Feb. 28, 1939. C. L. HUNSICKER 2,149,141

INSTRUMENT SUPPORTING APPARATUS

Filed June 26, 1937

FIG_1_

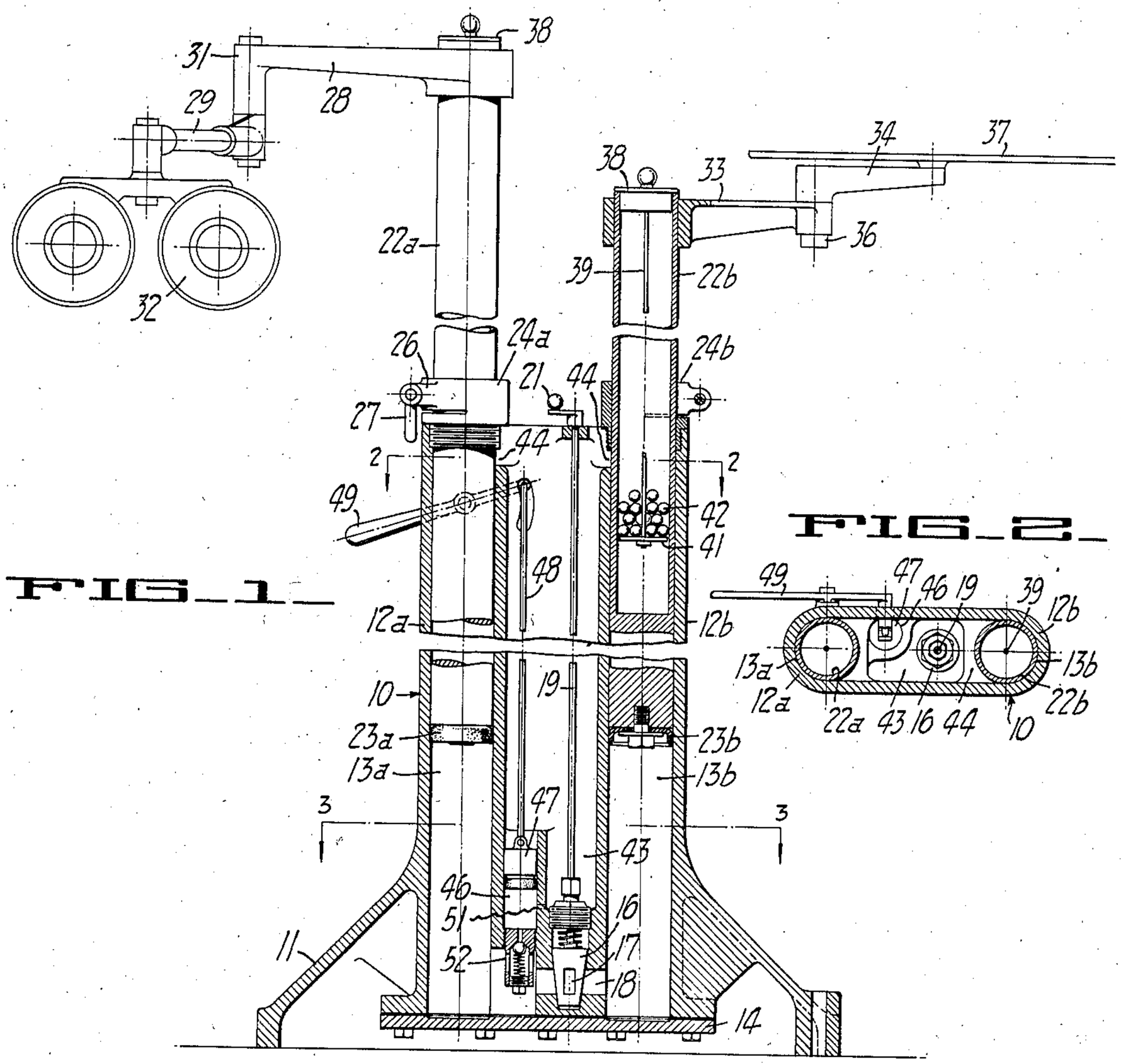
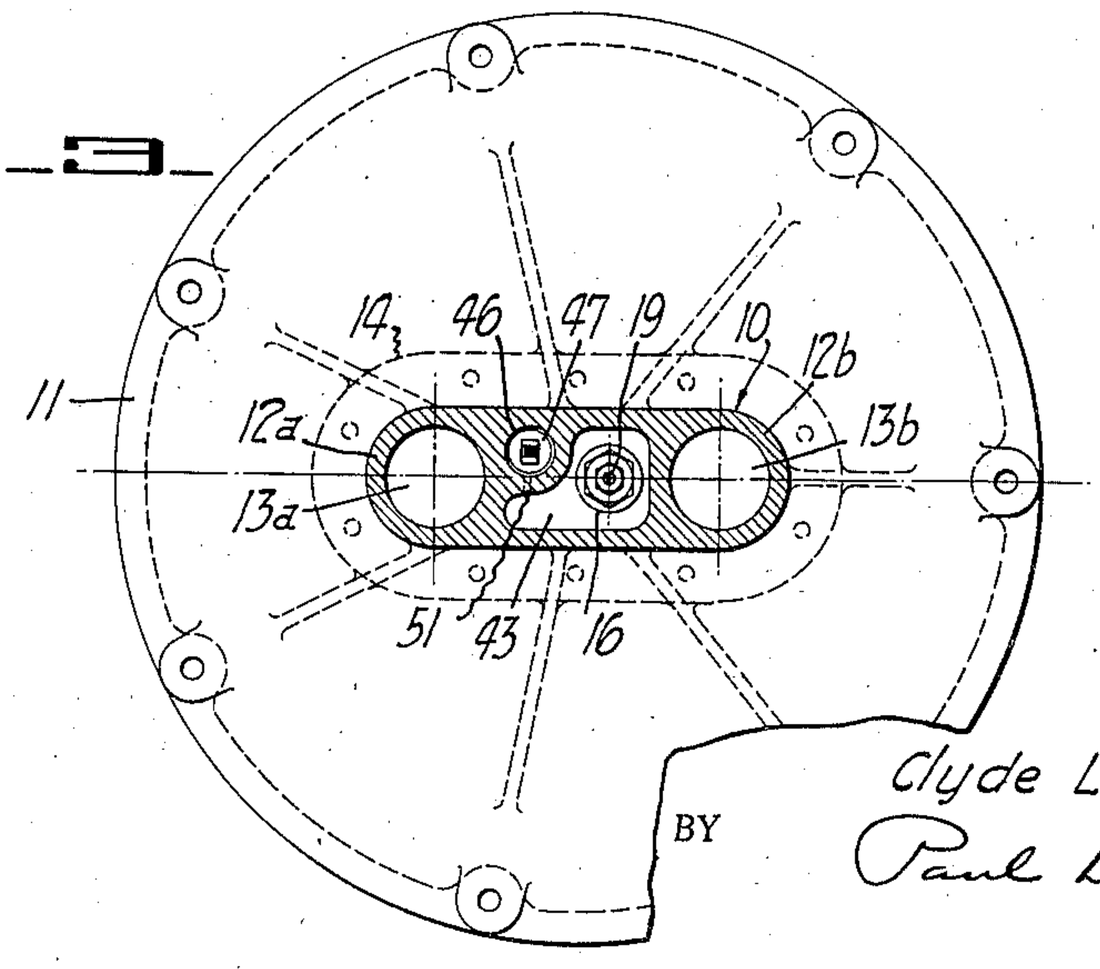



FIG_2_




FIG_3_

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## INSTRUMENT SUPPORTING APPARATUS

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8 Claims. (Cl. 254—93)

This invention relates generally to apparatus for adjustably supporting a wide variety of instruments and appliances. For example, it can be used to advantage by optometrists or ophthalmologists for the purpose of supporting various instruments and devices used in the testing or treatment of eyes.

It is an object of the invention to provide supporting means of the above character which can be quickly and readily adjusted to place instruments at various levels or different adjusted positions, with a minimum amount of effort on the part of the operator. In attaining this object the present invention is characterized by the use of hydraulic means for transmitting counterbalancing forces to a supporting standard. In the preferred form of the invention the counterbalancing forces are transmitted through hydraulic means, from a second supporting standard, which can be used for the support of auxiliary equipment.

Another object of the invention is to provide apparatus of the above character which dispenses with the use of conventional counter-balancing weights and springs, but which will afford a supporting standard capable of angular and vertical adjustments with optimum counter-balancing for any adjusted position.

Further objects of the invention will appear from the following description in which the preferred embodiment of the invention has been set forth in detail in conjunction with the accompanying drawing.

Fig. 1 is a side elevational view, partly in cross-section, showing apparatus incorporating the present invention.

Fig. 2 is a cross-sectional view taken along the line 2—2 of Fig. 1.

Fig. 3 is a cross-sectional view taken along the line 3—3 of Fig. 1.

The equipment as illustrated in the drawing makes use of a cylinder structure designated generally at 10. For convenience in manufacture this structure can be in the form of a casting, with a base portion 11 and upright portions 12*a* and 12*b*, which are bored to form two cylinders 13*a* and 13*b*. The lower ends of these cylinders are closed as by means of plate 14, and the axes of the two bores are parallel and generally upright. Suitably mounted in the lower portion of the casing 10 there is a valve or stop-cock 16, the port 17 of which can be turned to register with the intercommunicating duct 18. Thus dependent upon the positioning of the stop-cock 16, the two cylinders can be placed in direct communication through duct 18, or such communication can be interrupted. For convenience of operation the stop-cock is shown provided with an operating rod 19, which extends to the upper end of the casting 10, and is there provided with an operating handle 21.

Fitted within the two cylinder bores 13*a* and 13*b* are the standard 22*a* and 22*b*, which can be tubular in form. The lower ends of these members are shown provided with cup leathers 23*a* and 23*b*, in order to form sealed pistons.

Locking means are provided whereby the standards 22*a* and 22*b* can be clamped in a desired position. Thus collars 24*a* and 24*b* are secured to the upper ends of the portions 12*a* and 12*b*. These collars are split as illustrated, to afford resilient segments 26, which can be urged into tight clamping engagement with standards 22*a* and 22*b* by the manual operable clamping screws 27.

The standards 22*a* and 22*b* may carry various instruments and devices. In the form illustrated the upper end of standard 22*a* carries a laterally extending arm 28, and the free end of this arm is connected to a supplemental arm 29, through the pivotal joint 31. An ophthalmological instrument 32, such as used in the testing of eyes, is shown mounted upon the arm 29. The upper end of standard 22*b* is shown carrying a laterally extending arm 33, which in turn is connected to an arm 34, through the pivotal joint 36. The free end of arm 34 carries a tray 37, for the support of various instruments or devices.

It may be explained at this point that the cylinders 13*a* and 13*b*, below the cup leathers 23*a* and 23*b*, are ordinarily filled with suitable liquid, so that when the two cylinders are in communication through the valve cock 16, the downward weight of one standard is transmitted hydraulically to the lower end of the other standard. Thus the two standards tend to counterbalance each other through the hydraulic means provided, and the adequacy of this counter-balance, depends upon the comparative weights of parts carried by the standards. In order to facilitate making weight adjustments so that substantially perfect counter-balancing can be secured for any particular installation, a relatively simple arrangement is employed whereby individual weights can be added or removed with respect to the two standards 22*a* and 22*b*. Thus the upper end of each standard is provided with a removable cap or closure 38, and each closure is connected by a rod 39, with an inner disk 41. Each of the disks 41 can support a varying

number of lead balls 42, and by lifting either one of the closures 38 it is a simple matter to add or remove such weighting elements.

In using my apparatus some small amount of leakage may occur upwardly past the cup washers 23*a* and 23*b*, and in time may cause a serious loss of liquid from the hydraulic means. Between the two portions 12*a* and 12*b*, there is a well or sump 43, and any liquid leaking past the cup washers is caused to drain through the side vents 44, into this well. Adjacent the well 43 there is a small pumping cylinder 46, equipped with a piston 47. The piston is connected by rod 48 with a convenient operating handle 49. The cylinder space below piston 47 is in communication with the lower portion of well 43, through the drainage duct 51. Oil forced from cylinder 46 by downward movement of the piston 47, passes through the small check valve 52, into the cylinder 13*a*. Thus any liquid leaking from the hydraulic means is collected and occasionally the operator may return it into the hydraulic cylinders.

Operation of the apparatus described above can be briefly outlines as follows:—When the collars 24*a* and 24*b* grip the tubular standards 22*a* and 22*b*, these standards are held at a fixed elevation and also held against turning movements. If one desires to change the angular position of either standard, without changing its vertical position, the corresponding collar is released, whereby that particular standard can be turned without however moving in a vertical direction. Should one desire to adjust the standards as for example standard 22*a*, in a vertical direction or possibly both vertically and angularly, both the collars 24*a* and 24*b* are released, and the operator makes sure that valve cock 16 is in open position. The operator can now readily move the standard 22*a* upwardly or downwardly to any desired position, and as this standard moves in one direction, as for example, downwardly, liquid is displaced from the cylinder 23*a* and delivered to the cylinder 13*b* to correspondingly elevate the standard 22*b*. Assuming that the two standards have been properly balanced, the standards will remain in any particular position due to the small amount of friction provided. They can be readily shifted to any other position by a slight amount of force applied to either standard. After the desired adjustment has been obtained, further adjustment in a vertical direction can be prevented by closing the valve cock 16, without however, interfering with angular or turning adjustments of the two standards, providing the two collars 24*a* and 24*b* are still released. If desired, one can leave valve cock 16 open and engage the collars 24*a* and 24*b* when the desired adjustment has been obtained.

It will be evident that the type of adjustment made possible by use of this apparatus, will be more convenient and far smoother in its action than adjustable supporting apparatus available in the past. It frequently happens that two adjustable standards are required in close cooperating relationship, in which event, as in the modification described, one supporting standard serves as a counter-balancing weight for the other, through the hydraulic means. In such installations it is no serious limitation upon the apparatus that both standards cannot be moved simultaneously to a lowered position, or simultaneously to an elevated position. One of the standards is usually employed for supporting an instrument or appliance requiring exact location and frequent adjustments, while the other supporting standard is employed for auxiliary apparatus or equipment, not critical with respect to its elevation.

I claim:

1. In instrument supporting apparatus, a pair of hydraulic cylinders adapted to have hydraulic intercommunication, pistons slidably fitted in said cylinders whereby when said cylinders are in communication, motion of one piston is transmitted hydraulically to the other, an upright supporting standard secured to one piston, and means exerting a counter-balancing force upon the other piston.

2. In instrument supporting apparatus, a pair of hydraulic cylinders adapted to have hydraulic intercommunication, pistons slidably fitted in said cylinders whereby when said cylinders are in hydraulic communication motion of one piston is transmitted hydraulically to the other, an upright supporting standard secured to one piston, counter-balancing means acting upon the other piston, and means for returning liquid leaking past said pistons back to said cylinders.

3. In instrument supporting apparatus, a pair of hydraulic cylinders adapted to have hydraulic intercommunication, pistons slidably fitted in said cylinders whereby when said cylinders are in communication motion of one piston is transmitted hydraulically to the other, an upright supporting standard secured to one piston, counterbalancing means acting upon the other piston, and means for releasably clamping said standard in a fixed position with respect to the cylinder structure.

4. In instrument supporting apparatus, a structure forming a pair of parallel upright hydraulic cylinders, said cylinders being adapted to have hydraulic intercommunication, a pair of pistons slidably fitted in said cylinders whereby when said cylinders are in communication, downward movement of one piston is hydraulically transmitted to the other piston, an upright supporting standard having its lower end secured to one piston, and means forming a counter-balancing weight secured to the other piston.

5. In instrument supporting apparatus, a structure forming a pair of parallel and upright hydraulic cylinders, said cylinders being adapted to have hydraulic communication whereby downward movement of one piston is transmitted hydraulically to the other piston, an upright supporting standard slidably and rotatably fitted into one of said cylinders and having its lower end secured to the corresponding piston, means for releasably clamping said standard to said cylinder structure, whereby said standard can be retained against vertical and rotary adjustment with respect to the cylinder structure, another generally upright supporting standard slidably fitted in the other cylinder and having its lower end secured to the other piston, and means for weighting said second supporting standard to counter-balance the weight of the first named supporting standard and parts carried by the same.

6. In instrument supporting apparatus, a pair of hydraulic cylinders adapted to have hydraulic intercommunication, pistons slidably fitted in said cylinders whereby when said cylinders are in hydraulic communication motion of one piston is transmitted hydraulically to the other, an upright supporting standard secured to one piston, counter-balancing means acting upon the other piston, and valve means for controlling establishment or

interruption of hydraulic communication between said cylinders.

7. In instrument supporting apparatus, a pair of hydraulic cylinders adapted to have hydraulic intercommunication, pistons slidably fitted in said cylinders whereby when said cylinders are in communication motion of one piston is transmitted hydraulically to the other, an upright supporting standard secured to one piston, counter-balancing means acting upon the other piston, valve means for controlling communication between said cylinders, and pumping means for returning liquid leaking past said pistons back to said cylinders.

8. In instrument supporting apparatus, a cylinder structure providing a pair of upright hydraulic cylinders, valve means controlling hydraulic communication between said cylinders, a piston disposed within said cylinders whereby when said cylinders are in communication, motion of one piston is transmitted hydraulically to the other, a pair of standards slidably fitted in said cylinders and having their lower ends secured to said pistons, said standards being adapted to support additional elements, and means for releasably clamping said standard to said cylinder structure, whereby said standards can be retained against vertical and rotary adjustments.

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