United States Patent [19]

Cox

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[45] Aug. 13, 1974

[54] **TECHNIQUE FOR ALIGNING ANCHOR BOLTS**

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[52] **U.S. Cl.** **264/34,** 52/295, 52/714, 249/177, 249/213, 264/35

[51] **Int. Cl.** **E04b 1/38,** E02d 27/32

[58] **Field of Search** ..... 25/DIG. 25, 131 T, 128 D; 249/43, 177, 213; 94/18; 52/393, 699, 700, 701, 714, 309, 295; 248/21, 22; 264/34, 35

[56] **References Cited**

UNITED STATES PATENTS

1,323,067	11/1919	Keith	52/699
1,960,728	5/1934	Cannon	52/699
2,698,560	1/1955	Heltzel	94/18
2,950,576	8/1960	Rubenstein	52/309
3,420,491	1/1969	Bowden et al.	25/128 D
3,500,607	3/1970	Wilson	52/699
3,513,609	5/1970	Lang	52/309

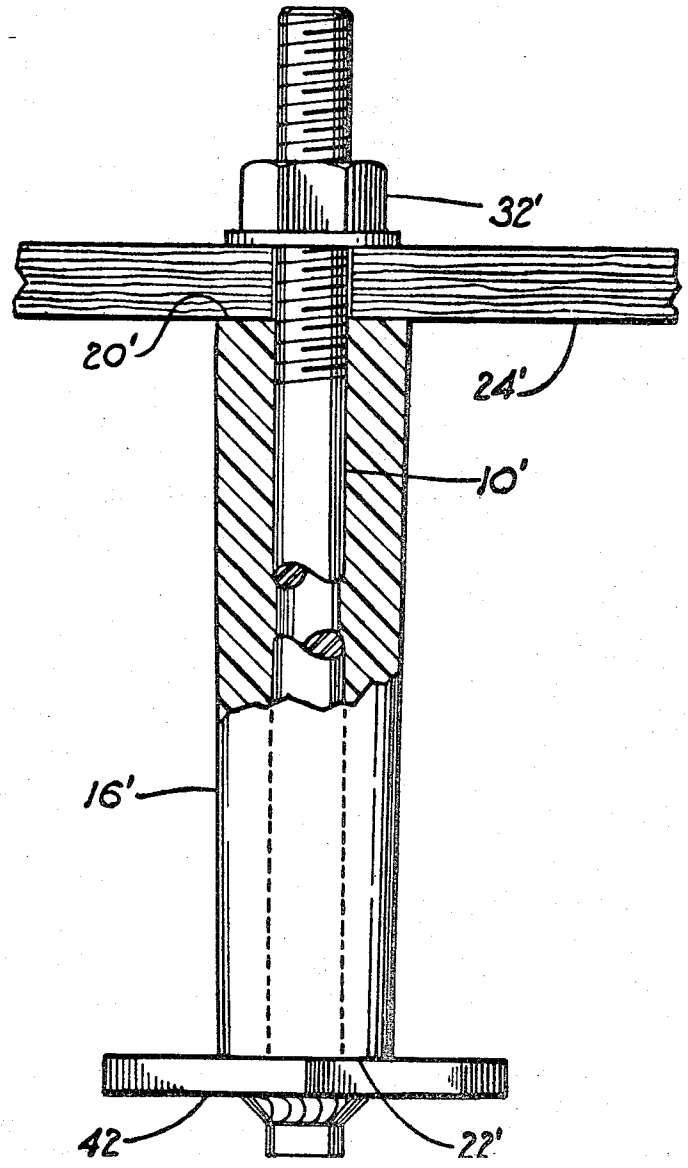
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[57] **ABSTRACT**

An improved anchor bolt shield is used to provide a yieldable, deformable annular sleeve about the upper portion of an anchor bolt when the lower end of the bolt is embedded in a concrete foundation. The relatively deformable charcteristics of the sleeve permit the upper, threaded end of the bolt to be adjusted laterally to facilitate alignment of the upper end of the bolt with a receptive hole in a member intended to be secured to the foundation. In one aspect of the invention the sleeve remains in place while in another aspect of the invention the sleeve may be removed and the annular void about the anchor bolt may be filled with an appropriate material.

10 Claims, 8 Drawing Figures



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SHEET 1 OF 2

Fig. 1

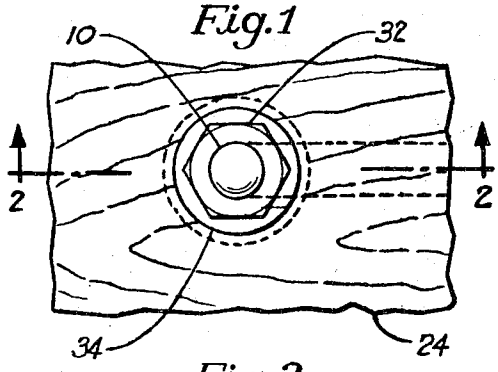


Fig. 3

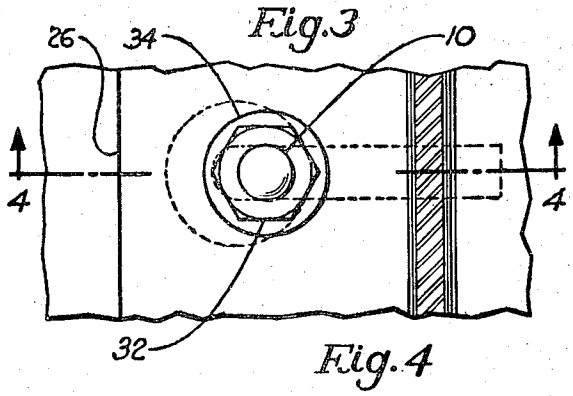


Fig. 2

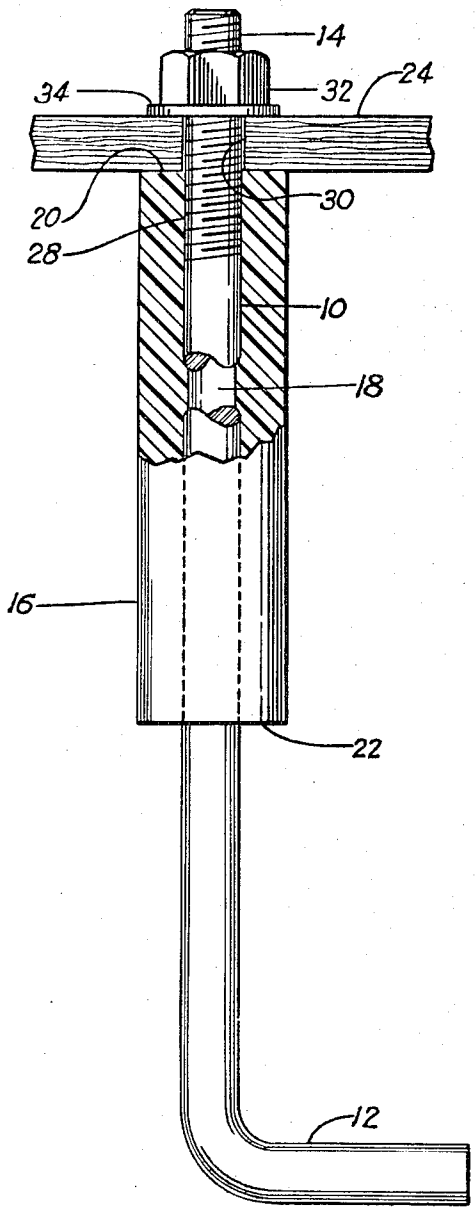
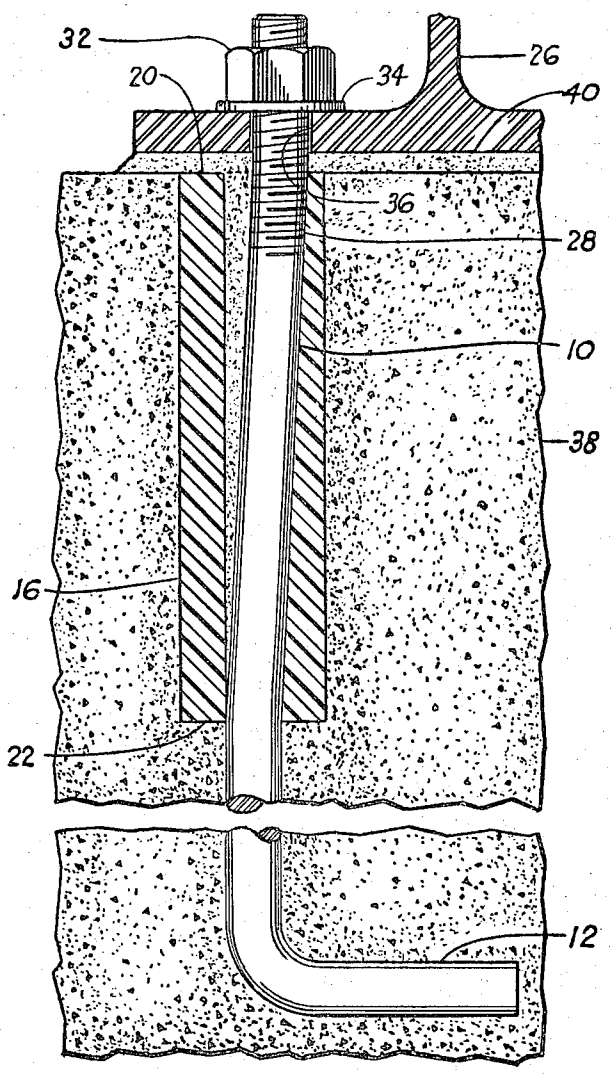


Fig. 4



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Fig. 5

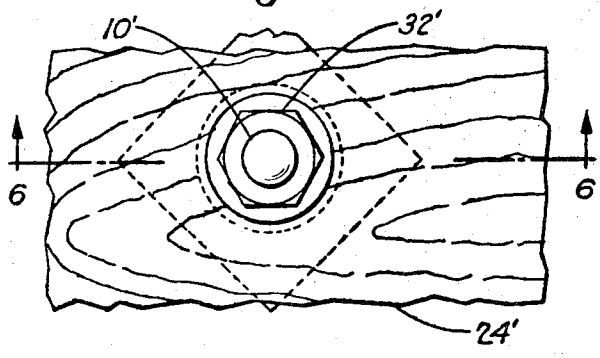


Fig. 7

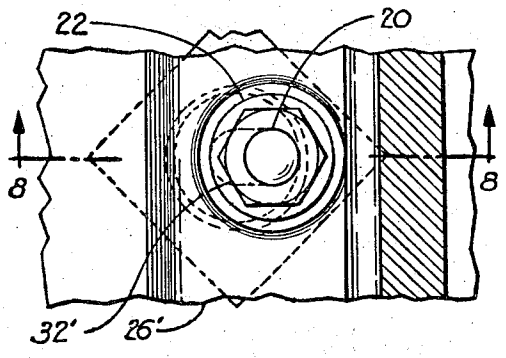


Fig. 6

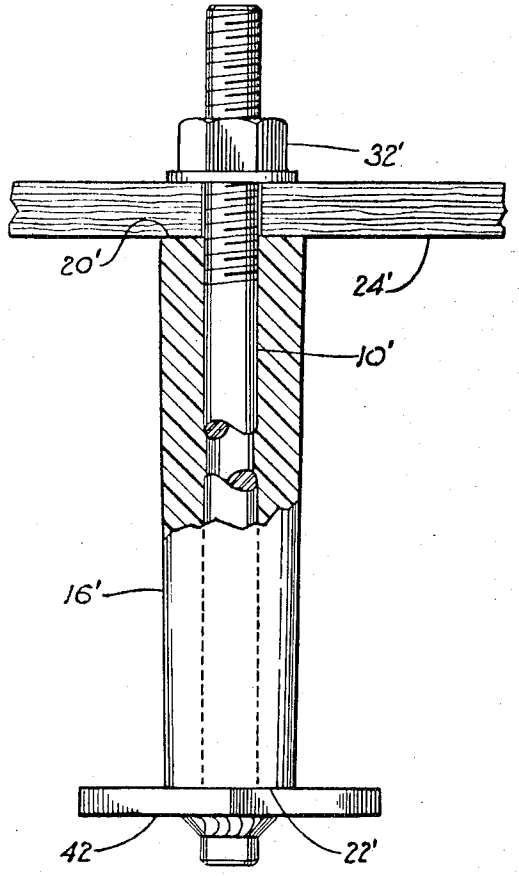
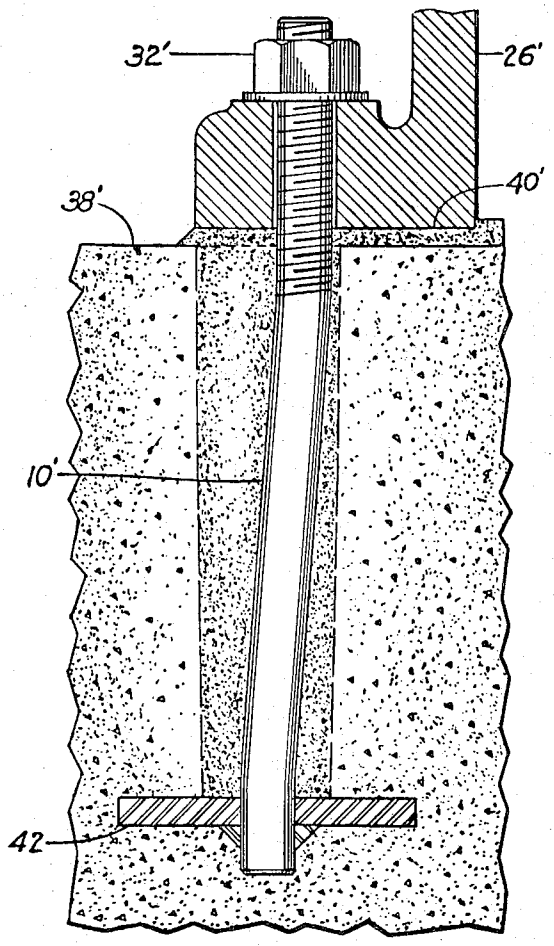


Fig. 8



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TECHNIQUE FOR ALIGNING ANCHOR BOLTS

BACKGROUND OF THE INVENTION

This invention relates to anchor bolt shields and, more particularly, to a shield which provides improved means to enable the alignment of anchor bolts embedded in a concrete foundation to be corrected easily. It is useful particularly in those instances where a heavy structure, such as a machine, must be bolted securely to a foundation, such as a concrete floor. The anchor bolts are embedded in the concrete so that their upper, threaded ends extend upwardly above the floor to pass through receptive holes formed in the base of the structure.

Because of the relatively critical requirements to align the bolts properly with the respective holes in the structure it is impractical to attempt to locate the bolts precisely when the foundation is poured. Instead, it has become somewhat common practice to provide a void in the foundation about the upper end of the anchor bolt to enable the bolt to be bent transversely into alignment with the holes in the structure. The most widely used technique for forming the void is to provide a sleeve which is closed at one end by a steel plate. A hole is formed centrally through the steel plate to coaxially receive the upper end of the bolt. The sleeve and threaded bolt then are located in the proper, desired relative axial position, with care being taken to maintain the concentricity of the open end of the pipe sleeve with the bolt. The bolt then is welded watertight to the steel plate while in this proper position. The pipe-anchor bolt assembly then is installed in the formwork into which the foundation is to be poured in a manner which also caps the open end of the pipe and provides a watertight seal at that end. The upper, threaded end of the bolt projects outwardly beyond the end of the pipe. After the concrete foundation has been poured and set and the formwork has been removed, the embedded pipe defines a void about the bolt in which the upper end of the bolt may be bent laterally to correct any misalignment.

Still another technique has been to employ an elongate tubular member, closed at both ends except for specially formed openings at the ends which receive the anchor bolt concentrically. These devices also employ specially formed seals in order to preclude water or concrete from entering into the generally annular void formed about the anchor bolt.

A number of difficulties are presented by the foregoing techniques. Initially, the sleeves tend to be relatively expensive and are somewhat difficult to install. Additionally, since a waterproof installation of the pipe or sleeve is required, special care must be taken to prevent the poured concrete from entering the space between the bolt and the pipe or sleeve so that after the concrete has set, the anchor bolt is not precluded from being realigned. It is among the primary objects of the invention to provide a method and apparatus for enabling anchor bolts of the type described to be aligned laterally in a manner which overcomes the foregoing difficulties.

SUMMARY OF THE INVENTION

In brief, the invention includes the provision of a tubular shield over the upper end of the anchor bolt. The tubular shield is formed from a relatively yieldable, deformable material such as a cellular plastic. The sleeve fits snugly about the anchor bolt with a portion of the threaded upper end of the anchor bolt extending upwardly beyond the upper end of the sleeve. The upwardly projecting end of the anchor bolt is passed through a receptive hole in a supporting form and is secured thereto by a nut threaded on to the free end of the anchor bolt. The seal between the anchor bolt and the sleeve is enhanced by threading the bolt sufficiently tight to press the supporting form firmly against the other end of the sleeve. The anchor bolt and sleeve assembly is then positioned and secured in the foundation form work and the concrete work is then poured. After the concrete has been set the supporting form is removed. The upper end of the anchor bolt then may be bent laterally in any desired direction against the deformable surrounding sleeve.

Another aspect of the invention relates to a shield configuration in which the sleeve is tapered downwardly. This configuration facilitates removal of the sleeve after the foundation has been set to provide a void about the anchor bolt. After the anchor bolt has been laterally aligned within the void, the void then may be filled with concrete or grout, as desired.

It is among the primary objects of the invention to provide an improved simple and inexpensive anchor bolt shield.

Another object of the invention is to provide an improved anchor bolt shield which avoids the usual difficulties of providing a watertight seal.

Still another object of the invention is to provide an improved anchor bolt shield in which the concentricity of the anchor bolt and its surrounding sleeve or shield is not critical.

A further object of the invention is to provide an anchor bolt shield of the type described which is in complete sealed and intimate surrounding relation to the anchor bolt during pouring of the concrete foundation in which the bolt is secured.

Still another object of the invention is to provide an anchor bolt shield from a deformable material to enable lateral displacement of the bolt.

Still another object of the invention is to provide an anchor bolt shield of the type described which may be withdrawn completely from the foundation if desired.

DESCRIPTION OF DRAWINGS

These and other objects and features of the invention, along with its attendant advantages, will be understood and appreciated more fully from the following detailed description thereof, selected for purpose of illustration and shown in the accompanying drawings in which:

FIG. 1 is a plan view of an anchor bolt shield embodying the invention as installed in the supporting form for the anchor bolt, prior to pouring of the concrete foundation.

FIG. 2 is a partly sectional elevation of the arrangement shown in FIG. 1 as seen along the lines 2—2 of FIG. 1;

FIG. 3 is a plan view of the arrangement in FIGS. 1 and 2 with the foundation set and the anchor bolt bent into an aligned position;

FIG. 4 is a sectional elevation of the arrangement shown in FIG. 3 as seen along the line 4—4 of FIG. 3;

FIG. 5 is a plan view of a modified form of the invention in which the shield is tapered in a frusto-conical configuration;

FIG. 6 is a partly sectional elevation of the arrangement shown in FIG. 5 as viewed along the line 6—6 of FIG. 5;

FIG. 7 is a plan view of the anchor bolt arrangement shown in FIGS. 5 and 6 in which the sleeve has been removed, and the anchor bolt has been realigned with the void above the anchor bolt being filled; and

FIG. 8 is a sectional elevation of the configuration of FIG. 7 as viewed along the line 8—8 of FIG. 7

DESCRIPTION OF PREFERRED EMBODIMENT

As shown in FIGS. 1 and 2, the invention includes an anchor bolt 10 having a lower end 12 which may be of L-shaped or other appropriate configuration to provide a firm footing in the foundation. The upper end 14 of the anchor bolt 10 is threaded in the usual manner. In accordance with the invention, the shield is of tubular construction and comprises the sleeve 16. The sleeve is formed from a cellular plastic material and has an axially bore 18 through which the bolt 10 is extended. The internal surface of the bore 18 is in close intimate contact with the bolt 10 to provide an effective seal against water or concrete along the length of the sleeve 16. The sleeve may be preformed with the bore 18 being of smaller diameter than that of the bolt 10 so that the parts may be mated in a press fit. Alternatively, to stress the sleeve in circumferential tension about the bolt, in some instances the sleeve 16 may be molded directly about the anchor bolt 10.

The ends 20, 22 of the sleeve 16 are formed flat and normal to its longitudinal axis so that either end of the sleeve 16 may be placed firmly against a surface, such as the supporting form 24, to enhance further the seal and exclude water and fluid concrete from the sleeve 16.

The sleeve 16 may be formed from a variety of appropriate plastic and/or thermoplastic materials which are sufficiently tough and rigid to withstand normal loads imposed upon it yet which is capable of deformation in the immediate area of extreme load as described below. The preferred material is cellular in nature and for example, may comprise polystyrene foam of rigidity, toughness and crush strength adequate to provide the necessary properties adopted for the particular purpose. The polystyrene also is amenable to formation by extrusion of moulding techniques or machined from rectangular stock boards of foamed polystyrene and therefore provides for considerable variety in manufacturing techniques. By way of illustration, a satisfactory foam could have a density of between 1.8 and 3.3 lbs/cubic ft. and a compressive strength of between 25 to 120 psi. Foam materials having the foregoing characteristics should be satisfactory for most applications, although in some instances it may be desirable to employ a foam material having characteristics which lie outside of the above range.

Before the concrete foundation is poured, the anchor bolt assembly is attached to the support form by passing the upper, free end 28 through a hole 30 in the support form 24 and then securing these parts together by a nut 32 and washer 34 threaded onto the end of the anchor bolt 10. The nut 32 is tightened to press the support form 24 firmly against the upper end 20 of the assemble. It should be noted that the seal of the sleeve along generally is sufficient. The seal obtained by pressing the form 24 to the sleeve end 20 is merely additive. The support form 24 then is located in an appropriate position in relation to the foundation form by any of a number of techniques well known to those familiar with the art.

After the foundation has been poured and the concrete has set, the upper portion of the bolt 10 may be deformed laterally as suggested in FIGS. 3 and 4 in order to align the threaded upper end 14, 28 of the bolt 10 with the respective hole 36 in the structure 26 which is to be secured to the foundation 38. The deformable nature of the sleeve 16 permits such lateral adjustment of the anchor bolt 10 to be made readily. After the structure 26 is placed over the anchor bolts 10 and finally positioned, and levelled by means of suitable metallic wedges or adjusting screws, the space between the structure 26 and the foundation 38 is filled with cement or grout 40 to provide for uniform bearing of the structure on the foundation. After the grout 40 has set, the structure 26 may then be fastened securely to the foundation 38.

In some anchor bolt installations, it may be desirable to provide a more rigid embeddment of the anchor bolt than that provided by the deformable sleeve. As shown in FIGS. 5 and 6 the sleeve 16′ may be tapered downwardly to define the frustum of a cone. The anchor bolt assembly may be the same in all other respects as that described above. After the concrete foundation has set about the sleeve 16′, the support form 24′ may be detached and the tapered sleeve 16′ may be removed. The tapered configuration of the sleeve 16′ facilitates its removal which may be effected by a corkscrew-type tool which may be screwed into the upper end of the sleeve 16′ about the upper end of the anchor bolt 10′. Although the tapered configuration of the sleeve 16′ facilitates its removal when desired, removal is not necessarily required and the sleeve 16′ may remain in place and function in the same manner as the sleeve 16 as described above.

When the more rigid embeddment of the anchor bolt is desired, the tapered sleeve 16′ is removed after the foundation has set, thus creating a void about the anchor bolt 10′. The anchor bolt 10′ then is bent to its desired location and the structural member 26′ is secured to the upwardly extending threaded end of the bolt. After final adjustment of the structure 26′ grout 40′ is poured between the structure 26′ and the foundation to provide for a uniform bearing of the structure on the foundation. The grout also flows about the anchor bolt into the void thus forming a practically homogeneous concrete structure around the embedded bolt.

In some instances where the depth of embeddment of the anchor bolt is limited, as in the case of a concrete floor or wall, the hook-type of bolt shown in FIGS. 2 and 4 is impractical. In this case, the anchors shown in FIGS. 5, 6, 7 and 8 may be employed which consist of a plate 42 welded to the lower end of the anchor bolt 10′ as shown. It may be noted that when this configuration is employed, the seal at both the upper and lower ends 20′, 22′ of the sleeve and 16′ is enhanced when the nut 32′ is tightened.

Thus, I have described an improved technique for aligning anchor bolts which is simple, inexpensive and which seals effectively the anchor bolt from water or fluid concrete during pouring of the foundation. It should be understood, however, that the foregoing de-

scription of the invention is intended merely to be illustrative thereof and that various changes and modifications may be apparent to those skilled in the art without departing from the spirit and scope of the invention as set forth in the appended claims.

Having thus described the invention what I desire to claim and secure by letters patent is:

1. An anchor bolt and shield assembly therefor comprising:

an anchor bolt having a threaded end and an anchor end;

a sleeve extending along said bolt between the ends thereof, said ends of said bolt projecting outwardly of the end of said sleeve, said sleeve circumscribing said bolt and being circumferentially stressed in tension about said bolt whereby said sleeve may be in firm, intimate, sealing engagement substantially along the full region of engagement of said sleeve with said bolt, said sleeve being formed of an expanded plastic material defined by a multiplicity of closed cells extending homogeneously throughout said sleeve, said material being relatively and permanently deformable in compression.

2. An anchor bolt and shield assembly as defined in claim **1** wherein said circumferentially tension of said sleeve is effected by means comprising:

said sleeve having a bore, which, when said sleeve is relaxed, is smaller in diameter then the diameter of said anchor bolt, said sleeve being press fitted on to said anchor bolt.

3. An anchor bolt and shield assembly as defined in claim **1** wherein said sleeve is of cylindrical configuration and in which the ends thereof are disposed in a plane substantially normal to the longitudinal axis of said sleeve.

4. An anchor bolt and shield assembly as defined in claim **1** wherein said sleeve is of frusto-conical configuration and in which the ends of said sleeve are disposed in planes which lie substantially normal to the longitudinal axis of said sleeve, the more narrow end of said sleeve being located adjacent to the anchor end of said anchor bolt.

5. A method of embedding an anchor bolt in a foundation to enable subsequent lateral adjustment of the end of said bolt comprising:

providing an anchor bolt having an anchor end and a connector end;

locating a sleeve circumferentially about said anchor bolt between the ends thereof and circumferentially stressing said sleeve in tension about said anchor bolt to cause said sleeve to contact said bolt in intimate, firm contact substantially along the full region of contact between said sleeve and said bolt, said sleeve being formed from an expanded plastic material having a multitude of closed cells extending homogeneously throughout said sleeve, said material being deformable in compression and relatively inelastic;

supporting said combined sleeve and bolt in a predetermined location in relation to a form in which said foundation is to be poured with said anchor end and said sleeve of said assembly extending into said form and with said connector end extending outwardly of said form;

pouring foundation material into said form and about said sleeve and anchor end of said bolt end causing said foundation material to rigidify;

said intimate contact between said sleeve and said bolt effecting a seal therebetween without requiring additional sealing members, said deformable character of said sleeve enabling said bolt to be deformed laterally after said foundation material has rigidified.

6. A method as defined in claim **5** further comprising;

removing said sleeve after said foundation has rigidified to leave a void about said anchor bolt;

deforming laterally the upper end of said bolt to a desired position within said void; and

thereafter filling said void with a hardenable material to provide a homogeneous rigid anchoring completely about said embedded portion of said anchor bolt.

7. A method is defined in claim **5** wherein said step of locating said sleeve in said sealed relation comprises;

providing a sleeve with an axial bore which is smaller in diameter than the diameter of said anchor bolt; and

press fitting said sleeve over said bolt to generate a circumferential tensile stress within said sleeve.

8. A method is defined in claim **5** wherein the upper end of said bolt is threaded and wherein said means for supporting said sleeve and said anchor in relation to said form comprises;

providing a support form having a hole therein which is receptive to the threaded, free end of said anchor bolt; and

bolting said form to said threaded end of said anchor bolt so that said form is urged firmly against the upper end of said sleeve and sealed relation thereto.

9. A method as defined in claim **5** wherein said expanded foam material of said sleeve has a density of approximately between 1.8 and 3.3 lbs per cubic foot and a compressive strength of between 25 to 120 psi.

10. An anchor bolt assembly as defined in claim **1** wherein said expanded foam material of said sleeve has a density of approximately between 1.8 and 3.3 lbs per cubic foot and a compressive strength of between 25 to 120 psi.

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