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ADJUSTABLE LAMP STRUCTURE

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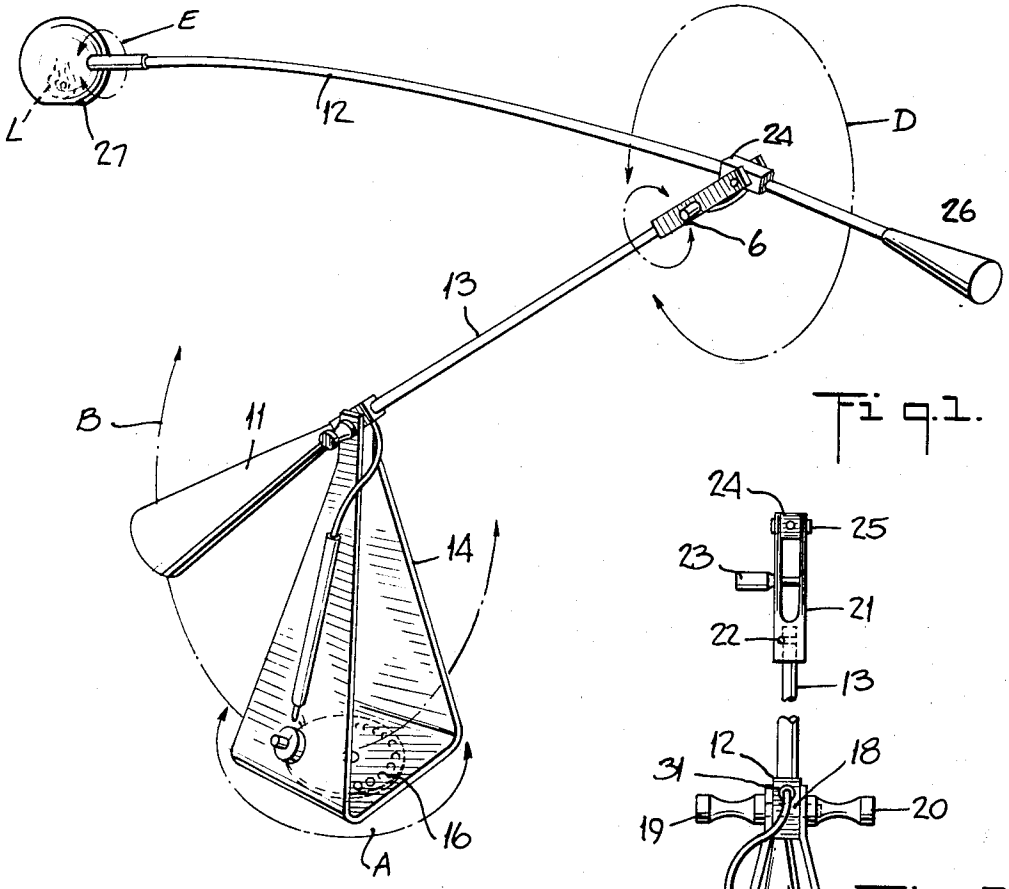



Fig. 1.



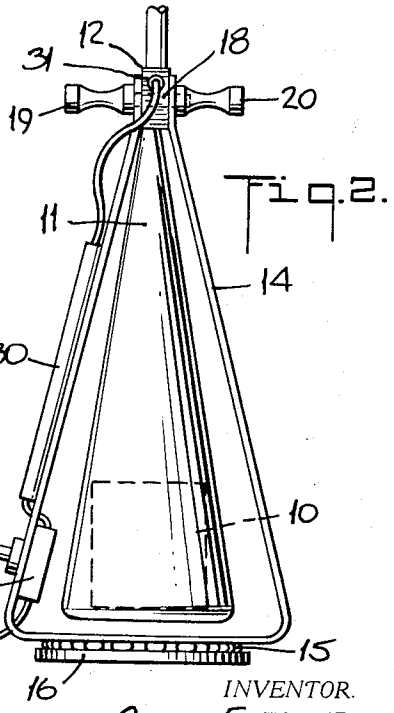




Fig. 2.

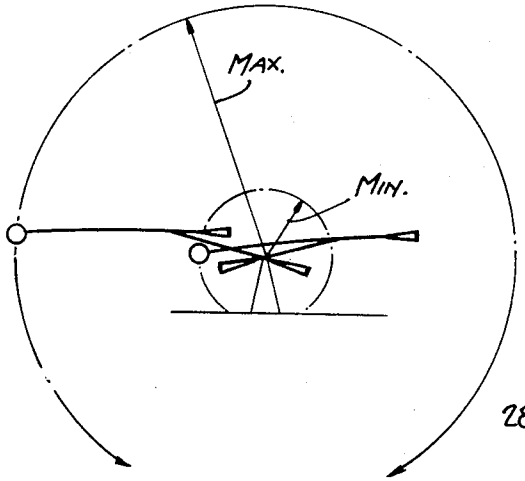



Fig. 3.

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# ADJUSTABLE LAMP STRUCTURE

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## ABSTRACT OF THE DISCLOSURE

An electric lamp structure formed by a counterbalanced system of major and minor booms that will be essentially stable in any position in which they may be placed. A lamp unit is secured to one end of the major boom whereby its position may be changed with minimal effort.

This invention relates generally to electrical lamps, and more particularly to an adjustable lamp structure of exceptional versatility.

It is a common requirement of electric lamps that the light source be movable with respect to the base or mechanical support point, especially in the case of lamps used for reading, draughting, needlework and other applications requiring a high local concentration of light.

Such movement of the light source with respect to the base is commonly provided in one of three ways: First, by the use of a flexible arm, or gooseneck; second by the use of rigid arms articulated by means of friction joints; thirdly by the use of hinged rigid arms in the form of linked parallelograms the movements of which are partly counterbalanced by tension springs and partly by friction joints.

Certain disadvantages are inherent in all of these well known structures. In the case of the flexible tube, the residual stiffness of the gooseneck needed to support the weight of the reflector and lamp requires a fairly substantial manual effort to change its posture, so that either the base must be held simultaneously, or be fixed to its plane of support (table, drawing board, wall, etc.). A further disadvantage is that the requirement of flexibility necessarily limits the length of tube able to support the load of the reflector in a cantilevered position. In addition, this type of tube commonly fractures due to fatigue, if its posture is frequently changed.

The second type of lamp wherein the reflector is supported by rigid arms in one or two segments articulated by friction joints, has also the disadvantage that a fairly substantial effort is needed to change its posture, requiring the use of both hands or a fixed base. Moreover the movement, due to friction, tends to be jerky and to suffer from springback. Finally, the joints commonly require fairly frequent adjustment of pressure due to wear on the friction surfaces.

The third system, consisting of a parallelogram or linked pair of parallelograms, supported by diagonal springs and damped by friction joints, has the advantage over the two former systems of permitting easy change of posture with a small manual effort applied with one hand. As a result its use has become widespread for applications where fairly frequent changes of posture are customary. However, one inherent defect of this system is that its stability is conditional on the horizontality of the base. Thus if the base be tilted with respect to the horizontal, the compensating effect of the springs is disturbed and the arms shoot forward and are no longer moveable at will. This makes the system inherently inapplicable to inclined drawing boards where it would otherwise be favored. A further disadvantage of this system is that, due to the requirements of the spring action, the plane of rotation of the upper arm must lie in the same



plane of rotation as that of the lower arm. A further disadvantage of this system is that the base must either be fixed, or else be large and heavy enough to resist the overturning moment when the lamp is horiozntally extended. A final drawback of this type of lamp, especially for domestic use is the presence of the springs which impart an unattractive mechanical appearance to the lamp.

Accordingly, it is an object of the present invention to provide a lamp structure constituted by a counterbalanced system of two or more booms that will be essentially stable in any position in which they may be placed.

A further object of the invention is to provide a system of the above-noted type in which the posture of the lamp may be changed with minimal effort and with one hand, without the need for restraining the base.

Still another object is to provide such a system in which an unusually large reach may be obtained between the retracted and extended postures of the booms.

Yet another object is to provide such a system in which the plane of rotation of the upper boom is rotatable with respect to the lower boom and that of the lower boom is rotatable with respect to the surface on which the base reposes.

A significant feature of the system in accordance with the invention is that the posture of the lamp remains stable even if the base is inclined with respect to the horizontal, for instance when applied to an inclined drawing board.

For a better understanding of the invention as well as other features thereof reference is made to the following detailed description to be read in conjunction with the appended drawing in which:

FIGURE 1 represents in perspective an adjustable lamp structure showing its several planes of rotation, identified by letters A, B, C, D and E;

FIGURE 2 shows in side view the base assembly and lower boom assembly;

FIGURE 3 illustrates schematically the range of inherently stable postures that can be assumed by the lamp structure.

The lamp structure in accordance with the invention preferably makes use of a bulb L of the low-voltage, high-intensity type operating in conjunction with a step-down transformed **10** (note FIG. 2) which may be conveniently situated in a lower counterweight **11**. The lamp is supported in an adjustable structure including upper (major) and lower (minor) booms **12** and **13**, respectively. These booms may be of tubular construction, preferably tapered to correspond with the cantilever moments and formed of metal or plastic-reinforced fiberglass, for example of the type used in the construction of fishing rods, which combine lightness with strength and flexibility.

In order to provide rotation in the horizontal plane, A, the base support **14**, which may be of Plexiglas, acrylic or similar transparent plastic, may be rotatably mounted on a ring **15** of ball-bearings mounted on a baseplate **16**. The configuration of the base support **14** is that of an open pyramid, and it is dimensioned to accommodate the conical counterweight **11**. A square sleeve **17**, which may be formed from the neck of the lower counterweight **11**, is rotatable in the vertical plane B about a pivot pin **18**. The pivot pin terminates at one end in a bolthead **19** and at the other in a nut **20**, both having a concave section in the sense of the axis and provided with knurled extremities for tightening purposes.

It will be appreciated that this bolt and nut assembly can be used to increase the function at the pivot and hence to dampen the swinging of lower boom **13**, if desired. The concavity of the two extremities of the pivot also serves as a convenient handle for the lifting by two fingers and moving of the whole lamp structure.

The upper end of lower boom **13** terminates in a forked articulation **21** that serves to support upper boom **12**. In order to permit rotation of the upper boom with respect to the plane C, the upper extremity of the lower boom is furnished with a circumferential groove designed to engage with a retaining pin **22**, which permits such rotation while preventing disengagement of the forked articulation from the lower boom. Alternatively the upper end of the lower boom may be equipped with spring clips or like conventional means to prevent its disengagement.

A screw **23** fitted with a knurled head serves to constrict the arms of the fork and thus to dampen the swinging of the upper boom with respect to the lower. The upper boom is provided with a sleeve **24**, serving both to receive the pivot pin **25** around which the upper boom can pivot in plane D about 320° and also to reinforce the upper boom at its support point.

One end of upper boom **12** terminates in a conical counterweight **26** and the other in a reflector **27** of suitable form which houses lamp L. The electrical wiring may then be conveniently arranged as follows: the main supply lead **28** passes through a hole in the base support into the on/off switch **29**. From there it is led through a supporting tube **30** and thence to the inlet hole **31** provided in the lower sleeve. From here it passes down the inside of the lower counterweight **11** to the input side of the transformer **10**. The output leads from the transformer pass up the counterweight, through the lower boom, exiting through the forked articulation and passing into the upper boom through the upper sleeve **24** and thence to reflector **27**.

The adjustable structure will now be analyzed in mechanical terms in order to explain why the lamp may be caused to assume a stable posture with an exceptionally wide range of positions with respect to its base.

Major boom **12** may be regarded as a lever whose fulcrum is the point of connection to minor boom **13**. The mass of lamp reflector unit **27** at one end of the major boom is counterbalanced by that of counterweight member **26** at the other end thereof. While an ideal condition of balance is never attained, particularly since the major boom is not perfectly straight but is somewhat curved because of its flexible nature, it takes very little friction at the fulcrum to maintain any adjusted position of the major boom.

It is to be noted that the major boom is capable of rotation in plane D about its fulcrum, the position of the major boom being rotatable also with respect to horizontal plane A by reason of the rotatability of the base support. Also the lamp unit **27** on the major boom is rotatable about its axis on plane E.

Minor boom **13** is also a lever whose fulcrum is its point of connection to the top of the pyramidical base, this lever being also in a fair state of balance by reason of the weight of the major boom at one end thereof and the counterweight **13** at the other. Hence it takes relatively little friction at this fulcrum to maintain any position assumed by the minor boom. The relative position of the major boom with respect to the minor boom is rotatable in plane C and the relative position of the minor boom with respect to the base is rotatable in plane B.

It will be apparent therefore that the major and minor booms may be caused to assume a wide range of relative positions in all of which a state of balance is approached, whereby only a slight degree of friction is necessary to prevent the lamp from altering its assumed posture. Thus the lamp structure has the characteristics of a stabilized mobile in which its components appear to float. The invention is by no means limited to the physical forms shown, for the lamp unit, the counterweight and the base support may have other shapes without any change in operating principles.



It will be appreciated that a lamp constructed as described, in which both arms are counterbalanced by corresponding weights, will be inherently stable in any posture in which it may be placed, that the several articulations and planes of rotation provided allow the reflector to be situated anywhere within the quasi-spherical volume bounded by the minimal and maximal radii of extension from the base support with a minimal fingerlight effort and that the base support may be tilted with respect to the horizontal without affecting the stability of posture.

While there has been shown a preferred embodiment of the invention, it will be apparent that many changes may be made therein without departing from the spirit of the invention as defined in the annexed claims.

What I claim is:

**1.** An adjustable lamp structure comprising:

(a) a major boom,

(b) a minor boom,

(c) a base,

(d) a lamp unit secured to one end of the major boom,

(e) a first counterweight secured to the other end of the major boom,

(f) first coupling means pivotally connecting one end of the minor boom to a fulcrum point on said major boom at which said lamp unit is substantially balanced by the first counterweight,

(g) a second counterweight secured to the other end of said minor boom, said base being in the form of an open pyramid adapted to receive said second counterweight when the minor boom occupies a vertical position, and

(h) a second coupling means pivotally connecting said minor boom to said base at a fulcrum point at which said counterweight is substantially balanced by said major boom whereby said lamp unit tends to stay in any position resulting from movement of said booms with respect to their respective fulcrums.

**2.** A structure as set forth in claim **1** wherein said lamp unit includes a low voltage lamp and said second counterweight has a transformer housed therein and connected to said lamp by wires extending through said booms for reducing the voltage from a power line to the operating voltage of the lamp.

**3.** A structure, as set forth in claim **1**, wherein said base is rotatable in a bearing with respect to a supporting plate.

**4.** A structure as set forth in claim **1** wherein said first coupling means is rotatable with respect to the axis of the minor boom.

**5.** A structure as set forth in claim **1** wherein said lamp unit is rotatable with respect to the axis of the major boom.

**6.** A structure, as set forth in claim **1**, wherein said booms are constituted by hollow rods of flexible material.

**7.** A structure, as set forth in claim **6**, wherein the output of said transformer is coupled to the lamp through wires passing through booms.


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