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Bouchard

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[54] **ANCHORING DEVICE FOR SECURING AND POSITIONING EQUIPMENT**

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[51] **Int. Cl.** **E04b 1/41;** E02d 27/44

[58] **Field of Search** 52/704, 714, 295; 248/19, 248/23; 151/41.76

[56] **References Cited**

UNITED STATES PATENTS

620,481	2/1899	Moody	52/704
923,188	6/1909	Kneas	52/706 X
1,037,678	9/1912	Snyder	52/706
1,245,414	11/1917	Widmar	52/709 X
2,625,815	1/1953	Black	52/707 X
2,733,785	2/1956	Beatty	52/295 X
2,881,876	4/1959	Williams	52/295 X
2,985,937	5/1961	Hillberg	52/707 X
3,397,494	8/1968	Waring	52/122
3,597,893	8/1971	Spanel	52/707
3,599,379	8/1971	Spanel	52/707
3,802,138	4/1974	McCarter	52/295 X

FOREIGN PATENTS OR APPLICATIONS

664,178	6/1963	Canada	52/704
18,633	7/1909	United Kingdom	85/50 R
369,274	6/1963	Switzerland	52/707
826,061	5/1938	France	52/706
471,946	11/1914	France	55/50 R
104,569	5/1926	Austria	52/704

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[57] **ABSTRACT**

There is disclosed an anchoring device for securing equipment in a concrete structure poured in at least two phases and for precisely positioning the equipment in the structure. The anchoring device is embedded in the primary phase and has a rod connected to the equipment which may take up a limited variety of angles to allow the equipment to be precisely positioned after pouring of the primary phase and securely held in such position during the pouring of the secondary phase.

10 Claims, 8 Drawing Figures

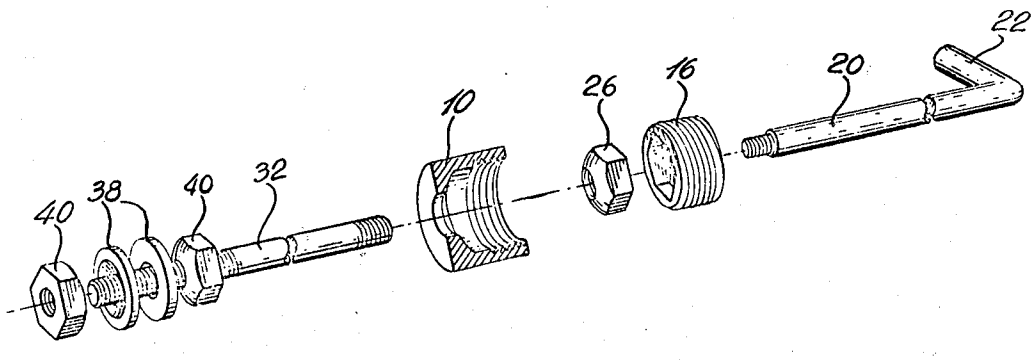
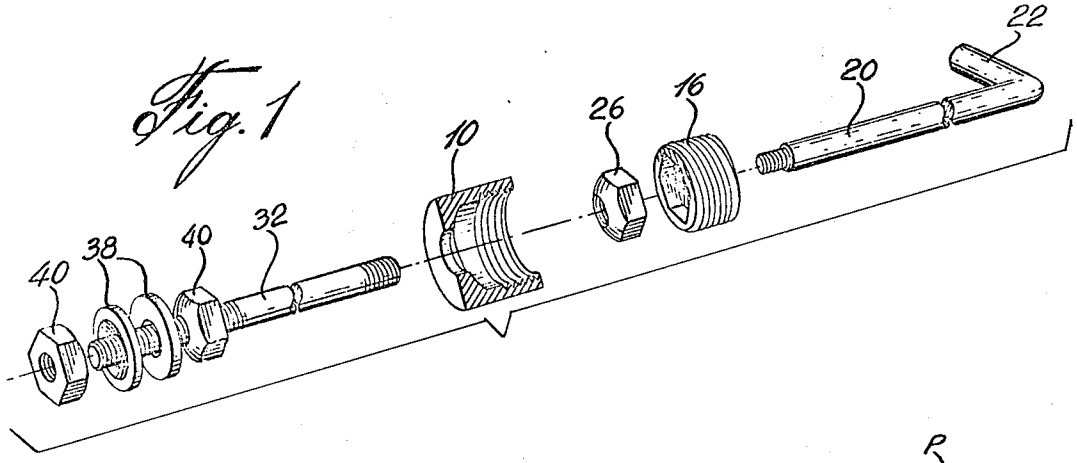


Fig. 1



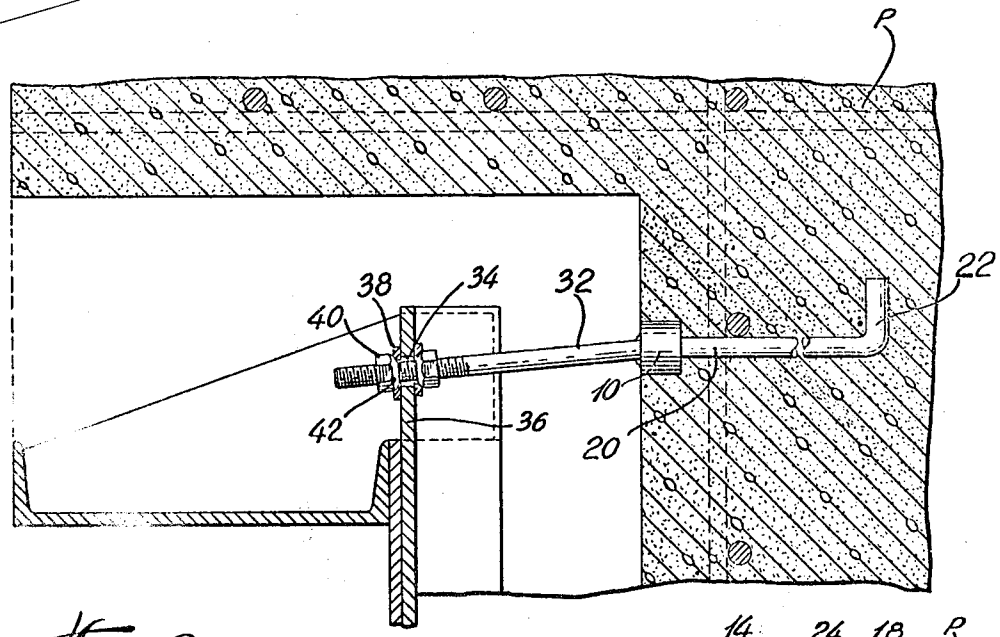


Fig. 2

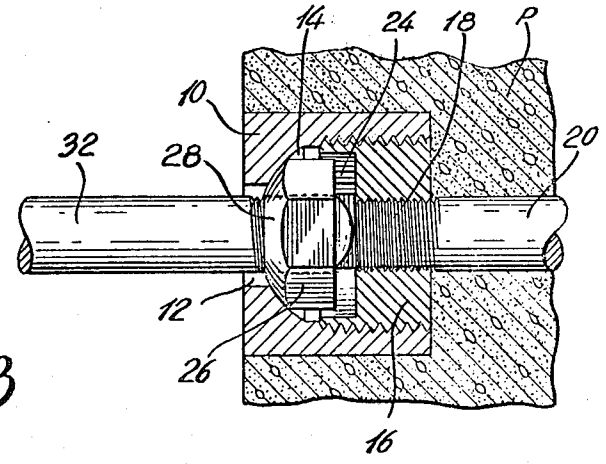


Fig. 3

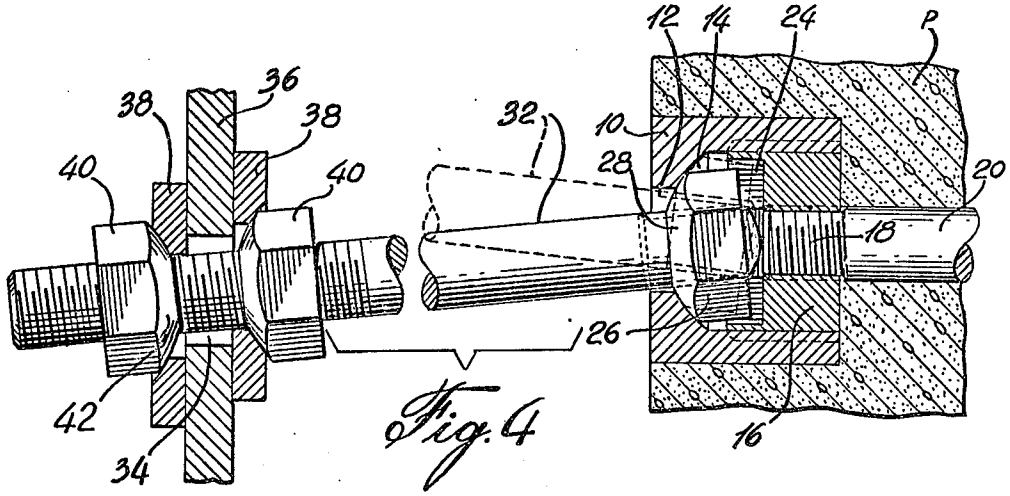


Fig. 4

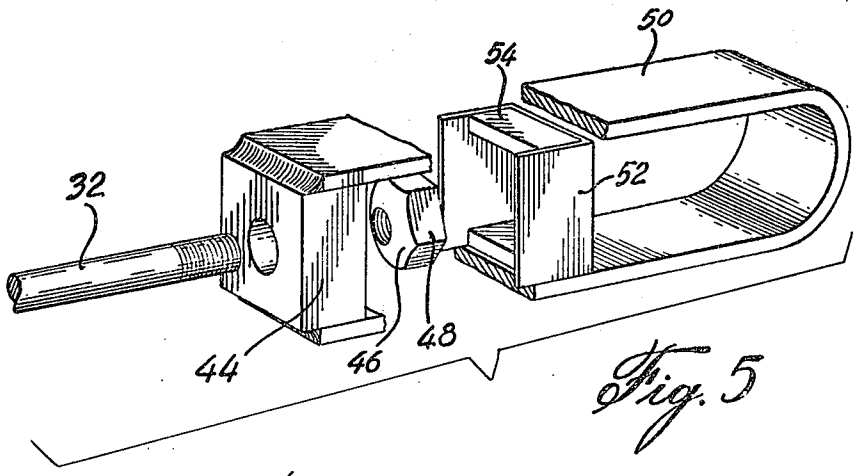


Fig. 5

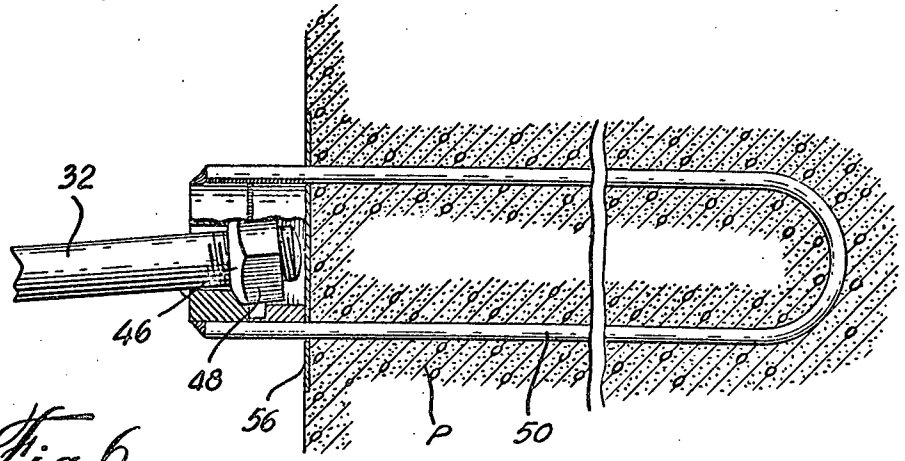


Fig. 6

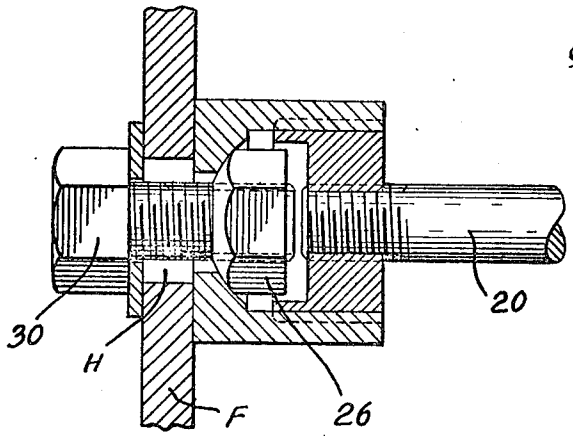


Fig. 7

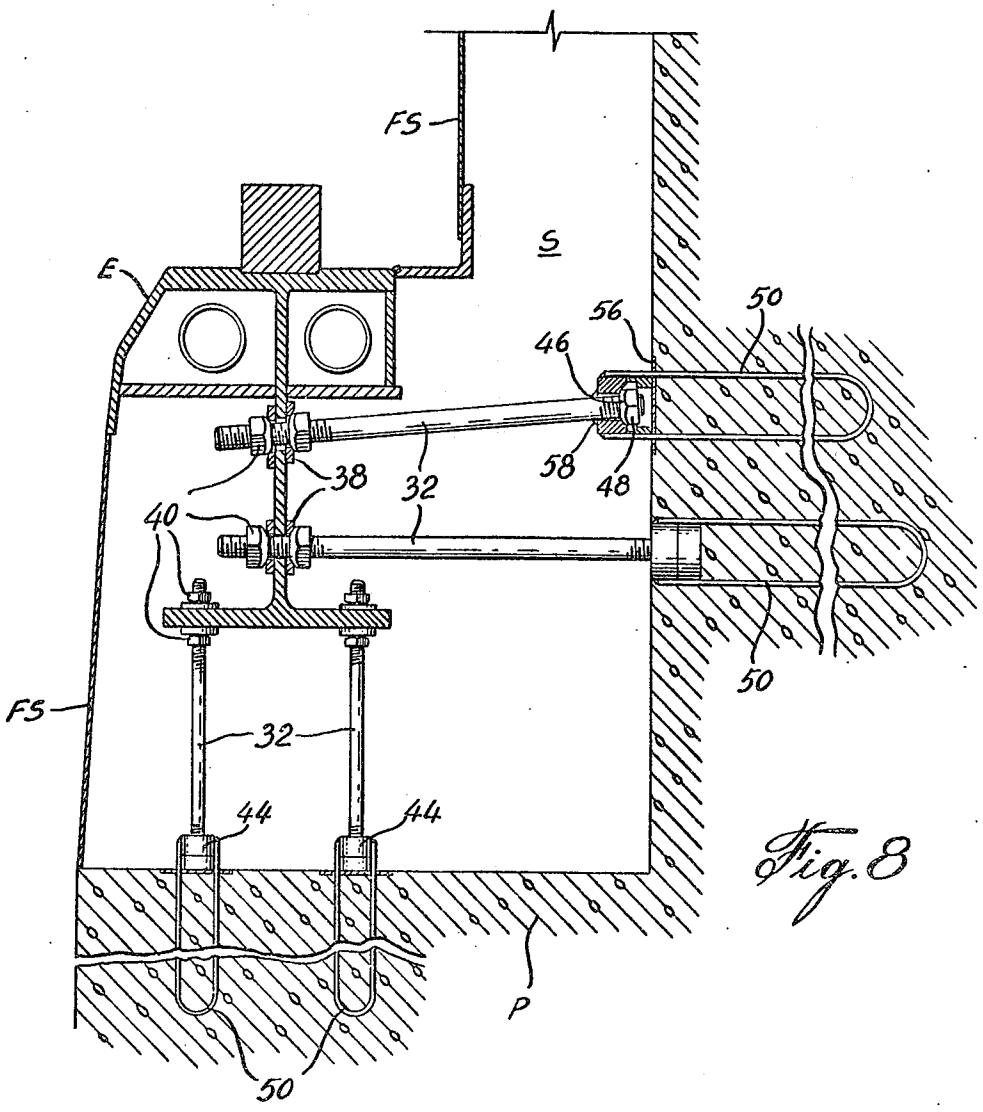


Fig. 8

ANCHORING DEVICE FOR SECURING AND POSITIONING EQUIPMENT

The present invention relates to an anchoring device for securing equipment in a concrete structure in a precisely adjusted position.

It is known that large concrete structures such as those housing hydro electric power plants are poured in a plurality of superposed phases. For purposes of the present description, the next to the last phase and the last phase in the pouring of such concrete structures will be defined herein as the primary and the secondary phase respectively.

Anchoring devices for hydro electric power equipment or the like heavy machinery have hitherto been embedded in the secondary phase. This arrangement has a twofold disadvantage. To locate the anchoring devices entirely in the mass of the secondary phase is unsatisfactory because the bond between the primary and the secondary phase may be too weak to allow transmission of the loads involved. Furthermore, the secondary phase itself may be insufficiently strong.

Another disadvantage lies in that the forms may undergo unpredictable deformation during pouring of the concrete and the anchoring devices which are connected to the forms will thus be improperly positioned, resulting in improper positioning of the equipment or difficulties in the connection thereof to the anchoring devices.

It is an object of the present invention to provide an anchoring device the use of which overcomes the aforementioned disadvantages. The invention accordingly provides an anchoring device for securing equipment in a concrete structure poured in at least two phases and for precisely positioning the equipment in the structure, comprising a threaded rod securable to the equipment, a nut on the rod having a spherical face, a socket with a hole for the rod larger than the rod and a matching internal spherical recess for the nut and an anchor connected to the socket and adapted to be positioned within the primary phase of the concrete structure. With this arrangement, the anchoring devices can be installed in the primary phase and after pouring of the primary phase, the equipment can be installed and accurately positioned by means of the threaded rod and the nuts thereon and the secondary phase can then be poured, the rods of the anchoring devices securely holding the equipment in the position during the pouring of the secondary phase.

Further according to the invention, the rod carries remote from the socket a pair of nuts with spherical faces directed towards each other and a washer engageable with each nut and having a matching spherical recess, the washers being adapted to contain therebetween a portion of the equipment having a hole for the rod larger than the rod.

The nuts allow the equipment to be accurately positioned by pulling or pushing thereon and then hold the equipment securely therebetween during the secondary phase pouring.

It will be seen that the provision of spherical nuts and spherical recesses and the fact that the holes in the socket and washers are larger than the rods, allows the rods to assume any position within a limited angle so that inaccuracies in the positioning of the anchors in the primary phase do not affect the possibility of subsequently properly positioning the equipment.

Further according to the invention, the socket has an internal thread, an internally and externally threaded plug screwed therein and the anchor has a threaded end screwed into the plug. The anchor has preferably a non-linear configuration to form a secure connection with the body of the concrete.

The plug in accordance with the invention has an internal recess loosely encircling the nut and of configuration adapted to prevent rotation of the nut to allow screwing of the rod into the nut.

According to an alternative feature of the invention, the anchor comprises a U-shaped bar having its free ends secured to the socket and a box between the legs of the bar and having an open face connected to the internal face of the socket to provide a concrete free enclosure for the nut during the pouring of the primary phase.

Also in this case, according to the invention, the box has an internal configuration encircling the nut and adapted to prevent rotation thereof.

According to the invention, the rod has its end disposed in the plug or the socket rounded to facilitate the angular displacement of the rod and secure it in position by pressure contact after the required adjustment has been reached.

Further according to the invention, mounting means are provided for securing the anchoring means to a form during the pouring of the primary phase of the concrete structure. This mounting means may comprise a bolt engageable with the nut to mount the socket to the inner face of a form during pouring of the primary phase.

Alternatively, according to the invention, a plate may be secured to the U-shaped bar of the above described alternative embodiment, roughly coplanar with the bottom of the box and securable to the inner face of a form so that the socket and box project out of the concrete.

Preferred embodiments of the invention are illustrated by way of example in the accompanying drawings in which

FIG. **1** is an exploded perspective view partly in axial section of an anchoring device according to a first embodiment of the invention,

FIG. **2** is a plan showing the device installed,

FIG. **3** is an axial sectional detail showing the socket and associated parts,

FIG. **4** is an axial sectional detail of the anchoring device,

FIG. **5** is a perspective view of part of an anchoring device according to a second embodiment of the invention,

FIG. **6** is a fragmentary plan showing the device of FIG. **5** installed, if a fixing plate is used,

FIG. **7** is a fragmentary axial section of mounting means for connecting the anchoring device of FIGS. **1** to **4** to a concrete form,

FIG. **8** is a plan showing the installation of a plurality of anchoring devices of the type shown in FIGS. **5** and **6.**

Referring to FIGS. **1** to **4,** the anchoring device illustrated therein comprises a socket **10** of circular cross-section having a hole **12** and next to the hole **12,** a spherical recess **14.** The interior of the socket **10** beyond the spherical recess **14** is threaded to receive a plug **16** having a threaded hole to receive the threaded end **18** of an anchor **20.** The anchor **20** has a non-linear configuration which in the illustrated embodiment is

constituted by a bent portion **22.** The inner face of plug **16** has a recess **24** which in assembled position loosely encircles a nut **26** located in the interior of socket **10.** Nut **26** is of hexagonal configuration and recess **24** also has a hexagonal configuration which is dimensioned to allow a certain amount of movement of the nut **26** while preventing rotation of the nut. The nut **26** has a spherical face **28** of radius matching spherical recess **14** and disposed adjacent the recess **14.**

FIG. **2** shows the above-described portions of the anchoring device embedded in primary phase concrete P as above defined. For purposes of installation, a bolt **30** shown in FIG. **7** is inserted through a hole H of a form F and passes through hole **12** and engages nut **26** to hold the socket **10** and associated parts against the inner wall of form F. After pouring of the primary phase P, the bolt **30** is removed and form F is dismantled leaving the socket **10** and associated parts including anchor **20,** embedded in the concrete of the primary phase with the outer face of socket **10** flush with the surface of the concrete.

Subsequent to the removal of bolt **30** and form F, a rod **32** with threaded end portions is inserted through hole **12** and screwed into nut **26** until the corresponding end of rod **32** which is rounded as shown, engages with contact pressure on the outer end of anchor **20.**

The other end of rod **32** passes through a hole **34** in a portion **36** forming part of an item such as hydro electric power equipment to be installed. On either side of equipment portion **36,** the rod **32** carries a washer **38** with an outwardly facing spherical recess and a nut **40** with a spherical face **42** matching and in engagement with the spherical recess of corresponding washer **38.**

The size of holes **12** and **34** is substantially larger than that of rod **32** so that the rod **32** may assume any number of angular positions within a limited range as shown in dotted lines in FIG. **4.** The equipment connected to portion **36** may be pulled towards or pushed away from the primary phase concrete structure P by suitably turning nuts **40** until the desired position is obtained, whereupon nuts **40** are tightened against equipment portion **36.** The angular freedom of movement of rod **32** allows the equipment to be precisely positioned even if inaccuracies are present in the positioning of the socket **10.** The spherical faces **28** and **42** and the matching spherical recess **14** and the recesses of washers **38** provide universal bearing surfaces at any angular position.

After the equipment has been precisely positioned, rod **32** and socket **10** may be welded together to prevent any further movement and the secondary phase of the concrete structure is poured to embed rod **32.**

In the alternative embodiment illustrated in FIGS. **5,** 6 and **8,** the anchoring device comprises an externally square socket **44** with a spherical internal recess in contact with the spherical face **46** of a nut **48.** An anchor **50** in the shape of a U-shaped flat bar, has its free ends welded to opposite outer faces of socket **44.** A box formed of a channel-shaped sheet metal member **52** and opposite end pieces **54,** is disposed between the legs of anchor **50** with its open face in contact with the internal face of socket **44** to provide a concrete free enclosure for nut **48.** End pieces **54** are dimensioned to allow a certain amount of movement to nut **48** but to prevent rotation thereof.

The anchoring device may be installed with the outer face of socket **44** flush with the surface of primary concrete P as shown at the lower right of FIG. **8** by the use of a bolt **30** as in FIG. **7.** Alternatively, the anchoring device may be installed with the socket **40** and box **52,** 54 projecting outwardly of the primary concrete surface as shown in FIG. **6** and elsewhere in FIG. **8.** To this end, a plate **56** is secured for example, by welding to the anchor **50** generally in line with the bottom of box channel **52,** the plate **56** being connected to the inner wall of a form (not shown) for the primary concrete P so that upon removal of the form, the plate **56** is flush with the outer surface of the primary concrete P.

The anchoring device illustrated in FIGS. **5, 6** and **8** takes a rod **32** identical to that described in connection with the embodiment of FIGS. **1** to **4** and the connection between rod **32** and the equipment is also effected by nuts **40** and washers **38** as in the first embodiment.

As shown in FIG. **8,** any number of anchoring devices may be used to properly secure the equipment indicated at E and to allow proper positioning of such equipment. After all the nuts **40** have been tightened and rods **32** have been welded as shown at **58,** suitable forms FS are constructed and secondary phase concrete is poured in the space S to embed the rods **32.**

I claim:

1. An anchoring device for securing equipment to a concrete structure poured in at least two phases and for precisely positioning said equipment in said structure, comprising:

a. a threaded rod securable to the equipment,

b. a nut on said rod having a spherical face,

c. a socket having a hole therein receiving said rod, said hole being larger than said rod, said socket also having a matching spherical internal recess for receiving said nut therein,

d. a plug connected to said socket with said nut therebetween whereby said nut is prevented from rotation by the plug, and

e. an anchor connected to said plug and adapted to be positioned within the primary phase of the concrete structure.

2. Anchoring device according to claim **1,** wherein said rod carries, remote from said socket, a pair of nuts with spherical faces directed towards each other, and a washer engageable with each nut and having a matching spherical recess, said washers being adapted to contain therebetween a portion of the equipment having a hole for said rod larger than said rod.

3. An anchoring device according to claim **1,** wherein said socket has an internal thread and said plug is internally and externally threaded, said anchor having a threaded end screwed into said plug.

4. Anchoring device according to claim **3,** wherein said anchor has preferably a non-linear configuration.

5. Anchoring device according to claim **3,** wherein said plug has an internal recess loosely encircling said nut and of configuration adapted to prevent rotation of said nut.

6. An anchoring device according to claim **1,** wherein the end of said rod disposed in said socket is rounded.

7. Anchoring device according to claim **1,** further comprising mounting means for securing said anchoring device to a form during the pouring of the primary phase of the concrete structure.

8. Anchoring device according to claim **1,** further comprising a bolt engageable with said nut to mount said socket to the inner face of a form during pouring of the primary phase of said concrete structure.

9. An anchoring device for securing equipment to a concrete structure poured in at least two phases and for precisely positioning said equipment in said structure, comprising:

a. a threaded rod securable to the equipment,

b. a nut on said rod having a spherical face,

c. a socket having a hole therein receiving said rod, said hole being larger than said rod, said socket also having a matching spherical internal recess for receiving said nut therein,

d. a box like member connected to said socket with said nut therebetween whereby said nut is prevented from rotating by the box like member,

e. a U-shaped anchor connected to said socket.

10. Anchoring device according to claim **9**, further comprising a plate secured to said U-shaped bar roughly coplanar with the bottom of said box and securable to the inner face of a form during pouring of the primary phase of said concrete structure.

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