

[54] DISPOSABLE PIPETTE

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[52] U.S. Cl. 23/259, 23/253 TP, 23/253 R, 23/292, 73/425.4 R, 73/425.4 P, 73/425.6

[51] Int. Cl. G01n 1/14, G01n 1/06

[58] Field of Search 23/292, 259, 253, 23/253 TP; 73/425.4 P, 425.4 R, 425.6

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[57] ABSTRACT

Apparatus into which fluids are taken and which comprises transparent resilient plastic tubes, or straws, of substantially uniform inside diameter and within which are disposed reagent matrixes, or chemically impregnated reagent or indicator strips, for absorbing and/or holding color reactions for visual or photometric interpretation or analysis.

Liquid samples are introduced into the tube, which may be termed a straw, so the liquid samples come into contact with ends of the reagent materials, which then absorb and/or hold color reactions for visual or photometric interpretation or analysis.

The tubes or straws may be open at both ends, or closed at one end and open at the other. Tubes which are closed at one end have the reagent material at the open end of such tubes, and liquid samples are introduced or drawn into the tubes by suction effected by compressing a short section of the tubes and then releasing the compressed part of the tube. The liquid is discharged from the tube by again compressing a section of the tube.

9 Claims, 14 Drawing Figures

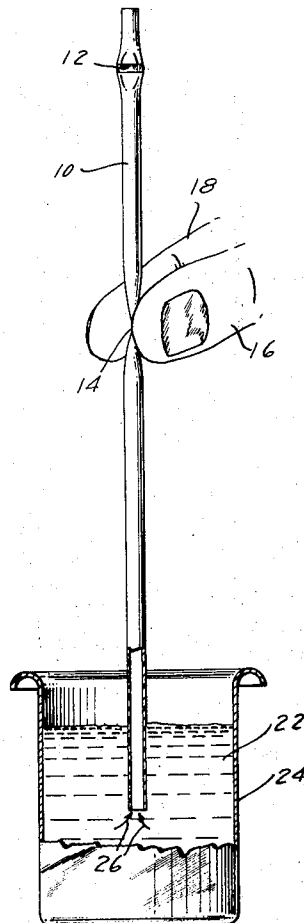


Fig. 1.

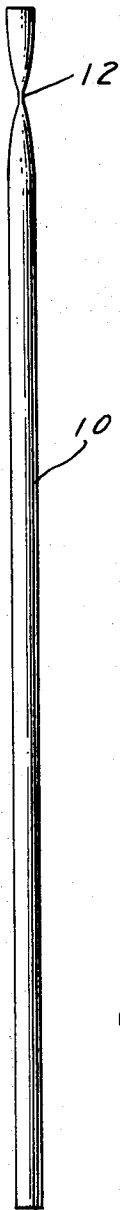


Fig. 4.

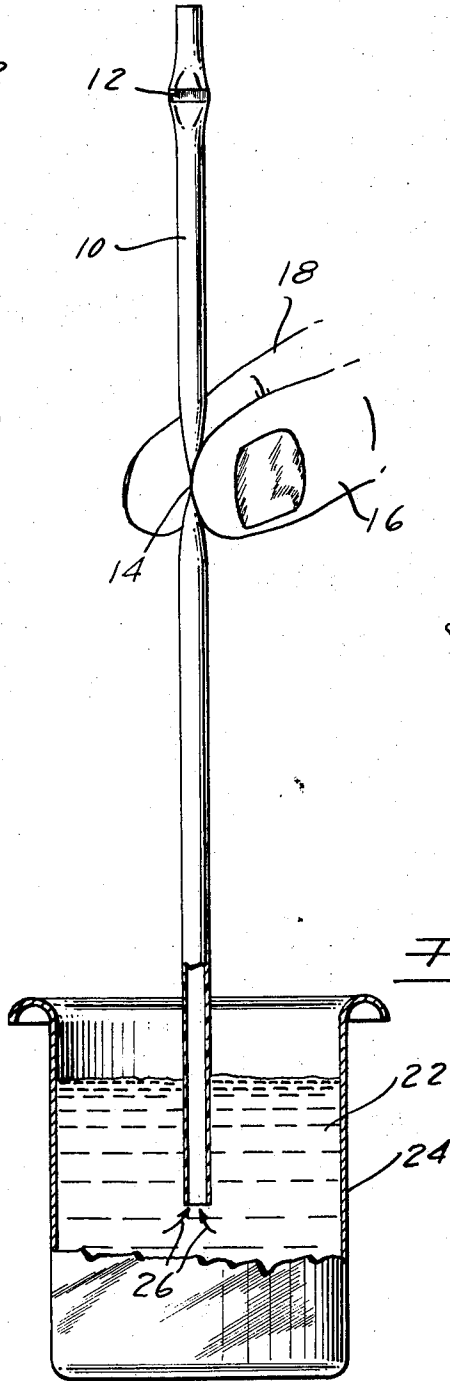


Fig. 3.

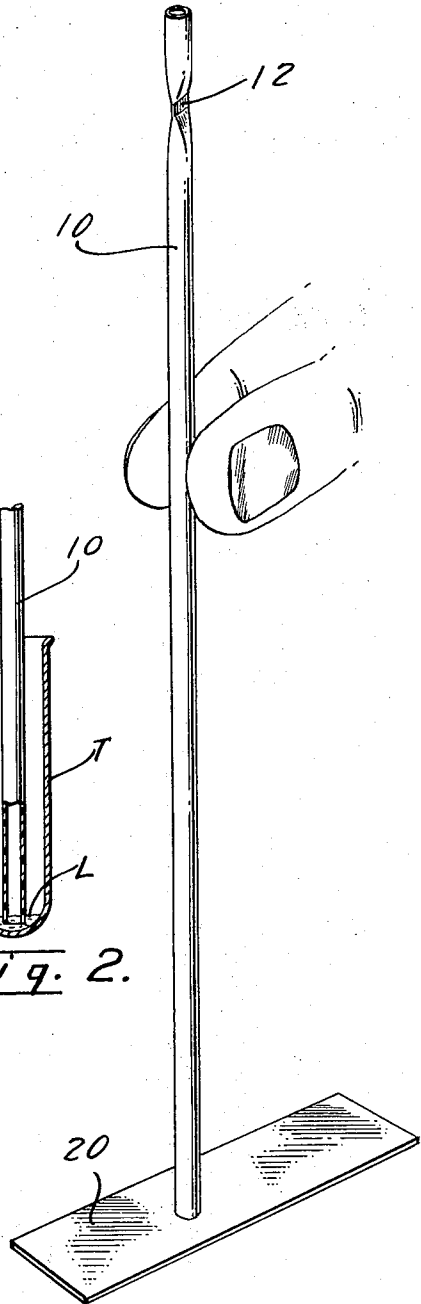
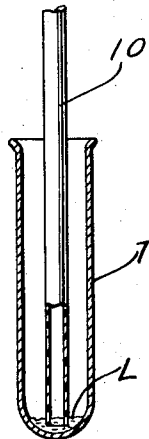


Fig. 2.



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Fig. 5.

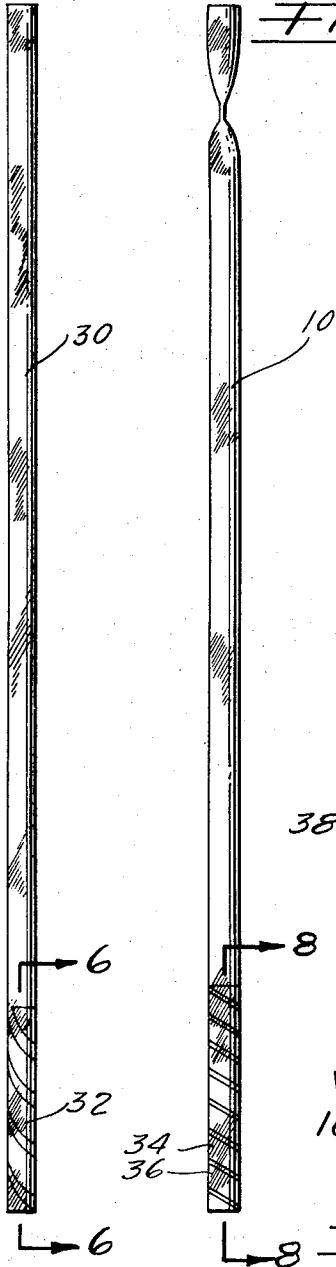


Fig. 7.

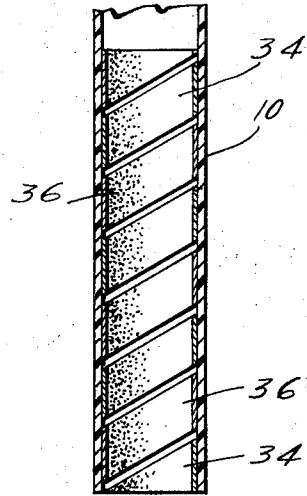
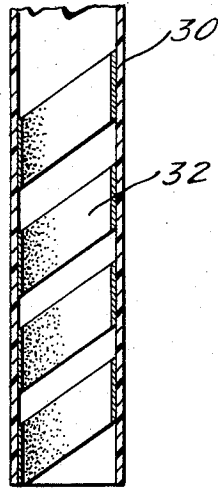


Fig. 6.

Fig. 8.

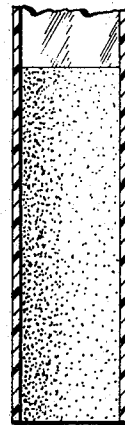
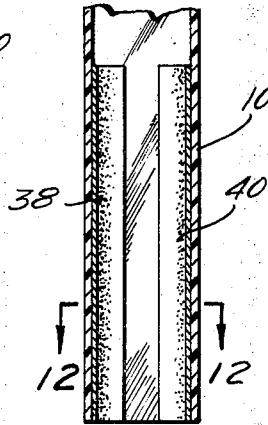
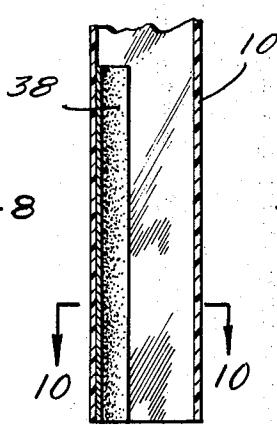


Fig. 9.

Fig. 11.

Fig. 13.

Fig. 10.

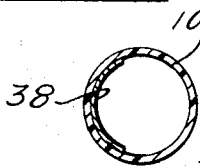


Fig. 12.

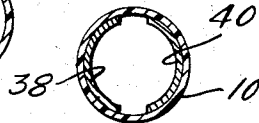
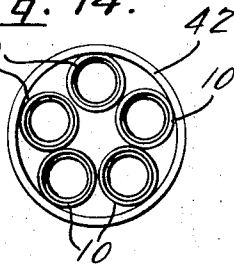


Fig. 14.



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DISPOSABLE PIPETTE**BACKGROUND OF THE INVENTION****1. Field of the Invention**

This invention relates, generally, to instruments for scientific work and the like and relates, more particularly, to pipettes used in making laboratory tests.

2. Description of the Prior Art

Apparatus is known into which fluids are taken and such apparatus principally consists of a narrow glass tube, open at both ends, with a reduced diameter forward or lower end portion into which the liquid is drawn by manual suction and retained therein by closing the upper end of the tube.

The suction is usually created by placing the upper end of the tube in the mouth and sucking the liquid into the tube. It is extremely difficult with this method to draw a predetermined or specific amount of fluid into the tube, as is often required or highly desirable. Also, such apparatus is subject to breakage.

Since such apparatus is relatively expensive it must be used over and over, and must be sterilized after each use. Sterilization, of course, takes time and several handlings of the apparatus.

Various types of chemically impregnated reagent strips are presently used to give a color reaction for visual or photometric interpretation or analysis but under certain conditions false test results occur.

Further, these strips are usually held with the fingers by the operator and the sample being tested is apt to get onto the operator's fingers.

SUMMARY OF THE INVENTION

The present invention comprises a transparent tube of resilient material such as, for example, a resilient plastic unaffected by the samples handled by the tubes.

The tubes serve not only as pipettes but, also, as holders for reagent matrixes, or chemically impregnated reagent strips, for absorbing and/or holding color reactions for visual or photometric interpretation or analysis. There may be a plurality of such strips, or single strips, and these strips may extend longitudinally of the tubes, or they may be spirally arranged. Also, a reagent matrix may be coated on the inside surface of the straws, or tubes.

The term "reagent material" as used herein includes both reagent matrixes and chemically impregnated reagent strips.

The term "clear" is used herein to mean reagent material within the tubes, or straws, which are sufficiently visible to identify the color, or colors, of such reagent material and the intensity of such colors.

OBJECTS AND ADVANTAGES OF THE INVENTION

It is an object of the invention to provide a very inexpensive and sanitary pipette that may be disposed of or thrown away after one use, so that it is unnecessary to sterilize it after being used.

It is another object of the invention to provide a device or apparatus of this character that is sufficiently accurate for various laboratory uses and that is extremely easy to use.

Still another object of the invention is to provide an apparatus or a device of this character that is a holder for reagent material; that is, it is a holder for chemically-impregnated reagent strips which absorb and/or hold

color reactions for visual or photometric interpretation or analysis.

A further object of the invention is to provide a device of this character which eliminates holding reagent strips by hand, so that sample material will not get onto the operator's fingers or hands.

A still further object of the invention is to provide devices of this character with which extremely accurate test results are secured, false results being eliminated.

Another object of the invention is to provide a tubular straw or device of this character having one end closed and wherewith suction to draw liquid thereinto is effected by squeezing a portion of the tubular straw between the thumb and a finger of the operator after the lower end or tip portion is placed into the liquid, or the lower end of the device may be placed into the liquid first and then the device squeezed.

Still another object is to provide a device of this character that is transparent, or at least sufficiently clear visually, to see the reaction colors and the intensity of the reagent material in the tubes or straws.

The characteristics and advantages of the invention are further sufficiently referred to in connection with the following detailed description of the accompanying drawings, which represent one embodiment. After considering this example, skilled persons will understand that many variations may be made without departing from the principles disclosed and we contemplate the employment of any structures, arrangements or modes of operation that are properly within the scope of the appended claims.

BRIEF DESCRIPTION OF THE DRAWINGS

Referring to the drawings, which are for illustrative purposes only:

FIG. 1 is a side-elevation view of the apparatus embodying the invention;

FIG. 2 is a fragmentary view of the end portion of the apparatus disposed in a test tube for drawing in liquid at the bottom of said test tube;

FIG. 3 is a perspective view of the apparatus with the lower end containing liquid disposed for depositing the liquid on a slide and preparatory to depositing said liquid on the slide by squeezing the tube between the thumb and a finger;

FIG. 4 is a side-elevation view of the apparatus or device with the lower end immersed in liquid in a beaker, a portion of the beaker being broken away to more clearly show the immersed portion of the tube, a portion of the tube being squeezed between the thumb and a finger of the operator;

FIG. 5 is a side-elevation view of a tube or straw having a single chemically-impregnated indicator strip or tape spirally arranged within the tube;

FIG. 6 is an enlarged, fragmentary sectional view of the portion of the tube or straw having the spirally-arranged, chemically-impregnated tape, and taken on line 6-6 of FIG. 5;

FIG. 7 is a view similar to FIG. 5 but having two spirally-arranged, chemically-impregnated indicator tapes;

FIG. 8 is an enlarged sectional view taken on line 8-8 of FIG. 7;

FIG. 9 is an enlarged, fragmentary sectional view of an alternative arrangement having a single chemically-impregnated or treated indicator strip;

FIG. 10 is a sectional view taken on line 10—10 of FIG. 9;

FIG. 11 is a view similar to FIG. 9 but with two indicator strips;

FIG. 12 is a sectional view taken on line 12—12 of FIG. 11;

FIG. 13 is an enlarged, fragmentary sectional view of a tube or straw having an inner portion coated with a reagent matrix; and

FIG. 14 is a cross-sectional view of another alternative arrangement.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring more particularly to the drawings, there is shown an apparatus or a device embodying the invention, said apparatus or device comprising a tube 10 of resilient material such as a plastic, polyethylene being one type of plastic that has been found to be very satisfactory. While the wall of the tube is resilient the tube is rigid longitudinally and not readily bent. The tube 10 has a relatively thin wall and is of uniform inside diameter, and is closed adjacent one end as at 12. As shown, the closed end is the upper end and closing of the upper end of the tube is effected by heat sealing. While it is not necessary, it is desirable that the tube be sufficiently transparent so that the liquid taken into the tube will be visible. The tube may be of any desired inside diameter but for certain tests an inside diameter of five thirty-seconds inch has been found to give very satisfactory results for picking up and depositing the desired amount or quantity of liquid upon squeezing a portion or section of the tube between the operator's thumb and a finger, and then releasing the pressure on such portion of the tube. To discharge this liquid the tube is again squeezed. When the tube is again released the resilient wall returns to its normal shape or configuration.

The liquid may be any sample to be tested and/or examined under a microscope, or otherwise examined and/or checked.

In FIG. 2 there is shown a glass test tube T with a small quantity of sample liquid L in the bottom. The lower end of the tube 10 is at the bottom of the test tube and, with the tube in this position, an upper part 14 of the tube below the seal 10 is squeezed between the operator's thumb 16 and a finger 18, as best shown in FIG. 4. That portion of the tube that is squeezed between the operator's thumb and finger is sufficient to draw the desired quantity or amount of the liquid into the tip end of the tube when pressure of the thumb and finger on the tube is released to permit the resilience of the tube to return the squeezed part 14 to its normal cylindrical form or shape. When the part 14 returns to its normal shape suction is created in the tube to draw up the desired quantity.

In FIG. 3 the tube 10 is shown with its lower or open tip end positioned for depositing the liquid therein onto a slide 20 for use in making a microscopic examination of the fluid. In FIG. 3 the tube 10 and the thumb and finger are shown preparatory to depositing the fluid onto said slide. In order to deposit the liquid onto the slide the tube is squeezed between the thumb and finger, thus providing air pressure within the tube to force the liquid in the tip end portion onto the slide. After the apparatus or device 10 has been used it is thrown away or disposed of, it being for use only once and thus saving the necessity of sterilizing it.

In FIG. 4 the apparatus or device is shown with the lower tip end immersed in liquid 22 in a beaker 24. The portion or section 14 of the tube has been squeezed between the operator's thumb and a finger and is about to be released to draw liquid into the tip end portion of the tube, as indicated by the arrows 26. Liquid thus drawn into the tube is deposited onto a slide, as described above.

It is to be understood, of course, that the liquid drawn into the tube may be deposited elsewhere than on the slide, this being merely one way the apparatus or device may be used.

PIPETTE AS A HOLDER FOR REAGENT MATRIX OR INDICATOR STRIPS

Certain substances interfere with certain tests. For example, certain tests in making urinalysis interfere so that false reactions occur.

Substances such as ascorbic acid (Vitamin C) interfere with the glucose reaction. Also, large concentrations of acetone in the urine can inhibit the reaction of the glucose tests with certain of the chemically treated reagent strips.

Other interfering substances of the glucose oxidase paper tests are as follows:

1. L-dope drug used for treatment of Parkinson's disease will show a false negative strip test. High concentrations will show a false positive test with certain strips.
2. Alcaptonuria will show a false negative.
3. Salicylates (aspirin) 2-4½ gms per day. (Approximately 12 to 32 five grain tablets) will show false negative tests.
4. Serotonin and its metabolites will show false negative results.
5. Uric acid, a normal component of the urine can inhibit the reaction.
6. Generally, all reducing substances similar to the drugs mentioned above, including the most commonly used, Vitamin C, could produce false negative reactions.

The present invention overcomes the difficulties encountered in making tests with present methods and strips, and gives accurate results. The results produced with the present invention give visual indications based on color and/or color intensity.

Referring to FIGS. 5 and 6, there is shown a straw 30 which may be of the same plastic material as the straw 10 hereinabove described. In the lower end there is a chemically-impregnated reagent strip 32, which may be of any suitable well known character, for making a particular test. For example, the strip may be a Tes-Tape of the Lilly Company for making a test for glucose. PH indicator strips and other types of indicator strips can, also, be used. In FIG. 5 the strip 32 is spirally disposed in the straw or tube 30. It is to be noted that the spiral edges are spaced apart and are absorbent.

In making a test with this device, a small amount of the sample to be tested is drawn into the lower end thereof and at least a part of this sample will be drawn to the upper end of the strip by capillary attraction. As the urine sample moves up in the reagent strip used for making the glucose test, interfering substances, such as ascorbic acid (vitamin C), which interfere with the glucose reaction are absorbed. When all or most of the interfering substances have been absorbed, the reaction will occur with the glucose, if present, and the color in-

dication will appear at the upper end of the strip. Without the absorption of the interfering substances, false negative results will occur and be reported.

By having the strips spirally arranged in the straws, a relatively long strip will occupy but a short portion of the straw.

In FIG. 5 the straw is shown as being open at both ends and external suction can be applied to the open upper end to draw a small sample of the urine into the lower end of the straw. However, the upper end of the straw may be closed, as shown in FIGS. 1, 3, 4 and 7, and the sample drawn into the lower end of the straw by squeezing a portion of the straw between the thumb and a finger of the operator, as shown in FIG. 3 and described hereinabove.

After the straw has been used for the test it is disposed of.

Referring to FIGS. 7 and 8, there are a plurality of indicator strips disposed spirally within a lower end portion of the straw. Adjacent edges of the indicator strips are spaced apart. As shown in FIGS. 7 and 8, there are two spirally-arranged tapes or indicators, although there may be more than two, these tapes being indicated at 34 and 36, respectively. One type of the indicator strips may be for a glucose test while the other may be for a PH test. Strips for other tests may, also, be used.

It has been found that the spiral strips remain in position within the straws due to a certain amount of resilience of the material of such strips. In other words, the strips are held in position by friction.

Referring to FIG. 9, there is shown indicator strip 38 disposed longitudinally within the straw 10. This strip is, also, held in place by friction, by having the strip slightly wider than the inside diameter of the straw. However, the strip 38 may be secured within the straw and held in position by means of an adhesive of any suitable character.

In FIG. 11 a plurality of strips are disposed within the straw, said strips being indicated at 38 and 40, respectively. The strips should be spaced apart somewhat to prevent intermixing of the chemicals of the respective strips.

Referring to FIG. 13, there is shown a straw having a lower end portion of the interior coated with a reagent or gel matrix adapted to provide a desired reaction. While the entire area of this lower end portion is shown as being coated with the reagent or gel matrix, it is to be understood that this area may be provided with reagents or gel matrixes of different characteristics to have different reactions and produce different test results. Here again, the areas coated with the respective reagents or gel matrixes should be separated.

Referring to FIG. 14, there is shown a holder tube 42 of a clear material such as a clear plastic, for example. Within the holder tube are a plurality of straws which may be either of the closed type 10 or the type 30, or a combination thereof. As shown, however, the straws are indicated as being of the type 10. With this arrangement there can be separate, simultaneous reactions within the respective straws. The straws may contain

either spirally-arranged tapes or longitudinally-arranged tapes, or the coated tapes such as shown in FIG. 13. The straws may have one or a plurality of spirally-arranged or longitudinally-arranged tapes.

As described above, the straws may be used as sample pipettes as well as holders for the reagent matrixes or chemically-impregnated reagent strips for absorbing and/or holding color reactions for visual or photometric interpretation or analysis. The straws having the reagent matrixes or the chemically-impregnated reagent strips will also function as pipettes as, for example, for depositing at least a portion of the sample on the slide 20.

Thus, more accurate tests are provided with the present invention and the handling of urine is minimized. Further, there is a substantial saving of time in making tests.

The invention and its attendant advantages will be understood from the foregoing description and it will be apparent that various changes may be made in the form, construction and arrangement of the parts of the invention without departing from the spirit and scope thereof or sacrificing its material advantages, the arrangement hereinbefore described being merely by way of example, and we do not wish to be restricted to the specific form shown or uses mentioned, except as defined in the accompanying claims.

We claim:

1. A disposable sample pipette adapted to be disposed in a sample liquid to be drawn thereinto, comprising:

A. an elongated clear tube of resilient material, closed at one end and open at the opposite end whereby when the open end is disposed in the liquid and squeezing pressure is first applied thereto intermediate said ends to collapse the tube and the pressure is thereafter released therefrom sample liquid is drawn into said open end and retained therein:

B. and a reagent arranged on the inner surface of said tube adjacent the open end thereof for contact with said sample liquid taken into said tube.

2. The invention defined by claim 1, wherein the reagent is in the form of spirally arranged strips.

3. The invention defined by claim 1, wherein the reagent is a single strip in said tube.

4. The invention defined by claim 2, wherein the reagent is in the form of a plurality of strips in said tube, said strips being spaced apart.

5. The invention defined by claim 4, wherein there are two strips in said tube.

6. The invention defined by claim 1, wherein the strips extend longitudinally in said tube.

7. The invention defined by claim 1, wherein the reagent comprises a coating on the interior of said tube.

8. The invention defined by claim 7, wherein the coating comprises a gel matrix.

9. The invention defined by claim 1, including a clear holder tube, and a plurality of said pipette tubes disposed therein.

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