United States Patent

Meyer et al.

[15] **3,696,241**

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[54] **LIGHT FIXTURE TOWER**

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[52] **U.S. Cl.** **240/84**

[51] **Int. Cl.** **F21s 3/10**

[58] **Field of Search** 240/84

[56] **References Cited**

UNITED STATES PATENTS

283,581	8/1883	Saisset	240/63 X
348,291	8/1886	Noe	240/69

OTHER PUBLICATIONS

Advertising Brochure from Osram (G.E.C.) Street Lighting Limited. 3 pp. Sept. 68

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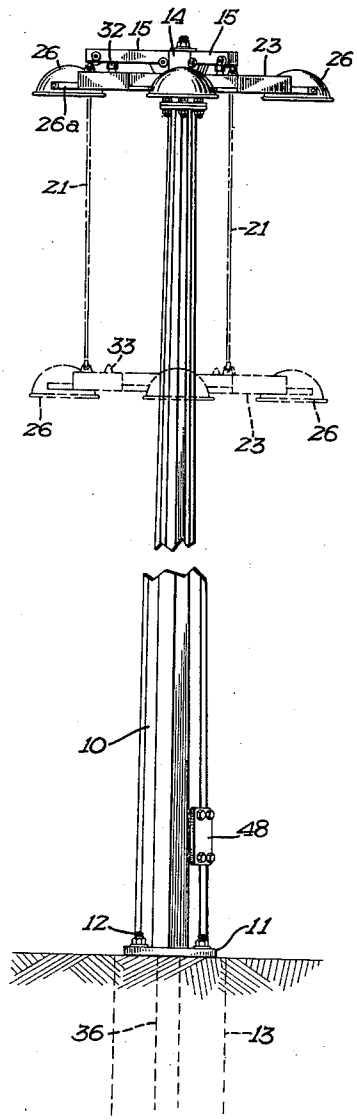
[57] **ABSTRACT**

A tower and support for mounting electric light fixtures at elevations up to and exceeding 100 feet above ground level; the fixtures being supported on a separate fixture frame supported on cables confined within the tower and to be lowered for maintenance and service work on the fixtures; the power supplying cable being anchored to the counterweight and traveling upwardly with the counterweight and support cables and being detachably connected to the power source at the base of the tower.

7 Claims, 9 Drawing Figures



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SHEET 1 OF 4

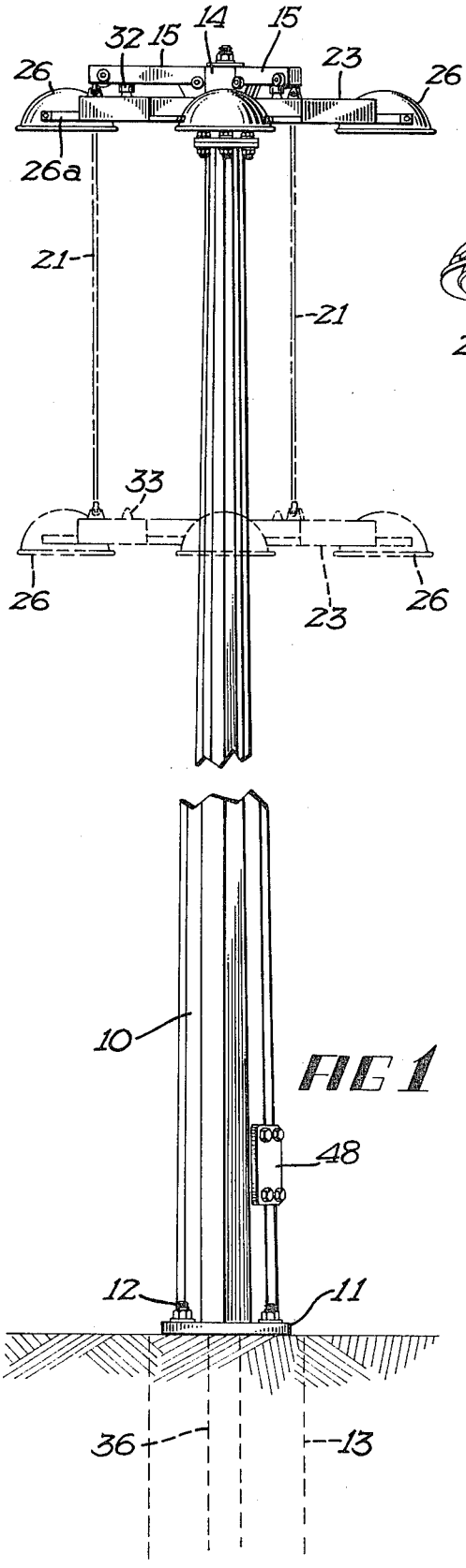

FIG 1

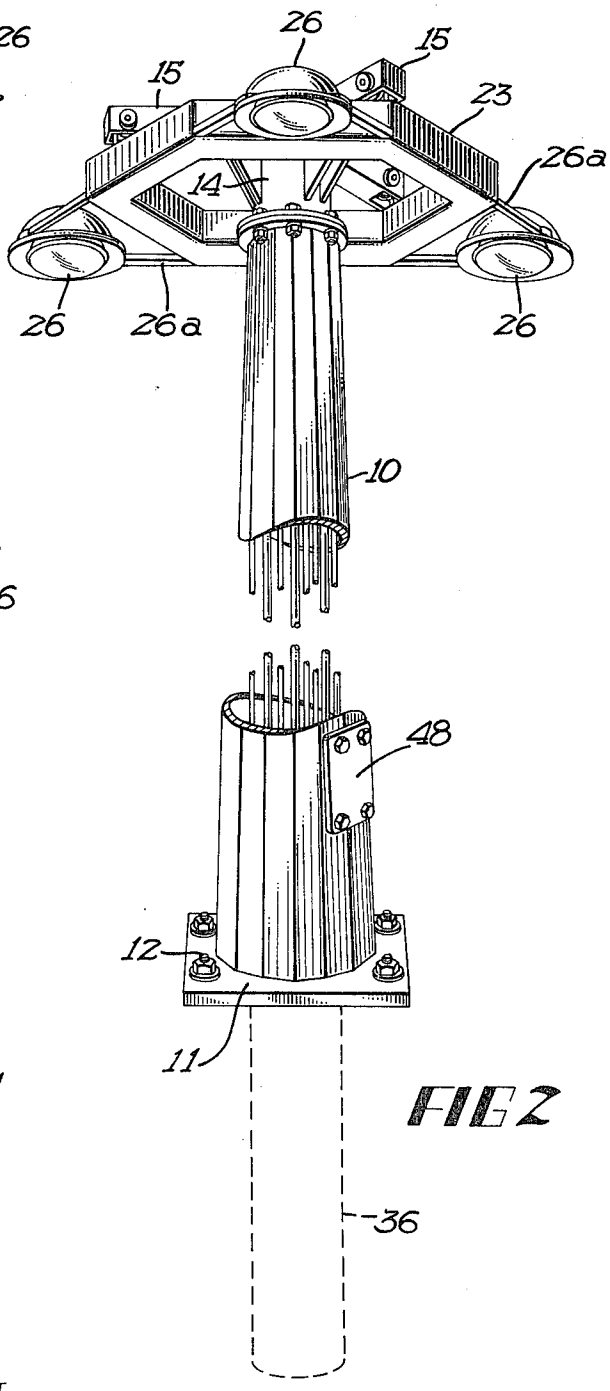

FIG 2

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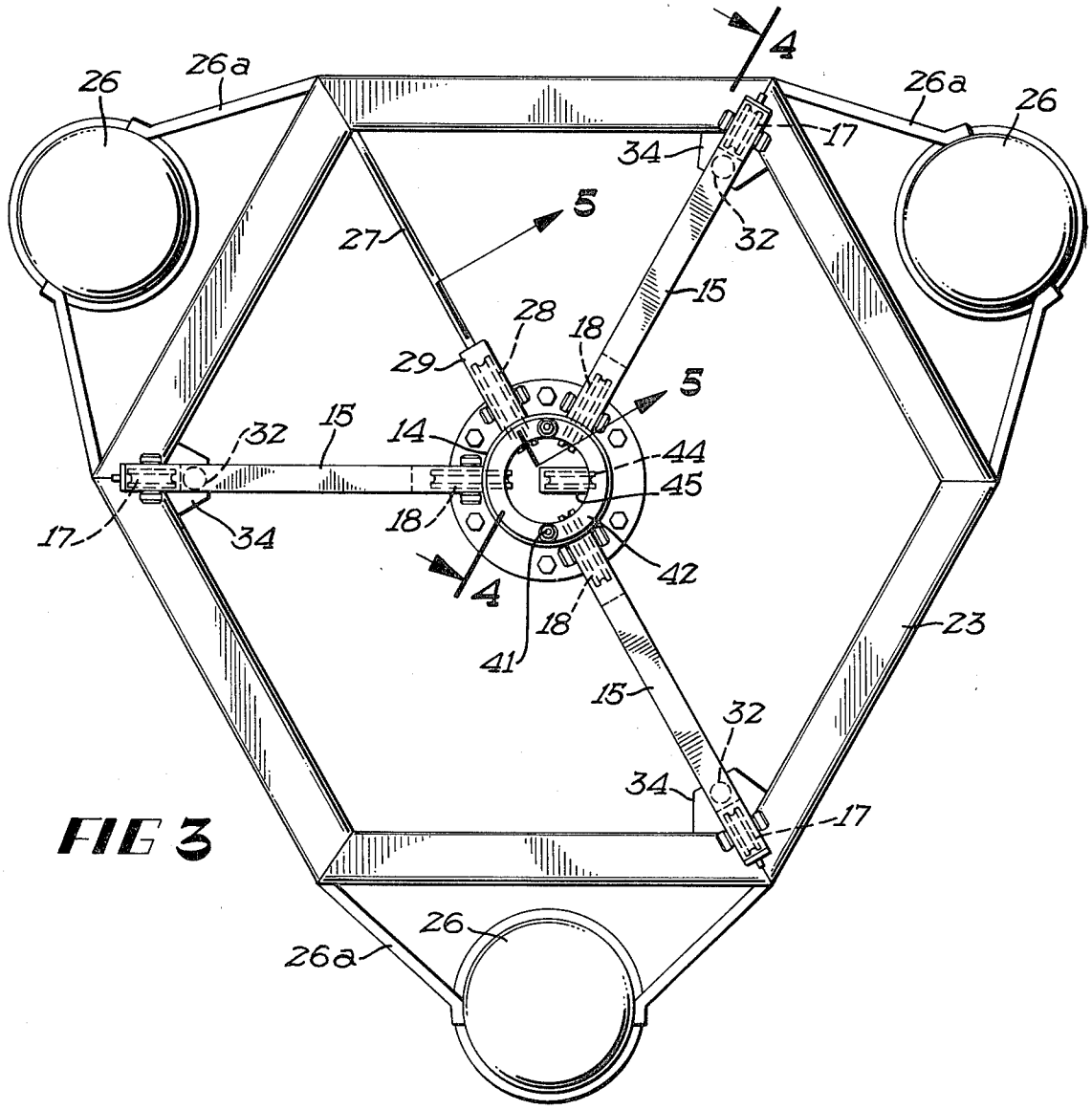

FIG 3

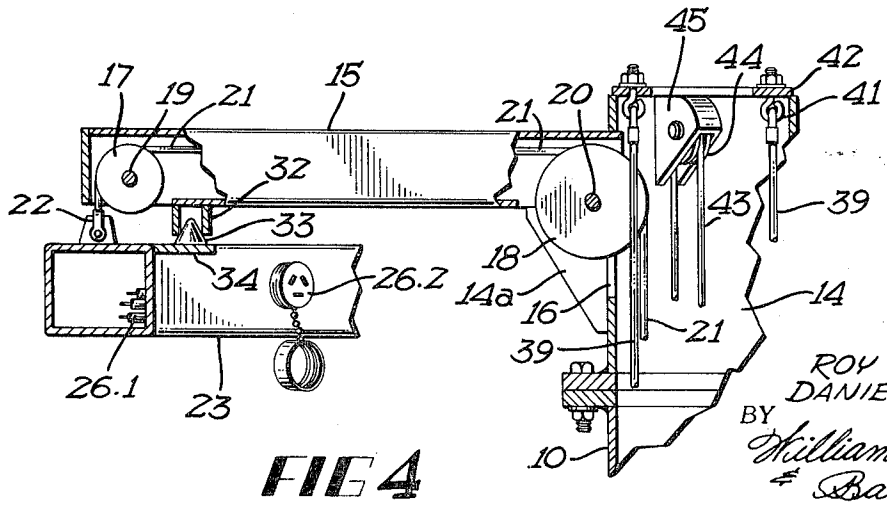

FIG 4

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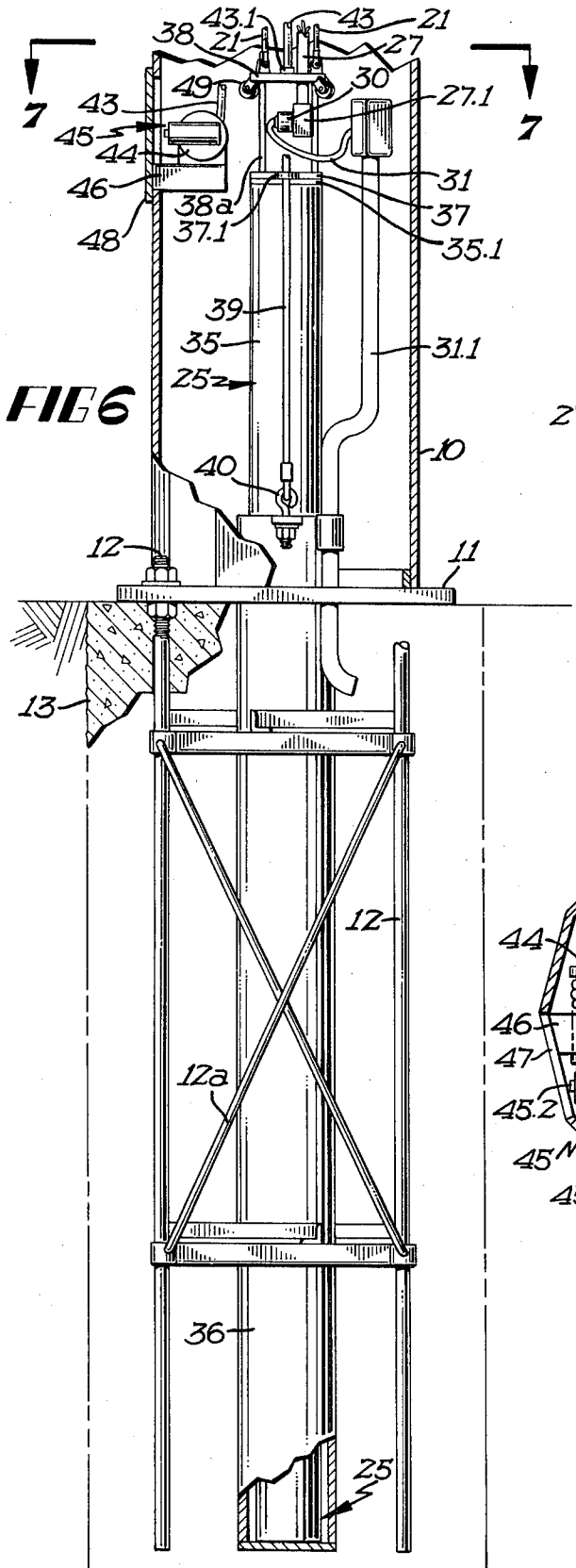

FIG 6

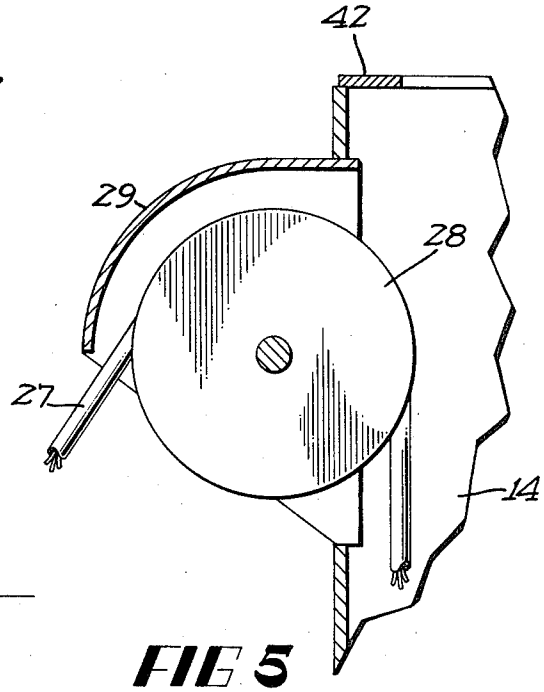

FIG 5

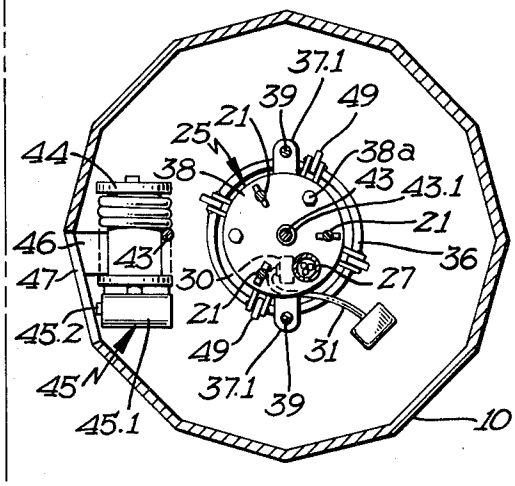

FIG 7

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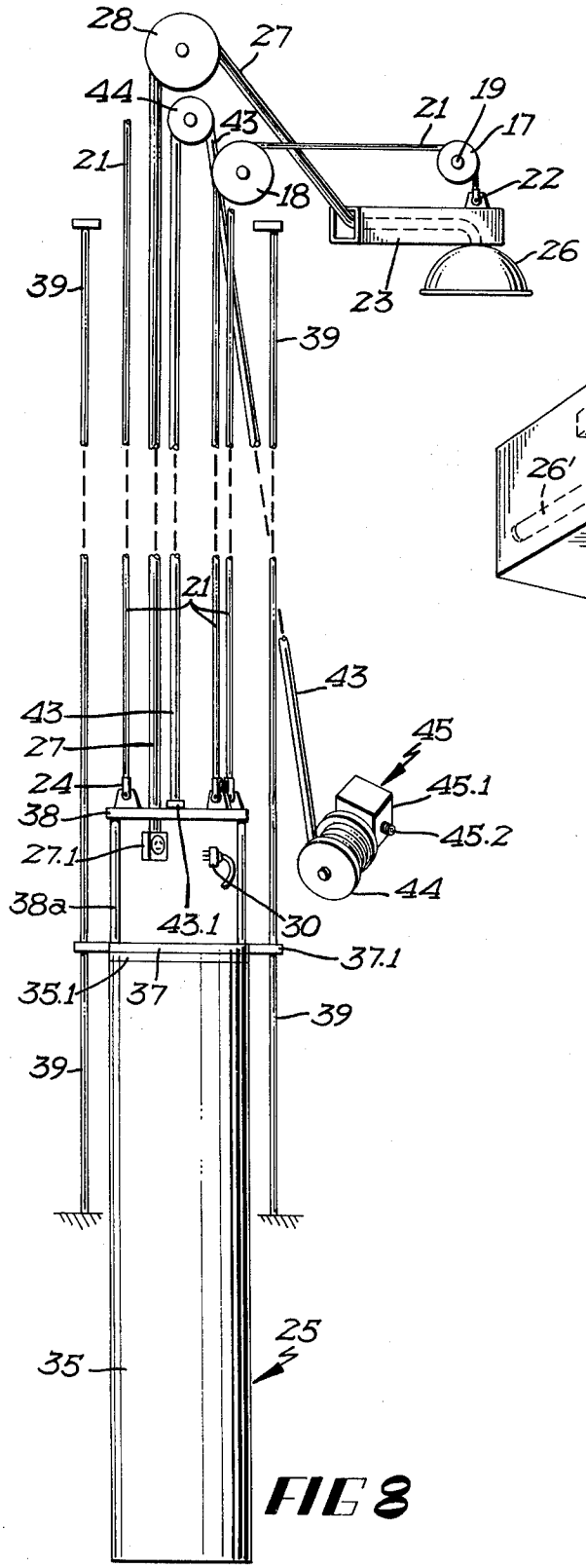

FIG 8

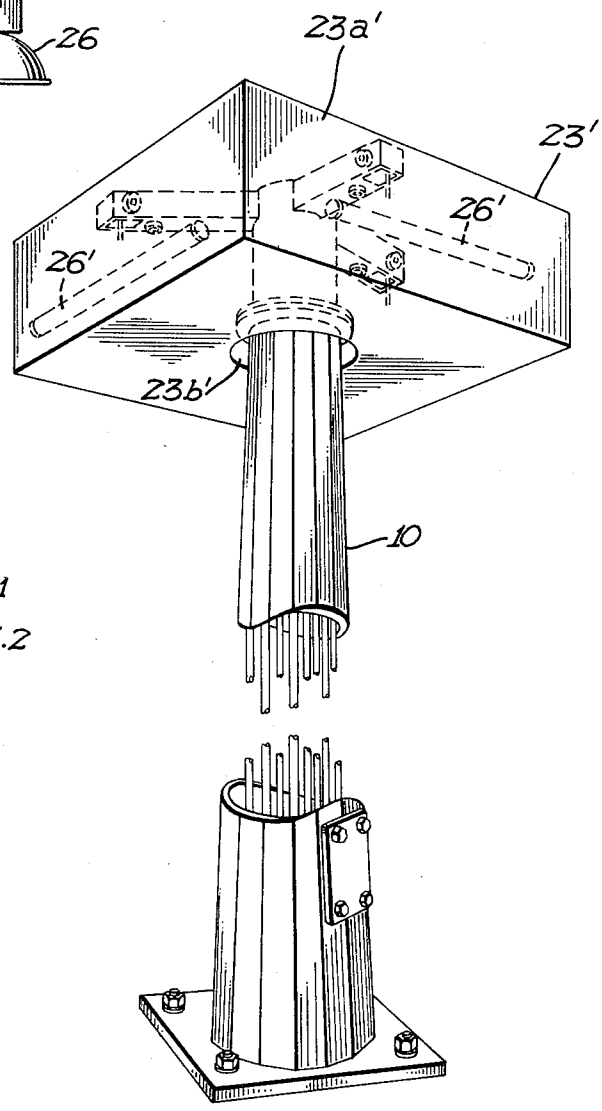

FIG 9

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LIGHT FIXTURE TOWER

BACKGROUND OF INVENTION

Tall light towers, of the type used for illuminating athletic fields and stadiums have supported many light fixtures in stationary position at elevations well in excess of one hundred feet in the past, but it has been necessary for workmen to ascend the tower in order to service these lights, and, of course, expensive special equipment must be provided for ascending the tower safely, and for moving about on the framework when the workman has reached the top of the tower.

Recently, the advances in lighting units have made it possible to illuminate entire highway intersections or expressway interchanges with just a few extremely high intensity light fixtures supported at an extremely high elevation. Likewise, there is a need for supporting other illuminated devices such as signs and advertising display at extremely high locations to signal the presence of motels and service stations to expressway travelers who cannot otherwise see such establishment located remotely from the highways. All such equipment involving lighting elements needs frequent servicing, but such servicing cannot be inexpensively and quickly accomplished with previously known equipment.

SUMMARY OF THE INVENTION

A tower for supporting light fixtures at so high a location as to be extremely hazardous for workmen to reach and maintain the lighting equipment. The light fixtures are supported on a frame separate from the tower which may be lowered to the ground for servicing the equipment carried thereby. The fixture frame is normally in an elevated position and is interlocked to support arms at the top of the tower to prevent swaying of the frame; and the fixture is carried by cables connected to a counterweight at the ground.

Raising the counterweight results in lowering the fixture frame for servicing. Power for the lights is supplied through a power cable anchored to the counterweight and detachably connected to a power source at the base of the tower. A lift cable trained over a sheave at the top of the tower facilitates raising the counterweight, and lowering the fixture frame, by a winch at the tower base.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is an elevation view, partly broken away, of the tower and support apparatus, and illustrating the fixture frame partly lowered in dotted lines.

FIG. 2 is a perspective view, partly broken away, and illustrating the present invention.

FIG. 3 is an enlarged top plan view of the top of the tower and support apparatus.

FIG. 4 is a detail section view taken approximately at 4—4 in FIG. 3 with portions of the apparatus broken away for clarity of detail.

FIG. 5 is an enlarged detail section view taken approximately at 5—5 in FIG. 3.

FIG. 6 is an enlarged section view taken on a vertical plane through the base of the tower and footing therefor.

FIG. 7 is an enlarged detail section view taken approximately at 7—7 in FIG. 6.

FIG 8 is a diagrammatic sketch illustrating the several cables and their arrangements within the tower.

FIG. 9 is a perspective view partly broken away and illustrating a modified form of the tower and support apparatus.

DETAILED DESCRIPTION OF THE INVENTION

The tower **10** is tubular in construction and is fabricated from flat sheet steel into a multi-sided tubular shape which tapers convergently from the base to the top of the tower. The tower **10** has a base plate **11** secured by anchor bolts **12** to the concrete footing **13** which extend down into the ground. Transverse and diagonal bracing **12a** is provided for the anchor bolts within the footing.

The top **14** of the tower is fabricated separately as seen in FIG. **4** and is affixed to the main tower by flanges and bolts.

Support arms **15** are affixed as by welding to the top of the tower and project horizontally therefrom in multi-directions. The arms **15** are tubular, and the inner ends thereof align with slots or openings **16** in the adjacent tower sidewall. Bracing plates **14a** are preferably provided to assist the arms in carrying the load.

Sheaves **17** and **18** are carried on fixed mounting pins or shafts **19** and **20** adjacent the outer and inner ends of each of the arms **15**. Support cables **21** are trained or carried over the sheaves **17** and **18**, and are securely attached by fittings **22** to the fixture frame **23**. The support cables **21** extend downwardly from the sheaves **18** throughout the entire length of the tower **10**, and are fastened by fittings **24** to the counterweight **25**, which is sufficient to keep the fixture frame **23** up against the arms **15** as illustrated.

The fixture frame **23** is rigid and tubular, and has a rectangular cross section in the form illustrated. The frame might also have a round cross section. As best illustrated in FIGS. **2** and **3**, the fixture frame is hexagonally shaped so as to encompass the tower **10** and its top **14**, but of course may have other configurations. The fixture frame **23** carries the electric light fixtures **26** on brackets **26*a***, and, as illustrated, the frame carries three such fixtures; however, it should be understood that any number of fixtures may be carried on the frame and in such position and orientation as is desired, according to the purpose for which the installation is made. The fixture frame **23** confines the distribution circuits **26.1** for the fixtures **26**.

Power is supplied to the distribution circuits and fixtures **26** from a power cable **27** which is trained over and supported by a pulley or sheave **28** supported on a covered bracket **29** which is affixed to the top **14** of the tower. One end of the power cable **27** is affixed, physically, to the fixture frame **23** and is connected electrically to the distribution circuits **26.1**; and the other end of the power cable **27** extends down through the entire length of the tower **10** and to the base thereof at which point the power cable is anchored, physically, to the counterweight **25**. A rigid receptacle box and receptacle **27.1** is affixed to the counterweight **25** to cooperate with a plug **30** in a detachable electrical coupling to the power source **31** at the base of the tower. As illustrated, the power source may be a short length of flexible cable connected through conduits and receptacles **31.1** to the switch gear and bus bars which supply high voltage electric current for the fixtures **26**.

An auxiliary power receptacle **26.2** is mounted on the fixture frame **23** and electrically connected to the distribution circuits **26.1** for facilitating the application of power to the lighting fixtures **26** when the fixture frame has been lowered to the base of the tower, at which condition the plug **30** will have been withdrawn from the receptacle **27.1**, thus facilitating upward movement of the counterweight and power cable **27** during lowering of the fixture frame.

Normally the fixture frame **23** is held up against the transverse arms **15** and is prevented from swaying by the interaction between the sockets **32** on the arms **15**, and the inserts or projections **33** confined in the sockets **32** and affixed on mounting plates **34** which are welded to the frame ring **23**. The inserts **33** are received in the sockets **32** during the normal upward travel of the fixture frame **23** toward the arms **15** so that the fixture frame and the electric light fixtures **26** are prevented from swaying relative to the tower **10** in their normal position.

The counterweight **25** comprises an elongate rigid sleeve **35** constructed of steel pipe and substantially filled with steel bars or rods so that the counterweight **25** will be heavier than the fixture frame **23** together with the fixtures **26** thereon. The steel sleeve **35** normally projects downwardly into a well **36** formed in the footing **13** for the tower **10**. The well **36** has a closed bottom and an open top to slidably receive the counterweight **25** therein.

The counterweight also includes a guide plate **37** and an anchoring plate **38**, both affixed to the cover plate **35.1** of the sleeve **35** by long bolts **38a** so that the anchor plate **38** is rigid with respect to the sleeve **35**. Plate **38** has upwardly projecting apertured ears facilitating anchoring the support cables **21** thereon. The receptacle box **27.1** is affixed to the plates **37** and **38** for anchoring the lower end of the power cable **27**.

The plate **37** has a pair of transversely outwardly projecting ears **37.1** rigidly connected thereto and apertured to slidably receive the guide cable **39** so as to prevent the counterweight **25**, as a whole, form revolving or rotating as it is raised and lowered in the tower **10**. The guide cables **39** are affixed as by fittings **40** to the stationary well **36** adjacent the base of the tower, and are affixed as by fittings **41** to the top annular plate **42** which is attached by welding to the top of the tower so that the cables **39** remain essentially stationary at all times.

Normally, the counterweight holds the fixture frame **23** in its elevated position, and, in order to lower the fixture frame **23**, the counterweight is raised in the tower **10** through the use of a lift cable **43** which is trained over and suspended from a pulley or sheave **44** mounted in a covered bracket **45** at the top of the tower **10**.

One end of the lift cable **43** is attached by fitting **43.1** to the anchor plate **38** of the counterweight **25**, and the other end of lift cable **43** is, in the form illustrated, wound on the drum **44** of winch **45** which is carried on the bracket plate **46** which is affixed as by welding to the interior of the tower **10**, immediately adjacent the hand hole **47** which is normally covered by a cover plate **48**. The winch **45** may be of any suitable type, and may actually be removably mounted in the tower, but in the form shown, the winch **45** has a gearbox **45.1** which may be supplied with mechanical power for operating the winch by an auxiliary portable electric motor which may be brought to the site by a workman and then detachably coupled to the input drive shaft **45.2** for operating the winch. Such a portable motor may be the type of motor which is ordinarily used for heavy duty drilling, but provided with a special coupling at the chuck.

It will be readily understood that by simply operating the winch **45**, the lift cable **43** is wound on the winch drum, and the counterweight is lifted, substantially throughout the entire height of the tower **10** for lowering the fixture frame **23** and the fixtures **26**.

The counterweight **25** is provided with a plurality of guide wheels **49**, being mounted in suitable brackets attached to the anchor plate **38** so that the counterweight will be guided freely along the interior of the upper portion of the tower wherein the interior dimensions are considerably less than the dimensions of the tower illustrated in FIG. **7**, such that the counterweight will not drag along the interior surfaces of the tower.

In the modified form of the invention illustrated in FIG. **9**, it is illustrated principally that the shape of the fixture frame **23'** may be varied considerably from the shape of the frame illustrated in FIGS. **1**, **2** and **3**. The fixture frame **23** may have sources of light such as fluorescent tubes **26'** incorporated therein and may incorporate translucent panels **23*a'*** for carrying advertising displays and the like. The tower **10** illustrated in FIG. **9** is essentially the same as that described hereinbefore and is provided with similar mounting arms at the top so as to support and stabilize the fixture frame **23'** and prevent it from swaying or otherwise moving relative to the tower, except when it is desired to lower the fixture frame. The fixture frame **23'** will have an opening **23*b'*** in the bottom of it so as to freely pass downwardly along the tower when the fixture frame is lowered.

In operation, the fixture frame **23** is ordinarily retained at the top of the tower **10**. The counterweight **25**, reposing in the well **36**, maintains the tension on the support cables **21** so that the sockets and inserts **32** and **33** are coupled and the fixture frame and fixtures are retained in stationary position relative to the tower. Power is supplied to the electric fixture **26** from the cable **27** which is supplied with power at the receptacle box **27.1** from the source of power provided by the plug **30** and flexible cable **31**. Normally the hand hole cover **48** is in place as illustrated in FIG. **2**, and the tower and lighting apparatus appears to be an integral unit.

However, when it is desired to service the light fixtures **26** at the top of the tower, the cover **48** is removed and a source of mechanical power is attached to the input shaft **45.2** of the winch, to prepare for raising the counterweight. The plug **30** is removed from the receptacle box **27.1** so as to uncouple the power cable **27** from the source of power and to free the counterweight for upward movement.

As the winch **45** is operated, the lift cable **43** is wound onto the drum **44** and the counterweight **25** is lifted. As the counterweight moves upwardly in the tower **10**, cables **21** lower the fixture frame **23** to the dotted line position shown in FIG. **1** and then to the base of the tower **10** where the fixtures **26** are readily accessible for replacement or repair. While the fixture frame and light fixtures are near the base of the tower,

the test procedures on the fixtures **26** may be accomplished by supplying electric power to the receptacle **26.2** on the fixture frame.

When the maintenance of the fixtures has been accomplished, the winch **45** is operated in reverse to pay off the lift cable **43** from the drum, whereby to lower the counterweight **25** in the tower **10** and cause lifting of the fixture frame **23** into the normal operating position illustrated in FIGS. **1** and **2**. The counterweight is prevented from rotating in the tower **10** by the guide cables **39**. Transverse movement of the fixture frame **23**, during lifting, is minimized because it is being lifted by three separate cables, and, as the fixture frame approaches the arms **15**, the lengths of support cables **21** suspended from the pulleys **17** is very short and, as a result, the inserts **33** are accurately guided into the sockets **32** for retaining the fixture frame against any transverse swing or wobbling movement. When the fixture frame **23** has reached its uppermost position against the arms **15** as illustrated, the source of power will be coupled to the cable **27**, simply by inserting the plug **30** into the receptacle box **27.1**. Detachment of the source of mechanical power from the winch **45**, and replacement of the cover plate **48** are the final steps in putting this light tower back into service.

The light tower, which may be well over one hundred feet high, would normally present very serious hazards for a workman to climb up to the fixtures for servicing, but, in view of the present invention which permits lowering the fixtures to the ground for servicing, the maintenance of these towers can be quick and inexpensive, and need not involve any unusual hazards normally associated with tower work. The counterweight, reposing in the well, holds the fixture frame up against the rigid transverse arms, and the support cables **21** which interconnect the frame with the counterweight are not subjected to any substantial wear as they are never wound on drums nor are they exposed to exterior weathering. The power is supplied to an distributed within the fixture frame, and the power cable can be readily and easily physically and electrically uncoupled or disconnected as the counterweight and support cables are allowed to move up the tower as the fixture frame and fixtures are lowered for servicing. Lowering of the fixture frame is accomplished simply by lifting the counterweight through the use of the winch at the base of the tower.

What is claimed is:

1. Apparatus supporting electric fixtures at an elevated location so high as to be dangerous to workmen and difficult to reach and maintain, comprising an elongate, vertical, tubular tower having a top, a base and a hollow interior, said tower secured at its base on a supporting surface, at least three transverse tubular support arms affixed at one end thereof to the top of the tower and extending at their other ends a substantial distance outwardly therefrom in different directions, an opening in the underside of each support arm at the other end thereof, a first rotatable sheave mounted within the other end of each support arm adjacent to and above said opening, a second sheave rotatably mounted within each said support arm at said one end thereof, a counterweight within said tubular tower, an annular fixture frame disposed in substantial outwardly spaced surrounding relationship to said tower at the top end thereof, a plurality of electric fixtures supported on said frame, self-aligning interfitting socket and tapered projecting means on said frame and on each said arm at the other end thereof spaced inwardly from and in juxtaposition with said opening in each said arm, support cable means secured at one end to said frame and extending upwardly over said first sheave in each said arm and through said arms and over said second sheave and thence downwardly through said tower and secured at the other end thereof to said counterweight, so that said fixture frame is continuously positively held upwardly against the underside of said support arms with said interfitting socket and projecting means interengaged to prevent swaying or transverse movement of said fixture frame but permitting lowering of said fixture frame around said tower when desired, pulley means mounted to the top of said tower, and power cable means connected with a source of electrical energy at the base of the tower and extending upwardly through said tower and over said pulley means, said power cable being operatively connected with the electric fixtures supported on said frame.

2. Apparatus as in claim **1**, wherein means are operatively connected with said counterweight for raising and lowering the counterweight in said tower to thereby raise and lower said fixture frame, said power cable being connected to said counterweight, and detachable connection means at the base of the tower for coupling the power cable to a power supply.

3. Apparatus as in claim **2**, wherein a pair of linear guide means extend upwardly through said tower between the top and base thereof, and means are on the counterweight operatively engaged with said linear guides to prevent rotation of the counterweight during travel thereof in the tower.

4. Apparatus as in claim **3**, wherein a well is beneath the base of the tower for receiving the counterweight when the counterweight is in its normal, lowered position, and said operable means for raising and lowering the counterweight includes a sheave rotatably mounted at the top of the tower, a lift cable trained over the sheave and connected at one end thereof to the counterweight, a winch at the base of the tower and the other end of said lift cable connected to said winch for lifting the counterweight and lowering the fixture frame.

5. Apparatus as in claim **4**, wherein said fixture frame comprises a plurality of straight tubular members jointed together at adjacent ends to form a hexagonally shaped frame at the outer ends of said arms.

6. Apparatus as in claim **4**, wherein advertising panel means are secured to said frame for displaying advertising material.

7. The fixture supporting apparatus according to claim **1** and the counterweight carrying an electrical receptacle connected to the power cable,

and the power source having a connector plug to fit the receptacle.

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