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(54) **VERTICAL SIDE GRADATION IN THE A BULLS-EYE LEVEL FOR SURFACE AND EDGE LEVELLINGLEVELING, ALONG WITH MEANS FOR ANGLE MEASUREMENT**

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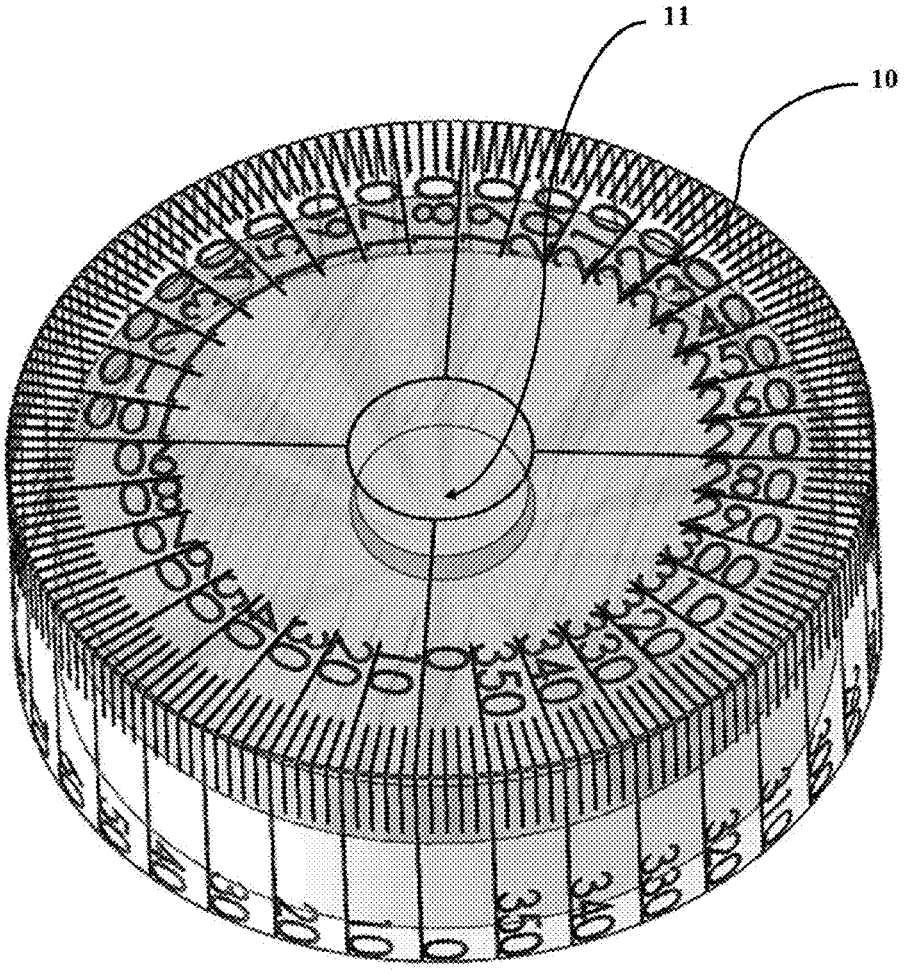
(57) **ABSTRACT**

The present invention describes a bulls-eye level to be used for levelling of surface and edges. The bulls-eye level includes a fluid case containing a fluid inside, an indicator i.e. bubble to indicate level and calibrated markings for measurement. The bulls-eye level can comprise of any degree or any sort of gradation that is printed on the surface of the bullseye level, which can be used to track the movement of the bubble along the side edges. The gradations present in the bulls-eye level can be used for surface and edge levelling in both vertical and horizontal positions, along with angle measurement. The gradations of the bulls-eye level are printed either on the outer surface or the inner surface, which is clearly visible with the luminous yellow color clear fluid inside. The gradations of the hulls-eye level comprises starts from 0° to 360° both in vertical and horizontal positions.



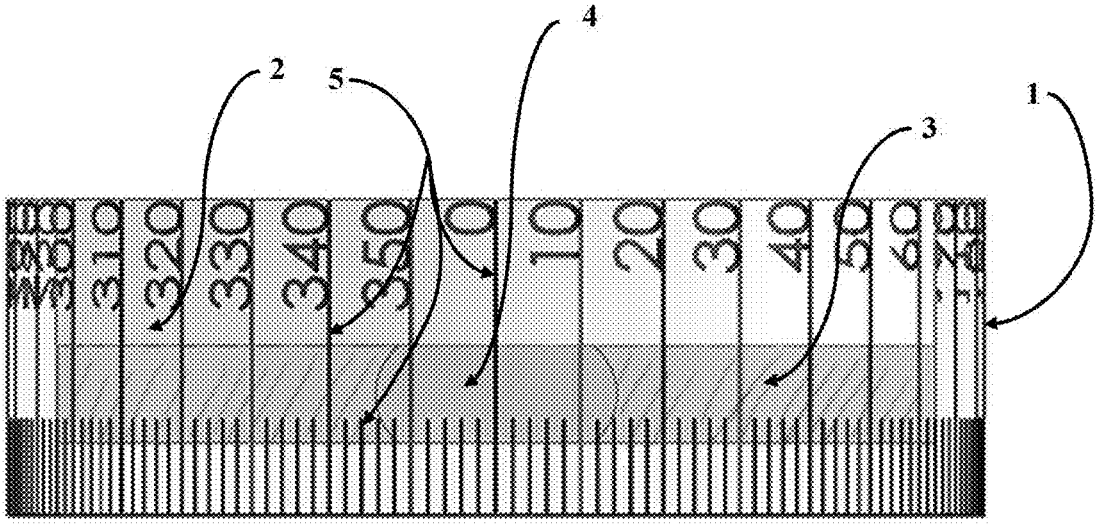


Fig 1

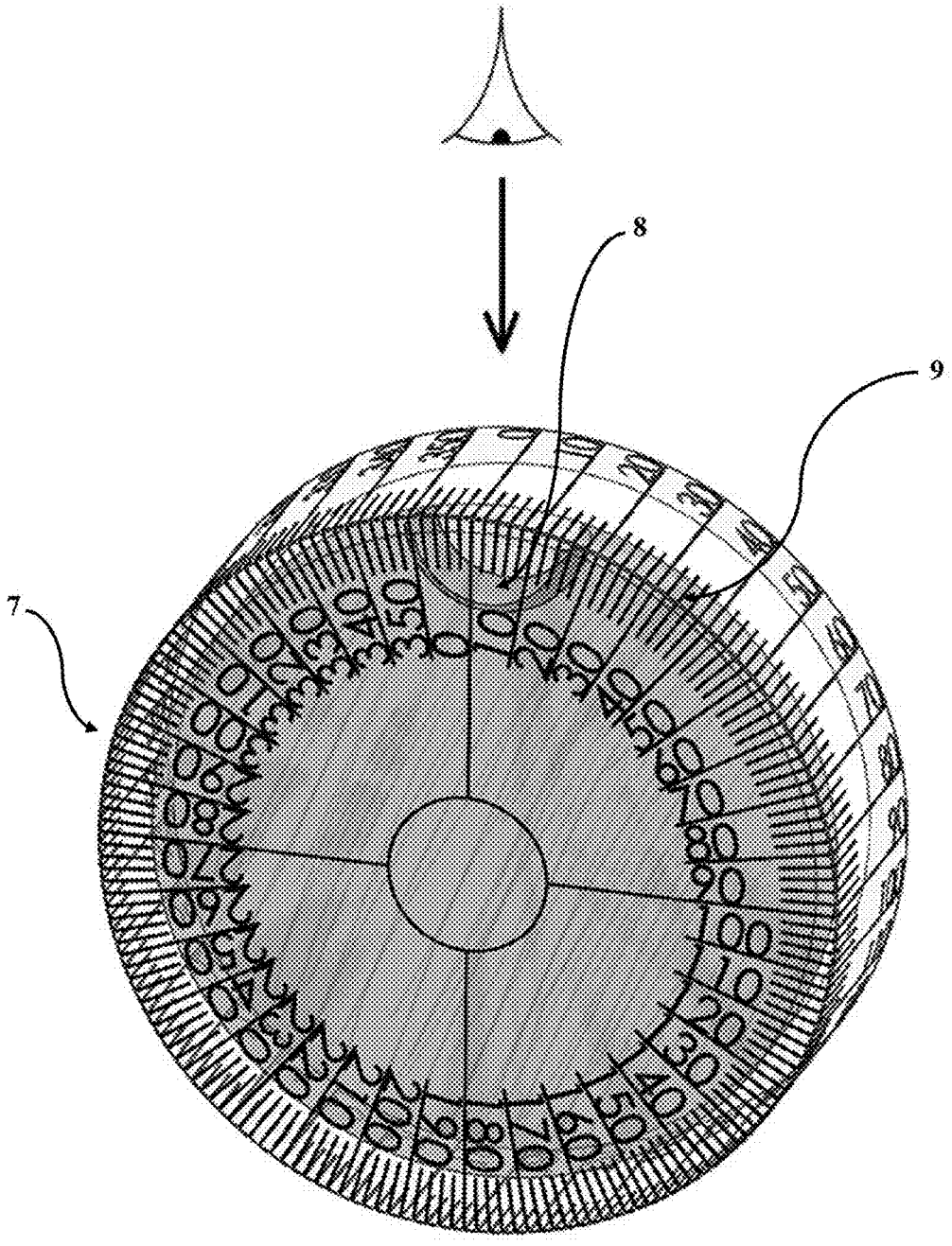


Fig 2

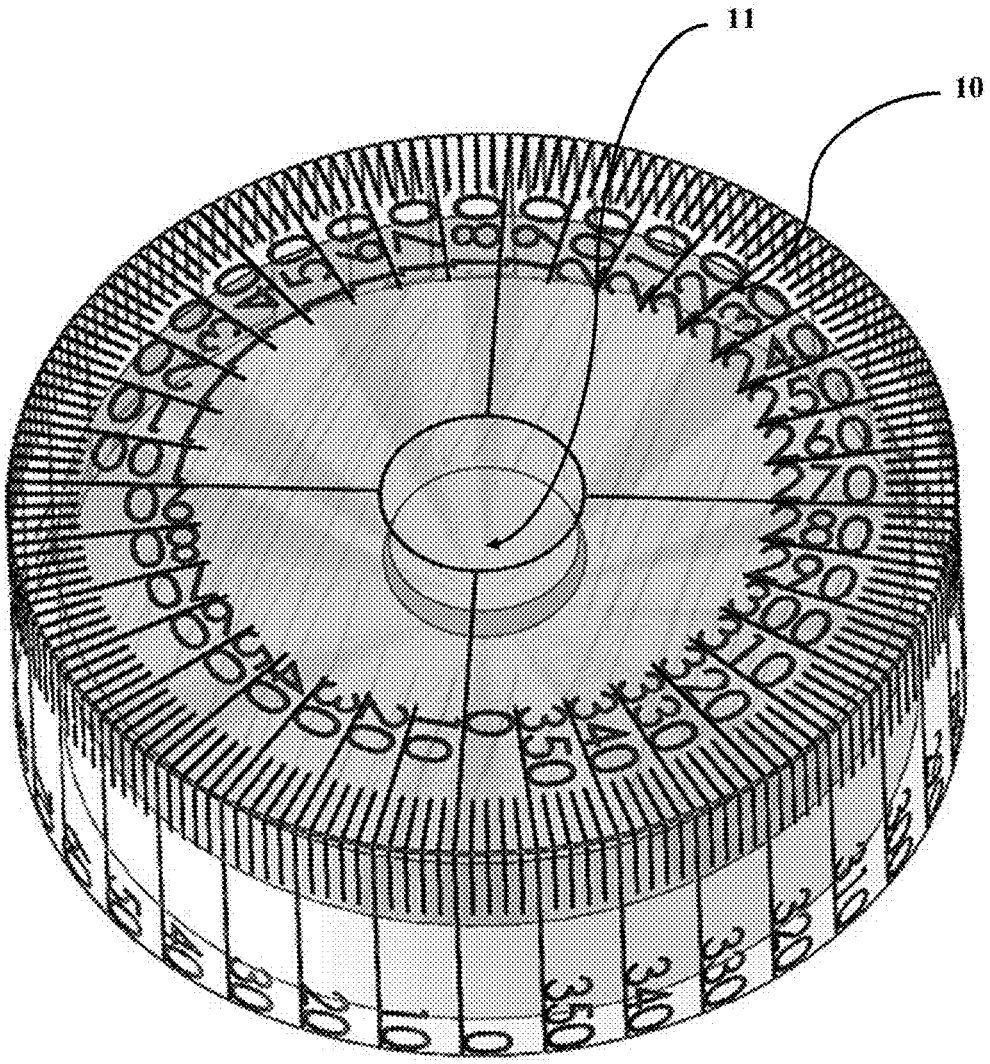


Fig 3

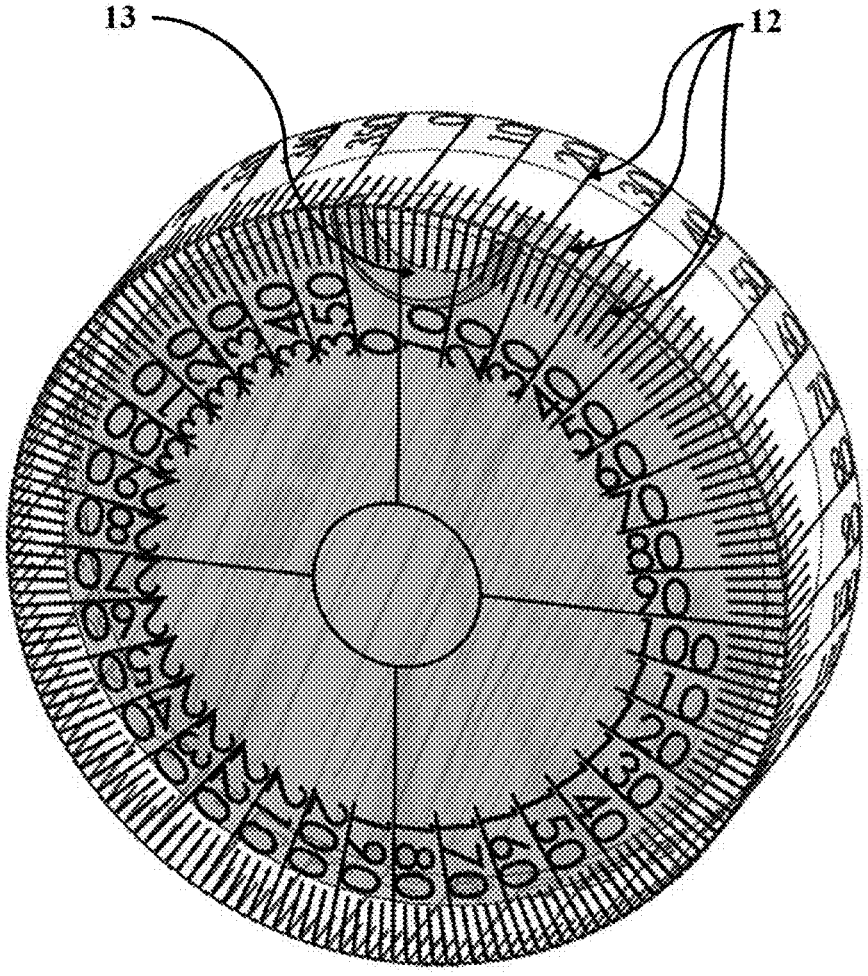


Fig 4

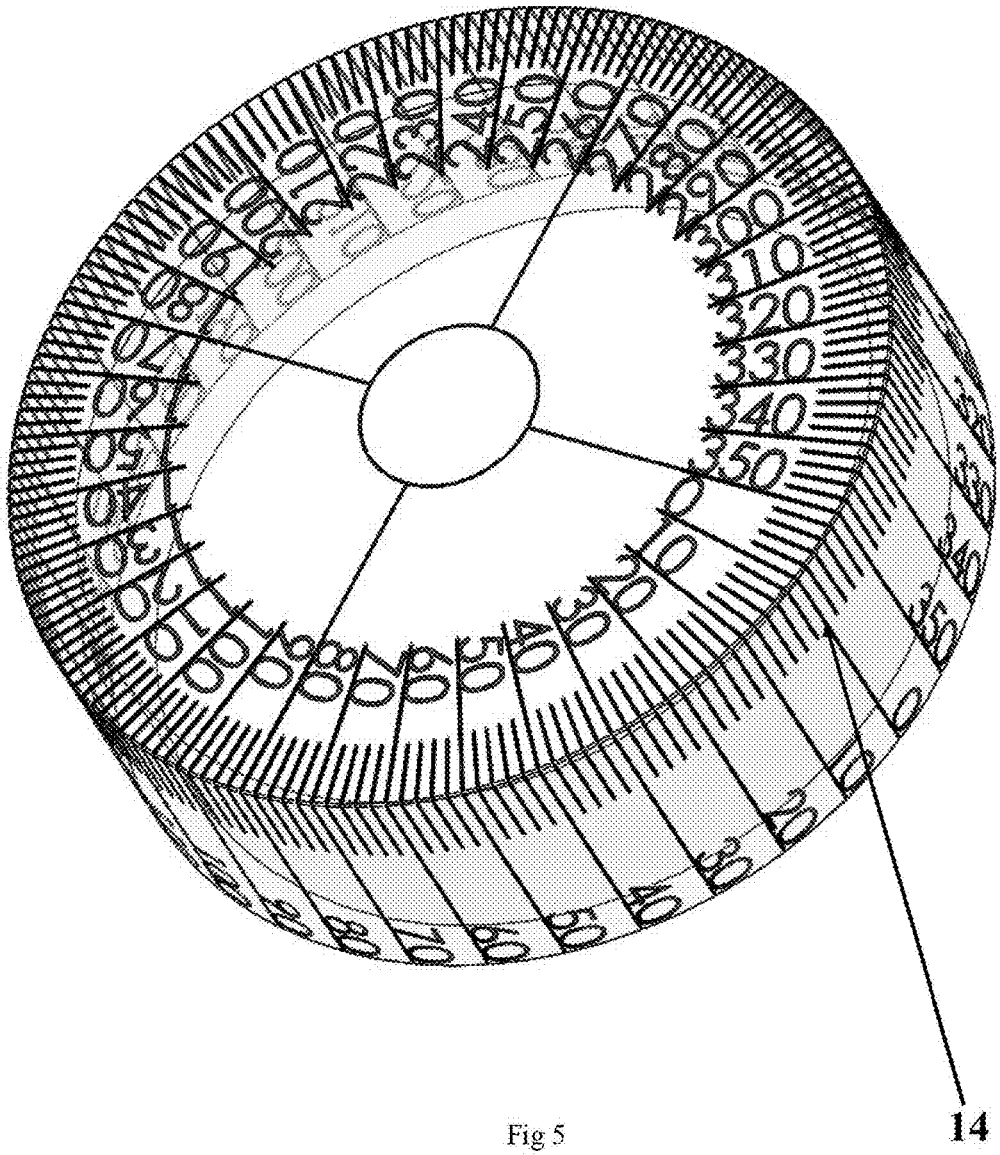


Fig 5

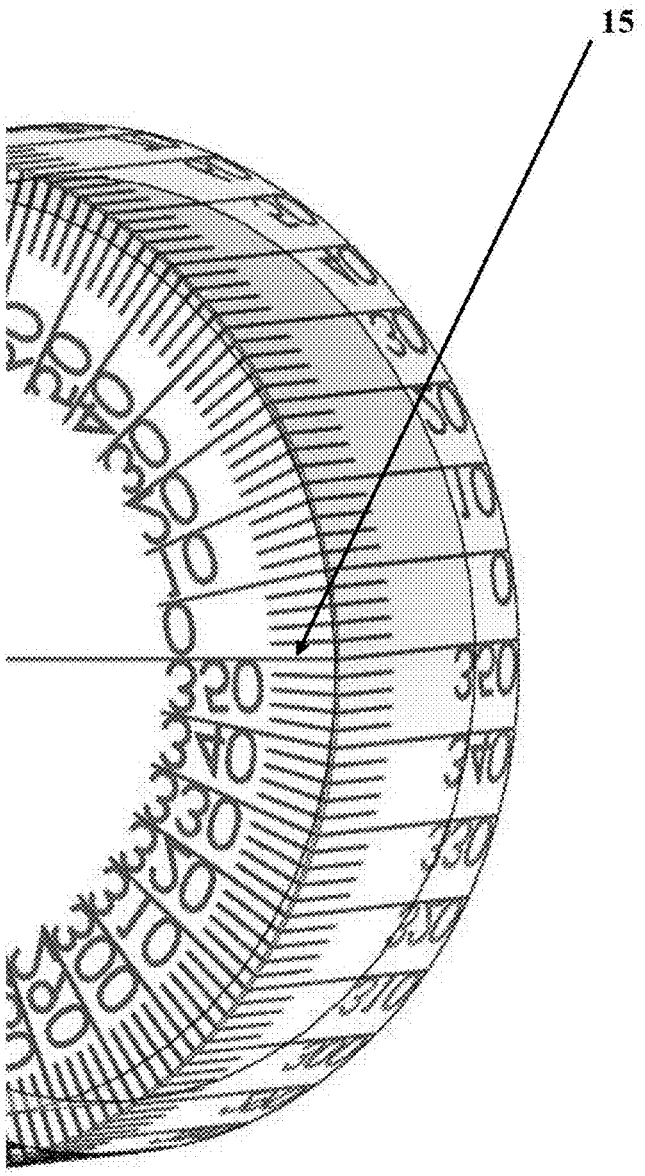


Fig 6

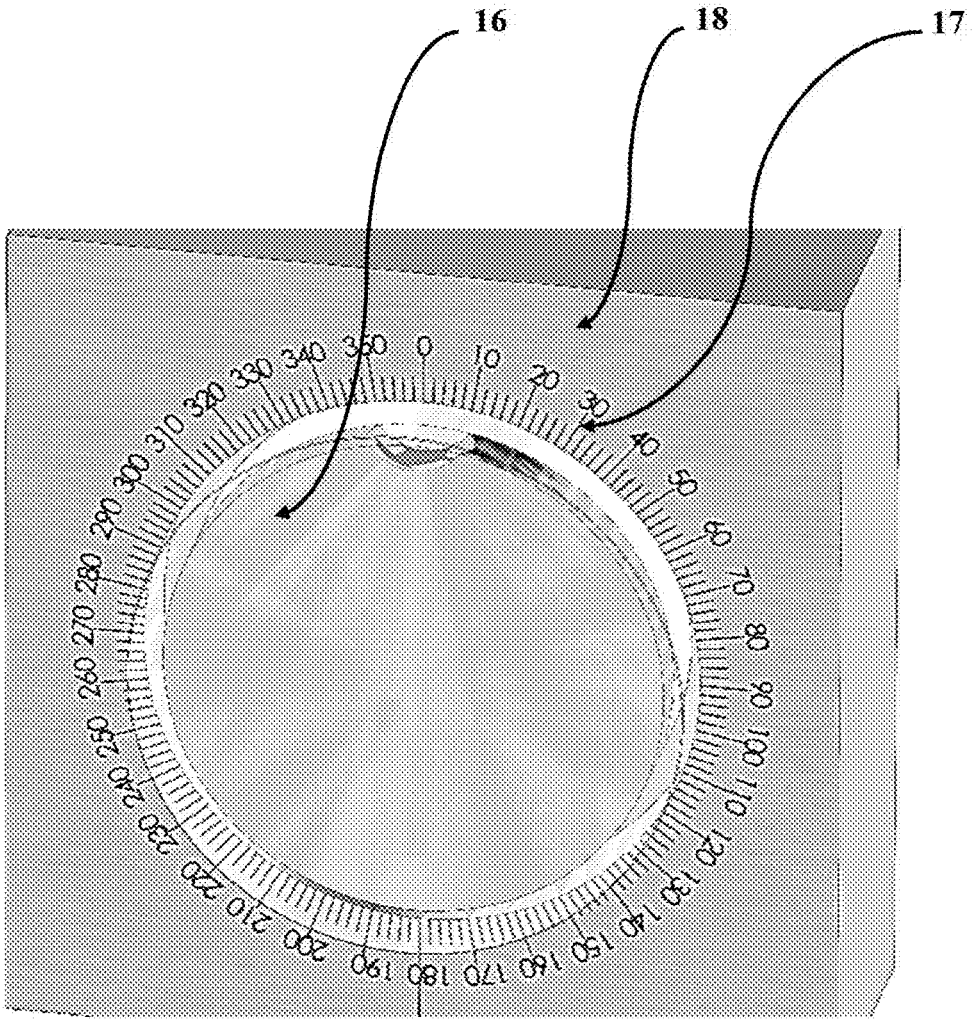

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Fig 7

VERTICAL SIDE GRADATION IN THE A BULLS-EYE LEVEL FOR SURFACE AND EDGE LEVELLINGLEVELING, ALONG WITH MEANS FOR ANGLE MEASUREMENT

FIELD OF THE INVENTION

[0001] The present invention relates generally to orientation devices and, more particularly, to "bulls-eye levels" and methods, used for leveling the surfaces and the edges of objects.

BACKGROUND OF THE INVENTION

[0002] Several tools are used for measuring the surface inclination in places such as construction sites, in order to gain accurate and precise measurements of the gradient and the inclination of a surface. Several systems are currently in use for measuring the gradient and the inclination angle. They include water-level instrumentation, electronic instrumentation etc, which help to measure whether the surface is level or not. Water-level instrumentation does not accurately measure gradient percentage and the angle of inclination. Electronic instrumentation is used for the same purpose. But at construction sites and in different environmental conditions, electronic instrumentation might get damaged and not operate properly. Another level measurement device which is commonly used at construction sites and other locations is the "bulls-eye level".

[0003] A bulls-eye level is a type of inclinometer, comprising a circular air bubble level where the bubble is free to move in an x-y plane. The bulls-eye level can measure positive inclines (slopes) as well as negative inclines. Positives slopes can be measured by an observer when they are looking upwards and negative slopes can be measured by an observer when they are looking downwards. The bulls-eye level is typically a cylindrical shaped container which has a base marked with the inclination indications.

[0004] The bulls-eye level has degree markings printed on the base that can be viewed through a transparent window. A small bubble is provided inside which moves when the bulls-eye level is moved. The position of the bubble is determined by the inclination and the level can be measured against the degree markings in order to determine the slope. The bulls-eye level instrument is typically secured to the equipment that must be leveled, typically prior to installation of any equipment or object.

[0005] There are several prior art patents which describe various ways through which levels and inclinations are measured.

[0006] A prior art patent US88806769 B2 describes a bulls-eye indicator and method. This patent describes a bulls-eye indicator device, and its method of manufacture, used to measure the two-dimensional angle of inclination of equipment that is mounted on the sea bed. A base and transparent window are sealed and fastened together. The transparent window is spherical and forms a dome. A volume between the base and transparent window is filled or substantially filled with liquid. A floating sphere floats against the two-dimensional angular degree indicia.

[0007] Another patent U85839200 A describes a Multi-function horizontal and vertical alignment tool which is a combination level that has a carrier forming two opposite parallel major surfaces. A tube level is mounted on one of the surfaces of the circular level and a circular level is mounted on the other, opposite, surface. Either one of the major surfaces can be used directly to abut against the work which is to be aligned, or an additional, preferably elongate, member can be attached to the carrier and which abuts against said work. The carrier is mounted on the abutting member at a known angular relationship or the carrier can be mounted for selected angular adjustments abutting to the abutting member, so that selected positioning of the tubular and circular levels is relative to each other on substantially horizontal planes where contact of the work allows measurement of vertical alignment and plumb condition of the work.

[0008] Another patent U820150308820A1 illustrates a bubble type level for determining the orientation of a structure, that includes first and second differently-oriented bubble vials that are secured within the level body in a manner such that if either of the bubble vials becomes broken or otherwise damaged, it can be easily replaced and the level need not be discarded. The bubble type level of the invention also includes a novel connector mechanism that enables the level to be removably interconnected with the structures to be leveled, such as conduit. The level further includes a plurality of longitudinally-spaced magnets that are connected to the bottom surface of the level body and a bulls-eye level that is mounted on the top surface of the level body.

[0009] Another patent U.S. Pat. No. 4,349,809 discloses an apparatus for detecting the angle of inclination of a vehicle and for providing an alarm signal when the inclination of the vehicle exceeds a predetermined maximum safe level. An elongate, pliant tubular member made of an electrically-conductive material has its intermediate segment mounted by an insulated clamp to a vertical panel which may be situated on the vehicle's dashboard. The end segments of the tubular member are upwardly inclined, and the degree of inclination is shown by angular indicia on adjacent portions of the vertical panel. A plurality of spherical contact elements made of an electrically-conductive material are positioned within the tubular member. A pair of contact points made of an electrically-conductive material are inserted into the opposite ends of the tubular member. When the angle of inclination of the vehicle exceeds the safe level, the contact elements will strike one of the contact points. This causes an electric current from the vehicle's battery to energize an indicator such as a buzzer which provides a warning signal.

[0010] The above described prior art patents provide various methods to measure the level of the surfaces. They provide very accurate results, but a common problem which is associated with the bulls-eye level is one of parallax error. Parallax error is caused by the observer and the object being observed being in different relational orientations, causing inaccurate readings.

[0011] Thus there is a need for a leveling system which provides both vertical and horizontal gradation provided along with the bulls-eye level that can be used to level both vertical and horizontal surfaces, and also measure the angle of inclination.

OBJECTIVES OF THE INVENTION

[0012] The primary object of the present invention is to provide an improved bulls-eye level.

[0013] Another object of the present invention is to provide a bulls-eye level having improved ability to accurately measure the level in both vertical and horizontal surfaces.

[0014] Another object of the present invention is to provide a bulls-eye level that provides accurate readings by eliminating observation-induced errors while measuring the angle of inclination.

[0015] Another object of the present invention is to provide a bulls-eye level having the degree or gradation on the vertical surface of the bulls-eye level.

[0016] Another object of the present invention is to provide a bulls-eye level that can measure horizontal, vertical and angle measurements of surfaces, along with pipe slope measurements etc.

SUMMARY OF THE INVENTION

[0017] The present invention describes an improved bulls-eye level that can be used for leveling of surface and edges. The bulls-eye level includes a transparent or substantially transparent enclosure containing a fluid, and calibrated markings on the fluid casing.

[0018] The present invention describes an improved bulls-eye level that can be used for leveling of surfaces and edges. The vertical gradations present in the bulls-eye level can be used for surface and edge leveling, as well as angle measurements.

[0019] The present invention comprises of plurality of lines which are used for angle measurement. The lines which are used for angle measurement are made on the transparent surface of the casing. The angle measurement lines are used to measure the two-dimensional angle of inclination that can be measured using the fluid and the bubble present in, the bulls-eye level.

[0020] In one embodiment of the present invention, the transparent fluid case of the bulls-eye level comprises of a clear fluid along with a bubble, which moves around when the bulls-eye level is inclined. The transparent fluid is colored, rendering it clearly visible through the transparent case and it highlights the printed or etched angle measurement lines. Usually a luminous yellow colored fluid is used in the transparent fluid case so that the angle measurement lines and the concentric indicia circles are clearly visible to the user. The clear colored fluid is inserted inside the transparent fluid case until the volume is almost but not completely filled, with a small space remaining, thus forming a bubble.

[0021] The bulls-eye level also comprises of more than one concentric circles along with angle measurement lines. The bubble which is formed in the transparent fluid case of the bulls-eye level accurately measures the two-dimensional angle using the angle measurement lines.

[0022] The bulls-eye level may comprise of any degree or any sort of gradation, etched or printed on the substantially vertical (side) surface of the bulls-eye level, which can be used to identify the location of the bubble along the side edges. When the leveling is done in the vertical position of the bulls-eye level, the bubble is always located at the highest vertical point. The vertical side gradation present on the bulls-eye level can also be expanded onto the horizontal edge that allows leveling in other dimension.

[0023] The present invention can be used for leveling surfaces in both vertical and horizontal planes. The gradations or markings of the bulls-eye level can be printed or etched either on the outer surface or the inner surface, which will be clearly visible with the clear fluid inside. The present invention can be used for both surface and edge leveling, along with angle measurement. The present invention along with an elongate ruler can be used for the surface, horizontal, vertical and any angle measurement, any shaft rotation angle measurement, pipe slope measurement etc.

BRIEF DESCRIPTION OF THE DRAWINGS

[0024] FIG. **1** is a top view of the bulls-eye level placed in a vertical position, which shows a bulls-eye level with gradations etched or printed on the vertical surface, which permit the movement of the bubble to be viewed along, the side edge.

[0025] FIG. **2** illustrates the front view of the bulls-eye level placed in a vertical position, which shows the gradations which are etched or printed on the vertical surface and expanded to the horizontal edge.

[0026] FIG. **3** is an isometric view of the bulls-eye level in the horizontal position to measure the levels of horizontal surfaces.

[0027] FIG. **4** is the isometric view of the bulls-eye level in the vertical position to measure the levels of vertical surfaces.

[0028] FIG. **5** is the front elevated view of the bulls-eye level, showing the gradations that are printed on the outer surface of the bulls-eye level.

[0029] FIG. **6** is the front elevated view of the bulls-eye level, showing the gradations that are printed on the inner surface of the bulls-eye level.

[0030] FIG. **7** is the front view of the bulls-eye level, which can be used along with an external or outside frame.

DETAILED DESCRIPTION OF THE INVENTION

[0031] Referring to FIGS. **1-6**, the bulls-eye level apparatus is shown for measurement of the surface level and angle of inclination.

[0032] FIG.**1** is a top view of the bulls-eye level placed in a vertical orientation, which shows a bulls-eye level with gradations etched or printed on the surface, which enable the user to track the movement of the bubble along the side edge. The bulls-eye level **1** includes a fluid case **2** having a colored transparent fluid **3** inside, along with an indicator **4**, such as an air bubble. The gradations **5** are etched or printed on the surface of bulls-eye level **1**. The degree marking or any sort of gradation **5** is printed or etched on the vertical surface or the side surface of the bulls-eye level I in order to track the movement of the indicator **4** i.e. bubble, along the side edge. The gradations **5** which are made along the vertical surface of the bulls-eye level **1**, start from zero degrees up to three hundred and, sixty degrees. When the bulls-eye level **1** is placed in a vertical position in order to measure the level, the indicator **4** i.e. the bubble, is always located at the highest point in the bulls-eye level **1**, and when the bulls-eye level **1** is placed in the horizontal position, the indicator **4** i.e. the bubble is always located at the center of the bulls-eye level. The indicator **4** i.e. the bubble, reacts directly to the changes made in the elevation of the angle of the bulls-eye level apparatus **1**.

[0033] FIG. **2** illustrates the front view of the bulls-eye level placed in a vertical position, which shows the gradation that is etched or printed on the vertical surface and expanded to the horizontal edge. The bulls-eye level **7**, when observed

from the top, comprises an indicator i.e. the bubble **8**, at the top, along with the angle measurement lines that are used in the measurement of the gradient and the angle of inclination. The bulls-eye level **7** has the gradations **9** made at the edge, which is extended to the vertical surface. The gradations **9** are made from zero degrees up to three hundred and sixty degrees both on vertical and horizontal surfaces. The transparent fluid case of the bulls-eye level **7** contains the colored transparent fluid that highlights the gradations made on the top surface of the bulls-eye level **7**.

[0034] FIG. **3** is an isometric view of the bulls-eye level in the horizontal position to measure the levels of horizontal surfaces. With the help of the present invention, the bulls-eye level could be used for horizontal level measurements. The horizontal position of the bulls-eye level comprises the gradations **10** on the top surface starting from zero degrees to three hundred and sixty degrees. The indicator **11** i.e. the bubble, is visible through the top horizontal surface that provides accurate positioning of the measured horizontal surface.

[0035] FIG. **4** illustrates the isometric view of the bulls-eye level in the vertical position to measure the levels of vertical surfaces and edges. With the help of the present invention, the bulls-eye level could be used in a substantially vertical position. The vertical position of the bulls-eye level comprises the gradations **12** on the top surface starting from zero degrees to three hundred and sixty degrees. The indicator **13**, i.e. the bubble, is visible at the top which provides accurate measurement of vertical surfaces, angles and inclinations.

[0036] FIG. **5** is the front elevated view of the bulls-eye level, showing the gradations **14** that are printed on the outer surface of the bulls-eye level. The colored transparent fluid is filled inside the empty transparent fluid case of the bulls-eye level. The gradations **14** which are printed on the outer side of the fluid case of the bulls-eye level are clearly visible with the colored background created with the help of the colored fluid.

[0037] FIG. **6** is the inside view of the transparent body of the bulls-eye level, showing the gradations that are printed on the inner surface of the bulls-eye level. The gradations **15** are printed on the inner surface of the bulls-eye level. The gradations **15** which are printed on the inner side of the fluid case of the bulls-eye level can be clearly visible with the colored background created by the colored fluid.

[0038] Another embodiment of the present invention discloses the bulls-eye level which can be used along with external frames. The illustration of the bulls-eye level used along with the external frame is disclosed in FIG. **7**.

[0039] FIG. **7** is the front view of the bulls-eye level, showing the gradations created on an external or outside frame. The gradations are generally used to track the movement of the bubble indicator along the edge of the bulls-eye level in vertical position. The bulls-eye level **16** can be placed inside an external frame **18** such as an elongate ruler or any other frame which has the gradations **17** on it and inclination measurements can be made.

[0040] The present invention can be used for leveling of surfaces and edges which is made possible by creating the gradations on both the horizontal and vertical surfaces. The vertical gradation can be used for measurement of vertical surfaces, angles and inclinations. The gradations can track the movement of the bubble indicator along the edge of the bulls-eye level in vertical position, which can be done in two ways. One way is by creating the gradations on the vertical edge of the bulls-eye level, and other way is by creating the gradations on an external frame and placing the bulls-eye level inside the external frame. When the bulls-eye level is placed inside the external frame, the fluid case is filled with the coloured transparent fluid and the outer surface is left clear without any imprint on it.

[0041] The fluid which is filled inside the transparent fluid container is a clear liquid with a distinctive color which is clearly visible through the transparent surface and the printed or etched angle measurement lines. Usually luminous yellow colour is liquid is used in the transparent container so that the angle measurement lines are clearly visible to the user to facilitate easy and accurate angle measurements. The clear liquid is filled inside the transparent container until the volume of full, with a small space inside, thus forming a bubble. The bubble which is formed in the transparent container of the bulls-eye level accurately measures the two-dimensional angle using the angle measurement lines. The bulls-eye level can be used to track the movement of the indicator i.e. the bubble along the side edges. When surface leveling is done in the vertical position, the indicator i.e. the bubble is always located at the highest point.

[0042] The present invention is not only limited to the use of an air bubble as indicator. The bulls-eye level can be used along with any kind of bubble or ball which could float in the filling liquid present inside the fluid case. The bubble or ball could be an oil drop, a solid ball made of light material such as plastic, a hollow ball or other kind of object having the property of being free-floating.

[0043] The main advantage of the present invention is that the surface leveling can be done in both vertical and horizontal positions.

[0044] Another advantage of the present invention is that the gradations or markings of the bulls-eye level can be printed either on the outer surface or the inner surface.

[0045] Yet another advantage of the present invention is that the bulls-eye level can be used for both surface and edge leveling, along with angle measurement.

[0046] Yet another advantage of the present invention is that the bulls-eye level along with the ruler can be used for the surface, horizontal, vertical measurement, angle measurements, shaft rotation angle measurement, and pipe slope measurement etc.

[0047] Yet another advantage of the present invention is that the bulls-eye level fluid case can be filled with a transparent liquid along with the bubble inside, which can be any kind of bubble or ball such as an air bubble, an oil drop, a plastic ball, a hollow ball etc.

I claim:

1. A bulls-eye level indicator for use in indicating the level of a surface, comprising:

a transparent case containing a fluid

a fluid which substantially fills said volume of the transparent case with the formation of a bubble,

a plurality of angle measurement lines formed on said transparent case, said plurality of angle measurement lines indicating said two-dimensional angle of inclination.

2. A bulls-eye level indicator for use in indicating the level of the surface as claimed in claim **1**, wherein the transparent case is a substantially circular disk shape.

3. A bulls-eye level indicator for use in indicating the level of the surface as claimed in claim **1**, wherein the said liquid is a colored and clear liquid which is filled in the said transparent case such that a bubble is formed.

4. A bulls-eye level indicator for use in indicating the level of the surface as claimed in claim **1**, wherein the said bubble acts as the level indicator in two dimensions.

5. A bulls-eye level indicator for use in indicating the level of the surface as claimed in claim **1**, wherein the tracking lines and circles are etched or printed on the horizontal surface of the case such that it tracks the position of the bubble.

7. A bulls-eye level indicator for use in indicating the level of the surface as claimed in claim **1** claim, wherein the said plurality of angle measurement lines measures the two-dimensional angle of inclination.

8. A bulls-eye level indicator for use in indicating the level of the surface as claimed in **1**, wherein the said lines of measurement are etched on the vertical surface (edge of the disk shaped case) and the horizontal surface of the circular disk shaped case.

9. A bulls-eye level indicator for use in indicating the level of the surface as claimed in claim **1** wherein the said lines of measurement are degree gradations from zero degrees to three hundred and sixty degrees covering the circumference of the disk-shaped case.

10. A bulls-eye level indicator for use in indicating the level of the surface as claimed in claim **1**, wherein the said bubble is at highest point in the vertical position of the level indicator and the bubble is at the center of the bull-eye level in the horizontal position of the level indicator.

11. A bulls-eye level indicator for use in indicating the level of the surface as claimed in claim **1**, wherein the said bull-eye level indicator is capable of measuring both edge and surface inclinations.

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