Nov. 28, 1967 W. J. FISHER 3,354,549

APPARATUS FOR TRANSFERRING A MARK FROM ONE HORIZONTAL PLANE TO ANOTHER

Filed March 29, 1965

Fig. 1.

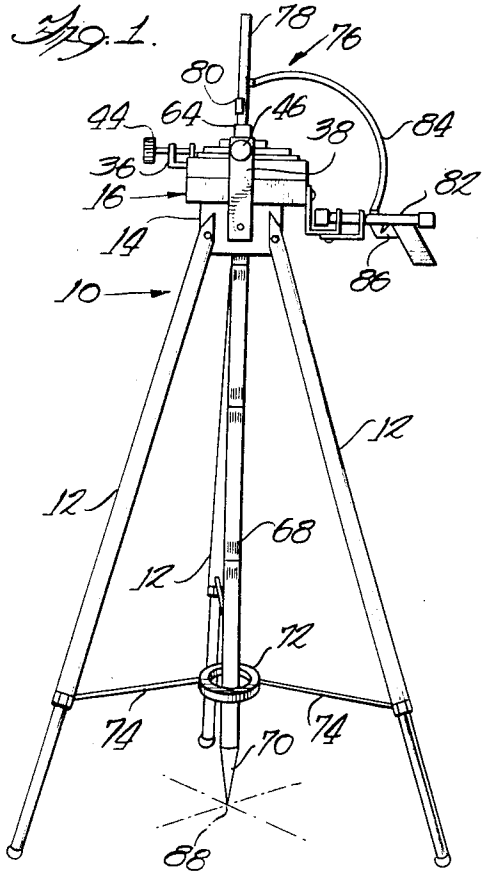


Fig. 2

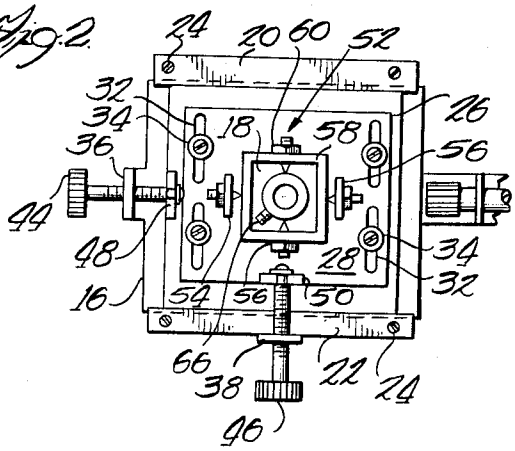


Fig. 3

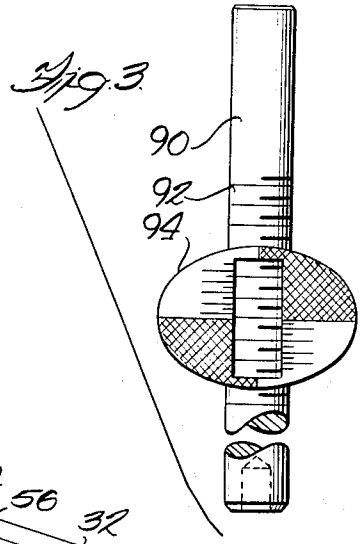
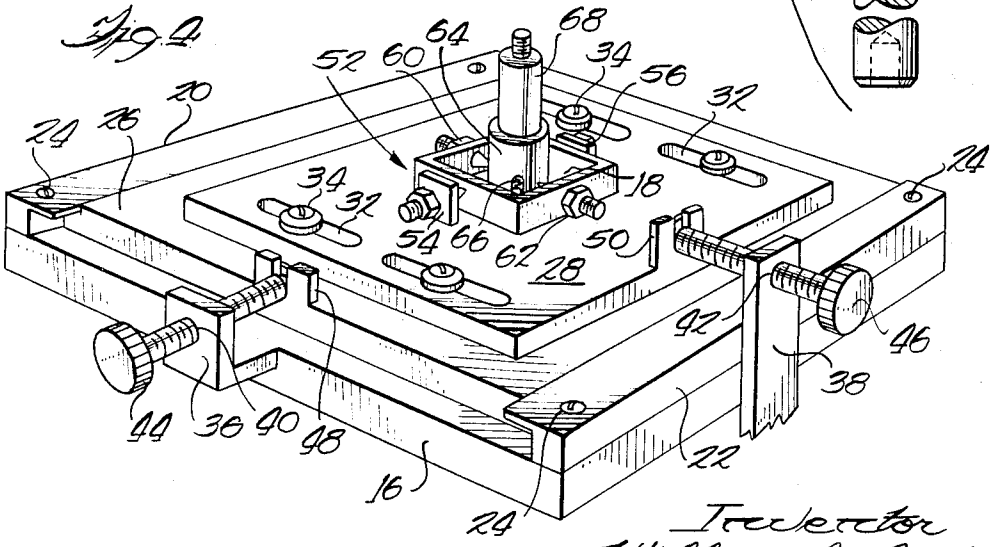


Fig. 4



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This invention relates generally to instruments and more particularly to instruments for accurately transferring a mark from one location to another.

In the construction industry, it is often necessary to establish the location of a mark or spot on some relatively convenient surface and then transfer that mark to a more inaccessible surface. For example, in attaching a light fixture to a ceiling, the attachment marks may be easily laid out on the floor at prescribed distances from the walls of the room. To transfer such mark to the ceiling, it has heretofore been necessary to position one workman on a ladder with a string, plumb bob and marking pencil and to position the plumb bob according to the directions of a second workman on the floor and mark the ceiling accordingly.

Similarly, in transferring a mark from one vertical elevation to another, the prior art method employed several workmen and was cumbersome in practice. One workman operates a surveyor's transit. A second workman is necessary to hold a level rod and a third person places the desired mark or brings the product to the proper elevation according to the reading being taken by the surveyor.

These methods require the participation of several workmen and are time consuming operations to perform a relatively simple task. In the course of a construction job this operation must be performed innumerable times and the time saved in each operation may be substantial in the whole.

Accordingly, it is an object of the present invention to provide an apparatus for maintaining one of the means or members, necesary to transpose a mark to a desired location in a vertical or horizontal direction, in a true vertical position.

It is another object of this invention to provide an apparatus which may be positioned over a mark on a lower horizontal surface and expels a marking substance in a vertical direction onto an elevated horizontal surface above the appartus so as to locate a mark on the upper surface substantially directly above the mark on the lower horizontal surface.

It is yet another object of the present invention to provide an apparatus for transferring a mark on a floor onto a ceiling at a location substantially directly above the floor mark by expelling a marking substance from a barrel maintained in a true vertical position by a high pressure gas source.

It is still another object of the present invention to provide an apparatus for slidably supporting a level rod in a true vertical position to be used with a surveying transit in transferring a mark from one vertical elevation to a second vertical elevation at a remote location.

One more object of the present invention is to provide an apparatus of the above-stated type wherein an elongated member, such as a marking gun barrel or a level rod, is supported by gimbal means so as to be oriented in a true vertical position and may be laterally positioned in a horizontal plane.

For a better understanding of the invention together with other further objects thereof, reference should now be made to the following detailed description which is to be read in conjunction with the accompanying drawing in which:

FIGURE 1 is a front elevational view of an apparatus for maintaining an elongated member in a true vertical position;

FIGURE 2 is a top view of the upper portion of the apparatus shown in FIGURE 1;

FIGURE 3 is an elevational view of a level rod for use with the apparatus shown in FIGURE 1; and

FIGURE 4 is a perspective view of a portion of the apparatus shown in FIGURE 1.

Referring now to the drawing and more particularly to FIGURE 1, there is shown an apparatus 10 maintaining an elongated member in a true vertical position. In the embodiment of FIGURE 1, the apparatus comprises a plurality of adjustable legs 12 attached to foot plate 14. This portion of the apparatus may be tripod, as shown, although other supports may be used. Mounted on foot plate 14 is a base 16 having an opening 18 therein as more clearly seen in FIGURE 2. The plate 16 has guide means comprising a pair of parallel spaced side walls 20 and 22 secured to base 16 by a plurality of screws 24. A horizontally disposed plate 26, having an opening is supported by base 16 and is slidable between horizontal wall portions 20 and 22. A second plate 28 is supported by plate 26 in a horizontal position and is slidable relative to plate 26 and base 16 in one direction at 90° to the direction in which plate 26 is slidable. Guide means for plate 28 are provided comprising slots 32 and nut and bolt combinations 34. Base 16 has mounted thereon wall portions 36 and 38 having threaded holes 40 and 42, respectively. Adjustment screws 44 and 46 are respectively threaded in holes 40 and 42 for positioning the sliding plates 26 and 28. Plate 26 has a wall member 48 upon which bears the end of adjusting screw 44 for slidable movement in a direction parrallel to the axis of screw 44. Plate 28 has a wall member 50 upon which bears the end of adjusting screw 46 for moving plate 28 at a right angle to plate 26.

Slidable plate 28 supports gimbal means 52 comprising a fixed pair of trunnions 54 and 56 which support a gimball ring 53: Gimbal ring 58 supports a second pair of trunnions 60 and 62 which pivotally support a collar 64. Collar 64 has a tightening screw 66 threaded therein.

As seen in FIGURE 1, a pendulum 68 is freely supported by gimbal means 52 through collar 64. Pendulum 68 may be made of several sections varying in size with the most lower end section having a point 70. The length of pendulum 68 may be adjusted according to the height of the legs 12 so that pendulum point 70 will be in close proximity to the surface upon which the apparatus 10 rests. A rigid ring 72 is positioned around pendulum 68 through supports 74 which are attached to tripod legs 12. Ring 72 prevents pendulum 68 from excessive movement during transfer of apparatus 10.

In the embodiment shown in FIGURE 1, apparatus 10 is prepared for transposing a mark on the surface upon which the apparatus rests to an upper surface disposed above the apparatus. For this purpose, marking means 76 is provided comprising a barrel 78 for expelling a marking substance coaxially connected to pendulum 68 through collar 64. Barrel 78 has means 80 for loading the marking substance to be expelled from the barrel. Marking means 76 additionally comprises a high pressure gas source, such as CO_2 gun 82. Gun 82 is in fluid communication with barrel 78 through tube 84. A triggering device 86 is provided on gun 82 for selectively releasing the high pressure gas to barrel 78.

In operation, for transposing a mark from a floor to a ceiling, for example, the apparatus 10 is positioned over the floor mark 88 so that pendulum tip 70 is approximately aligned over the mark 88. Pendulum 68 is then shifted precisely over mark 88 by adjusting screws 44 and 46 which shift gimbal means 52 relative to base 16. Barrel

78 of marking means 76 being coaxially attached to pendulum 68 is thereby positioned directly over floor mark 88 and the weight of pendulum 68 relative to barrel 78 maintains the latter in a true vertical position. A marking substance in the form of a pellet or a fluid disposed on a pellet is loaded into barrel 78 through loading means 80. Trigger 86 is manually operated so as to release high pressure gas from gun 82 through tube 84 into barrel 78 so as to expel the marking substance from the barrel and onto the upper surface. This mark will be precisely positioned above floor mark 88.

It is to be understood that marking means 76 may comprise any high pressure gas source and trigger mechanism for releasing the high pressure gas so as to expel the marking substance from barrel 78.

The apparatus 10 may be used for transposing elevation marks from one location to another in conjunction with a surveyor's transit (not shown). For such use, the barrel 78 shown in FIGURE 1 is replaced by a level rod 90 shown in FIGURE 3. The level rod is graduated with marks 92 and has slidably mounted thereon a target 94. The width of rod 90 is such that it may be slidably positioned in collar 64, abutting pendulum 68 and is coaxial therewith. Tightening screw 66 is unthreaded from collar 64 sufficient to allow pendulum 68 to be slidably moved through collar 64.

In operation, a surveyor's transit is set up on a floor or other horizontal surface and adjusted or sighted on a mark which is on a vertical surface, such as a wall. To transfer this mark onto a second wall, the transit telescope is rotated so as to sight upon the target 94 of level rod 90. The rod 90 is held in a true vertical position by apparatus 10 and therefore may be vertically positioned by one workman to the proper height, at which time the same workman can conveniently mark the desired wall at the same elevation as the original mark.

It will thus be seen that the apparatus 10 may be used for transposing marks in a vertical or horizontal direction with a minimum number of steps and fewer workmen than prior art methods required. In transposing such marks, the operations require that an elongated member such as the barrel 78 or the level rod 90 is held in a true vertical position. Apparatus 10 accomplishes this requirement through the use of gimbal means 52 and pendulum 68; the latter being of greater weight than the elongated member which extends upward from the gimbal means 52, allowing the force of gravity to align the coaxial pendulum and elongated member in a true vertical position.

While several embodiments of the present invention have been shown and described, it will be obvious to those skilled in the art that changes and modifications may be made without departing from the invention in its broader aspects. Accordingly, the aim in the appended claims is to cover all such changes and modifications as fall within the true spirit and scope of the invention.

I claim:

1. An apparatus for marking an elevated surface above the apparatus at a location substantially directly above a mark on a floor comprising:

(a) a tripod;

(b) a base having an opening, mounted on said tripod, said base having parallel spaced first guide means;

(c) a first plate having an opening positioned above said base opening and supported by said base, said first plate being slidable between said first guide means and having parallel spaced second guide means positioned 90° with respect to said first guide means;

(d) a second plate having an opening positioned above said base opening and supported by said base, said second plate being slidable between said second guide means;

(e) gimbal means suported by said second slidable plate and positioned above said base opening;

(f) a pendulum supported by said gimbal means at one end and depending downwardly through said openings, the free end of said pendulum being in close proximity to the floor;

(g) a barrel for expelling a marking pellet coaxially connected to the upper end of said pendulum, said barrel having means for loading the marking pellet;

(h) a high pressure gas source connected to said barrel; and

(i) a triggering device for releasing high pressure gas into said barrel whereby the marking pellet is expelled from said barrel and deposits marking substance on the ceiling upon contact, directly above the floor mark, when the lower end of said pendulum is directly above the floor mark.

2. An apparatus for marking a ceiling in accordance with claim 1 wherein said base includes means for adjusting the position of said slidable plates relative to said base whereby the gimbal means, pendulum and barrel with claim 3 aditionally including a rigid ring positioned ed above the floor mark.

3. An apparatus for marking a ceiling in accordance with claim 2 wherein said pendulum has an adjustable length whereby the lower end of said pendulum may be positioned in proximity to the floor.

4. An apparatus for marking a ceiling in accordance with claim 3 additionally including a rigid ring positioned around said pendulum and means for supporting said ring from said tripod.

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