



US 20040204655A1

(19) **United States**

(12) **Patent Application Publication**

Stock et al.

(10) **Pub. No.: US 2004/0204655 A1**

(43) **Pub. Date: Oct. 14, 2004**

(54) **BREATH ALCOHOL MEASURING DEVICE WITH IMPROVED MOUTHPIECE**

Publication Classification

(76) **Inventors: Burkhard Stock, Lubeck (DE); Jens Rekow, Lubeck (DE); Rigobert Chrzan, Bad Oldesloe (DE)**

(51) **Int. Cl.⁷ A61B 5/08**
(52) **U.S. Cl. 600/532; 600/529**

Correspondence Address:
MCGLEW & TUTTLE, PC
1 SCARBOROUGH STATION PLAZA
SCARBOROUGH, NY 10510-0827 (US)

(57) **ABSTRACT**

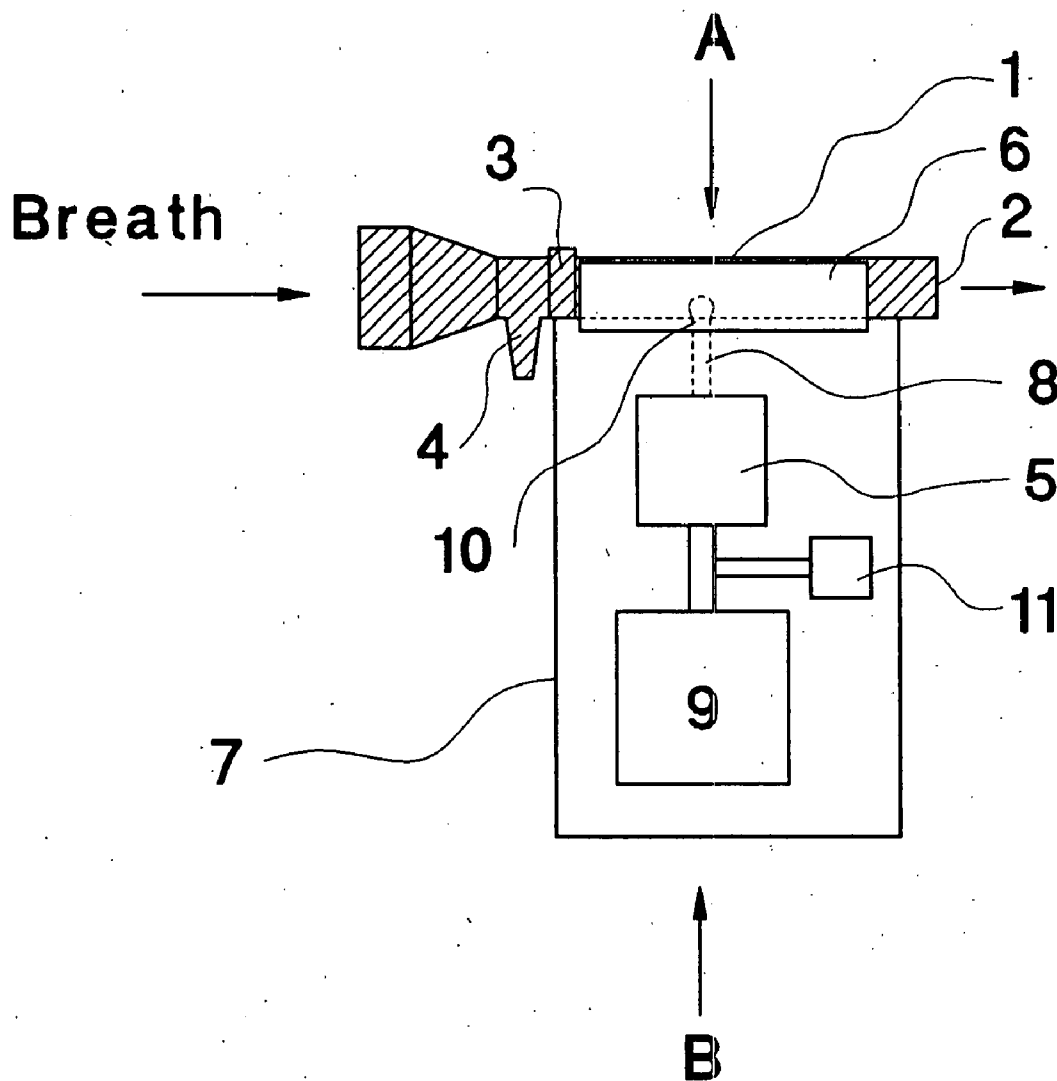
A breath alcohol measuring device (7) is provided with features for superior handling especially of the replaceable mouthpiece (1). A direct physical contact between the test subject being tested and the measuring device is practically ruled out by the combination. The mouthpiece (1) of the breath alcohol measuring device (7) has a trapezoidal cross section, which is complementary to a corresponding negative shape in a holder (6) of the breath alcohol measuring device (7) for the flush mounting of the mouthpiece (1).

(21) **Appl. No.: 10/802,296**

(22) **Filed: Mar. 17, 2004**

(30) **Foreign Application Priority Data**

Apr. 10, 2003 (DE)..... 103 16 333.6



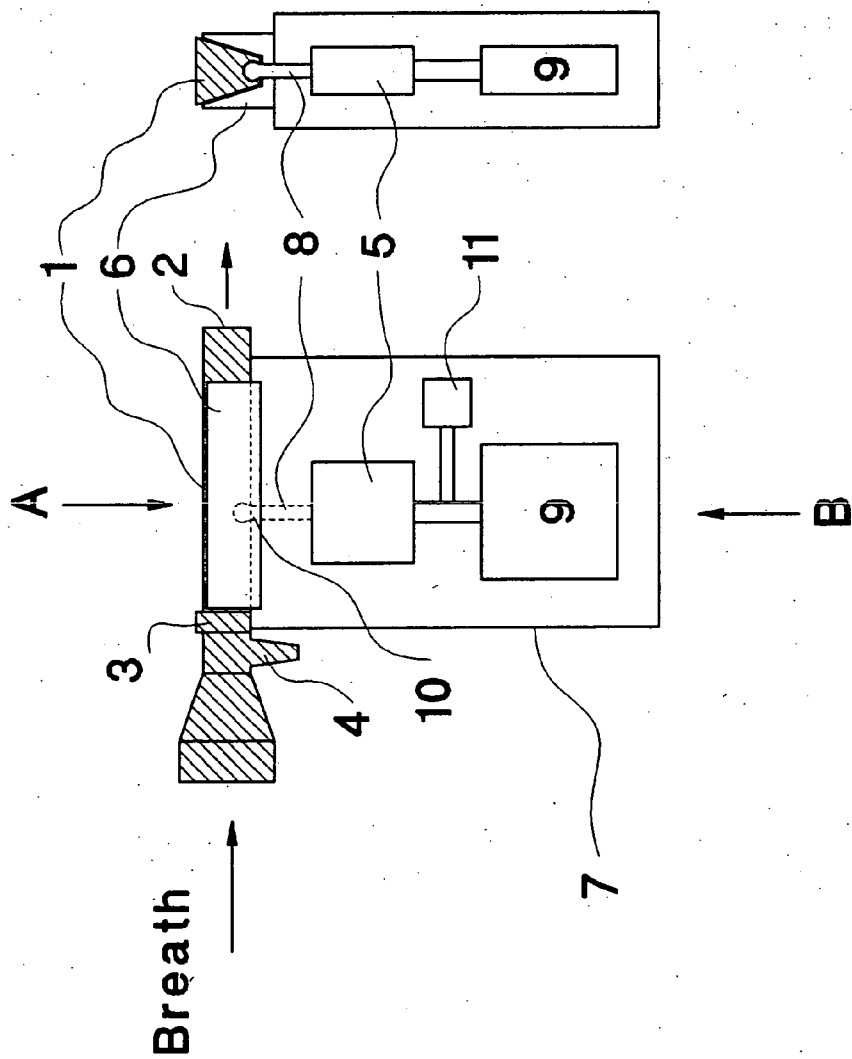


Fig. 1

Fig. 2

BREATH ALCOHOL MEASURING DEVICE WITH IMPROVED MOUTHPIECE

FIELD OF THE INVENTION

[0001] The present invention pertains to a breath alcohol measuring device with a mouthpiece designed as a pressure tube with a hole for sampling breathing gas for an alcohol sensor.

BACKGROUND OF THE INVENTION

[0002] A breath alcohol measuring device of this type has become known from DE 195 45 794 C2, in which the breathing gas flow within the mouthpiece is split into a main gas stream flowing directly to the environment and a measuring gas stream. The measuring gas stream is sent through the sampling system of the device and set due to the design embodiment of the device in terms of the flow volume to a value that corresponds to that delivered by prior-art calibrating devices, so that calibration of the sampling system is possible under real flow conditions. The drawback of this prior-art measuring device is the lack of hygiene and the condensation of the breathing gas stream during the direct flow of the split measuring gas stream through the sampling system.

[0003] Another breath alcohol measuring device of this type is disclosed in EP 0 153 883 A2, in which it is especially difficult to attach the mouthpiece with circular cross section to the measuring device.

SUMMARY OF THE INVENTION

[0004] The basic problem that the present invention addresses is that the mouthpiece must be changed for each test subject in breath alcohol measuring devices for hygienic reasons. This operation should be as simple and rapid as possible, because it is often necessary to test many test subjects with one measuring device in a short time, especially at night under unfavorable light conditions in the case of use by the police. The mouthpiece must have a reliable connection with the measuring device during the measurement so that it will not separate during the measurement. Furthermore, it should be ensured for hygienic reasons that the exhaled breathing gas is fed in the mouthpiece only and does not come into contact with the interior of the measuring device. The test subject should have direct contact with the replaceable mouthpiece only during the release of the breathing gas sample and the test subject should not touch the measuring device with lips of the test subject.

[0005] Thus, the object of the present invention is to provide a breath alcohol measuring device that is substantially improved in terms of its handling and especially the replaceable mouthpiece. At the same time, the direct physical contact between the test subject being tested as well as the exhaled breathing gas sample and the breath alcohol measuring device shall be practically ruled out with the present invention.

[0006] According to the invention, a breath alcohol measuring device is provided with a mouthpiece designed as a pressure tube with a hole for sampling breathing gas for an alcohol sensor. The mouthpiece has a trapezoidal cross section, which is complementary to a corresponding negative shape in the holder of the breath alcohol measuring device. This allows for a flush mounting of the mouthpiece.

[0007] The handling of the breath alcohol measuring device in terms of the replacement and the mounting of the replaceable mouthpiece in the measuring device is substantially simplified by means of the present invention, which can be attributed especially to the trapezoidal cross section of the mouthpiece with the fitting negative shape of the complementary holder at the measuring device.

[0008] An especially preferred embodiment of the present invention is characterized in that the trapezoidal cross section of the mouthpiece is equilateral, and the hole in the mouthpiece for breathing gas sampling is located in the shorter of the two parallel sides of the cross section of the mouthpiece. Another preferred embodiment is characterized in that the mouthpiece has a stop, which extends over at least some sections circumferentially in the circumferential direction of the cross section and which sets the correct position of the mouthpiece in the longitudinal direction relative to the holder, so that the suction channel of the measuring device extends exactly through the hole of the mouthpiece for taking a breathing gas sample.

[0009] An exemplary embodiment of the present invention will be explained in greater detail below on the basis of the figures. The various features of novelty which characterize the invention are pointed out with particularity in the claims annexed to and forming a part of this disclosure. For a better understanding of the invention, its operating advantages and specific objects attained by its uses, reference is made to the accompanying drawings and descriptive matter in which a preferred embodiment of the invention is illustrated.

BRIEF DESCRIPTION OF THE DRAWINGS

[0010] FIG. 1 is a schematic view of a breath alcohol measuring device according to the invention; and

[0011] FIG. 2 is a vertical sectional view taken along the line A-B of FIG. 1.

DESCRIPTION OF THE PREFERRED EMBODIMENT

[0012] Referring to the drawings in particular, FIG. 1 shows the view of a breath alcohol measuring device 7. Similar such measuring devices are available commercially especially under the trademark Alcotest®. The replaceable mouthpiece 1 is inserted into the holder 6 and is made of, e.g., a plastic such as polyethylene. The mouthpiece 1 has a hole 10, through which the suction channel 8 extends into the breathing gas stream (breath stream) blown in from the left as indicated by the arrow in FIG. 1. The pump 9 is actuated such that it delivers a breathing gas sample from the breathing gas stream into the measuring device and consequently into the alcohol sensor 5 by means of a sampling stroke when the test subject has blown a sufficient volume of breathing gas through the mouthpiece 1. The blow-in opening of the mouthpiece 1 is expanded in a circular pattern in order to make possible a good closure with the lips. The mouthpiece 1 also has a trapezoidal cross section as can be seen in FIG. 2. The trapezoidal cross section of the mouthpiece 1 is complementary to a corresponding negative shape in the holder 6 of the breath alcohol measuring device 7. The trapezoidal cross section of the mouthpiece 1 is preferably equilateral, and the hole 10 for sampling breathing gas is

located in the shorter of the two parallel sides of the cross section as can be seen in **FIG. 2**.

[0013] A blow-out opening **2** with a diameter of about 4 mm to 5 mm is located at the outlet-side end of the mouthpiece **1**, which is the right-hand end in **FIG. 1**.

[0014] As a result, the breathing gas stream generates a dynamic pressure, which is detected by means of the pressure sensor **11**. The measured pressure corresponds to a certain breathing gas volume flow, from which the breathing gas volume released is determined by time integration.

[0015] The mouthpiece **1** has the cross section described at least in the area of the holder **6**. The upper parallel side (parallel to the lower side) has a length of about 9 mm. The lower parallel side (parallel to the upper side) has a length of about 4 mm. The height of the trapezoid is about 10 mm. The holder **6** is designed as a negative shape to the shape of the mouthpiece **1**. The mouthpiece can be guided securely on the three lateral surfaces that are complementary to the holder **6** and it is as a result firmly seated in the holder **6**. Furthermore, the trapezoidal cross-sectional shape of the mouthpiece **1** facilitates the attachment to the holder **6**, so that the suction channel **8** extends through the hole **10** as desired. The orientation of the mouthpiece **1** in relation to the measuring device is thus defined unambiguously. Furthermore, an external stop **3** extending circumferentially over at least some sections is present, in particular, in the circumferential direction of the cross section of the mouthpiece **1** for the lateral position of the mouthpiece **1** in the holder **6**, so that the mouthpiece **1** fits the holder **6** in a completely fitting manner only when the suction channel **8** extends through the hole **10**. The stop **3** thus defines the correct lateral position of the mouthpiece **1** in relation to the holder **6**. The positioning pin **4**, which is optionally present, is used, on the one hand, as an aid for the correct orientation of the mouthpiece **1** for being received in the holder **6**, especially also when the mouthpiece **1** is still packaged, e.g., in a transport film. The positioning pin **4** is especially useful in the case of unfavorable light conditions during use for measurement and because the mouthpiece **1** still has to be partially packaged in the contact area for hygienic reasons during the attachment to the holder **6** by the user. In addition, the positioning pin **4** acts as a spacer for the test subject, so that contact between the measuring device and the test subject's lips is prevented from occurring.

[0016] According to a preferred embodiment, the mouthpiece **1** and the holder **6** are symmetrical in relation to the breath alcohol measuring device **7**, so that the mouthpiece **1** can be received in the holder **6** in two different positions differing from each other by 180°, and an additional improvement of the handling of the mouthpiece **1** is thus made possible.

[0017] While a specific embodiment of the invention has been shown and described in detail to illustrate the application of the principles of the invention, it will be understood that the invention may be embodied otherwise without departing from such principles.

What is claimed is:

1. A breath alcohol measuring device, comprising:

a holder; and

a mouthpiece designed as a pressure tube with a hole for sampling breathing gas for an alcohol sensor, the mouthpiece having a trapezoidal cross section, which is

complementary to a corresponding negative shape in said holder for a flush mounting of said mouthpiece.

2. A breath alcohol measuring device in accordance with claim 1, wherein the trapezoidal cross section of the mouthpiece is equilateral, and said hole for taking a breath sample is located in a shorter of two parallel sides of the cross section of the mouthpiece.

3. A breath alcohol measuring device in accordance with claim 1, wherein the alcohol measuring device has a parallelepipedic form and said mouthpiece is received in said holder extending in parallel to one of two shorter end faces of the parallelepipedic breath alcohol measuring device.

4. A breath alcohol measuring device in accordance with claim 2, wherein said mouthpiece has a stop extending outside in a circumferential direction of the trapezoidal cross section over at least some sections of said trapezoidal cross section, said stop setting a position of said mouthpiece in the longitudinal direction in relation to said holder for alignment of an extending suction channel for sampling breathing gas to said hole.

5. A breath alcohol measuring device in accordance with claim 1, wherein said mouthpiece has a positioning pin, which is arranged outside said holder when the mouthpiece is mounted in said holder.

6. A breath alcohol measuring device in accordance with claim 4, wherein the alcohol sensor includes an electrochemical alcohol sensor in flow connection with said suction channel and a pump, wherein the breathing gas is sampled by means of a sampling stroke of said pump, said pump being arranged downstream of said electrochemical alcohol sensor with the breathing gas being drawn through said electrochemical alcohol sensor.

7. A breath alcohol measuring device in accordance with claim 2, wherein said holder and said mouthpiece are symmetrical in relation to the breath alcohol measuring device whereby said mouthpiece can be mounted in said holder without a preferred direction in two different positions forming an angle of 180° with each other.

8. A breath alcohol measuring device, comprising:

a sensor housing with a suction channel;

a holder connected to said sensor housing, said holder having a receiving portion; and

a mouthpiece with a breathing gas passage with a hole for sampling breathing gas, the mouthpiece including a portion with surfaces defining a trapezoidal cross section, said receiving portion of said holder being complementary to some of said surfaces defining the trapezoidal cross section for a flush mounting of said mouthpiece to said holder.

9. A breath alcohol measuring device in accordance with claim 8, wherein the trapezoidal cross section of the mouthpiece is equilateral, and said hole for taking a breath sample is located in a shorter of two parallel sides of the cross section of the mouthpiece.

10. A breath alcohol measuring device in accordance with claim 8, wherein said sensor housing has a parallelepipedic form and said mouthpiece is received in said holder extending in parallel to one of two shorter end faces of the parallelepipedic sensor housing.

11. A breath alcohol measuring device in accordance with claim 9, wherein said mouthpiece has a stop extending radially outwardly of the trapezoidal cross section over at least some sections of said trapezoidal cross section, said stop setting a position of said mouthpiece in a longitudinal direction in relation to said holder for alignment of an extending suction channel for sampling breathing gas to said hole.

12. A breath alcohol measuring device in accordance with claim 9, wherein said mouthpiece has a positioning pin, which is arranged outside said holder when the mouthpiece is mounted in said holder.

13. A breath alcohol measuring device in accordance with claim 11, wherein the alcohol sensor includes an electrochemical alcohol sensor in said sensor housing and in flow

connection with said suction channel and includes a pump in said sensor housing, wherein the breathing gas is sampled by means of a sampling stroke of said pump, said pump being arranged downstream of said electrochemical alcohol sensor with the breathing gas being drawn through said electrochemical alcohol sensor.

14. A breath alcohol measuring device in accordance with claim 9, wherein said holder and said mouthpiece are symmetrical in relation to said sensor housing whereby said mouthpiece can be mounted in said holder without a preferred direction in two different positions forming an angle of 180° with each other.

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