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Petrik

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[54] VERTICAL ALIGNMENT GAUGE

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Related U.S. Application Data

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[52] **U.S. Cl.** **33/347,** 33/371, 33/392

[51] **Int. Cl.** **G01c 15/10**

[58] **Field of Search**.....33/370, 371, 392, 393, 394; 248/206 A, 214, 215, 210, 211

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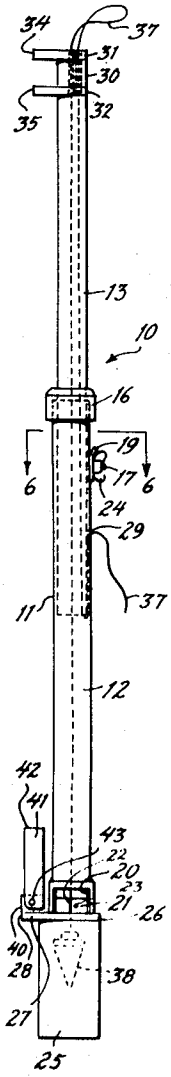
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[57] **ABSTRACT**

A telescopically adjustable tubular construction for upright arrangement having a central opening in its upper end and permanent magnet means extending laterally from an upper region of the tubular construction for holding engagement with a door jamb or the like, a standoff member adjacent to a lower region of the tubular construction, a window provided in a lower region of the tubular construction, and plumb bob means suspended interiorly of the tubular construction visually accessible through the window.

2 Claims, 6 Drawing Figures



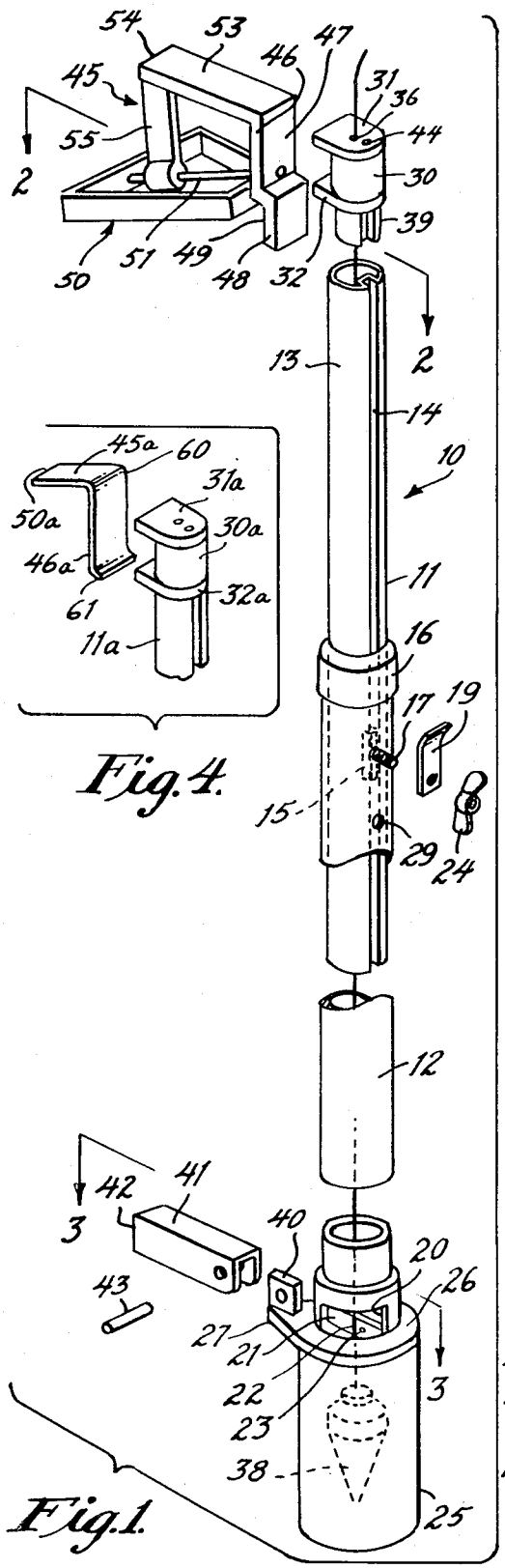


Fig. 1.

Fig. 4.

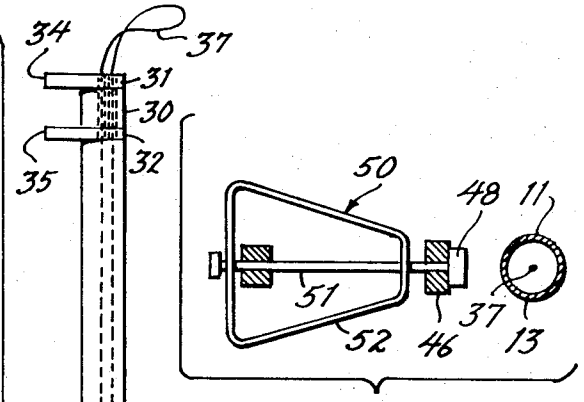


Fig. 2.

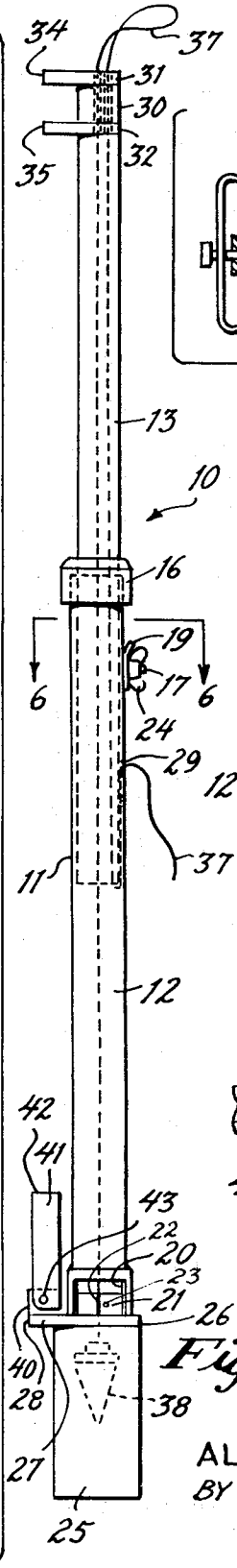


Fig. 5.

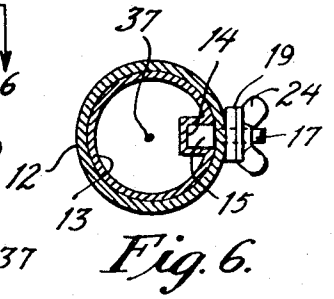


Fig. 6.

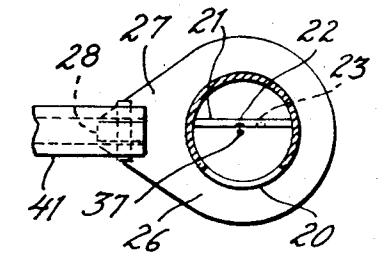


Fig. 3.

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VERTICAL ALIGNMENT GAUGE

CROSS-REFERENCES TO RELATED APPLICATIONS

This patent application is a division of my copending patent application Ser. No. 866,995 filed Oct. 16, 1969 now U.S. Pat. No. 3,638,325.

BACKGROUND OF THE INVENTION

As is well known to those versed in the construction industry, and particularly in steel construction, prior plumbing devices for steel components, such as columns and frames, were extremely cumbersome and difficult to handle, usually involving at least a two-man operation and often requiring hazardous climbing by a user, or unavailable sighting space and expert personnel, as in the use of transits, and the like.

SUMMARY OF THE INVENTION

It is an important object of the present invention to provide a vertical alignment gauge which is especially well adapted for plumbing construction components, as in reinforced concrete and steel construction but not limited thereto, which device is capable of quick and easy one-man operation even at elevated locations which cannot be reached by the user and wherein precise verticality is conveniently observable and obtainable even by inexperienced persons, wherein adverse weather conditions, such as high winds do not affect the ease and accuracy of operation.

It is still another object of the present invention to provide a vertical alignment gauge of the type described which is extremely versatile for use in a wide variety of conditions, and which includes different suspension means for employment under different conditions and use in different types of construction.

It is still another object of the present invention to provide a vertical alignment gauge having the advantageous characteristics mentioned in the preceding paragraph, which is extremely simple and durable in construction, reliable throughout a long useful life, and which can be economically manufactured for sale at a reasonable price.

Other objects of the present invention will become apparent upon reading the following specification and referring to the accompanying drawings, which form a material part of this disclosure.

The invention accordingly consists in the features of construction, combinations of elements, and arrangements of parts, which will be exemplified in the construction hereinafter described, and of which the scope will be indicated by the appended claims.

BRIEF DESCRIPTION OF THE DRAWING

FIG. 1 is an exploded perspective view showing a vertical alignment gauge constructed in accordance with the teachings of the present invention, partly broken away to conserve drawing space.

FIG. 2 is a generally horizontal sectional view taken generally along the line 2—2 of FIG. 1.

FIG. 3 is a horizontal sectional view taken generally along the line 3—3 of FIG. 1.

FIG. 4 is a partial exploded top perspective view showing a slightly modified embodiment of vertical alignment gauge constructed in accordance with the present invention.

FIG. 5 is a side elevational view of the instant alignment gauge in a slightly different condition of use.

FIG. 6 is a transverse sectional view taken generally along the line 6—6 of FIG. 5.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring now more particularly to the drawings, and specifically to FIG. 1 thereof, a vertical alignment gauge of the present invention is there generally designated 10, and includes a tubular construction 11 preferably of telescopic arrangement, say including a lower tubular member 12 and an upper tubular member 13 having its lower end region extending slidably into the upper end region of the lower tubular member. Suitable means, such as a rotative locking collar 16, may be provided for releasably holding the tubular members 12 and 13 in a selected position of their relative extension.

The upper tubular member may be formed with a longitudinally coextensive keyway or groove 14, which opens or faces radially outwardly toward the inner surface of the lower, outer tubular member 12 when received in the latter. A block or key 15 is located interiorly of the lower, outer tubular member 12, in an upper region thereof, and conformably and slidably received in the groove 14. A threaded stud or pin 17 projects rigidly from the key 15 radially through and exteriorly of the lower tubular member 12. A resilient strip or spring clip 19 is engaged over the stud 17 and held in facing engagement with the exterior of the tubular member 12, as by a suitable retaining member, such as a wing nut 24 threaded on the stud 17, the assembled condition being best seen in FIGS. 5 and 6. Spaced below the spring clip 19, in vertical alignment therewith, may be a through hole or opening 29 formed in the lower tubular member 12 and communicating therethrough with the groove 14 of inner, upper tubular member 13.

Formed in a lower region of the lower tubular member 12 is a through opening or window 20, preferably at an angle of about 90° from the upper end keyway 14 in the assembled condition. Interiorly of the window 20 in the lower tubular member 12 there is provided a marked plate 21. The marked plate 21 is arranged with one surface facing toward the window 20 and may extend generally diametrically across the interior of the tubular member 12, but spaced slightly beyond the axis of the tubular member away from the window. The surface of plate 21 facing toward the window 20 is provided with a center marking or vertical line 22, and is also provided with an additional marking, say a dot 23 slightly spaced laterally from the center marking 22 rightward, as seen in FIGS. 1 and 3.

Depending from the lower end of the lower tubular member 12, in alignment therewith, is an enlarged hood 25. Just above the hood there may be provided a collar 26 extending about the lower region of lower member 12, and formed with a lateral extension or standoff member 27 terminating in an outwardly facing abutment surface 28. The standoff member 27 projects laterally outwardly diametrically opposite to the direction of offset of the dot or marking 23 with respect to the center line marking 22.

A generally cylindrical magnet member 30 is located coaxially on the upper end region of the upper tubular

member 13, having a slotted tubular mounting member 39 concentrically received in the upper end of tubular member 13. A pair of upper and lower pole pieces 31 and 32 are respectively fixedly secured by any suitable means to the upper and lower ends of the cylindrical magnet 30, and project laterally therefrom outwardly beyond the tubular construction 11. The cylindrical magnet 30 and the upper and lower pole pieces 31 and 32 are provided with a through guideway or opening 36 coaxial with the cylindrical magnet member and with the tubular construction 11. The pole pieces 31 and 32 and cylinder 30 thus combine to define a generally horseshoe shaped magnet fixed to the upper region of the tubular construction 11. The upper and lower pole pieces 31 and 32 terminate at their outer ends in respective faces 34 and 35 which are coplanar with each other, and also coplanar with the abutment face 28 of stand-off member 27.

The upper end of the magnet assembly 30–32 may receive through the opening 36 a flexible elongate member or string 37. The elongate flexible member 37 extends from exteriorly of the tubular construction 11 downwardly through the guideway 36 entirely through the tubular construction 11 to its lower end in the hood 25, where it is secured to a plumb bob 38. The upper end of the elongate element 37 may loop downward for return to the interior of the tubular construction 11, as through an opening or guideway 44 formed through the magnet 30 and pole pieces 31 and 32, adjacent to the opening 36. Passing downward through the opening 44, the elongate member or flexible line 37, as best seen in FIG. 5, passes beneath the lower end of upper tubular member 13, upwardly within the groove or keyway 14, and extends exteriorly of the tubular construction through the hole 29. With the plumb bob suspended at a desired location within the hood 25, the opposite, free end of the flexible element 37 may be wound about the tubular member 12 and frictionally engaged beneath the spring clip 19 for effective retention thereby. In this condition, the tubular members 12 and 13 may be telescopically extended and contracted without changing the location of the plumb bob 38 in the hood 25, the elongate element being configured, as described hereinbefore, to define a running loop take-up.

Pivotally connected to a lower region of the tubular construction 11, say to a lug 40 upstanding from the stand-off 27, may be an elongate arm or spacer strut 41. That is, the strut mounting lug 40 is on the same side of the tubular construction 11 as the pole pieces 31 and 32, in substantial alignment therewith longitudinally of the tubular construction; and, the spacer strut 41 is pivotally connected, as by pin 43, to the lug 40 for swinging movement between a generally radially outstanding position, shown in FIG. 1, and a retracted position rotated vertically and parallel to the lower region of the lower tubular member 12, shown in FIG. 5. The spacer strut 41 is of a length so as to terminate at its free end 42 a predetermined distance from the axis or center line of the tubular construction 11.

Extending laterally outwardly from an upper region of the tubular construction 11 is a hanger, generally designated 45. The hanger 45 may include a generally vertically disposed attachment member 46 removably located in magnetically held engagement with and extending between the end faces 34 and 35 of pole pieces 31 and 32. That is, the attachment member 46 has a generally flat inner face 47 secured in facing engagement with the coplanar end faces of pole pieces 31 and 32. A depending extension 48 is provided on a lower region of the attachment member 46, and formed with an outwardly facing generally planar surface 49 which, in the assembled condition of FIG. 1 is coplanar with the pole faces 34 and 35. Thus, the pole faces 34 and 35, outer face 49 of depending attachment member extension 48, and abutment surface 28 of stand-off member 27, are all substantially coplanar with each other, and equidistant from the center line or axis of the tubular structure 11.

The hanger 45 includes a hanger support 50 which extends obliquely laterally outwardly and downwardly from a lower region of the attachment member 46. The hanger support may include a pintle pin or rod 51, see FIG. 2, having its inner end fixed to a lower region of the attachment member 46, and extending laterally outwardly and downwardly therefrom. In addition, a generally polygonal, substantially coplanar open frame member or lower hanger support element 52 has opposite ends pivotally mounted on the rod 51 for rotation about the axis thereof, for a purpose appearing presently.

Extending rigidly from the attachment member 46, the hanger 45 includes an upper arm 53 which terminates in an outer end face 54 generally coplanar with the outer end face 42 of spacer strut 41 when the latter is in its outstanding position. That is, the hanger arm 53 extends laterally outwardly or radially with respect to the tubular construction 11, so that its outer end surface 54 is spaced equidistant with the outer end surface 42 of extended space strut 41 from the axis or center line of the tubular construction.

A rigidifying member 55 may extend rigidly from an outer region of the upper hanger arm 53 toward the hanger support 50, and serve to pivotally receive and journal an outer region of the hanger support rod 51.

In the embodiment shown in FIG. 4, the tubular structure 11*a* may be identical to the tubular structure 11, and the magnet means 30*a*, 31*a* and 32*a* may be identical to the first described magnet means 30, 31 and 32.

However, the hanger 45*a* differs from the hanger 45, in the inclusion of a generally upright attachment member 46*a* detachably secured in magnetic engagement with the faces of pole pieces 31*a* and 32*a*, and having at its upper end a diagonally laterally outwardly and downwardly hanger support 50*a*. The hanger 45*a* may be fabricated of a single integral piece of sheet metal, the attachment 46*a* being formed integral with and connected to the hanger support 50*a* by a curved portion or bend 60. Also, the lower end portion 61 of the attachment member may be deformed to extend obliquely laterally inwardly and downwardly toward the tubular construction 11*a*.

The various modes of operation will now be considered. In the solid line condition of the alignment gauge shown in FIG. 1, the entire gauge may be suspended on a wale, as by resting the hanger support 50 on the upper edge of a wale extending rearwardly or inwardly therebeyond. The hanger support 50 may gravitationally slide rearward or leftward until the end

face 54 of the hanger arm 53 abuts an upper region of a concrete form surface. The end face 42 of spacer strut 41 will abut a lower region of the concrete form surface; and, as the end faces 54 and 42 are equidistant from the center line of tubular structure 11, the latter will assume the verticality of the concrete form or wall. When the form or wall is precisely vertical, the elongate element or string 37, as viewed through the window 20, will be in registry with the marking 22.

In use for vertical alignment of a thick member, such as a wall, partition, form, tilt-up, precast, or the like, the support 50 of the hanger 45 is similarly rested on the upper edge of the thick member extending rearwardly or inwardly therebeyond, and slides across the thick member until the face 49 of depending extension engages the face of the thick member. In this mode of operation, the spacer strut 41 is swung upward to its retracted position, and the abutment surface 28 of stand-off 27 engages the face of the thick member at a lower region thereof. As the coplanar surfaces 49 and 28 both engage the face of the thick member to be plumbed, and are both equidistant from the center line of the tubular structure 11, the tubular structure assumes the verticality of the thick member. Accordingly, when the thick member is precisely vertical, the elongate element or string 37 will be in registry with the center marking 22.

When the vertical alignment gauge 10 is employed for use in conjunction with structural steel, door bucks, metal buildings, and the like, the hanger 45 or 45*a* may be removed from its magnetic engagement with the pole pieces 31 and 32. Also, the spacer strut 41 is swung upwardly to its retracted position. In this condition, the pole faces 34 and 35 are coplanar with the stand-off surface 28, all being equidistant from the center line of the tubular structure 11. The gauge 10 may then be placed with its pole faces 34 and 35 engaging the steel member to be plumbed, a lower region of the steel member being in engagement with the stand-off surface 28. Here again, the precise verticality of the steel member will be indicated by registry of the elongate element or string 37 with the marking 22.

For use with thin members, such as plywood panels, thin frames, flanges, and the like, the hanger 45*a* is employed in conjunction with the magnetic pole pieces 31*a* and 32*a*, as seen in FIG. 4. The hanger 45a is arranged with its support 50*a* resting on the upper edge of a thin member, gravitationally sliding to a position extending across and beyond the latter with the attachment member 46*a* in facing engagement with the thin member. The spacer strut 41 is swung upwardly, and the lower engagement surface 28 abuts a lower region of the thin member to be plumbed. In this condition, the tubular construction 11 is slightly out of parallel with respect to the thin member, specifically being out of parallel by the thickness of attachment member 46*a*. This thickness may be on the order of one-eighth inch, and to compensate for this slight out of parallelism, the window marking 23 is employed. That is, precise verticality of the thin member is indicated when the elongate element or string 37 is in registry with the marking 23, which is offset from the center marking 22 approximately equal to the thickness of attachment member 46.

From the foregoing, it is seen that the present invention provides a vertical alignment gauge of extreme versatility in use, and which otherwise fully accomplishes its intended objects.

Although the present invention has been described in some detail by way of illustration and example for purposes of clarity of understanding, it is understood that certain changes and modifications may be made within the spirit of the invention.

What is claimed is:

1. A vertical alignment gauge comprising a telescopically adjustable tubular construction adapted to be arranged in upright relation, a closure on the upper end of said tubular construction and having a central through opening, permanent magnet means extending laterally from said tubular construction adjacent to the upper end thereof and terminating in pole faces spaced a predetermined distance from the center line of said tubular construction, said pole faces being adapted for magnetic holding engagement with a door jamb or the like, a laterally extending stand-off member on said tubular construction adjacent to the lower end thereof terminating in an abutment face spaced said predetermined distance from said center line for abutting engagement with the door jamb, a window in the lower region of said tubular construction and provided with a center line marking, and elongate flexible element depending through said opening interiorly of said tubular construction and past said window, a plumb bob on the lower end of said flexible element, so that vertical alignment of said tubular construction can be determined by observation through said window of said flexible element relative to said center line marking, a hanger comprising a generally vertical attachment member having one side removably secured in magnetic engagement with said magnet means, a hanger support extending from said attachment member laterally outwardly and obliquely downwardly for resting engagement with the upper edge of a supporting member or the like, said hanger support extending laterally outwardly and downwardly from said attachment member for sliding gravitational movement of said hanger support across an upper supporting member edge to place the outer side of said attachment member against said supporting member, said tubular construction center line being located at a distance from said supporting member equal to said predetermined distance plus the thickness of said attachment member, and an additional marking in said window spaced outwardly from said center line marking a distance equal to the thickness of said attachment member.

2. A vertical alignment gauge according to claim 1, said hanger support being integral with and extending from an upper region of said attachment member.

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