May 10, 1949. L. SUVERKROP 2,469,583

ADJUSTABLE PLUMB BOB

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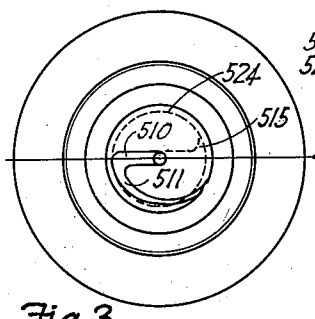


Fig. 3

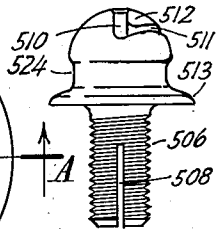


Fig. 4

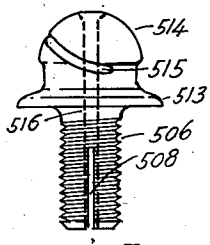


Fig. 5

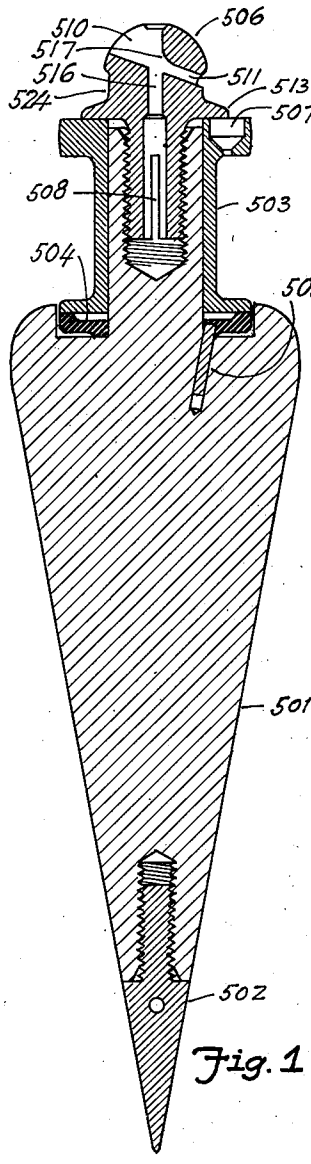


Fig. 1

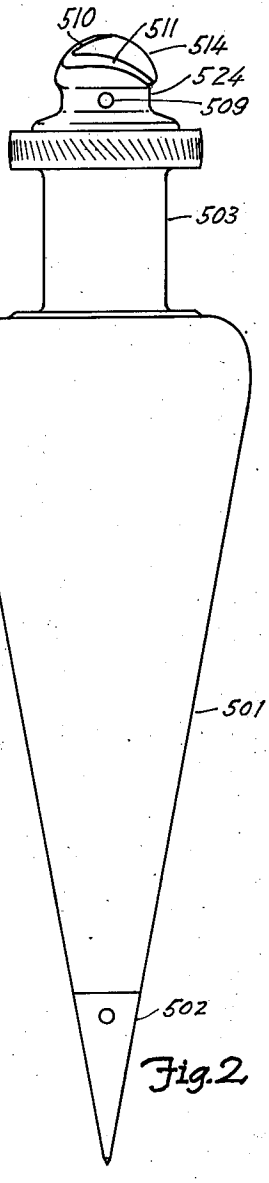


Fig. 2

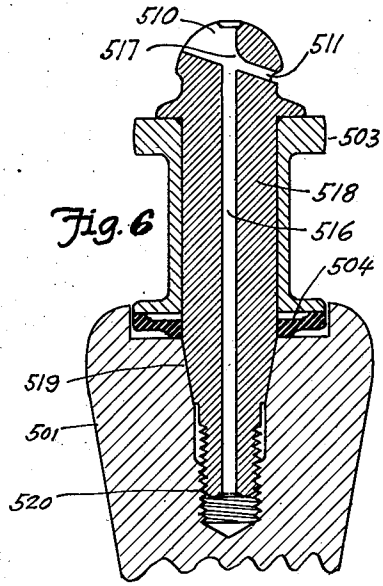


Fig. 6

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ADJUSTABLE PLUMB BOB

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6 Claims. (Cl. 33—217)

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My invention relates particularly to the geometrical instrument known as the plumb bob, used to establish a location vertically above or below a point. The improvements apply especially to the types used by builders, surveyors, etc. in the more exacting work requiring fine adjustment of the string length so as to place the plumb bob point closely above a reference point. For such work, the ordinary plumb bob, having no provision for holding or adjusting the string, has serious disadvantages. To adjust the length of the string, it must be knotted or otherwise manipulated, or a separate attachment must be employed for the purpose. If the adjustment is made with sufficient precision, it is usually a time consuming job. The lack of a place provided for carrying the string when the plumb bob is not in use is an additional disadvantage. The string is usually wound about the neck of the bob or looped in figure-eight fashion over its body; but this is untidy, the string frequently becomes tangled, and time is consumed in winding or withdrawing the string.

Plumb bobs have been constructed heretofore with reels, usually with the common advantage over the ordinary type of bob in that they provide a place for the string so it will not become tangled when the bob is not in use. Those bobs are of two types. The reels are either internal or external. In general, the internal reel type permits fine adjustment of the string length; but has the disadvantages of somewhat complicated and delicate mechanism, and is slow in operation—especially in winding up the string. In the external type, the string may be quickly wound up; but such bobs have the disadvantage of not permitting quick, fine adjustment of the string length. Moreover, this type of plumb bob requires a string hook and this is usually made integral with a larger part of the bob all of which must be replaced in event of damage to the hook. In addition, the hook is difficult to manipulate.

One object of this invention is to provide a plumb bob with a reel on which the string may be more quickly wound than in the internal reel type, and from which the string may be more quickly withdrawn than is the usual external reel type. A further object is to provide a plumb bob with a reel which may be directly rotated by the hand for the purpose of adjusting string length. A further object is to provide a plumb bob with a head affording a string hook which will facilitate the introduction of the string into position for suspension of the plumb bob. A further object is to provide a detachable head and string head

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for a plumb bob so that the head may be readily replaced in event of damage, without replacing any other part of the plumb bob. A further object is to provide a detachable plumb bob head with a through hole so that the plumb bob may be used as an ordinary plumb bob in the event of damage to the head, until such time as it may be convenient to replace the head. A further object is to provide a plumb bob with an external rotatable reel on which the string may be wound and from which the string may be withdrawn, with friction control of the reel's rotation so that the reel will stand and hold any amount of string payed out from it against any action due to the weight of the bob. A further object of the invention is to provide that friction with an adjustment so that the degree of control of the reel's rotation may be regulated as desired. A further object is to provide that friction control with a self-contained spring which will automatically compensate for slight dimensional changes due to wear or weather conditions so as to maintain a substantially constant friction. These and other objects of the invention will be clear from the following description and the accompanying illustrations, in which:

Fig. 1 is a cross section, taken along the line A in Fig. 3, showing a plumb bob made according to this specification.

Fig. 2 is an elevation of the same.

Fig. 3 is a plan of the same.

Figs. 4 and 5 are elevations of a head for plumb bobs made according to this specification.

Fig. 6 is a cross section of a detail of another embodiment of plumb bob made according to this specification.

The plumb bob shown in Fig. 1 consists of a body **501** of the usual form and material and fitted with the usual hardened point or indicator **502**. The upper end or neck of the body **501** is of cylindrical form to receive the rotatable reel **503** and is recessed for the friction washer **504** which is preferably keyed against rotation by the pin **505** in the body **501**. The upper termination of the neck of the body **501** is threaded to receive a threaded shank on the head **506**.

The string reel **503** is preferably provided with a countersunk hole **507** for holding one end of the string to the reel **503**. Except for the action of the friction washer **504**, the string reel **503** is free to rotate on the neck of the plumb bob body **501**. The upper flange of the string reel **503** is preferably wide enough to provide a suitable knurled surface for gripping with the fingers and so as to carry the countersunk hole **507**. The

reel may be made of one piece as shown or can be constructed of two flanges permanently attached to the ends of a short piece of tubing. The lower flange may be made rather thin and should fit into the recess at the top of the plumb bob body 501 as shown.

The friction washer or aperture disc 504 may be made of fibre or phenolic condensation product or like material. By placing a raised ring at the outer edge of the washer on one side and another raised ring at the inner edge of the washer on the other side, as illustrated in Figs. 1 and 6, these rings bear against the reel and body respectively, and the thin part of the washer between these rings serves as a spring. This spring compensates for any irregularities in the surfaces of these parts which are in contact with the friction washer 504, and for any changes in dimensions due to temperature or weather conditions, thereby maintaining a substantially constant friction.

The threaded shank of the head 506 is split with a saw slot 508 as shown in Figs. 4 and 5 so that the threads fit snug in the threaded hole in the body 501. A capstan hole 509 is provided for turning the head 506 by means of a common adjusting pin or small nail. In this way the distance between the shoulder of the head 506 and the friction washer 504 may be adjusted so as to vary the friction of the washer 504 against the reel 503. The snug fit of the head 506 in the body 501 prevents accidental rotation of the head 506 so that the adjustment is retained.

The so-called hook part of the head 506 is formed by the intersection of two slots, 510 and 511, shown in the various illustrations, which are milled in the metal of which the head is made. One of these, 510, is vertical and extends outward from the axis of the head. The other slot, 511, slopes upward slightly as it extends outward from the center of the head. The plane of the slot 511 slopes so that it intersects slot 510 in a line that tilts slightly upward from a perpendicular extending outward from the axis of the head, and the plane of the slot 511 also slopes slightly upward from a perpendicular to the plane of slot 510. The intersection of such planes 510 and 511 results in a rather sharp edge which will cut the plumb bob string unless rounded as at 512 in Fig. 4. In effect, the intersecting slots 510 and 511 define a notch into which projects a tongue terminating in rounded edge 512, the sides of said tongue being parallel to the side surfaces defining said notch. A flange 513 is formed on the head to shoulder against the reel 503 and the upper part of the head 506 is preferably roughly hemispherical in form as indicated in the drawings and at 514 in Fig. 5. From Figs. 1, 2 and 6, it will be seen that flange 513 has a smaller diameter than the upper flange of reel 503. Between the hemispherical knob 514 and the flange 513 is a slight recess 524 which is annular. The slot 511 intersects the upper part of the recess 524 as shown in Figs. 2, 3, and 5; and the intersection, which otherwise would form a sharp corner that would wear the string, is rounded off at 515 as indicated in Figs. 3 and 5. As the string passes from the reel, around at least a portion of annular recess 524, into slot 511, and up through slot 510, said string passes around the root portion of the tongue which terminates in end 512. Said portion of recess 524 and the root portion of said tongue provide adjoining snubbing surfaces defining a somewhat tortuous path and their function regarding the string is very similar to that of a snubbing post. Said snubbing function supplements the friction of washer 504 in arresting rotation of reel 503 and maintaining any selected position of said reel relative to the body 501. A hole 516 runs through the body of the head 506 in Fig. 3 and 518 in Fig. 6 and may be used for suspending the bob as an ordinary plumb bob without making use of the projection 512. This hole 516 is drilled precisely central with the plumb bob and when suspended the string bears against the wall of this hole. The slot 510 is milled to the center of the hole 516 but not beyond so that sufficient of the hole 516 remains for support of the string as described. The intersection between slot 511 and hole 516 is rounded as at 517 in Figs. 1 and 6 to reduce wear on the string. It will thus be seen that in addition to the string snubbing function described above, the inner end of vertical slot 510 as defined by hole 516 affords an accurate and readily accessible means for positioning the string in the center of the head 506, whereby the bob is suspended in an accurate, vertical position.

The friction washer key 505 is simply a pin forced into a hole drilled in the body of the plumb bob, 501. This key 505 protrudes from the recess in the body 501 sufficiently to engage a notch or keyway in the friction washer 504 as indicated in Fig. 1. Keying the friction washer 504 in this way makes it more positive in action but is not absolutely necessary and the key 505 may be omitted as indicated in Fig. 6.

Putting the hole in the neck of the body 501 to receive the hook 506 as indicated in Fig. 1 reduces the cross sectional area and tends to weaken the neck of the body 501. This may be corrected by having the head constructed as shown in Fig. 6. Here the body or shank of the head 518 is sufficiently large to provide the axle on which the reel 503 rotates and sufficiently long to extend downward directly into the body 501 of the plumb bob. Thus the head 518 itself is made to serve as an equivalent of the neck of the body 501 with no reduction in cross section other than that of the hole 516. As shown in Fig. 6, no adjustment of the friction is provided other than the automatic adjustment due to the flexibility of the friction washer 504. As shown, the head 518 is provided with a taper 519 which is drawn into a suitable seat in the body 501 of the bob by means of the thread 520. However, this taper 519 may be omitted and the head 518 screwed adjustably into the body 501 so as to vary the friction of the washer 504 employing the principles of the construction shown in Fig. 1.

For use, the plumb bob string is passed through the hole 507 from above so that a knot on one end of the string is drawn into the countersink of the hole 507. Then the other, free end of the string is formed into a bowline or other permanent loop by means of which the string may be attached to a hook or the like for use.

To prepare the bob for carrying, the body 501 is held in the left hand and, using the right hand, the string is wound around the core of the reel 503 until but a couple of inches of unwound string remain. This remainder is drawn around the hook 512, Fig. 4, by passing the string first into slot 511 and then into slot 510 and drawing it upward against the rounded place 517, Fig. 1, at the root of the projection 512. The reel 503 is then rotated with the fingers to draw the string around the rounded place 515, Fig. 5, and into the recess 524. This pulls the loop on the string down to the top of the head 506 and will keep the string

ready for use without danger of unintentional loosening or becoming tangled.

To use the plumb bob, the reel 503 is first rotated slightly in the reverse direction so as to release the looped end of the string from the top of the head 506. The body 501 is then held in the left hand and, holding the looped end of the string with the right hand, the string is pulled so as to rotate the reel 503 and unwind a slight excess of string beyond that necessary to suspend the plumb bob in the position wanted. The loop is attached to the desired object and the string near the plumb bob is passed around the projection 512 as previously described. Then the reel 503 is rotated with the fingers in the direction which will draw the string around the recess 524, thus shortening the string issuing from the bob until the point or indicating means 502 is brought to precisely the height desired. The hooking of the string and the final, minute adjustment of the string may be performed with one hand. In general, passing the string from the reel, around at least part of annular recess 524, into slot 511, around projection 512, and into slot 510, resembles passing a string around a snubbing post and then around a projection which serves as a sort of hook for suspending the snubbing post from the string.

Some of the details disclosed in this specification are applicable to and may be used in other devices, and may be used in entirely different arts. Moreover, while I have illustrated and described preferred forms of construction, I do not wish to limit myself to the precise details of structure shown in the drawings, but desire to avail myself of such variations and modifications as come within the scope of the appended claims.

What I claim is:

1. A plumb bob comprising in combination, a body having a central axis arranged to be suspended during use in a vertical position, a flanged reel mounted on the upper end of said body for rotation around said central axis of said body, and a head mounted above the upper flange of said reel and disposed inward from the periphery of said upper flange, said head including slot means constructed and arranged freely to receive a string from the periphery of the upper flange of said reel and dispose said string in a tortuous path to restrain movement thereof relative to said head and also position said string so that it extends upward from said head in alignment with the vertical axis of said body, whereby the upper flange of said reel may readily be manually engaged to rotate the reel in opposite directions to raise or lower said plumb bob when suspended from said string.

2. A plumb bob comprising in combination, a body having a central axis arranged to be suspended during use in a vertical position, a flanged reel mounted on the upper end of said body for rotation relative thereto around said axis, and a head mounted above said reel and disposed inward from the periphery of the upper flange of said reel, said head including a substantially horizontal annular groove comprising snubbing means and also an open-sided slot shaped to provide a tortuous path for and freely receive a string from said reel, the walls of said slot and said snubbing means co-acting to retard movement of said string relative to said head and also dispose said string so that during use it extends upward from said head in alignment with the vertical axis of said body.

3. A plumb bob comprising in combination, a body having a central axis arranged to be suspended during use in a vertical position, a flanged reel mounted on the upper end of said body for rotation around said central axis of said body, a head mounted above the upper flange of said reel and extending inward from the periphery of said upper flange, said head being threadably connected to said body so as to afford relative adjustment between said head and body and said head also including slot means constructed and arranged freely to receive a string from the periphery of the upper flange of said reel and dispose said string so that it extends upward from said head in alignment with the vertical axis of said body, and disc-like friction means acting between said body and reel to retard relative rotation therebetween, the frictional force exerted by said friction means being variable upon rotation of said head relative to said body.

4. A plumb bob comprising in combination, a body having a central axis arranged to be suspended during use in a vertical position, a flanged reel mounted on the upper end of said body for rotation around said central axis of said body, a head mounted above the upper flange of said reel and extending inward from the periphery of said upper flange, said head having a split stem threadedly connected to and exerting frictional force relative to said body so as to yieldably maintain relative adjustment between said head and body and said head also including slot means constructed and arranged to receive a string from the periphery of the upper flange of said reel and dispose said string so that it extends upward from said head in alignment with the vertical axis of said body, and disc-like friction means disposed between said body and reel to retard relative rotation therebetween, the frictional force exerted by said friction means being variable upon rotation of said head relative to said body.

5. A plumb bob comprising in combination, a body having a central axis arranged to be suspended during use in a vertical position, a flanged reel mounted on the upper end of said body for rotation around said central axis of said body, a head mounted above and in engagement with the upper flange of said reel and having a split stem threadably connected to and exerting frictional force relative to said body so as to yieldably maintain relative adjustment between said head and body and said head also including a passageway constructed and arranged to receive a string from the periphery of the upper flange of said reel and dispose said string so that it extends upward from said head in alignment with the vertical axis of said body, and a friction element between said reel and body and acting upon said reel to retard rotation thereof relative to said body.

6. A plumb bob comprising in combination, a body having a central axis arranged to be suspended during use in a vertical position, a flanged reel mounted on the upper end of said body for rotation around said central axis of said body, a head mounted above the upper flange of said reel and disposed inward from the periphery thereof, said head including a passageway constructed and arranged to receive a string from the periphery of said upper flange of said reel and dispose said string so that it extends upward from said head in alignment with the vertical axis of said body, whereby the upper flange of said reel may be manually engaged to rotate said reel in opposite directions to raise or lower said plumb bob when suspended from said string, and friction

means acting upon said reel to retard rotation thereof relative to said body.

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