United States Patent [19]

Abbott

[11] **3,907,244**

[45] **Sept. 23, 1975**

[54] **TIE ROD WITH EXPANSIBLE CONE SEAL MEMBERS**

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[21] Appl. No.: **357,465**

[52] **U.S. Cl.** **249/40;** 249/46; 249/216

[51] **Int. Cl.** **E04g 17/08**

[58] **Field of Search** 249/40, 43, 45–47, 249/190–191, 213, 216, 217, 214, 215, 41, 44

[56] **References Cited**

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Assistant Examiner—John McQuade
Attorney, Agent, or Firm—Phillips, Moore, Weissenberger Lempio & Strabala

[57] **ABSTRACT**

A deformable cone seal member and retainer for tie rods in concrete wall forms is provided. The seal member is radially expansible into sealing engagement with a form bore through which the tie rod passes so as to prevent leakage of wet concrete from the form.

11 Claims, 13 Drawing Figures

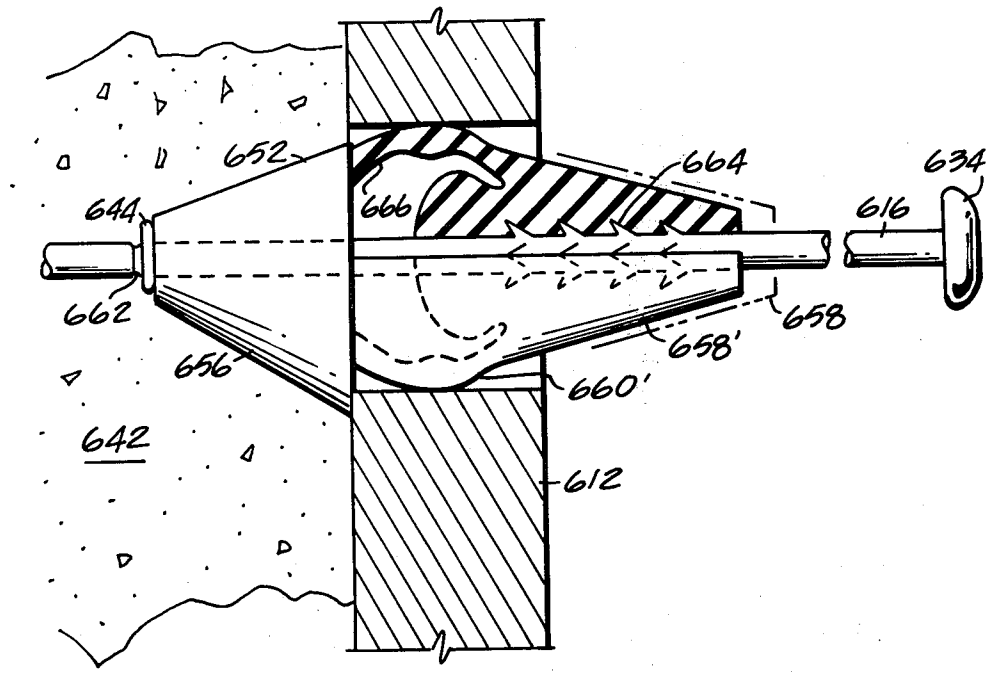


FIG. 1.

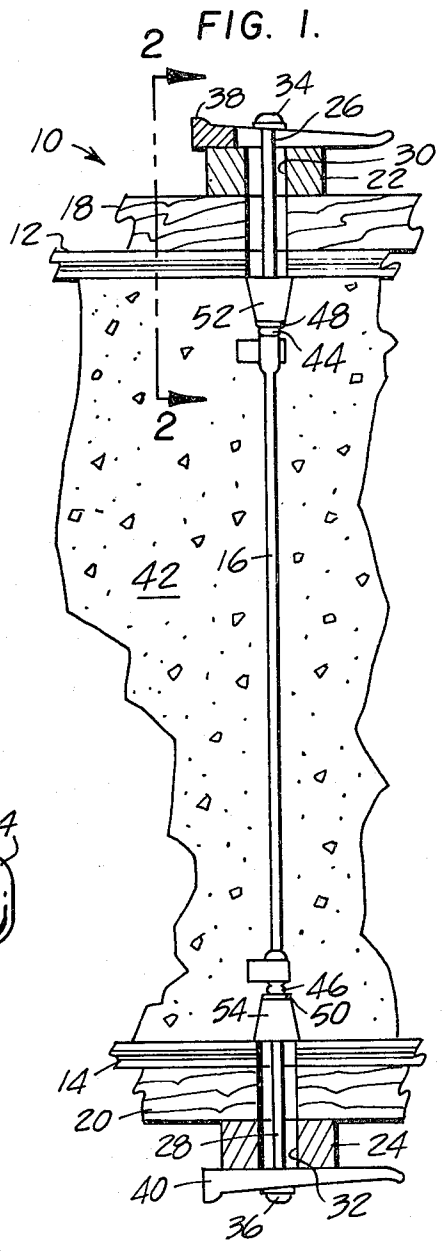


FIG. 2.

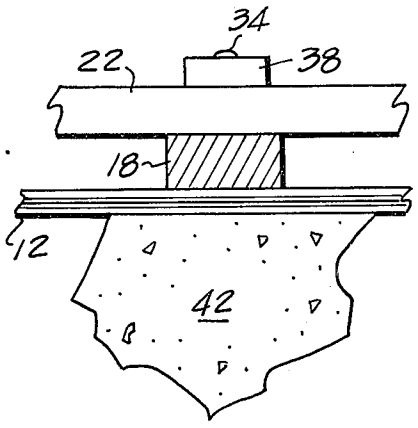


FIG. 3.

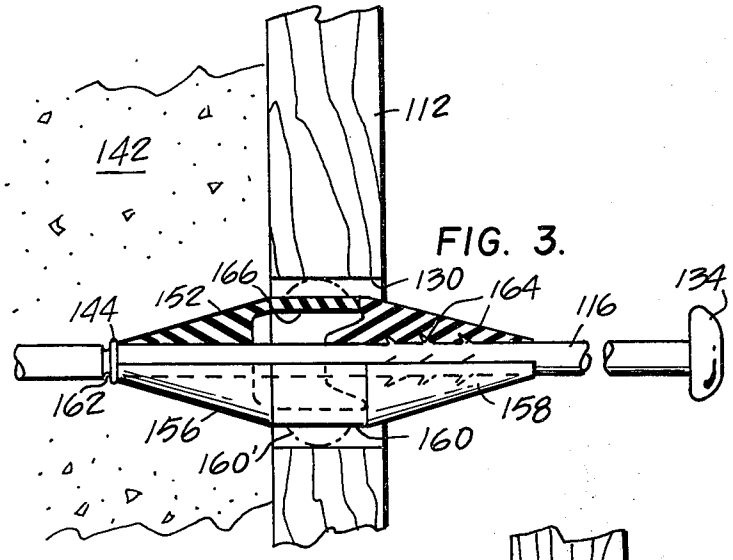


FIG. 4.

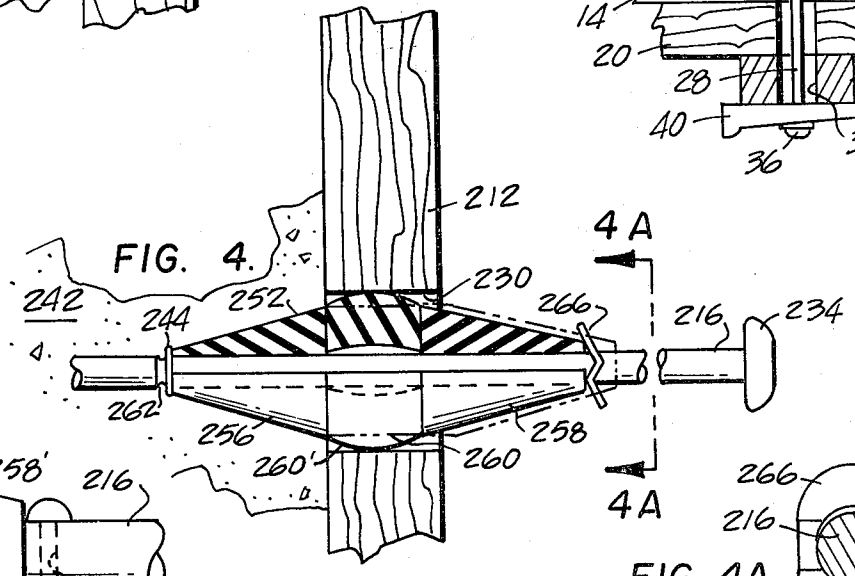


FIG. 4B

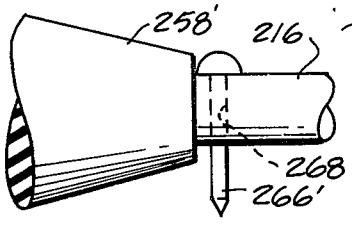
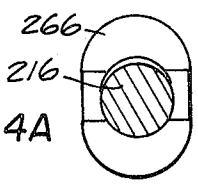


FIG. 4A



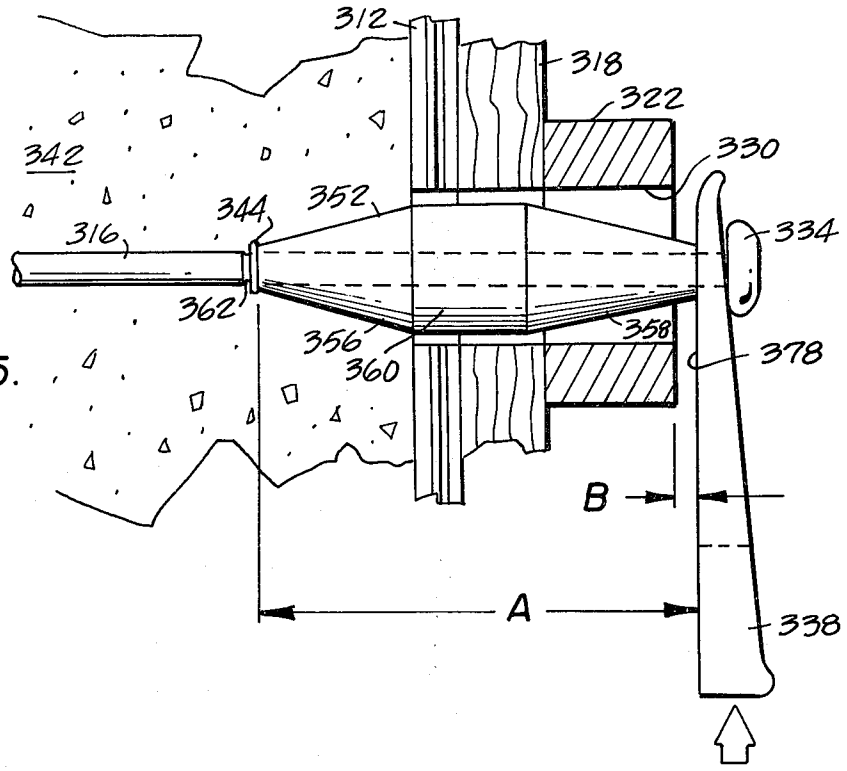


FIG. 5.

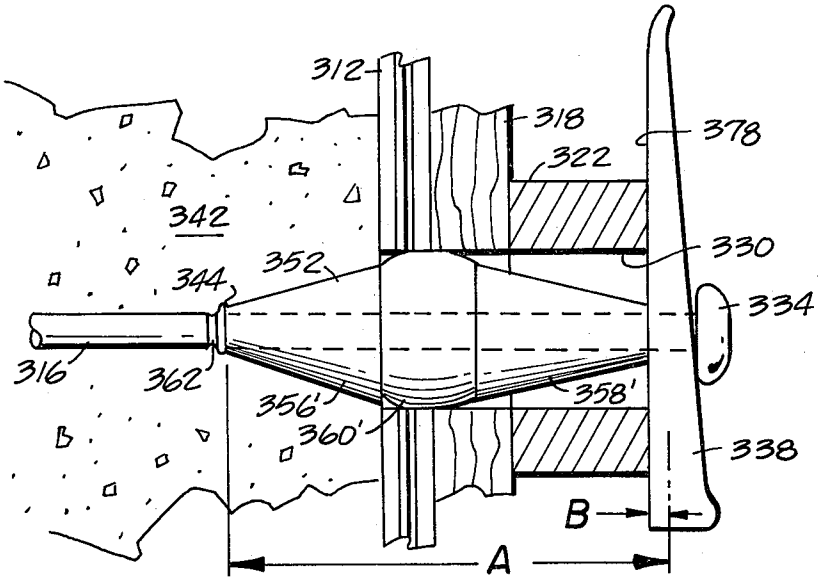


FIG. 6.

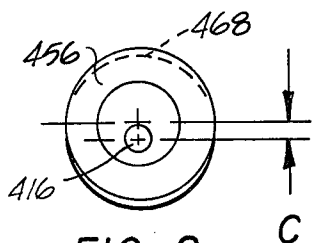


FIG. 8.

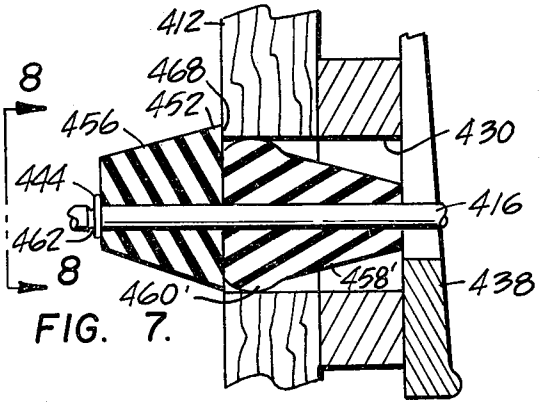


FIG. 7.

FIG. 9.

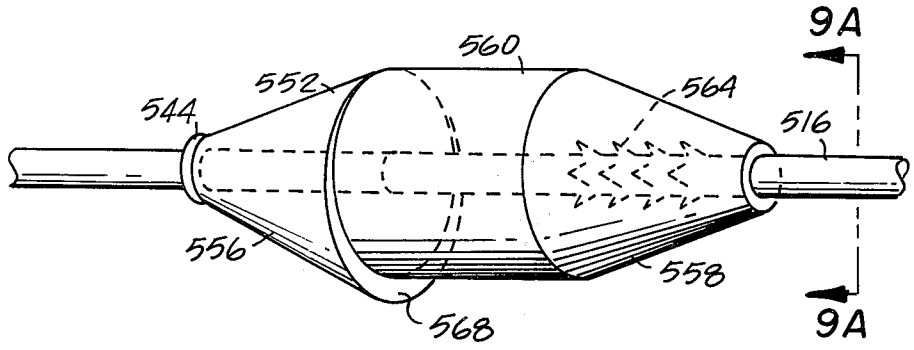


FIG. 9A

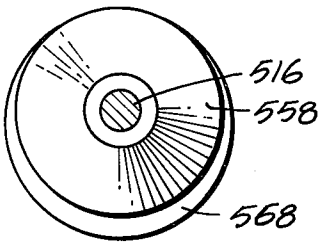
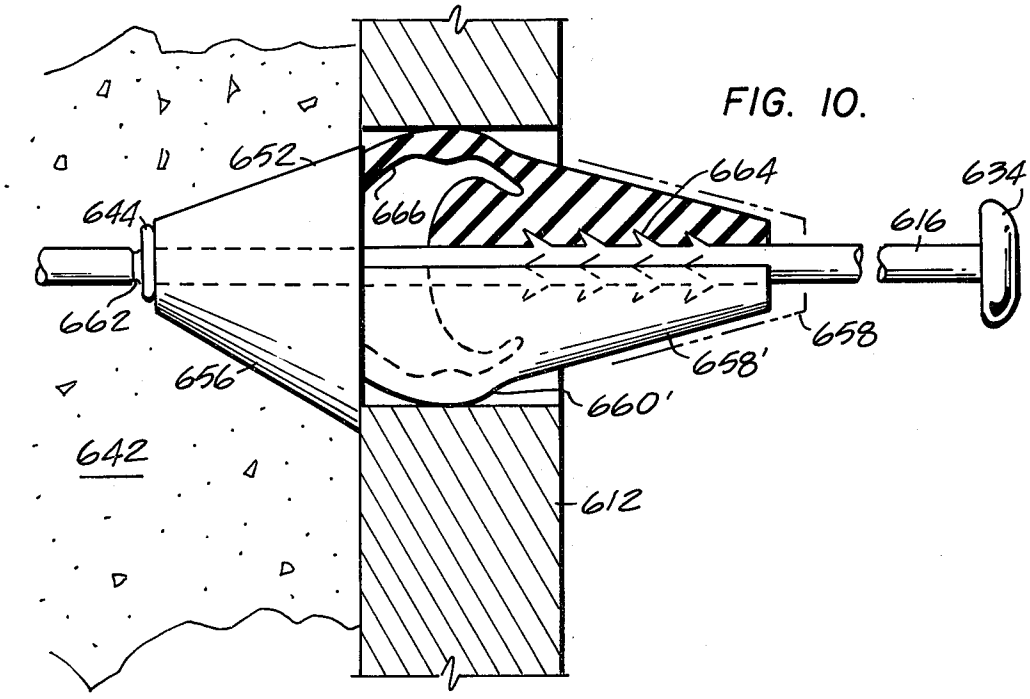


FIG. 10.



TIE ROD WITH EXPANSIBLE CONE SEAL MEMBERS

BACKGROUND OF THE INVENTION

The present invention is directed to tie rods and cone assemblies for concrete wall forms of the "snap tie" type which are designed to be broken off after hardening of a concrete wall. More particularly, the invention is directed to a tie rod with expansible cone assembly for sealingly engaging a wall form so as to prevent loss of wet concrete and entrained water through wall from bores through which the tie rods pass.

In concrete wall construction, a large number of tie rods and cones in the form of tie rod and cone assemblies are used to temporarily position a pair of spaced, parallel planar wall forms so as to provide a mold for receiving wet concrete. Cones in the form of generally frustoconical members are positioned within the form at opposite ends of each tie rod for a basic purpose of leaving a depression or cavity in the hardened wall at the point of protrusion of the tie rod ends. A weakened portion is provided on the tie rod at the innermost part of the conical depression which allows the rod to be snapped or broken off within the wall. Subsequent finish operations include grouting of the depressions to the plane of the finished wall surface.

Some of the many prior art patents extant in the concrete wall form area are as follows: U.S. Pat. Nos. **2,245,559; 2,370,174; 2,728,127; 2,977,659; 3,075,272; 3,464,667; 3,482,813; 3,625,471; 3,643,909;** and **3,653,628.** These patents illustrate a number of problems and attempted solutions in the concrete wall form area. One of the most pressing problems is in the area of sealing the wall form bore to prevent leakage of the wet concrete material around the tie rods and out through the form bore through which the tie rod protrudes.

Leakage of wet concrete and/or the water or "milk" of the concrete out through the form bores is undesirable for several reasons. First, such may result in a ragged or rounded edge at the wall surface which is difficult to grout and thus gives the finished wall an unsightly appearance. Second, the loss of water from the curing concrete results in a degradation of wall strength. Third, the leaked concrete fouls the form "dogs" or other locking devices on the form exterior thus necessitating expensive clean-up operations.

Present attempts to solve this problem have not been satisfactory. The present attempts have had to accommodate themselves to tolerating some leakage since none provides an absolutely perfect seal. Most rely in some manner on the cones for this purpose. For example, U.S. Pat. Nos. **2,370,174** and **3,643,909,** illustrate the use of a cone having a diameter greater than that of the form bore diameter such that the large diameter end of the cone obturates the bore. However, form bores tend to enlarge after repeated use and thus provide an avenue for leakage. Also, misalignment of the tie rod and cone with respect to the bore results in leakage. Even when the large diameter end of the cone is positioned against the interior wall of the form, discontinuities and misalignments result in leakage.

Another approach illustrated in U.S. Pat. No. **3,482,813,** has the cone in the form of a double frustoconical member closely fitted within the form bore. However, dimensional changes during use as well as dimensional tolerances result in having to accept some leakage.

SUMMARY OF THE INVENTION

Accordingly, it is the primary object of this invention to provide a positive sealing device for use in concrete wall construction to prevent undesired leakage of concrete and moisture.

It is also an object of this invention to provide such a device which is inexpensive as well as easily installed and removed.

It is a further object to provide such a device whereby the positive seal is achieved automatically as inherent in locking up the forms.

The invention takes the form of an expansible tie rod cone adapted to be fitted within a form bore and radially expanded into sealing engagement therewith. Retention means are also included for holding the cone in sealing engagement whereby leakage is positively prevented.

Other objects and advantages will be readily apparent to those skilled in the art from a review of the following drawings and description.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. **1** is a transverse view in partial cross section of a prior art concrete form enclosing a body of concrete between the walls thereof and illustrating the tie rod, cone and locking structure thereof;

FIG. **2** is a fragmentary view of the same in partial cross section taken along lines **2—2** in FIG. **1**;

FIG. **3** is an elevational view in partial cross section of a first embodiment of the instant invention;

FIG. **4** is an elevational view in partial cross section of a second embodiment of the instant invention;

FIG. **4A** is an end elevational view taken along lines **4A—4A** in FIG. **4** showing details of the retainer;

FIG. **4B** is a partial side elevational view showing an alternate form of the retainer;

FIG. **5** is an elevational view in partial cross section of a third embodiment of the invention showing the cone member prior to sealing;

FIG. **6** is a view of the same with the cone member sealingly engaged in the form bore;

FIG. **7** is an elevational view in partial cross section of a fourth embodiment of the invention also sealingly engaged;

FIG. **8** is a view of the same taken along lines **8—8** in FIG. **7**;

FIG. **9** is an isometric elevational view of a fifth embodiment of the invention in an unexpanded state;

FIG. **9A** is an end elevational view of the same taken along lines **9A—9A** in FIG. **9**; and

FIG. **10** is an elevational view in partial cross section of the same shown in the expanded state in its sealing environment.

DETAILED DESCRIPTION

FIGS. **1** and **2** illustrate the environment and the prior art tie rod and cone device which the instant invention is designed to replace. With particular reference to FIG. **1**, the concrete form shown generally at **10** includes a pair of planar walls **12, 14** supported in spaced, parallel relation by means of a plurality of tie rods, one of which is shown at **16.** Upright struts **18, 20** have transverse wales **22, 24** thereon.

The rod **16** extends transverse to the form and has opposite ends thereof **26, 28** extending through form bores **30, 32** and in spaced concentric relation therewith. The rod ends extend athrough the struts and wales. The rod ends are provided with heads **34, 36** which are engaged by bifurcated wedges or dogs **38, 40**, respectively. The bifurcations of the ramp shaped wedges straddle the rod intermediate the heads **34, 36** and wales **22, 24**, respectively.

Intermediate the walls and within the area of the enclosed concrete **42** are stops in the form of lateral enlargements **44, 46** against which washers **48, 50** are placed. Also concentrically disposed on the rod adjacent the washers are cone members **52, 54.** These cone members act as spreaders in concert with the washers and stops to index the walls a desired distance apart. The cone members are of frustoconical configuration. The larger diameter ends thereof abut against the interior of the form walls. The cones also serve to mold a depression or cavity in the finished concrete wall to allow the rod end to be broken off within the wall at a fracture point (not shown) on each rod end and within the wall. A more complete description of the prior art device may be gotten, if desired, by having reference to aforementioned U.S. Pat. No. **2,370,174.**

Turning to FIG. **3**, there is shown a preferred embodiment of the referenced device wherein a cone member **152** is shown within a form bore **130** of form **112.** It should be noted that structure in this and in following embodiments having numerical analogues in other embodiments will be distinguished by the addition of a prefatory number, i.e., "**1**" for the first embodiment, "**2**" for the second, etc. Cone member **152** is designed to replace the similar member of the prior art. Member **152** is of generally elongated construction having oppositely directed, double frustoconical inner **156** and outer **158** end portions and an intermediate cylindrical center portion **160** of a diameter which is dimensioned so as to be in closely spaced relation with bore **130.** It may be parenthetically noted that the spacing between the center portion and bore is exaggerated in the drawings for purposes of illustration. The cone member abuts projection **144** at its innermost end adjacent annular recess **162** which is provided for breaking off the rod within the wall. Cone member **152** may be of any deformable material such as plastic or resilient rubber. After the rod and cone member are threaded through the form bore to the position shown, the cone member is radially expanded from its original, relaxed diameter to a greater diameter and into sealing engagement with the bore **130** by advancing the outer end portion **158** inwardly along rod **116** until it expands as shown at **160'**. Advancement can be accomplished either by hand or by use of an suxiliary tool (not shown). At this point, concrete leakage will be positively prevented. Retainer means in the form of a plurality of unidirectional barbs or projections **164** formed on the exterior surface of the rod serve to hold the expansible cone member in sealing engagement. As shown, a hollow cavity **166** may advantageously be formed within the member thereby producing a more easily deformed center portion. This hollow cavity is not required if the material of the cone member is very readily deformable as is the case with sponge rubber.

FIGS. **4** and **4A** illustrate a second embodiment utilizing such a material, however, having an alternate form of retainer means in the form of an eccentric, bent washer member **266.** With this embodiment, the bent washer member **266** frictionally holds the cone member **252** in expanded sealing engagement thus eliminating the necessity of the barbs of the previous embodiment. In FIG. **4B**, there is shown an alternative to the bent washer member in the form of a nail or the like **266'** which is inserted in a hole **268** through the rod **216.** Of course, the hole must be positioned so as to abut the outer end portion **258'** when the cone member is radially expanded.

FIGS. **5** and **6** show yet another embodiment which is like that shown in the previous embodiments except that the necessity of providing an extraneous retainer means is eliminated by utilizing the inherent structure present with the concrete form, and, in particular, the locking devices thereof. With this embodiment, the cone member is dimensioned so as to be of a length A sufficient to extend a distance B above the top surface of wale **322,** as best seen in FIG. **5.** When the wedge **338** is advanced in the arrow direction to lock up the form, the underside of the wedge **378** will bear on the outer end of end portion **358** and cause radial expansion of the center portion to position **360'** shown in FIG. **6.** Thus, sealing engagement as well as disengagement are achieved automatically. With this embodiment, spacers or spreaders (not shown) must be provided to position and hold the walls apart.

With the embodiments shown in the remaining figures, no additional spreader means are required since such is integral with the cone members as will be described. FIGS. **7** and **8** show a solid cone member **452** wherein the inner frustoconical end portion **456** is of a diameter greater than that of the central portion and axially offset with respect thereto a distance C. By having the axial offset, a lip portion **468** of member **456** will engage the inner surface of wall **412** and, in conjunction with rod **416** and stop **444,** serves to spread the walls. The maximum diameter of member **456** is conveniently set such that it may be threaded through bore **430** from the outside. Lateral positioning of the lip **468** is automatic since radial expansion of center portion to **460'** will center that portion in the bore.

Referring to FIGS. **9** and **9A**, a similar embodiment is shown which also includes a barb retainer means **564** like that shown in the first embodiment. A closely similar last embodiment shown in FIG. **10** has an internal cavity **666** and barb retainer means **664** similar to that shown with the first embodiment.

It is to be understood that the foregoing description is merely illustrative of preferred embodiments of the invention and that the scope of the invention is not to be limited thereto, but is to be determined by the scope of the appended claims.

I claim:

1. A tie rod and cone assembly for use in temporarily positioning a pair of spaced-apart wall forms, the tie rod and cone assembly comprising a rod in the form of a generally elongated member defining an axis each end of which is adapted to project through a respective bore in the spaced-apart wall forms and a cone member of circular configuration positioned on each end of the rod and adapted to be positioned at least partially within a respective bore and normally in concentric spaced relation with a respective bore and defining a first outer diameter, said cone members being of a deformable material so as to be adapted to be radially deformed to a second diameter greater than said first di-

ameter and into sealing engagement with the interior of a respective bore and retainer means for holding the cone members in sealing engagement with a respective bore whereby leakage from the forms is prevented, each cone member being a generally elongated member having oppositely directed frustoconical end portions, and a generally cylindrical center portion intermediate said frustoconical end portions wherein the frustoconical end portion directed toward the rod end and the center portion are symmetric and coaxial to the rod axis and wherein said frustoconical end portion directed away from the rod end is asymmetric with respect to the rod axis and has a maximum diameter which is greater than the diameter of the center portion thereby defining a lip adapted for contacting the inner wall of the form so as to provide a spreader function.

2. A tie rod and cone assembly in combination with a pair of spaced-apart wall forms for use in temporarily positioning said pair of spaced-apart wall forms, the tie rod and cone assembly comprising rod means in the form of a generally elongated member defining an axis each end of which is adapted to project through a respective bore in said spaced-apart wall forms and cone means of circular configuration positioned on each end of the rod for positioning at least partially within a respective bore and normally in concentric spaced relation with a respective bore and defining a first outer diameter less than the diameter of the respective bore, said cone means being of a readily deformable material for being radially deformed to a second diameter greater than said first diameter and for expanding into sealing engagement with the interior of a respective bore and retainer means for holding the cone members in said radially deformed second diameter and in sealing engagement with a respective bore whereby leakage from the forms is prevented.

3. The invention of claim **1** wherein the retainer means comprise a plurality of stop projections on the rod.

4. The invention of claim **1** wherein the retainer means comprise a stop projection on the rod for each cone means and a plurality of unidirectional barbs on said rod oriented so as to permit axial movement of said cone means toward but not away from said stop projection.

5. The invention of claim **1** wherein the retainer means comprise a stop projection on the rod and a means selectively frictionally engageable with said rod.

6. The invention of claim **1** wherein the retainer means comprise a stop projection on the rod and a means selectively mechanically engageable with said rod.

7. The invention of claim **1** wherein each cone means is a generally elongated member having at least one frustonconical end portion.

8. The invention of claim **7** wherein said cone means has a pair of oppositely directed frustoconical end portions.

9. The invention of claim **8** wherein said cone means has a generally cylindrical center portion intermediate said frustoconical end portions.

10. The invention of claim **7** wherein said cone means has a hollow cavity formed therein so as to define thin wall portions thus facilitating deformation of said cone means.

11. The invention of claim **1** wherein each cone means includes a generally elongated member having a frustoconical end portion directed toward the rod center portion which is asymmetrically mounted with respect to the rod axis, and a center portion which is symmetric and coaxial with respect to the rod axis wherein said frustoconical end portion overlaps said center portion so as to produce a lip adapted for contacting the inner wall of the form so as to provide a spreader function.

* * * * *