mounting portion **16**. The clearance is desirable to prevent premature abutment of the flange with the rearward end of the mounting portion and possible interference with complete assembly of the barrel and gripping sections.

Disposed within the bores **22** and **24** of the gripping section **14** is a porous marking tip **15**, which comprises a body portion **53**, an integral, axially aligned, reduced shank portion **54** and an integral laterally distented head portion **55**. The body portion **53** is longer than the bore **22**, and it is slidably disposed in this bore with the forward end thereof extending beyond the forward end of the gripping section **14** to provide a writing tip preferably rounded or hemispherically shaped as illustrated. The shank portion **54** is of smaller cross-sectional diameter than the body portion, and it is slidably disposed in the smaller bore **24**. The length of the shank portion **54** exceeds the length of the bore **24** by a distance equal to the length of permitted longitudinal movement of the marking tip within the gripping section which may, for example, be about $\frac{3}{16}$ of an inch.

The rearwardly facing shoulder **56**, formed at and as a result of the junction of the body portion **53** and the reduced shank portion **54** of the marking tip, is sized to abut the forwardly facing shoulder **57**, which is formed within the gripping section at and as a result of the junction of the concentric bores **22** and **24**. This abutment consequently provides a means of limiting the rearward axial movement of the tip **15** within the aperture **20** of the gripping section.

The laterally or radially distended head portion **55** of the marking tip, on the other hand, is provided to limit the forward axial movement of the tip within the aperture **20** of the gripping section and thus prevent inadvertent loss of the tip **15** through the forward end of the gripping section. As best illustrated in FIGURE 6, the head portion **55** is preferably in the form of a radial eccentric flange-like projection sized to abut the rearward end of the collar **18**. If preferred, the head may be a concentric disc shaped configuration or even a removable projecting pin or plate. However, as will be explained in more detail herebelow, the tip **15** preferably is formed of a material of a relatively resilient nature whereby the head **55**, which itself is relatively rigid, may be deformed or displaced generally inwardly to permit passage thereof through the rearward bore **24** should the user wish to remove the tip either by grasping its exposed outer end or pushing forwardly on its rearward end with a narrow instrument. It has been found that, if the configuration of the head is that of a slight eccentric projection as illustrated, it will resiliently deform with greater ease, thus facilitating its forcible insertion into and removal from the narrow bore **24** of the gripping section. Thus, the present invention provides the unique feature of a tip which, for purposes of inspection and/or replacement, can be removed readily while still being restrained against inadvertent loss.

Although other types of material may be used for the tip **15**, such as felted fibers, preferably it is formed of a plastic material consisting of a cohesive matrix of a synthetic polymeric material having formed therethrough interconnected pores or cells of a size which will retain a charge of marking fluid by capillary attraction but will readily release such fluid upon contact with a marking surface.

The matrix preferably consists of a multiplicity of solid particles of a generally predetermined size which have been sintered or otherwise fused primarily at their points of surface contact to provide the interconnected pores. The polymeric material from which the matrix is formed should be inert, that is, it should not react adversely in the presence of the constituents of the marking ink being used. Moreover, the matrix material should be of a tough and semi-flexible nature, and it should have good resistance to abrasion and wear. For this purpose, polyethylene granules have been found to serve satisfactorily, although other materials, such as nylon, may be chosen.

After the body portion **53** and reduced shank portion **54** of the plastic tip **15** have been molded or otherwise fabricated, the offset or projection **55** may be formed preferably by remolding or hot forming, and the upper or rearward surface of the head may be simultaneously dimpled to provide a dish or cup shaped concavity of approximately the same radius as the spherical ball or valve member **32**. This concavity may be formed by pressing a heated die of the desired configuration against the rearward end of the head portion **55**, and it may be facilitated by supporting the upper end of the shank portion **54** in a die or similar member having a cavity which will confine the movement of the softened plastic to insure formation of the desired offset. The head portion may be provided with a rounded or beveled edge to facilitate insertion thereof into the gripping section. As a result of this forming operation, the head portion of the tip is somewhat solidified to provide a substantially solid and rigid surface or seat for abutment with and support of the ball **32**.

In preparing the reservoir unit **12**, ink is deposited in the barrel **26** and the spring **34** is then dropped into position within the barrel to rest upon the shoulder **50**. The insert member **30** and the ball **32** are then forced into position within the open end of the barrel by means of a punch. During this positioning, the punch holds the ball away from seating engagement with the valve seat so that there will be no entrapment of air or buildup of pressure within the barrel. After the unit **12** has thus been filled and assembled, it may be desired to place the unit in a vacuum chamber to draw the ball **32** somewhat more securely into the flange than would be effected by the spring pressure alone.

In use, the reservoir unit **12** and writing unit **10** are threaded together to effect the previously described seal between the forwardly extending flange **39** and the surface of the rearwardly extending collar **18**. Thus, a fluid tight connection is created between the reservoir and the gripping section. To ink the tip for writing, it is then merely necessary for the user to press the forward end of the tip **15** against a hard surface in order to move the tip and the ball rearwardly against the resistance of the spring **34** to a position spaced from the second flange **40**, as illustrated in FIGURE 3. The concave rearward surface of the head **55** will maintain the ball centered on the head, thus assuring full opening of the valve upon rearward movement of the tip. During this movement, ink from the reservoir will flow through the passageway **46** of the valve seat **30**, and through the annular space between adjacent surfaces of the tip shank portion **54** and aperture **24** of the gripping section, from where it flows over and is absorbed by the tip body portion **53** for subsequent application to a writing surface. Re-inking of the tip, of course, is effected in the same manner. Upon release of the rearward pressure on the tip, the spring **34** will move the ball **32** and tip forwardly to close the valve and project the forward end of the tip for writing. It is preferred that the spring **34** be sufficiently strong to resist rearward movement of the ball **32** under normal writing pressure, since the re-inking should normally be a conscious movement of the tip and not an unexpected movement which could be objectionable during writing.

It is desirable to provide the forward bore **22** of the gripping section **14** with a plurality of longitudinally extending, spaced splines **60**, which lightly but frictionally engage the body portion **53** of the tip **15**. These splines are best illustrated in FIGURE 5. It is preferred that three such splines be provided angularly spaced about 120° apart and extending substantially the entire length of

the bore 22. The splines 60 not only insure proper positioning of the tip centrally within the bore 22, but also provide spaces 62 for the movement of ink and air during inking and re-inking of the tip 15. Thus, as the valve is opened, fluid may "flood" downwardly over at least a portion of the exterior surface of the tip, and the tip can be charged with fluid quite quickly since it does not have to filter through the pores of the tip for the entire length of the tip.

Another advantage of the present invention is that the color or types of ink can be changed readily by simply changing the reservoir unit 12, and this may be done even if the contents of the reservoir unit are not completely depleted. By virtue of the spring 34, the ball 32 normally is sealed within the flange 40, whereby any contents of the reservoir will be fully protected against loss or evaporation, should the reservoir be removed and stored even for long periods of time.

Referring now to the embodiment of FIGURE 7, the gripping section 100 illustrated therein is substantially the same as the gripping section described hereabove with respect to the embodiment of FIGURES 1–5. Briefly, it includes a reduced rearward mounting portion 102, and a still further reduced collar 104, which is provided with a generally frusto-conical sealing surface 106. Extending longitudinally through the gripping section 100 is an aperture 108, which includes a forward bore 110 and a reduced rearward bore 112.

The reservoir unit 114 is substantially the same as the reservoir unit 12 of the previously described embodiment, comprising a replaceable fluid cartridge defining a barrel section 116 having an open end adapted for threadable engagement with the mounting portion 102. Press-fitted within the barrel 116 is a valve seat 118 molded or otherwise formed of a material such as polypropylene and provided with a first annular flange 120 extending forwardly thereof, and a second annular flange 122 extending rearwardly. As will be apparent from FIGURE 7, both flanges are spaced radially from adjacent wall portions of the barrel portion 116 and, therefore, are free to expand radially whereby the forward flange 120 will provide a sliding seal with the sealing surface 106 of the collar 104 as the barrel and gripping section are screwed together.

Disposed within the barrel 116 and urged forwardly by a coil spring 124 is a movable valve member 126. The valve member 126 is molded or otherwise formed with a generally circular forward portion 128 having a curved or beveled forward edge providing what might be termed a "lead-in" for convenient entry into the upper end of the passageway 130 as defined by the valve seat 118 and flanges 120 and 122. Preferably the side surface of the forward portion 128 is tapered somewhat so that, as it is moved into the flange 122, the surface will cause radial expansion of the flange to insure a complete seal between the valve member 126 and flange 122. In the illustrated embodiment, the rearwardly extending flange 122 of the valve seat insert is not flared, though, if desired, a flare may be provided either in the place of or in addition to the taper on the forward portion 128 of the valve member.

The rearward portion 123 of the valve member 126 is preferably of enlarged diameter and may be provided in its rearward surface with a recess 134 sized to receive the forward end of the spring 124.

In this embodiment, the porous marking tip 136 is of reduced length, and does not extend the full length of the bore 110. Instead it is frictionally retained in the bore by contact with a plurality of longitudinally extending spaced splines 138 which preferably are of the same general character as the splines 60 described previously with respect to the first embodiment. Between the rearward end of the porous tip 136 and the forward surface of the valve member 128 is a rod-like spacer member 140 which is of smaller diameter than the porous tip and is provided on its rearward end with a radial offset or head 142 to prevent inadvertent loss thereof through the forward end of the gripping section, should the tip 136 be removed for replacement purposes. The marking tip 136 and the spacer rod 140 are not connected within the gripping section though they are retained in contact engagement by the frictional resistance of the splines and the spring 124, which is stronger than the frictional resistance of the splines. In this embodiment, the spacer rod 140 does not necessarily have to be of a deformable or resilient nature, since it can be readily removed rearwardly through the reduced bore 112 after the barrel and gripping sections have been disassembled.

It may be desirable to provide a reversible marking tip 136 (i.e., one having a writing point 137 at each end thereof). For this purpose, the forward end of the spacer rod 140 preferably is provided with a "socket" or recess 141 of a shape generally complementary to that of the points 137. While other recess configurations may be chosen, a transversely disposed generally V-shaped slot has proven to be desirable, since such a slot will receive and center any of the usual tip shapes, such as a wedge, a cone or a hemisphere, without undesirable distortion or damage thereto under writing and valve opening pressures. If desired, the writing points at the respective ends of the tip 136 may differ in configuration and in writing characteristics. For example, one end may be sharper than the other for producing a thinner written line. Even if a reversible tip should not be used, complementary abutting surfaces on the tip and adjacent valve member, or spacer, are desirable for the purpose of preventing relative lateral slipping and thus assisting in maintaining alignment of the parts.

In use, the prefilled reservoir unit 114 is assembled with the gripping section 100, whereby the forward flange 120 of the valve seat insert slidingly and sealingly engages the sealing surface 106 of the gripping section collar and is deformed thereover to provide a fluid tight connection and passage between the reservoir and the aperture 108 of the gripping section 100. Subsequently, to effect inking of the tip, the tip is moved rearwardly relative to the gripping section 100 whereby the valve member 126 will be unseated from the flange 122 to permit the movement of ink through the passageway 130, and thence through the rearward bore 112 into the forward bore 110 for absorption by the porous marking tip and subsequent deposit on a writing surface.

The embodiment of FIGURE 8 illustrates a modified valve seat and collar. In this embodiment, the valve seat insert 200 is formed with a rearward flange 202 and a forwardly projecting flange 204 which, as in the previously described embodiments, are transversely deformable.

The gripping section 206 is provided with a mounting portion 208 of a generally annular nature, the mounting portion being internally threaded to receive the reduced extension 210 provided on the forward end of the barrel or reservoir portion 212. Radially spaced from the mounting portion 208 of the gripping section 206 is a rearwardly projecting collar 214 having formed internally thereof a flaring, generally frusto-conical sealing surface 216 which is sized to slidingly and sealingly receive and engage the laterally deformable forward flange 204 as the gripping section 206 and barrel portion 212 are assembled together. Thus, a fluid tight connection and passageway 218 is provided through the valve seat 200 between the reservoir and the bore 220 of the gripping section 206.

Disposed within the bore 220 of the gripping section 206 is a spacer or writing tip 222 which is free to move longitudinally and carries an enlarged head portion 223 rearwardly of the bore 220 and in abutment with the ball valve member 224. Thus the valve member is caused to move rearwardly upon manual depression of the tip 222 for purposes of inking or re-inking the tip as described in more detail with respect to the preceding embodiments.

Although the invention has been described with a certain particularity, it is understood that the foregoing embodiments are illustrated and described herein only by way of example and that this invention is not to be limited thereto as various modifications may be made without departing from its true spirit and scope, as hereinafter claimed.

What is claimed is:

1. In a writing implement the combination of a reservoir section having an opening end, a gripping section removably attached to the open end of said reservoir section, a valve disposed within said reservoir section adjacent said open end for controlling liquid flow from said reservoir section, said valve comprising a valve seat, a movable valve member and resilient means urging said valve member toward a closed position, said gripping section having a central bore, means forming a restriction within said bore spaced from the forward end of said gripping section and from said valve seat, a marking tip having an absorbent forward portion and a rearward portion having a shank of greater length and smaller cross-sectional diameter than said bore restriction and a head of slightly greater cross-sectional diameter than said bore restriction, said marking tip being slidably mounted within said bore with said absorbent forward portion disposed forwardly of said bore restriction and with said rearward portion disposed with the head thereof in engagement with said movable valve member and the shank thereof extending through said bore restriction, whereby said marking tip may be held in a forward position by said resilient means and said valve may be opened by axial movement of said marketing tip.

2. In a writing implement, the combination of a reservoir section open at one end, a gripping section threaded into the open end of said reservoir section, a tip carried by said gripping section, a member having an annular body portion mounted within said reservoir section in spaced relationship with respect to said open end, a first annular flange portion projecting from said body portion for sealingly engaging said gripping section, a second annular flange portion projecting from said body portion in a direction opposite that of said first flange portion, said body portion and said flanges defining a reduced central passageway, a valve member disposed at the inner end of said passageway, said valve member being movable between a first position sealingly engaging said second flange portion and a second position spaced from said second flange portion, said tip having a rearward portion disposed within said passageway in operative engagement with said valve member and being reciprocal relative to said gripping section to move said valve member between said first and said second positions, and means for resiliently urging said valve member toward said first position to close said reservoir section.

3. In a writing implement, the combination of a reservoir section having an open forward end, a gripping section having a rearward mounting portion detachably assembled with the open end of said reservoir section, a tip carried by said gripping section for reciprocal movement relative thereto, a member having an annular body portion disposed within the open end of said reservoir section, a first annular flange portion projecting forwardly from said body portion for sealing engagement with the mounting portion of said gripping section, a second annular flange portion co-axially aligned with said first flange portion and projecting rearwardly from said body portion and defining a resilient valve seat, said body portion and said first and second flange portions defining a passageway through the open end of said reservoir section, a valve member within said reservoir section and movable therein between a forward position sealingly engaging said second flange to close said passageway and a rearward position spaced from said second flange to open said passageway, said tip being in operative engagement with said valve member and movable from a forward position to a rearward position to move said valve member from its forward to its rearward position, and means urging said valve member and said tip simultaneously toward their forward positions.

4. In a writing implement, the combination of a reservoir section having an open forward end, a gripping section having a rearward mounting portion detachably assembled with said open end, said gripping section defining a longitudinal aperture extending therethrough, a rearwardly projecting tapered sealing surface provided by said mounting portion, a marking element carried by said gripping section for sliding movement within said longitudinal aperture, said marking element having an absorbent tip, valve means within said reservoir section, said valve means including a valve seat mounted within and sealingly engaging the portions of said reservoir section adjacent said open end, a laterally resilient annular flange projecting forwardly from said valve seat, said flange being in surrounding sealing engagement with the tapered sealing surface of said gripping section mounting portion, said valve seat and said flange defining a central passageway aligned with said longitudinal aperture to provide fluid communication from said reservoir section through said gripping section, a valve member within said reservoir portion and movable therein between a forward position sealingly engaging said valve seat and a rearward position spaced from said valve seat, said marking element being in engagement with said valve member, said valve member being movable from said forward position to said rearward position in response to rearward movement of said marking element and, resilient means within said reservoir portion for urging said valve member and said marking element simultaneously in a forward direction to project said tip from said gripping section and to close said passageway in said reservoir section.

5. In a writing implement, the combination of a disposable reservoir section having an open end, a gripping section having a rearward mounting portion adapted to be detachably assembled with the open end of said reservoir section, a rigid collar axially aligned with and extending outwardly beyond said mounting portion, said collar defining a generally frusto-conical sealing surface, a member mounted within an sealingly engaging said barrel adjacent said open end, said member including a valve seat portion and an integral forwardly projecting laterally deformable resilient annular flange portion, said flange portion slidingly engaging said frusto-conical sealing surface and concomitantly being resiliently deformed thereby to provide a laterally acting, longitudinally adjustable seal between the collar of said gripping section and the open end of said reservoir section when said sections are assembled, said valve seat and said flange defining a fluid passageway between said reservoir section and said gripping section, and means for selectively closing said passageway after assembly of said gripping section and said reservoir section.

6. In a valve unit for a marking implement of the type having an ink reservoir section open at one end and a gripping section adapted to be detachably assembled with the open end of the reservoir section, the combination of a resilient member having a body portion mounted within and sealingly engaging the open end of the reservoir section, a first flange portion projecting forwardly from said body portion, a second flange portion concentric with said first flange portion and projecting rearwardly from said body portion, said first flange sealingly engaging said gripping section and concomitantly being resiliently deformed laterally thereby upon assembly of said gripping section and said reservoir portion, said body portion and said first and second flange portions defining a passageway through the open end of the reservoir section, and a valve member axially movable between a forward position sealingly engaging said second flange to

close said passageway and a rearward position spaced from said second flange to open said passageway.

7. In a marking implement, an ink reservoir section open at one end, a gripping section having a rearward mounting portion detachably assembled with the open end of said reservoir section, an annular member sealingly disposed within the open end of said reservoir section, said member including an integral first annular flange projecting forwardly toward said open end, and an integral second annular flange concentric with said first flange and projecting rearwardly from said open end, said first flange surrounding and sealingly engaging said mounting portion and concomitantly being radially deformed thereby upon assembly of said gripping section and said reservoir section, said valve seat and said first and second flanges defining a fluid passageway through the open end of said reservoir section, a spherical valve member axially movable between a forward position sealingly engaging and laterally deforming said second flange, and a rearward position spaced from said second flange, means for urging said valve member toward said forward position to close said passageway, and means for selectively moving said valve member toward its rearward position and for conducting fluid from said reservoir section through said gripping section.

8. In a writing implement, the combination of a disposable barrel having an open forward end and defining internally thereof a writing fluid reservoir, a gripping section having a forward end portion and a rearward end portion, said rearward end portion detachably assembled with the open end of said barrel and being provided with a rearwardly extending collar having a generally frusto-conical exterior surface, a resilient annular member sealingly disposed within the open end of said barrel, said member including an annular body portion, an integral first annular flange portion projectiong forwardly toward said open end in a radially spaced relation with the adjacent surface of said barrel, and an integral second annular flange portion concentric with said first flange portion and projecting rearwardly from said open end in a radially spaced relation with the adjacent surface of said barrel, said first flange portion sealingly engaging the collar of said mounting portion and concomitantly being expanded laterally thereby upon assembly of said gripping section and said barrel, said body portion and said first and second flange portions defining a fluid passageway through the open end of said barrel, a valve member axially movable within said barrel between a forward position sealingly engaging and laterally deforming said second flange, and a rearward position spaced from said second flange, means for urging said valve member toward said forward position to close said passageway, and means for selectively moving said valve member toward its rearward position and for conducting ink from said barrel through said gripping section.

9. The structure of claim 8 wherein said valve member is spherical.

10. In a writing implement, the combination of a reservoir section having an open end, a gripping section having a rearward mounting portion adapted to be detachably assembled with said open end of said reservoir section, said gripping section defining a longitudinal aperture extending therethrough, an absorbent marking tip disposed for reciprocal movement within said aperture and extending beyond both ends of said gripping section, said marking tip having a laterally distended head disposed rearwardly of and sized to abut the rearward end of said gripping section to restrict forward movement of said marking tip, and means operable by said tip for selectively blocking fluid flow from said reservoir section into the aperture of said gripping section.

11. In a writing implement, the combination of a reservoir section having an open end, a gripping section having a rearward mounting portion adapted to be detachably assembled with the open end of said reservoir section, a valve unit disposed within said reservoir section for controlling fluid communication between said reservoir section and said gripping section, said gripping section defining a pair of co-axial bores including a first bore extending through the forward end thereof and a second bore of reduced diameter extending from said first bore through the mounting portion thereof, a marking tip having an absorbent body portion slidably disposed in said first bore, a head portion disposed rearwardly of said second bore for operating engagement with said valve unit, and an intermediate shank portion of reduced cross section slidably disposed in said second bore, said shank portion being of greater length than said second bore and said head portion being positioned for abutting engagement with said mounting portion thereby restraining said tip against loss through the forward end of said gripping section, said head portion being resiliently displaceable whereby said tip may be removed manually from said bores.

12. In a writing implement, the combination of a disposable barrel having an open forward end and defining internally thereof a writing fluid reservoir, a gripping section having a forward end portion and a rearward end portion, said rearward end portion detachably assembled with the open end of said barrel and being provided with a rearwardly extending collar having a generally frusto-conical exterior surface, said gripping section having a pair of co-axial bores including a first bore extending through said forward end portion and a second bore of reduced diameter extending from said first bore through said rearward end portion and said collar, a marking tip having an absorbent body portion slidably disposed in said first bore, a laterally distended head portion disposed rearwardly of said second bore, and an intermediate shank portion of reduced cross section slidably disposed in said second bore, said body portion being at least as long as said first bore, said shank portion being of greater length than said second bore, and said head portion being positioned for abutting engagement with said collar to restrict forward movement of said marking tip, a valve having an apertured valve seat mounted within and sealingly engaging said barrel adjacent said open end, a laterally resilient annular flange projecting forwardly from said valve seat into surrounding sealing engagement with the exterior surface of said gripping section collar portion, a valve member movable within said reservoir between a forward position sealingly engaging said valve seat and a rearward position spaced from said valve seat, the head of said marking tip projecting into engagement with said valve member when said barrel and said gripping section are assembled, whereby member may be moved from said forward position to said rearward position in response to corresponding longitudinal sliding movement of said marking tip, and a means disposed within said reservoir urging said valve member and said marking tip simultaneously in a forward direction to prevent movement of writing fluid from said reservoir and to partially project said marking tip body portion from the forward end portion of said gripping section.

13. In a writing implement, the combination of a reservoir section having an open end, a gripping section having a rearward mounting portion adapted to be detachably assembled with the open end of said reservoir section, a valve unit disposed within said reservoir section for controlling fluid communication between said reservoir section and said gripping section, said gripping section defining a pair of co-axial bores including a first bore extending through the forward end thereof and a second bore of reduced diameter extending from said first bore through the mounting portion thereof, a plurality of radially protuberant longitudinal splines disposed within said first bore, a marking tip having an absorbent body portion slidably disposed in said first bore, a head portion disposed rearwardly of said second bore for operating engagement with said valve unit, and an intermediate

shank portion of reduced cross section slidably disposed in said second bore, said shank portion being of greater length than said second bore and said head portion being positioned for abutting engagement with said mounting portion thereby restraining said tip against loss through the forward end of said gripping section, the cross-sectional diameter of said body portion being smaller than the diameter of said first bore, the longitudinal splines in said first bore being effective to support said marking tip body portion in spaced relation with respect to the bore defining walls of said gripping section and thus provide a longitudinal fluid passageway adjacent said body portion within said first bore, and said head portion being resiliently displaceable whereby said tip may be removed manually from said bores.

14. In a writing implement having a barrel section and a gripping section releasably joined to the forward end of the barrel section in axial alignment therewith, a valve disposed in said barrel section, said valve comprising a valve seat, a valve member movable between a forward position sealingly engaging said valve seat and a rearward position spaced from said valve seat, and means urging said valve member forwardly into sealing engagement with said valve seat, and a marking element slidably disposed within said gripping section for engagement of the rearward end thereof with the forward end of said valve member, whereby said valve member may be moved rearwardly in response to corresponding movement of said marking element, said marking element comprising two separable sections one of which is disposed forwardly of the other for writing engagement with a writing surface, said one section being in frictional engagement with portions of the surrounding gripping section and having reduced forward and rearward ends, and said other section of said marking element having its forward end recessed to accommodate alternatively the reduced ends of said one section whereby said one section may be reversed.

15. The structure of claim 14 wherein the reduced ends of said marking element one section differ in configuration and writing characteristics.

16. In a writing implement, the combination of a reservoir section having an open end, a gripping section having a rearward mounting portion adapted to be detachably assembled with the open end of said reservoir section, a valve unit disposed within said reservoir section for controlling fluid communication between said reservoir section and said gripping section, said gripping section defining a pair of co-axial bores including a first bore extending through the forward end thereof and a second bore of reduced diameter extending from said first bore through the mounting portion thereof, a plurality of radially protuberant longitudinal splines disposed within said first bore, a marking tip having an absorbent body portion slidably disposed in said first bore, a head portion disposed rearwardly of said second bore for operating engagement with said valve unit, and an intermediate shank portion of reduced cross section slidably disposed in said second bore, said shank portion being of greater length than said second bore, the cross-sectional diameter of said body portion being smaller than the diameter of said first bore, the longitudinal splines in said first bore being in frictional engagement with and effective to support said marking tip body portion in spaced relation with respect to the bore defining walls of said gripping section and thus provide a lonigtudinal fluid passageway adjacent said body portion within said first bore.

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UNITED STATES PATENT OFFICE

CERTIFICATE OF CORRECTION

Patent No. 3,233,275 February 8, 1966

Lewis C. Hansen et al.

It is hereby certified that error appears in the above numbered patent requiring correction and that the said Letters Patent should read as corrected below.

Column 2, line 71, for "an disposable" read -- and disposable --; column 5, line 13, for "distented" read -- distended --; column 9, line 10, for "opening" read -- open --; column 10, line 44, for "an" read -- and --; column 11, line 36, for "projectiong" read -- projecting --.

Signed and sealed this 10th day of January 1967.

(SEAL)
Attest:

ERNEST W. SWIDER
Attesting Officer

EDWARD J. BRENNER
Commissioner of Patents