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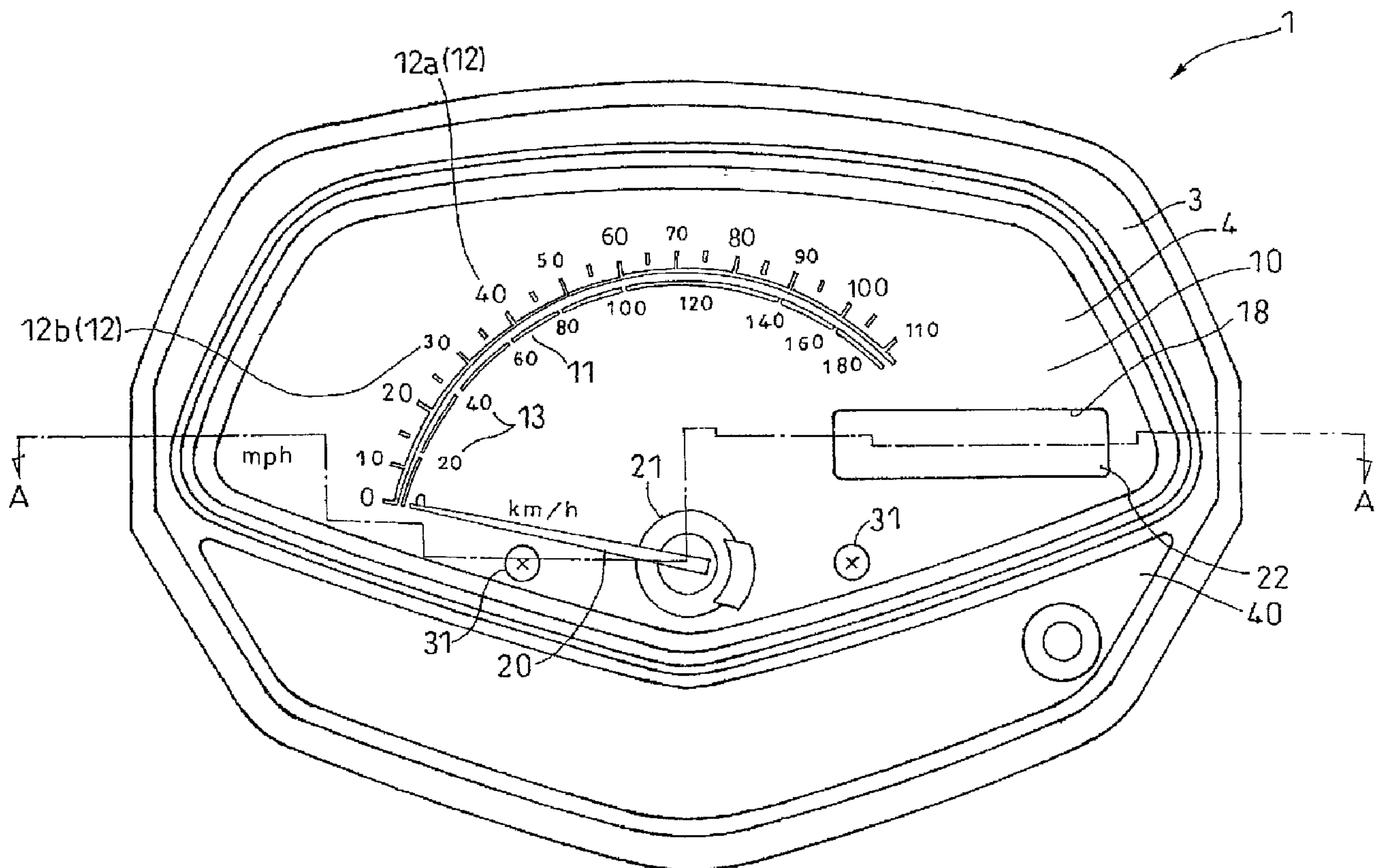
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(54) Title: VEHICLE METER



(57) **Abrégé/Abstract:**

A vehicle meter mounted on a motorcycle has a structure capable of ensuring more satisfactory visibility relative to characters arranged on a dial through transmitted light even in the twilight or under sodium lights. In a vehicle meter including a dial and light

(21) **2 665 321**(13) **A1**

(57) **Abrégé(suite)/Abstract(continued):**

sources provided on the rear face of the dial, a plurality of characters (capital characters and small characters) arranged on the dial are displayed by transmitting light from the light sources (a plurality of LEDs 25) and formed differently from each other in amount of transmitted light. The characters arranged on the dial are increased and decreased in amount of transmitted light to improve the visibility of the character (the capital letter) intended to be emphasized. This makes it easy to visually recognize the entire string of characters in the vehicle meter.

ABSTRACT OF THE DISCLOSURE

A vehicle meter mounted on a motorcycle has a structure capable of ensuring more satisfactory visibility relative to characters arranged on a dial through transmitted light even in the twilight or under sodium lights. In a vehicle meter including a dial and light sources provided on the rear face of the dial, a plurality of characters (capital characters and small characters) arranged on the dial are displayed by transmitting light from the light sources (a plurality of LEDs 25) and formed differently from each other in amount of transmitted light. The characters arranged on the dial are increased and decreased in amount of transmitted light to improve the visibility of the character (the capital letter) intended to be emphasized. This makes it easy to visually recognize the entire string of characters in the vehicle meter.

VEHICLE METER

FIELD OF THE INVENTION

5 The present invention relates generally to a vehicle meter such as a speed meter, a tachometer, etc. mounted on a vehicle. In particular, the invention relates to a vehicle meter, mounted on a motorcycle, that achieves an improvement in twilight or nighttime visibility of characters such as numerals, arranged on a dial of the vehicle meter.

10 BACKGROUND OF THE INVENTION

A vehicle meter mounted on a motorcycle is configured, by way of example, to include a dial and a light source provided on the back face of the dial as described in the conventional art of Japanese Patent Laid-open No. Hei 8-128865 (paragraph number 0004). The dial of the vehicle meter includes a base plate
15 formed of a light-shielding plate and a transmissive portion shaping characters such as numerals arranged on the base plate. With the vehicle meter configured as above, during nighttime traveling, light emitted from the light source passes through the transmissive portion from the rear side of the dial so that the characters are visually recognized from the view point of an operator mounting
20 on the vehicle.

If the vehicle meter configured as above uses a white dial, the characters are displayed with transmitted light passing through the characters (the transmissive portion) arranged on the white dial. However, deformation of the characters
25 occurs due to outside light reflected from the white dial and to glare of the transmitted light. Thus, it is relatively difficult to visually recognize the characters drawn on the white dial from the riding view point in some cases.

In particular, compared with four-wheel vehicles arranged with a meter in the compartment, two-wheel vehicles with a meter exposed to the outside are very significantly affected by outside light. Thus, it is probable that it is difficult to visually recognize light passing through the characters of the dial in the twilight,
5 namely, under dim outside light, under the freeway lightings in the United States, or under sodium lightings used as in-tunnel illumination.

It is sometimes possible to deal with such a case by modifying the dial into blackish colors, by changing the font design or font size of the characters, or by
10 adding edging to characters. However, the recent motorcycles have harmoniously designed under a single concept including vehicle design. Therefore, even if the color of the dial of the vehicle meter which is part of the concept is modified, the designer's target for the type cannot frequently be achieved.

15 The present invention has been made in view of the above-mentioned situations and it is an object of the invention to provide a vehicle meter structure that can ensure more satisfactory visibility relative to characters arranged on a dial through transmitted light even in the twilight or under sodium lights.

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SUMMARY OF THE INVENTION

The vehicle meter of the present invention is firstly characterized by including a dial; and a light source provided on a rear face of the dial; and in that a plurality
25 of characters arranged on the dial are displayed by transmitting light from the light source, and the characters are made different from each other in amount of transmitted light and a character with a small amount of transmitted light is arranged between characters with a large amount of transmitted light.

30 According to the present invention having the first characteristic, the characters arranged on the dial are increased or decreased in amount of transmitted light. Therefore, while the electric power consumption of the light source is not increased, that is, remains unchanged, visibility of a character intended to be emphasized can be improved.

The vehicle meter of the present invention is secondly characterized in that the characters are arranged such that adjacent characters have a given difference therebetween in amount of transmitted light.

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According to the present invention having the second characteristic, the adjacent characters are made to have a difference therebetween in amount of transmitted light. Therefore, in the string of characters, characters intended to be improved in visibility for emphasizing can alternately be arranged.

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The vehicle meter of the present invention is thirdly characterized in that the characters are such that a character with a large amount of transmitted light is displayed in large font size, whereas a character with a small amount of transmitted light is displayed in small font size.

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According to the present invention having the third characteristic, the character with a large amount of transmitted light is displayed in large font size, whereas a character with a small amount of transmitted light is displayed in small font size. Therefore, the visibility of the characters can further be made different in degree from each other.

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The vehicle meter of the present invention is fourthly characterized in that the characters are such that the character displayed in large font size is different in font from that in small font size.

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According to the present invention having the fourth characteristic, the character displayed in large font size is different in font from that in small font size. Therefore, it can be facilitated to discriminate the characters.

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The vehicle meter of the present invention is fifthly characterized in that the dial is formed in a whitish color and the light emitted from the light source is made reddish.

According to the present invention having the fifth characteristic, if the dial is formed in whitish colors, light emitted from the light source is made reddish. Therefore, the visibility of transmitted light can be made satisfactory when the character display is performed in the whitish dial by light passing therethrough.

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The vehicle meter of the present invention is sixthly characterized in that the light source is formed of a plurality of light-emitting diodes.

According to the present invention having the sixth characteristic, the light source is formed of a plurality of light-emitting diodes. Therefore, uniform transmitted light is given to the characters arranged in the wide range of the dial. In addition, electric power consumption can be reduced.

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The vehicle meter of the present invention is seventhly characterized in that a vehicle using the vehicle meter is a motorcycle.

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According to the present invention having the seventh characteristic, the vehicle meter is used in a motorcycle without a roof. The degradation in visibility can be prevented in a case susceptible to an influence of outside light.

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BRIEF DESCRIPTION OF THE DRAWINGS

Preferred embodiments of the invention are shown in the drawings, wherein:

Fig. 1 is an explanatory plan view of a vehicle meter according to an embodiment of the present invention.

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Fig. 2 is an explanatory cross-sectional view of the vehicle meter taken along line A-A of Fig. 1.

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Fig. 3 is an explanatory plan view for assistance in explaining a dial and support panel portion used in the vehicle meter.

Fig. 4 is an explanatory plan view of the partially expanded dial including characters.

5 Figs. 5(a), (b) and (c) are schematic views for assistance in explaining the configuration of the character portion displayed on the dial.

Fig. 6 is an explanatory plan view of a circuit board used in the vehicle meter.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

10 An embodiment of a vehicle meter according to the present invention will hereinafter be described with reference to the drawings.

A vehicle meter is provided, for example, on the upper portion of a steering device attached to the front side of a motorcycle.

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Referring to Figs. 1 and 2, the vehicle meter 1 includes a lower case 2 integrally formed of resin or the like to have an attachment portion (not illustrated) for the steering device; an upper case 3 secured to cover the lower case 2; a dial 10 on which characters such as numerals indicating speed, etc. are displayed; a support plate 30 used to support the dial 10; and light sources (LEDs) provided on the back surface of the dial 10 and support plate 30. The upper surface of the upper case 3 is formed of a resinous transparent cover 4 so that the characters of the dial 10 can visually be recognized from outside.

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25 The dial 10 is such that a light-shielding print material having a whitish color being a dial color is printed, in a stratified manner, on the rear face of its substrate excluding a portion corresponding to a graduation portion 11 and a pattern display portion such as characters 12, 13, etc. In addition, a black print material is laminated on the pattern display portion so as to cover the light-shielding print material and to have a translucent structure. The substrate is formed of a transparent acrylic material or the like. In this way, if the dial 10 is viewed from the front side, a fan-like black graduation portion 11, mile (mph)-display black numerals 12 on the upper side of the graduation portion 11 and

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kilo (km/h)-display black numerals 13 on the lower side of the graduation portion 11 are arranged on the front face of the whitish dial.

5 In the dial 10 illustrated in Figs. 1 and 3, the numerals 12, 13 and the graduation portion 11 are designed to transmit light emitted from the light sources for character display. Specifically, the black portions of the numerals and of the graduation portion (in Fig. 3, the areas internally edging the numerals and the graduation portion) are formed such that the transmissive portions (see-through portions) and the light-shielding portions formed with black ink exist in a mixed
10 manner. In addition, light emitted from the light sources installed on the rear side of the dial passes through the transmissive portions to shape the characters, etc. In such a configuration, the numerals and graduation portions can visually be recognized by the vehicle operator during nighttime travel.

15 The mile (mph)-display numerals 12 on the upper side in the dial 10 is configured such that the font sizes (dimensions) of adjacent numerals are made different from each other and the amounts of light passing through the characters are alternately increased and decreased. Specifically, numerals "0," "20," "40," "60," "80" and "100" are indicated with capital letters 12a, whereas
20 "10," "30," "50," "70" and "110" are indicated with small letters 12b. In addition, as illustrated in Fig. 4, the capital letter 12a and the small letter 12b are made different from each other in the area transmitting light from the light source to increase and decrease the amounts of light passing through the capital letter 12a and the small letter 12b, respectively. This enhances the visibility of the capital
25 letter 12a.

More specifically, the capital letter 12a and the small letter 12b formed on the dial 10 are each formed to have an area where the light-shielding white ink is not printed. This area is configured to include a see-through portion 15 with
30 translucency and a plurality of fine dots 16 printed from rear side with a black print material in the see-through portion 15. When being printed, the fine dots 16 are varied in size and in density to adjust the area of the see-through portion 15, thereby increasing or decreasing the amount of transmitted light. In

particular, the capital letter 12a is made larger than the small letter 12b in the area of the see-through portion 15 per unit area.

For e.g. the capital letter 12a, in the case where the fine dots 16 are printed in the see-through portion 15 at a rate as illustrated in Fig. 5(a), if the size of the fine dots 16 is made larger at the same density as illustrated in Fig. 5(b), the area of the see-through portion 15 is reduced. In other words, the small letter 12b (Fig. 5(b)) can be made smaller in the amount of transmitted light than the capital letter 12a (Fig. 5(a)).

Alternatively, as illustrated in Fig. 5(c), even if the size of the printed fine dots 16 is the same, the density thereof may be made higher to reduce the area of the see-through portion 15. In such a case, the small letter 12b (Fig. 5(c)) can be made smaller in the amount of transmitted light than the capital letter 12a (Fig. 5(a)).

When the fine dots 16 are printed with the black print material on the rear face of the dial 10, to change the size and density of the fine dots 16, the area of the capital letter 12a or of the small letter 12b may be formed so as to be covered by a corresponding one of different layers (for example, masks formed with apertures different in the size and density of the fine dots 16 are used to print the black print material).

In the embodiments as described above, the fine dots 15 printed to form the capital letter 12a and the small letter 12b are shaped in circle; however, they may be formed in any shape such as rectangle, triangle or the like.

As illustrated in Fig. 3, the dial 10 is provided at a central lower portion with a circular opening 17 adapted to receive a shaft 21 of a meter-pointer 20 inserted therethrough.

As illustrated in Fig. 2, the dial 10 is secured to the support plate 30 supporting the circumferential edge portion of the dial 10 by means of screws 31 from the front side and is secured to the lower case 2 by means of screws 33 attached to a stay 32 provided on the rear side of the support plate 30 to project therefrom.

A liquid crystal display (LCD) 22 is secured to the support plate 30 so that a display section faces an opening window 18 provided in the dial 10. The liquid crystal display 22 is configured to include a liquid crystal display section adapted to digital-display travel distance, etc. Backlight LEDs (two) 23 are disposed below the liquid crystal display 22.

A warning section 40 is formed below the dial 10 of the vehicle meter 1 with a plurality of warning lamps (not shown) in a generally V-shaped region as shown in Fig. 1. The warning section 40 is adapted to light the warning lamps to inform an operator of various pieces of information on the vehicle such as a neutral position of a gear, low fuel warning, oil temperature warning, low oil warning, high-beam, etc., at the time of engine starting or during travel of the vehicle. Turn signal lamps (not shown) operated by the operator when the vehicle is turned to the left or right are provided in the warning section 40. The upper surface of the warning section 40 is covered by a plastic-made smoke cover with translucency.

As shown in Fig. 2, a circuit board 50 is secured between the lower case 2 and the support plate 30. Referring to Fig. 6, the above-mentioned backlight LEDs (light-emitting diodes) 23 and a plurality of LEDs (light-emitting diodes) 25 serving as light sources of light passing through the characters 12, 13 and graduation portion 11 and as vehicle meter illumination are formed at respective desired positions in a printed wiring area 55 formed in the circuit board 50. The LEDs (light-emitting diodes) serving as the light sources for vehicle meter illumination are designed to emit reddish light.

Since the light sources are formed of the plurality of LEDs (light-emitting diodes) 25, uniform transmitted light is given to the characters 12, 13 and the graduation portion 11 arranged in the wide range of the dial 10. In addition, the use of the LEDs (the light-emitting diodes) can reduce electric power consumption.

The warning lamps of the warning section 40 are configured to light various colors, i.e., red (low fuel warning and the like), green (gear neutral position), blue

(high-beam), and orange (turn signal), depending on the kinds of information to be displayed.

5 The shaft 21 of the meter pointer 20 is inserted into the circular opening 17 located at the center of the dial 10. The shaft 21 is connected to a shaft of a movement 51 secured to the circuit board 50. In response to a signal inputted to the movement 51 resulting from detected vehicle speed, the meter-pointer 20 is moved above the graduation portion 11 of the dial 10.

10 With the vehicle meter 1 configured as above, the character display is performed by the reddish transmitted light passing through the graduation portion 11 and the numerals 12, 13 arranged on the whitish dial 10. The capital letters 12a and the small letters 12b corresponding to the respective numerals indicated in mile (mph) in the dial 10 are designed such that the adjacent characters are made
15 different from each other in the amount of transmitted light. Thus, deformation of the characters can be prevented from occurring due otherwise to outside light reflected from the dial 10 and to glare of transmitted light. This can improve the visibility of the characters (the capital letters 12a) intended to be emphasized. Consequently, it is possible to make it easy to visually recognize the entire string
20 of characters in the vehicle meter 1, which makes it easy to make out the information issued by the vehicle meter 1.

The capital letter 12a with a large amount of transmitted light is displayed in large font size, whereas the small letter 12b with a small amount of transmission
25 light is displayed in small font size. The visibility of the characters can be made different from each other in degree to further improve the visibility of the characters intended to be emphasized.

The dial 10 of the vehicle meter 1 configured as above is such that the capital
30 letter 12a and the small letter 12b are displayed in the same font type. However, the character displayed in large font size and that in small font size may be made different from each other to make it easy to make out the characters.

- 10 -

In the embodiment described above, the dial 10 is formed in a whitish color and light emitted from the light sources (the LEDs 25) is made to have a reddish color. This confirms the satisfactory visibility of transmitted light when the character display is performed in the whitish dial 10 by light passing therethrough. However, even if the dial 10 has color such as blackish colors other than whitish colors and it can be assumed that the dial reflects outside light from the dial because of containing metallic particles or pearl particles, the adoption of the configuration of the present invention can make the visibility of the transmitted light satisfactory. In addition, light emitted from the light source is not limited to reddish colors but light of other colors may be used.

The above-embodiment describes the example in which the invention is applied to the vehicle meter to be mounted on a motorcycle. However, the structure of the invention can be adopted as a vehicle meter for four-wheel vehicles, etc. in which a speed meter, a tachometer, etc. are arranged in its compartment.

In a vehicle meter mounted on vehicles, particularly, on motorcycles, a vehicle meter structure can ensure more satisfactory visibility relative to characters arranged on a dial through transmitted light even in the twilight or under sodium lights. Therefore, the flexibility of setting color of a dial and of selecting font design can be increased to facilitate the productization of vehicles having a concept intended by a designer.

Although various preferred embodiments of the present invention have been described herein in detail, it will be appreciated by those skilled in the art, that variations may be made thereto without departing from the spirit of the invention or the scope of the appended claims.

THE EMBODIMENTS OF THE INVENTION IN WHICH AN EXCLUSIVE PROPERTY OR PRIVILEGE IS CLAIMED ARE DEFINED AS FOLLOWS:

1. A vehicle meter comprising: a dial; and a light source provided on a rear face of the dial; wherein a plurality of characters arranged on the dial are displayed by transmitting light from the light source, and the characters are made different from each other in amount of transmitted light and a character with a small amount of transmitted light is arranged between characters with a large amount of transmitted light.
2. The vehicle meter according to claim 1, wherein the characters are arranged such that adjacent characters have a given difference therebetween in amount of transmitted light.
3. The vehicle meter according to claim 2, wherein the characters are such that a character with a large amount of transmitted light is displayed in large font size whereas a character with a small amount of transmitted light is displayed in small font size.
4. The vehicle meter according to claim 3, wherein the characters are such that the character displayed in large font size is different in font from that in small font size.
5. The vehicle meter according to claim 1, wherein the dial is formed in a whitish color and the light emitted from the light source is made reddish.
6. The vehicle meter according to claim 1, wherein the light source is formed of a plurality of light-emitting diodes.
7. The vehicle meter according to claim 1, wherein a vehicle using the vehicle meter is a motorcycle.

FIG. 1

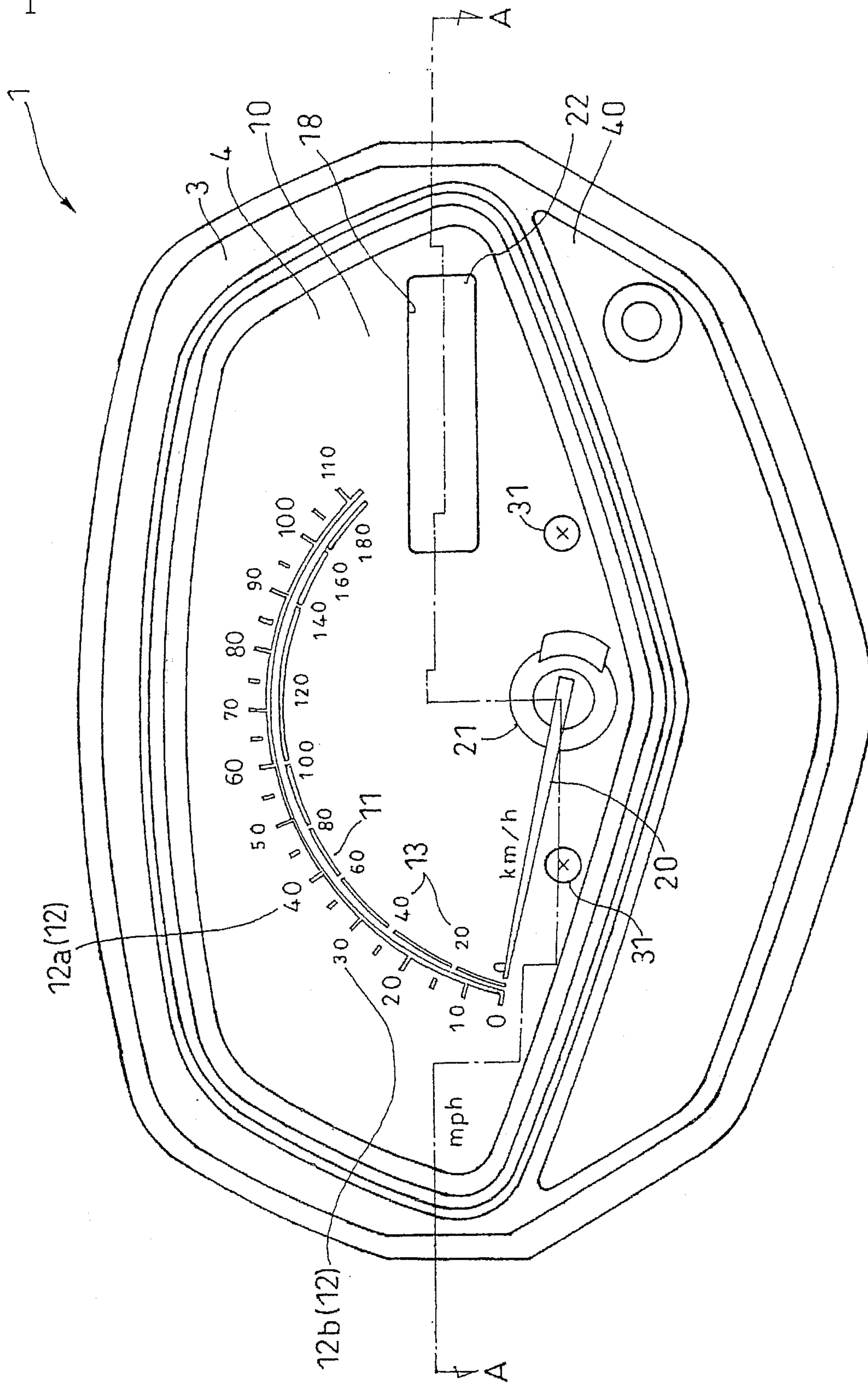


FIG. 2

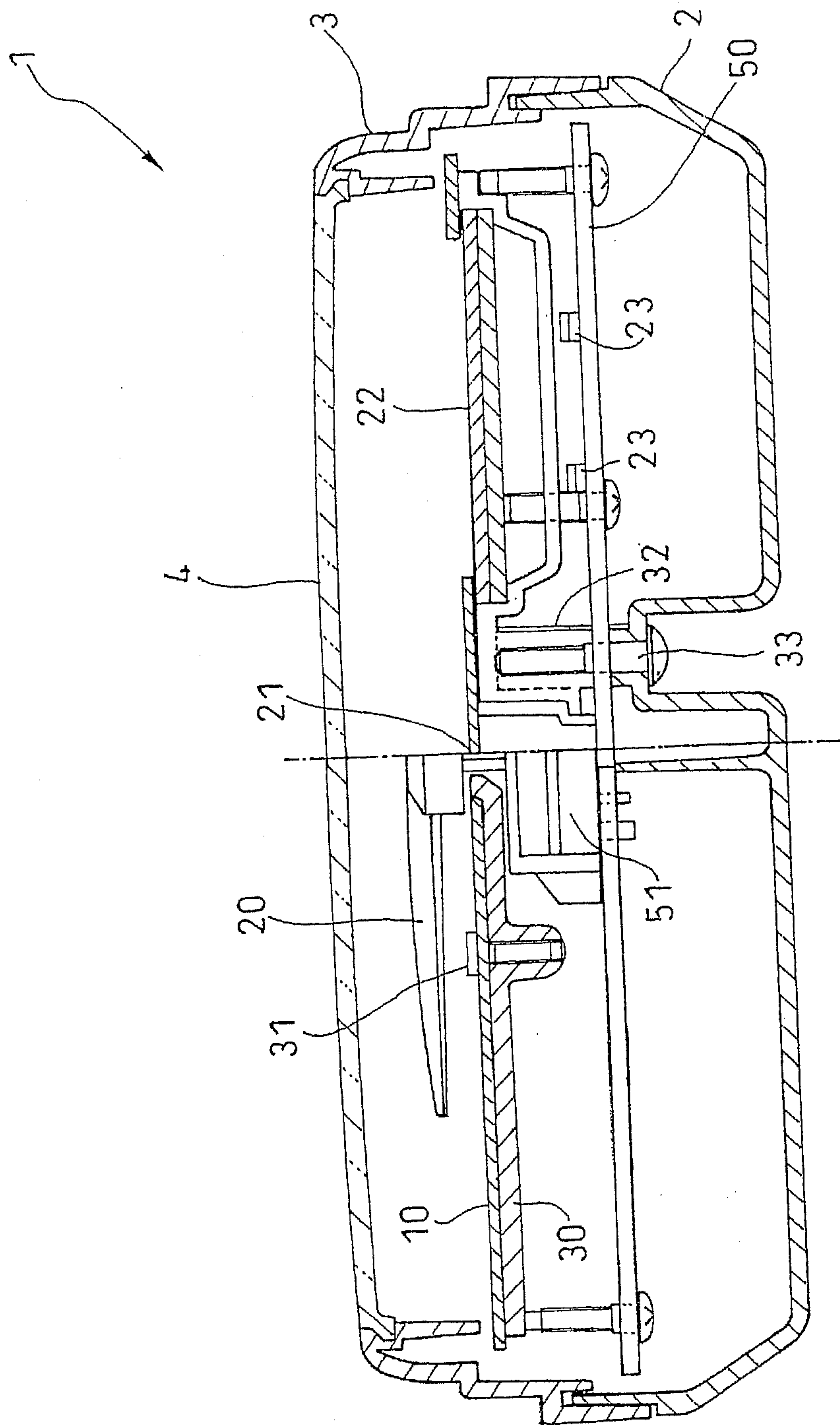


FIG. 3

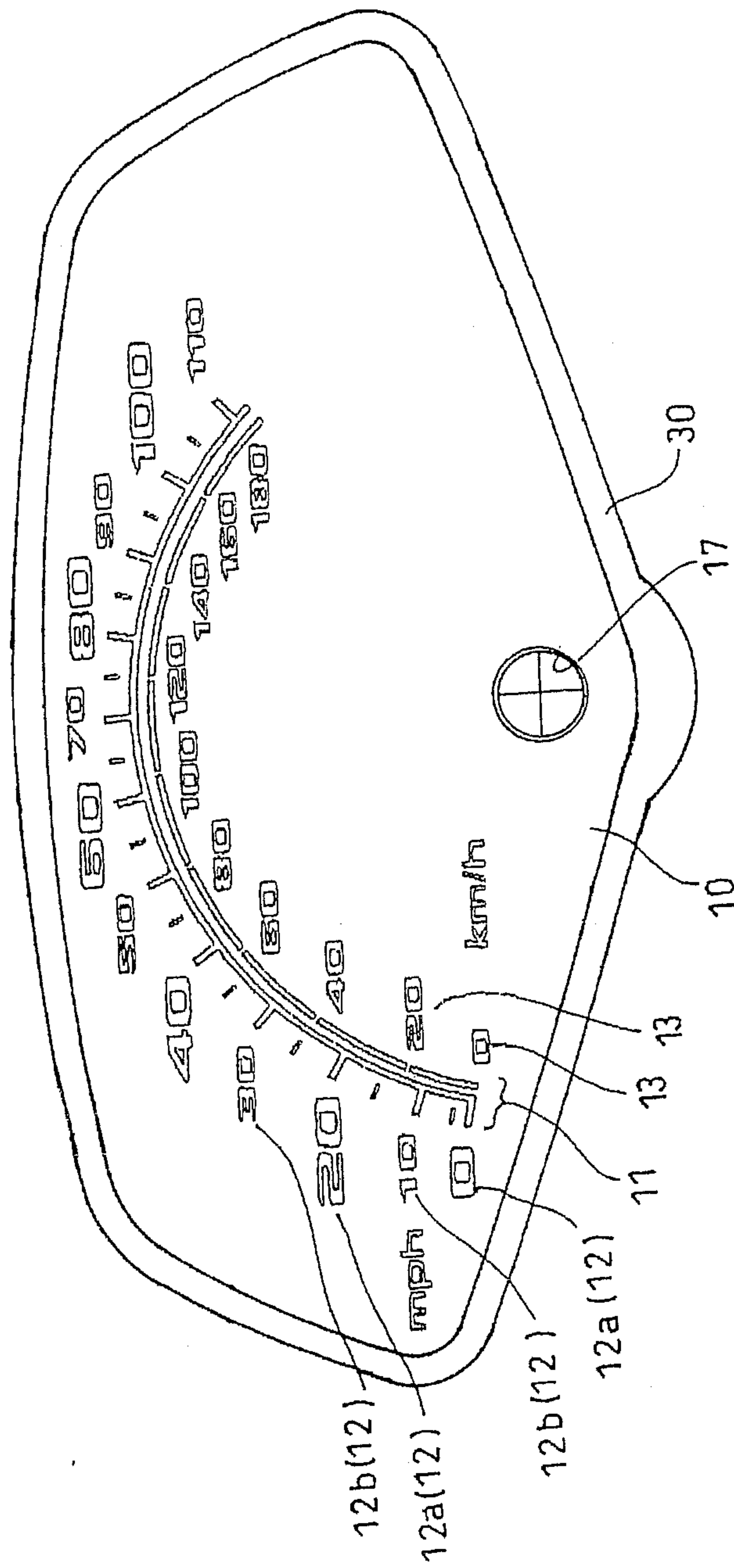


FIG. 4

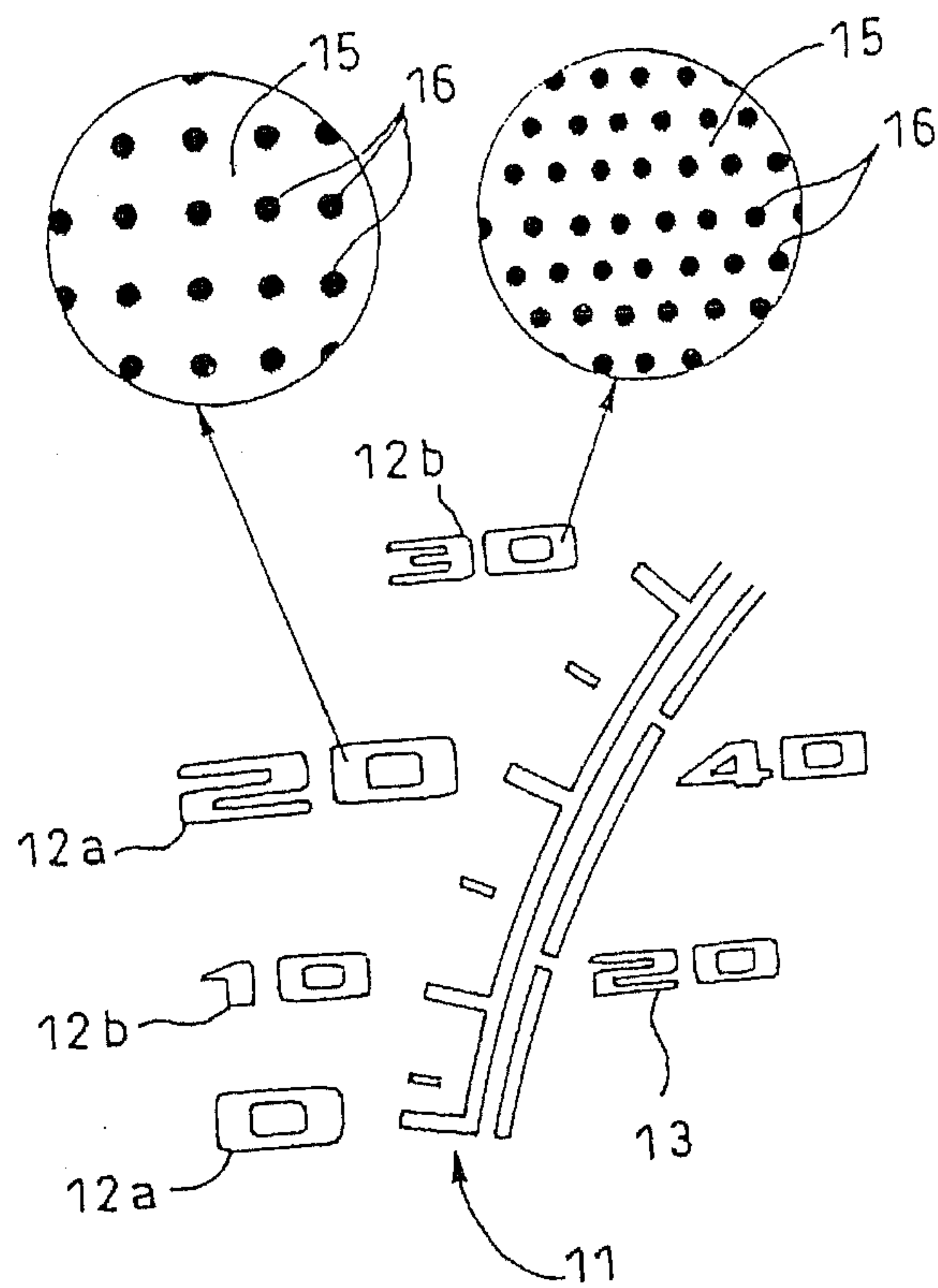


FIG. 5

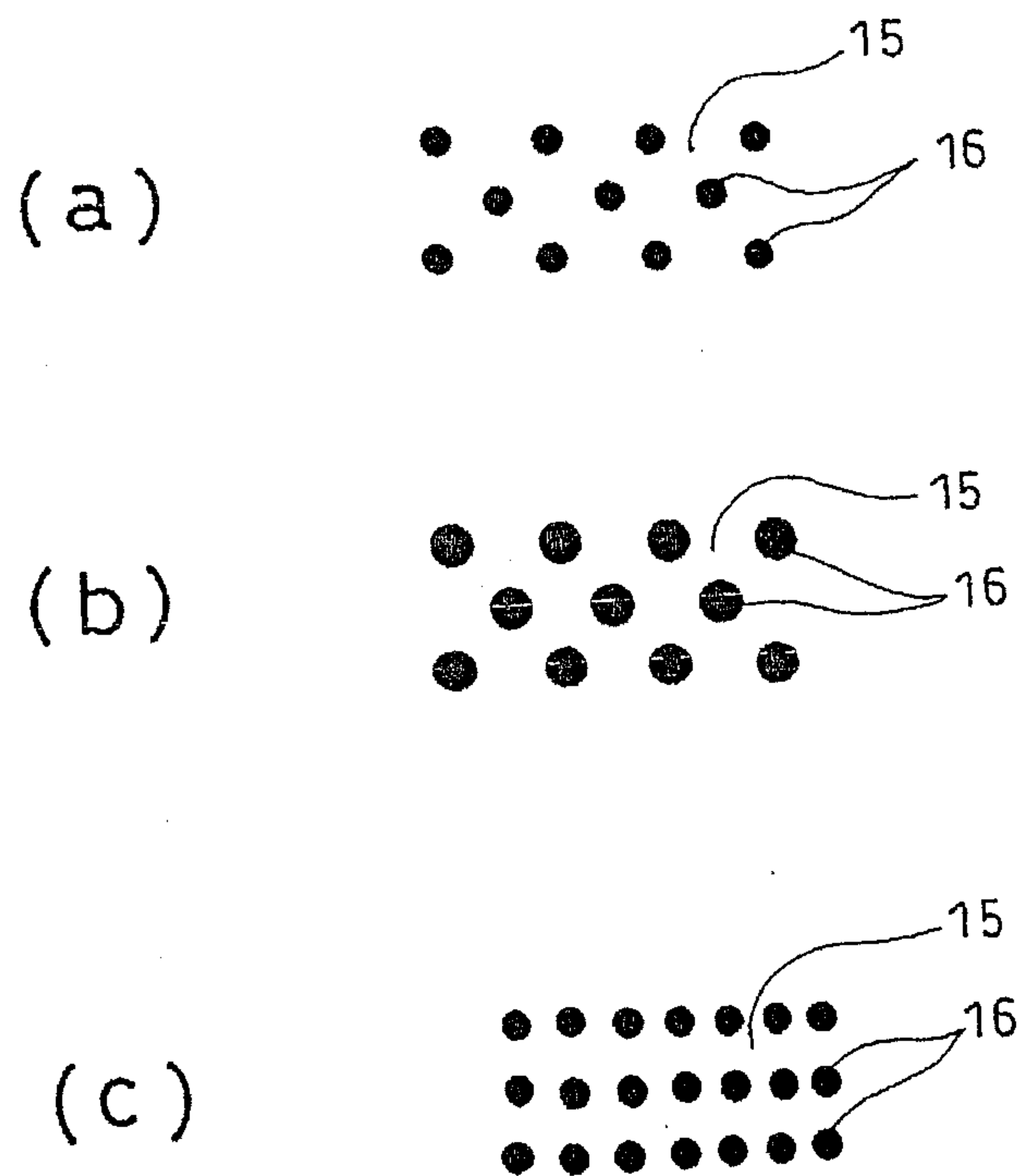


FIG. 6

