April 16, 1963 E. W. DAVIS 3,085,465

HAND LEVEL WITH MIRROR

Filed April 30, 1959

Fig.1

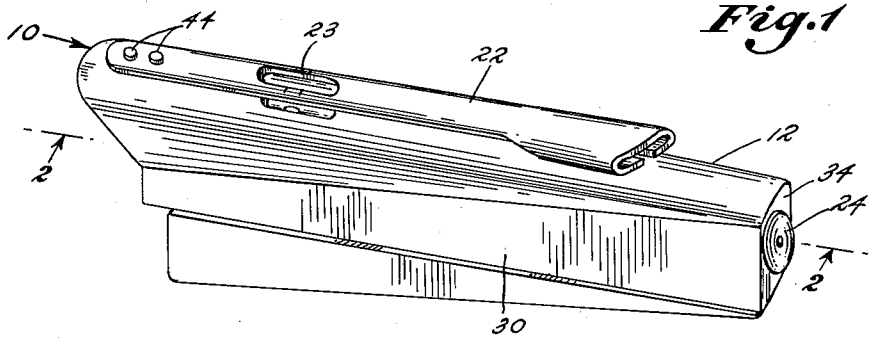


Fig.2

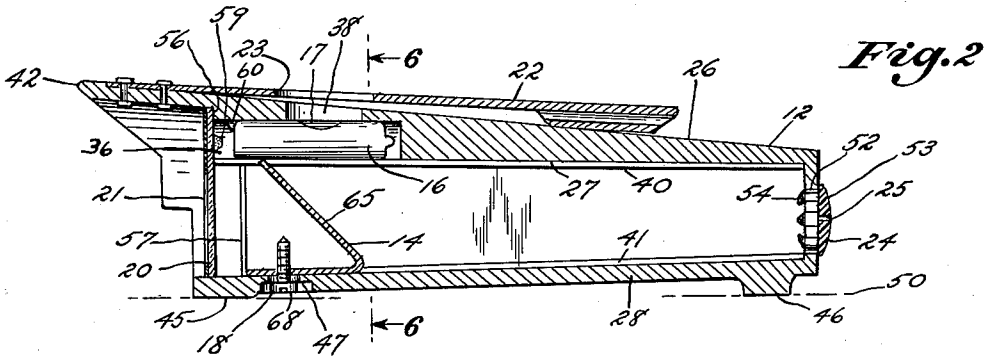


Fig.3

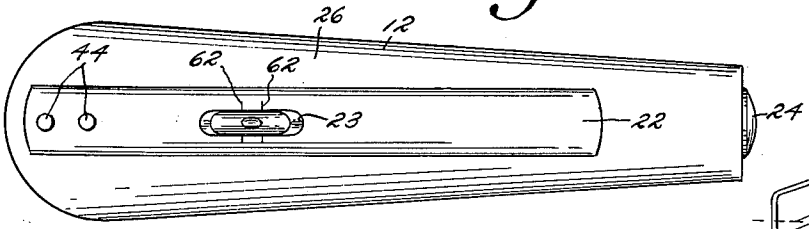
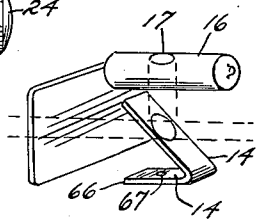


Fig.7



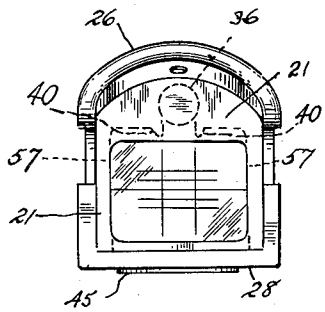


Fig.4

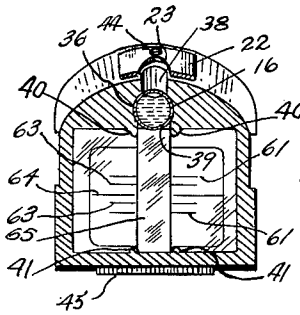


Fig.6

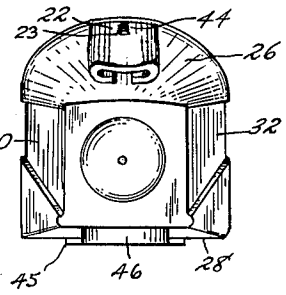


Fig.5

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3,085,465

HAND LEVEL WITH MIRROR

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2 Claims. (Cl. 88—2.3)

This invention relates generally to surveying and more particularly to an improved hand level.

Among the objects of the present invention is the provision of hand level construction which is easy to use and accurate.

Another object herein is to provide a hand level in which no lenses are required. A bubble tube and mirror afford simultaneous viewing of the sighting point, plane objective and bubble.

A still further object lies in the provision of structure of the class described which is rugged so as to withstand rough usage, and which is compact and convenient to use.

A feature of the invention is that it may be used as a surface level.

Another feature of the invention is that the level may be easily placed within the users pocket and clipped thereto, preventing accidental loss.

These objects and other incidental ends and advantages will more fully appear in the progress of this disclosure and be pointed out in the appended claims.

In the drawing, in which similar reference characters designate corresponding parts throughout the several views.

FIGURE 1 is a view in perspective showing a preferred embodiment of the invention.

FIGURE 2 is a sectional view as seen from the plane 2—2 on FIGURE 1.

FIGURE 3 is a top plan view.

FIGURE 4 is a front elevational view as seen from the left of FIGURE 1.

FIGURE 5 is a rear elevational view as seen from the right of FIGURE 1.

FIGURE 6 is a vertical sectional view as seen from the plane 6—6 on FIGURE 2.

FIGURE 7 is a schematic view in perspective.

In accordance with the invention, the device, generally indicated by reference character **10**, comprises, broadly: a body element **12**, a reflector element **14**, a leveling element **16**, reflector element adjusting means **18**, a sighting window element **20**, a clip element **22**, and a viewing orificed element **24**.

The body element **12** is preferably a casting of light durable metal, such as magnesium or aluminum and is of irregular configuration best seen in FIGURES 2 and 6 of the drawings. The body element is of generally hollow shape having a top wall **26**, a bottom wall **28**, side walls **30** and **32**, a rear wall **34**.

The top wall **26** is relatively thick and has a front opening bore **36** which is of a size sufficient to receive the leveling element **16**. The wall **26** has a top elongated opening **38** which is of sufficient size to enable the user to see the element **16** when viewed from above, and which also admits light so that the bubble **17** may be clearly seen as reflected from the element **14** through the aperture **25**. The under surface **27** of top wall **26** is open at **39** below the element **16**, and said under surface has a pair of spaced dependent ribs **40** which guide and laterally support the upper end of the reflector element **14**.

The top wall **26** and the side walls **30** and **32** project forward beyond the sighting window element **20** to form the hood member **42** which physically protects the window element **20** and also acts as a shade. The clip element **22** is secured to the top wall **26** in a suitable manner

as by means of the rivets **44**. The clip element is preferably formed from resilient planar material, and has an elongated orifice **23** which generally coincides with the opening **38** to enable viewing the element **16** from above and to illuminate the said element.

The bottom wall **28** preferably has a flat upper surface with a pair of upwardly projecting ribs **41** which guide and laterally support the lower portion of the reflector element **14**. The bottom wall **28** on the lower surface thereof is provided with a front pad **45** and a rear pad **46**, the height of which is such that when resting on a level surface **50**, the leveling element **16** will be level. The bottom wall **28** has an elongated slot and recess **47** for receiving the adjusting means **18**.

The rear wall **34** is provided with a hole **52** into which the orificed member **24** is a frictional or snap fit. The orificed member **24** has a body **53** in which the aperture **25** is located on the principal horizontal optical axis of the device **10**. The member **24** is maintained in position by a plurality of resilient fingers **54** which engage the inner surface of the border of the hole **52**. The fingers in their normal unstressed condition radiate outwardly so that when the member **24** is in place, said fingers **54** maintain a constant outward pressure against the inner surface of the border of the hole **52**.

In the forward portion thereof, the body element **12** is provided with a top shoulder **56** and side shoulders **57** against which the inner surface of the sighting window element **20** rests, said element being suitably secured in place, for example, by cement **59**.

The leveling element **16** is preferably a bubble vial well known in the art, and it is secured in place preferably by cement **60**. The size of the bubble **17** is correlated to the distance between the lines **62** on the clip element **22**, and the lines **63** on the sighting window element **20**. Line **64** is the horizontal center line on the window element **20**.

The reflector element **14** is preferably formed from a bent strip of metal, such as, brightly polished brass chrome plated, brightly polished stainless steel, or brightly polished aluminum. The upper rear surface **65** therefor, forms a mirror from which an image of the bubble **17** is reflected toward the aperture **25**. The base **66** of the element **14** is provided with a threaded orifice **67** which is engaged by the screw **68**. Tightening the screw **68** clamps the element **14** at the optimum position thereof. When the screw is loosened, adjustment can be made since then the element **14** may be shifted longitudinally of the device.

The sighting window element **20** is provided with a mask **21**. This may be a separate piece of opaque material, but is preferably an opaque coating obtained by roughening the front surface of the element **20** and applying an opaque layer of enamel paint or the like. Another way of producing this structure is to have the central portion of the element **20** depressed so as to be clear glass while the surrounding masking area is raised and sandblasted to be opaque. The stadia lines (lines **63**, **64** and **61**) being depressed into the front surface of the glass.

In actual use, it is preferable that the interspacing of the lines **63** be substantitially equal to or slightly greater than the length of the bubble in the bubble vial.

It may thus be seen that there has been provided a novel and useful hand level construction which although capable of mass production provides a high degree of accuracy. In use, the user may draw a sight on some predetermined point viewing the same through the aperture **25** and the window **20**. At the same time, the device **10** may be brought to a level condition so that the image of the bubble **17** as reflected by the mirror surface **65** coincides with the image which the user sees at either side

of the mirror. The stadia lines assist in making calculations and changes.

I wish it to be understood that I do not desire to be limited to the exact details of construction for obvious modifications will occur to a person skilled in the art to which the present invention relates.

I claim:

1. In a hand level, a hollow body element having a top wall, there being an opening in said top wall, a clip element secured to said top wall of said body element, a reflector element within said body element, a slighting window element at the front of the body element, a viewing orificed member at the rear of said body element, and forming with said sighting window a principal sighting axis, a leveling element having a bubble and connected to said top wall of said body element, said leveling element being disposed out of teh principal sighting axis, and being visible by reflection through said viewing orificed member and also visible through said top opening, said clip element having an orifice corresponding with said top opening and through which said leveling element is visible from above said level, said reflector element being narrower than said sighting window element, so that said reflector element reflects an image of said bubble and only partially obstructs the passage of light through said slighting window element and along said principal sighting axis, said body element having a downwardly facing surface lying in a plane parallel to said principal sighting axis, first level indicating lines disposed on said sighting window and viewable along said principal sighting axis, and second level indicating lines disposed on said body element above said leveling element; whereby said level may be selectively used as a sighting level and a fixed surface measuring level.

2. In a hand level, a hollow body element having a top wall, there being an opening in said top wall, a clip element secured to said top wall of said body element, a reflector element within said body element, a sighting window element at the front of the body element, a viewing orificed member at the rear of said body element,

and forming with said sighting window a principal sighting axis, a leveling element having a bubble and connected to said top wall of said body element, said leveling element being disposed out of the principal sighting axis, and being visible by reflection through said viewing orificed member and also visible through said top opening, said clip element having an orifice corresponding with said top opening and through which said leveling element is visible from above said level, said reflector element being narrower than said sighting window element, so that said reflector element reflects an image of said bubble and only partially obstructs the passage of light through said sighting window element and along said principal sighting axis, said body element having a downwardly facing surface lying in a plane parallel to said principal sighting axis, first level indicating lines disposed on said sighting window and viewable along said principal sighting axis, and second level indicating lines disposed on said clip element adjacent the opening therein and above said leveling element; whereby said level may be selectively used as a sighting level and a fixed surface measuring level.

References Cited in the file of this patent

UNITED STATES PATENTS

7,477	Locke	July 2, 1850
54,698	Davidson	May 15, 1866
303,269	Dunham	Aug. 12, 1884
360,805	Gurley	Apr. 5, 1887
518,678	Paoli	Apr. 24, 1894
887,256	Konig	May 12, 1908
1,086,124	Beebe	Feb. 3, 1914
1,682,034	Burnister	Aug. 28, 1928
1,696,508	Thorborn	Dec. 25, 1928
1,714,827	Torka et al.	May 28, 1929
1,799,801	Langsner	Apr. 7, 1931
2,731,873	Churgin et al.	Jan. 24, 1956
2,780,960	Miller	Feb. 12, 1957