June 26, 1951 C. E. SCHMIDT 2,558,004

HYDROSTATIC LEVEL

Filed July 14, 1949

FIG. 1.

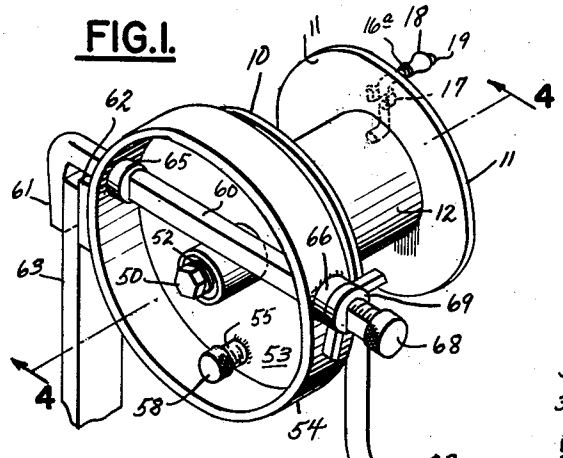


FIG. 3.

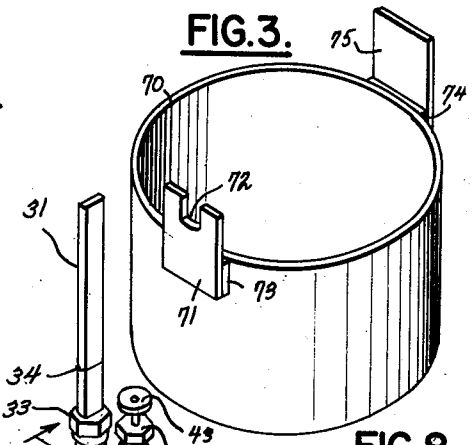


FIG. 8.

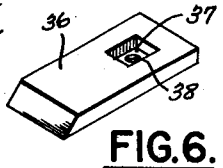


FIG. 2.

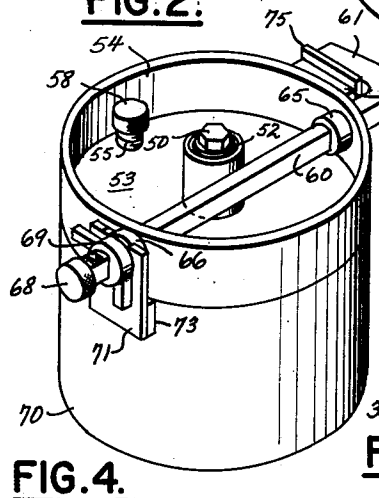


FIG. 5.

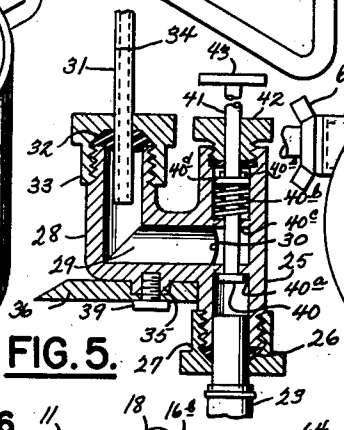


FIG. 6.

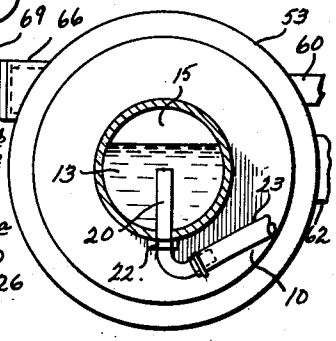
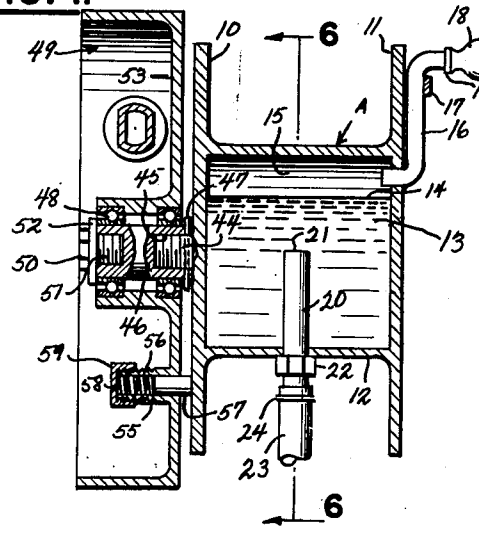


FIG. 4.



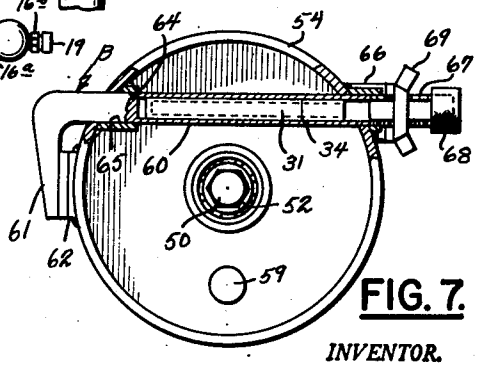


FIG. 7.

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Patented June 26, 1951

2,558,004

UNITED STATES PATENT OFFICE

2,558,004

HYDROSTATIC LEVEL

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Application July 14, 1949, Serial No. 104,605

7 Claims. (Cl. 33—209)

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The present invention relates to improvements in a hydro-level and has for an object to provide a device of this kind which makes use of the principle that water seeks its level and can be employed for establishing a plane or line of levels.

Another object of the present invention is to provide an improved level which can be operated by one person and the use of which results in a considerable saving of time over that required when employing a conventional level.

A further object of the present invention is to provide an improved structure in which the reservoir for the supply of liquid also serves as a reel upon which the flexible tube or hose can be wound when the level is not in use.

A still further object of the present invention is to provide an improved device of this character in which an air space is formed above the liquid in the reservoir and the reservoir connection for the tube or hydrostatic communicating member terminates at substantially the geometric center of the reservoir. With this arrangement, the terminus of the tube cannot emerge into the air space, regardless of the position of the reservoir. If this connection emerged into the air space at each revolution of the reservoir when winding the tube thereon, air would enter the tube and this would be fatal to the accuracy of the device.

The present invention contemplates an improved level provided with a supporting base upon which is mounted clamping means for attaching the level to a support.

It is an aim of the present invention to provide an improved device of this type in which the clamping means also serves to secure a cover in place and to store the sight glass when the level is not in use.

With the foregoing and other objects in view, the invention will be hereinafter more fully described and more particularly pointed out in the appended claims.

In the drawings, in which the same parts are denoted by the same reference numerals throughout the several views,

Figure 1 is a perspective view of the improved device constructed in accordance with the present invention and illustrated as ready for use,

Figure 2 is a perspective view of the device shown as ready for storage,

Figure 3 is a top perspective view of the cover,

Figure 4 is a sectional view taken on the line 4—4 of Figure 1 and looking in the direction of the arrows,

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Figure 5 is a sectional view taken on the line 5—5 of Figure 1 and looking in the direction of the arrows,

Figure 6 is a sectional view taken on the line 6—6 of Figure 4 and looking in the direction of the arrows,

Figure 7 is a side elevational view of the device with parts broken away and parts in section, and

Figure 8 is a perspective view of the scoring blade.

Referring more particularly to the drawings, A generally represents a combined reel and reservoir comprising a pair of spaced apart heads 10 and 11 which can be in the form of disks or plates of die cast aluminum, plastic, or other suitable material and a drum 12 disposed between the heads. The drum 12 can be made of die cast aluminum, plastic or other suitable material and forms with the heads 10 and 11 a liquid tight reservoir for the reception of a liquid 13, such as water. The heads 10 and 11 can be formed integral with the drum 12 or they can be formed separate and secured to the drum by liquid tight joints.

The drum 12 is filled with the liquid 13 to a height indicated at 14 to provide an air space 15 between the liquid level 14 and the inner surface of the adjacent portion of the wall of the drum 12. The air space 15 communicates with the outside atmosphere through a passageway in a hollow handle 16 which is shown in the form of a crank but can be made in any other suitable shape. The inner end portion of the handle 16 extends through a suitable opening in the head 11 and is secured to the outer face of the head 11.

A substantially U-shaped clip 17 which is secured to the outer face of the head 11 embraces the handle 16 adjacent its outer end portion to help secure the handle to the head 11. A knob 18 is freely mounted on the outer end portion of the handle 16 between a collar 16^a fixed to the handle and a nut 16^b which is threaded on the handle. A vent valve 19 in the form of a threaded cap is mounted on the outer end portion of the handle 16 for controlling the venting of the air space 15 to the outside atmosphere.

A substantially L-shaped reservoir connector or hydrostatic communicating member 20 has one leg extending through a suitable opening in the wall of the drum 12 at a point approximately diametrically opposite to that at which the handle 16 enters the air space 15. The inner end or terminus 21 of the connector 20 terminates substantially at the geometric center of the reservoir

12 so that the end 21 of the connector 20 will at all times be immersed in the liquid 13. A nut 22 is mounted on the connector 20 and engages the outer surface of the drum 12 to limit the extent of insertion of the connector 20 into the drum 12 to properly locate the end 21 of the connector as described above.

A flexible tube or hose 23 has one end portion attached to the outer free end portion of the connector 20 by a clamping ring 24 or the like. The tube 23 can be translucent and can have an inside diameter of one-fourth inch and a length of about 50 feet. These dimensions can be changed to suit various conditions. The opposite end portion of the tube 23 is attached to the lower end portion of a valve body 25 by a washer 26 and a nut 27 which is received by the exteriorly threaded lower end portion of the valve body 25. A fitting 28, which can be substantially L-shaped, is mounted upon or formed integrally with the valve body 25. The fitting 28 has a through passageway 29, one end of which communicates with a port 30 in the valve body 25 and the opposite end portion of which removably receives the lower end portion of a level sight 31.

The level sight 31 is removably secured to the fitting 28 by a washer 32 and a nut 33 which is threadedly received by the upper threaded end portion of the fitting 28. The level sight 31 can be a tube of any suitably rigid transparent material so that the height of the liquid therein may be observed and is provided with a circumferential line 34 which is disposed about two inches from the lower end of the level sight. The outer lower face of the horizontal leg of the L-shaped fitting 28 has a depending substantially square boss 35 having a centrally disposed screw threaded recess therein.

A scoring blade 36 has formed in its upper face a socket 37 which corresponds in size and shape to the boss 35 of the fitting 28 and a hole 38 which communicates with the socket 37 and opens through the lower face of the blade 36. The blade 36 is adapted to be removably attached to the fitting 28 by a screw 39 which extends through the hole 38 and the socket 37 and is received by the threaded opening in the fitting 28. When the blade 36 is attached to the fitting 28 the socket 37 thereof receives the boss 35 of the fitting to prevent rotation of the blade 36 with respect to the fitting 28.

Flow of the fluid 13 from the tube 23 to the level sight 31 is controlled by a spring loaded valve 40 which is mounted upon the lower end portion of a valve stem 41. The valve stem 41 extends upwardly through a suitable opening in a bonnet nut 42 which is threadedly received by the upper end portion of the valve body 25. The upper end portion of the valve stem 41 extends above the bonnet nut 42 and has mounted thereon a button 43 by which the valve 40 may be moved to its open position.

The valve 40 is normally urged against a valve seat 40^a by a coiled spring 40^b the lower end of which rests upon an interior annular shoulder 40^c. The upper end of the spring 40^b engages the under face of a washer 40^d which is mounted on the valve stem 41 by a pin 40^e.

The outer face of the head 10 has extending therefrom a threaded stud 44 which is received by an interiorly threaded socket 45 of a plug 46. A pin 47 extends through suitable aligned openings in the stud 44 and the plug 46 to prevent relative rotation thereof. The plug 46 is mounted for rotation on the bearings 48 which in turn are mounted in a suitable opening in a base generally indicated at 49. A screw 50 is received by an interiorly threaded recess 51 formed in the end portion of the plug 46 opposite to the socket 45.

A washer 52 is held in engagement with the outer bearing 48 by the screw 50 for retaining the bearings 48 and the plug 46 mounted upon the base 49. The base 49 is substantially cup shaped and has a disk like inner side 53 and an annular flange 54 extending outwardly therefrom. It will be noted from Figure 4 that the screw 50 and the washer 52 are disposed within the confines of the annular flange 54 of the base 49.

A nipple 55 extends outwardly from the inner side 53 of the base 49 and has a through guideway 56 therethrough. A snubber 57 in the form of a plunger is slidably received in the guideway 56 of the nipple 55 and is urged by a coil spring 58 into engagement with the outer face of the head 10 of the combined reel and reservoir A. The spring 58 is confined within the guideway 56 of the nipple 55 by a cap 59 which is threadedly received by the outer free end portion of the nipple 55. The nipple 55 and the cap 59 are located within the confines of the annular flange 54 of the base 49.

A clamp, generally indicated at B, comprises a substantially rectangular housing 60 which extends through suitable aligned openings in the flange 54 of the base 49. One end portion of the housing 60 is bent over to provide a clamping jaw 61 which cooperates with a stationary jaw 62 mounted upon the outer surface of the flange 54 to clamp therebetween a support 63. The portion of the housing 60 adjacent the jaw 61 is solid, as indicated at 64, to form a bottom for the housing 60. A supporting sleeve 65 which is mounted upon the inner face of the flange 54 of the base 49 surrounds the solid portion 64 of the housing 60 to support the same.

The opposite end portion of the housing 60 extends through a boss 66 which is mounted upon the outer face of the flange 54 of the base 49. The housing 60, due to its rectangular in cross section shape, has a sliding but non-rotative fit with the flange 54, the sleeve 65 and the boss 66. The outwardly extending portion of the housing 60 is exteriorly threaded as indicated at 67 and removably receives thereon a closure cap 68. A wing nut 69 is also received by the threads 67 of the housing 60 and is adapted to engage the boss 66 for moving the jaw 61 into clamping engagement with the support 63.

A cover 70 has a lug 71 provided with a notch 72 mounted thereon. The lug 71 is secured to a block 73 which in turn is attached to the outer surface of the cover 70 adjacent the opening end thereof. The block 73 has a thickness substantially equal to the length of the boss 66 and the notch 72 extends beyond the edge of the open end of the cover 70. The cover 70 has a second block 74 secured to its outer face at a point substantially diametrically opposite to that at which the block 73 is attached. This block 74 has a thickness substantially equal to that of the stationary jaw 62. A plate 75 is mounted on the block 74 and extends beyond the edge of the opening of the cover 70.

In the use of the device, assuming that it is in the storage position as illustrated in Figure 2, the wing nut 69 will be loosened to free the lug 71 and the housing 60 will be slid longitudinally so that the jaw 61 will release the plate 75. The

cover 70 is then free to be removed and the tube 23 will be unwound from the drum 12. During the unreeling operation of the tube 23, the vent valve 19 and the valve 40 should be kept closed so that no air can enter the system and so that no liquid can escape. When the tube 23 is completely unwound, the closure cap 68 of the housing 60 will be removed and one of the two level sights 31 which are stored within the housing in side by side relation will be withdrawn from the housing 60 and the cap 68 replaced. The lower end portion of the sight 31 is inserted into the upper end of the passageway 29 of the fitting 28.

The combined reel and reservoir A can then be supported on any convenient surface by placing the base 49 on said surface with the axis of rotation of the reel vertically disposed. If desired, the device may be mounted upon the support 63 by having the upper end portion of the support received between the clamping jaw 61 and the stationary jaw 62 of the base 49. The wing nut 69 will be secured upon the threaded end of the housing 60 until it engages the boss 66. Continued rotation of the wing nut 69 will cause longitudinal movement of the housing 60 so that the clamping jaw 61 will firmly clamp the support 63 against the stationary jaw 62.

The valves 19 and 40 are then opened and the liquid 13 is brought into registry with the circumferential line 34 on the level sight 31 by raising or lowering the sight. The scoring blade 36 is disposed in a predetermined fixed relation to the line 34 on the sight 31 so that when the liquid is brought into registry with the line 34 a level line can be transferred to a fixed object by the scoring blade 36, instead of marking with a pencil which becomes easily lost or broken.

The improved hydro-level is especially adapted for use in setting batter boards in small construction and is also useful in establishing grade lines for drainage.

When the operator has finished using the device, it can be quickly and easily stored away as shown in Figure 2. The fitting 28 and the level sight 31 will be raised until all liquid therein returns to the tube 23. The valves 19 and 40 will then be closed and the nut 33 loosened so that the level sight 31 can be detached from the fitting 28 and stored in the housing 60 which is large enough to accommodate two level sights.

The tube 23 will be wound upon the drum 12 by the handle 16. In the event the base 49 is not attached to the support 63, the operator can use the base 49 as a handle or grip by which to hold the drum 12 during the winding operation. During the reeling of the tube 23 the frictional engagement of the snubber 57 with the head 10 can be lessened by unscrewing the cap 59 to decrease the tension of the spring 58 to permit free action of the drum. After completion of the reeling operation, the tension of the spring 58 can be increased so that the snubber 57 will lock the drum 12 against rotation. While the tube 23 is being unwound, the snubber will be used to prevent free wheeling of the drum, or in other words, to prevent the drum from spinning faster than the tube is unwound.

The cover 70 will be placed over the reel and reservoir A with the plate 75 received between the jaws 61 and 62 and the lug 71 disposed between the boss 66 and the wing nut 69 with the notch 72 receiving the housing 60. Tightening of the wing nut 69 will clamp the cover in place.

It is obvious that various changes and modifications may be made in the details of construction and design of the above specifically described embodiment of this invention without departing from the spirit thereof, such changes and modifications being restricted only by the scope of the following claims.

What I claim is:

1. An improved hydrostatic level comprising a support, a reservoir rotatably carried by said support and containing therein a liquid the height of which is greater than one-half the depth of said reservoir, a hydrostatic communicating member entering said reservoir, one end of said communicating member being at the geometric center thereof and communicating with said reservoir thereat and being immersed in the liquid of said reservoir, an atmosphere connection communicating with said reservoir carried by said reservoir at its end remote from said support, and a distant reading level sight connected to the other end of said hydrostatic communicating member.

2. An improved hydrostatic level as claimed in claim 1 characterized by the fact that that portion of said hydrostatic communicating member which is connected to said level sight is flexible to permit said level sight to be movable independently of said reservoir.

3. An improved hydrostatic level comprising a reservoir, a reel rotatably carrying said reservoir, support means for rotatably supporting said reel, a level sight movable independently of said reservoir, a flexible connection between said reservoir and said level sight for communicating hydrostatic pressure changes therebetween, one end of said flexible connection entering the reservoir through said reel and the other end being connected to said level sight, a crank member carried by said reel and having a bore through at least a portion of the length thereof, one end of said bore being in communication with said reservoir and the other end of said bore communicating with atmosphere, valve means at the end of said bore communicate with atmosphere for opening and closing the port area of said bore, and braking means carried by said support means positioned to frictionally engage said rotatable reel for restricting rotation thereof.

4. An improved hydrostatic level as claimed in claim 3 further comprising clamp means carried by said support means and having one end adapted to bite upon the surface to which said support means is to be secured and having adjusting means at the other end for controlling the bite of said clamp means, said clamp means having a bore partially therethrough adapted to receive therein the sight portion of said level sight for protecting the same against breakage in transit.

5. An improved hydrostatic level as claimed in claim 3 further comprising a scribe carried by said level sight.

6. An improved hydrostatic level as claimed in claim 3 wherein said braking means comprises a boss carried by said support means and having a bore therethrough, a plunger receivable through said bore, and adjusting means carried by the free end of said boss for urging said plunger into frictional engagement with said reel.

7. An improved hydrostatic level as claimed in claim 3 further comprising a tubular connection between the end of said flexible connection communicating with said reservoir and the hydrostatic media the length of which is equal to at least ½ the diameter of said reservoir, the longi-

tudinal axis of which is at substantially a right angle to the axis of rotation of said reel.

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