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SUPPORTING AND WEIGHING DEVICE

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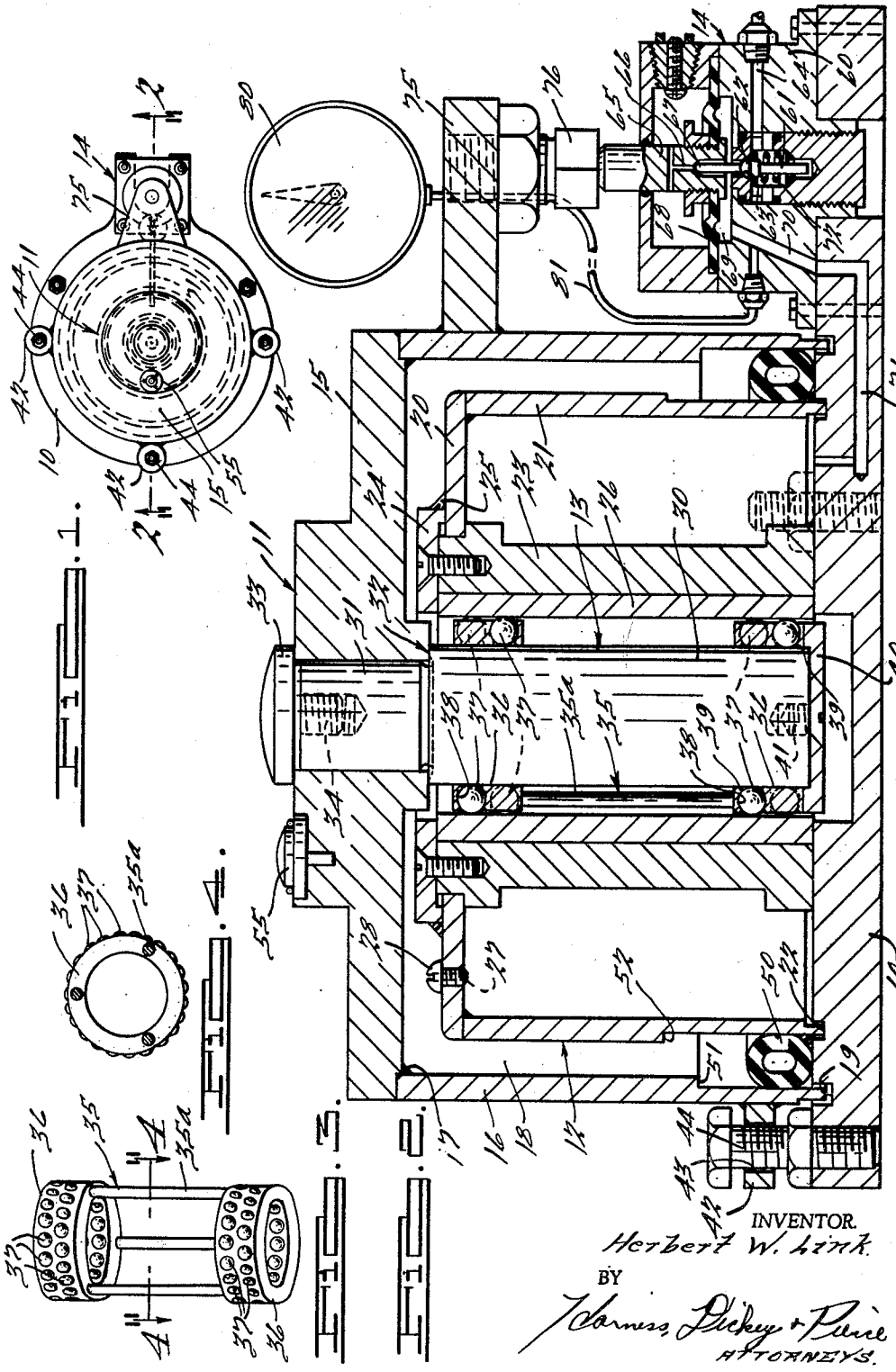

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SUPPORTING AND WEIGHING DEVICE

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This invention relates to a supporting and weighing device and more particularly to a device of this type which is self-contained.

The present invention relates more especially to an improvement in the device shown in the patent to Weber Number 2,956,761 dated October 18, 1960.

Devices of this type comprise a platform upon which the load is supported and fluid pressure means for supporting the platform, the fluid pressure being controlled by a pilot valve actuated by changes in the load, to maintain the platform at a constant level.

In devices of this type the platform moves vertically with respect to its supporting structure, in response to vibrations and changes in the load, and is apt to become canted or askew and thus bind on its support.

It is therefore a primary object of this invention to provide a device of this type having means for guiding the platform in its vertical movement so that the platform will always move perpendicularly to its supporting structure and all tendency to tilt or cant is eliminated.

Another object of the invention is to provide a device of this type in which the platform guiding means comprises a bearing member preferably of the ball bearing type which will support the platform for free and easy movement, without binding on its supporting structure.

In accomplishing the foregoing objects and advantages the movable platform is provided with a rigid guide shaft extending perpendicularly therefrom and the base or supporting structure is provided with a bearing member comprising spaced sets of ball bearings adapted to engage the guide shaft at longitudinally spaced areas thereof to firmly support the platform against tilting while permitting frictionless vertical movement thereof.

The various objects and advantages, and the novel details of construction of one commercially practical embodiment of the invention will become more apparent as this description proceeds, espeically when considered in connection with the accompanying drawings, in which:

FIGURE 1 is a top plan view of the device;

FIGURE 2 is an enlarged longitudinal vertical sectional view taken substantially on the plane indicated by line 2—2 in FIGURE 1;

FIGURE 3 is a detail elevational view of the bearing member; and

FIGURE 4 is a sectional elevational view taken substantially on the plane indicated by line 4—4 in FIGURE 3.

The device of this invention consists essentially of a base plate 10, a load supporting platform 11, a reservoir 12, a center support 13 for the load supporting platform, and a pilot valve 14.

The load supporting platform 11 is provided with a top plate 15, here shown as circular in cross section, having an annular flange 16 depending therefrom and sealed thereto as at 17 to define the outer side of an air chamber 18. The lower edge of the annular flange 16 extends into a groove 19 in the base plate 10.

The inner wall of the chamber 18 is formed by the resrevoir 12 which consists of a top plate 20 and a depending annular wall 21, the lower edge of which engages a groove 22 in the base plate 10. The inner wall of the reservoir 12 is formed by a sleeve member 23 secured to the top plate 20 by means of an annular securing ring 24, which is sealed to the top plate 20 as at 25. Fastening screws secure the ring 24 to the end of sleeve member 23. Arranged within the sleeve 23 is a bearing sleeve 26 for a purpose to be more fully hereinafter described.

The space 18 between the load supporting platform member 11 and the reservoir member 12 constitutes an air chamber, adapted to contain air under pressure, to support the load supporting platform in the same manner as described in the aforesaid patent. Communication between the reservoir 12 and the chamber 18 is established by means of a restricted opening 27 formed in a screw 28 which passes through the top plate 20. With this construction, the size of the restricted aperture may be varied by inserting screws having different size openings 27 therethrough.

Arranged centrally of the top plate 15 of the load supporting platform is a guide shaft 30 provided with a reduced portion 31 which passes through the top plate 15. The reduced portion 31 provides a shoulder 32 which abuts the underside of the top plate 15 and the guide shaft 30 is rigidly secured to the load supporting platform by means of a headed member 33 having a threaded portion 34 engaging a threaded recess in the upper end of the reduced portion 31. Thus, the guide shaft is rigidly supported on the plate 15 of the load supporting platform 11 and depends perpendicularly therefrom. The headed member 33 will constitute a load support button which engages the load resting upon the load supporting platform.

The space between the guide shaft 30 and the bearing sleeve 26 is adapted to contain a bearing member in the form of a cage 35 having upper and lower bearing supporting portions 36 adapted to receive ball bearings 37. These ball bearings are positioned in the transversely extending recesses 38 in the cage, and to retain the ball bearings 37 in position these transverse openings 38 may be peened over slightly at their ends, as indicated at 39 in FIGURE 2. The bearing supporting portions 36 are spaced apart by struts 35*a*, forming part of the cage 35, so that the spaced sets of ball bearings 37 engage the guide shaft at longitudinally spaced areas thereof so as to firmly support the guide shaft and consequently the load supporting platform against tilting movement.

As shown in FIGURES 2 and 3, the ball bearings are arranged in two rows at the top and at the bottom of the cage 35 and the ball bearings of one row at each end of the cage are staggered with respect to the ball bearings of the adjacent row. The ball bearings extend entirely around the guide shaft 30.

It will be noted that the ball bearings 37 extend between and engage the guide shaft 30 on one hand and the bearing sleeve 26 on the other hand. Also, the sets of ball bearings engaging the guide shaft and bearing sleeve engage longitudinally spaced areas of the guide shaft to firmly support the same and hence the load supporting platform, against tilting or canting while permitting frictionless vertical movement of the guide shaft.

The cage 35 is supported at its lower end by resting on a support bracket 40 secured as for instance by means of a screw 41 to the lower end of the guide shaft 30 for movement therewith.

The annular flange 16 of the load supporting platform is provided with a plurality of laterally extending lugs 42, each provided with an aperture 43 adapted to engage a guide member 44 threaded into the base plate 10.

The space between the annular wall 21 of the reservoir 12 and the annular flange 16 of the load supporting platform member is sealed at the lower ends of these mem-

bers by means of a hollow tubular sealing ring 50 formed of suitable plastic or other elastomeric material. The normal diameter of the sealing ring 50 is greater than the distance between the annular wall 21 and the annular flange 16, so that the annular ring is substantially flattened when inserted. As the load supporting platform member moves up and down, the sealing ring 50 rolls along the opposed surfaces of the members 16 and 21 to effectively seal the space between these two members. The flange 16 may be provided with an annular shoulder 51 and the wall 21 may be provided with an annular shoulder 52 which will act to limit any excessive upward movement of the sealing ring.

If desired, a level indicator 55 may be provided on the top surface of the load supporting platform member.

The pilot valve shown at the right-hand side of FIGURE 2 is substantially the same as that shown and described in the aforesaid patent and consists of a housing 60 provided with a valve stem 61 provided with a valve part 62 adapted to normally close a port 63 interposed in the air inlet 64. The valve also comprises a plunger 65 provided with an exhaust passage 66 which is controlled by the end 67 of the valve stem 61. The plunger 65 is connected to a diaphragm 68 which extends across the valve housing 60 to define a chamber 69. This chamber is connected by ports 70 and 71 to the reservoir 12. A spring 72 normally holds the valve in the position illustrated in FIGURE 2.

The load supporting platform member is provided with a lateral extension 75 carrying an adjustable stud 76 which engages the end of the plunger 65 to actuate the latter.

As described in the aforesaid patent, when the load on the load supporting platform increases, the plunger 65 will be depressed to depress the valve stem 61 and valve part 62 and open the port 63 to permit an additional supply of air under pressure to enter through the inlet 64 and flow into the chamber 69 and through ports 70 and 71 into the reservoir to counteract the increase in the load. When, however, the load is lightened and the load supporting platform rises above its normal level, the air in the chamber 69 will raise the plunger 65 and open the exhaust port 66 to permit air to escape from the reservoir so that the load supporting platform will return to its normal position.

The pressure of air in the system may be measured by a gauge device 80 connected by a conduit 81 to the passageway 70. The dial is preferably calibrated to indicate in pounds the load placed upon the load supporting platform.

No claim is made herein to the pilot valve 14 or the measuring device 80, as they form no part of this invention.

It will be understood that in devices of this type having a vertically moving load supporting platform, the load may not always be placed squarely upon the center of the platform so that during its vertical movement, the platform is liable to become canted or askew and thus bind on its supports. With the present invention, in which the guiding means for the platform comprises spaced ball bearing members, the platform is supported against any tendency to tilt or cant and a frictionless vertical movement thereof is provided for. By staggering the sets of ball bearings and spacing the sets longitudinally of the guide shaft, adequate lateral support is provided to accomplish the purposes of this invention. While ball bearings have been found particularly suitable for the purpose, it will be understood that other types of bearing members, such as rollers, may be employed and still remain within the scope of this invention.

While one commercially practical embodiment of the invention has been described and illustrated herein somewhat in detail, it will be understood that various changes may be made as may come within the purview of the accompanying claims.

What is claimed is:

1. In a device of the class described, a base plate, a reservoir secured to said base plate, a bearing sleeve extending through said reservoir, a vertically movable load supporting platform having a portion in spaced telescoped relation with said reservoir and forming a chamber therebetween, a guide shaft rigidly connected to said platform and extending perpendicularly therefrom, into said bearing sleeve in spaced relation thereto, and bearing means between said guide shaft and bearing sleeve providing lateral support for said guide shaft while permitting frictionless longitudinal movement thereof.

2. A device as described in claim 1 in which said bearings are ball bearings.

3. In a device of the class described, a base plate, a reservoir secured to said base plate, a bearing sleeve extending through said reservoir, a vertically movable load supporting platform having a portion in spaced telescoped relation with said reservoir and forming a chamber therebetween, a guide shaft rigidly connected to said platform and extending perpendicularly therefrom, into said bearing sleeve in spaced relation thereto, and a bearing cage in the space between said guide shaft and bearing sleeve having sets of bearings therein providing lateral and longitudinal support for said guide shaft.

4. In a device of the class described, a base plate, a reservoir secured to said base plate, a bearing sleeve extending through said reservoir, a vertically movable load supporting platform having a portion in spaced telescoped relation with said reservoir and forming a chamber therebetween, a guide shaft rigidly connected to said platform and extending perpendicularly therefrom, into said bearing sleeve in spaced relation thereto, a bearing cage in the space between said guide shaft and bearing sleeve having sets of bearings therein providing low friction support for said guide shaft, and stop means for said bearing cage secured to said guide shaft.

5. In a device of the class described, a base member, a reservoir secured to said base member, a bearing sleeve extending through said reservoir, a vertically movable load supporting platform having an annular flange telescoped over said reservoir in spaced relation thereto to form a chamber between said platform and reservoir, a downwardly extending guide shaft rigidly connected to said platform, and projecting into said bearing sleeve in spaced relation thereto, a cylindrical bearing cage in the space between said guide shaft and bearing sleeve having sets of bearing elements located adjacent the ends thereof providing bearings for said guide shaft at longitudinally spaced areas thereof, and stop means for said cage secured to the free end of said guide shaft.

6. A device as described in claim 5 in which said bearing cage comprises means for carrying two spaced sets of ball bearings adapted to extend circumferentially around said guide shaft and engaging said guide shaft and bearing sleeve at longitudinally spaced areas thereof, each set of ball bearings comprising at least two rows of ball bearings with the ball bearings of one row being circumferentially staggered with respect to the ball bearings of the other row.

7. In a supporting and weighing device comprising, a base plate, a reservoir secured to said base plate, a bearing sleeve extending through said reservoir a vertically movable load supporting platform having a flanged portion arranged in spaced telescopic relation with said reservoir and forming a chamber therebetween, that improvement which comprises, a downwardly extending guide shaft rigidly connected to said platform and projecting into said bearing sleeve in spaced relation thereto, bearing cage means in the space between said guide shaft and bearing sleeve, spaced sets of bearings in said cage means engaging said guide shaft at longitudinally spaced areas thereof providing lateral and longitudinal support for said

guide shaft, and stop means for said bearing cage means secured to said guide shaft for movement therewith.

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