United States Patent [19]

Franc

[11] **3,926,400**

[45] **Dec. 16, 1975**

[54] **TIE ROD AND SEAL ASSEMBLY**

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[73] Assignee: **Construction Engineering Products,** San Rafael, Calif.

[22] Filed: **Dec. 3, 1973**

[21] Appl. No.: **421,398**

[52] **U.S. Cl.** **249/40;** 249/46; 249/217

[51] **Int. Cl.**[2] **E04G 17/08**

[58] **Field of Search** 249/40, 43–47, 249/140–141, 213–214, 216–217

[56] **References Cited**

UNITED STATES PATENTS

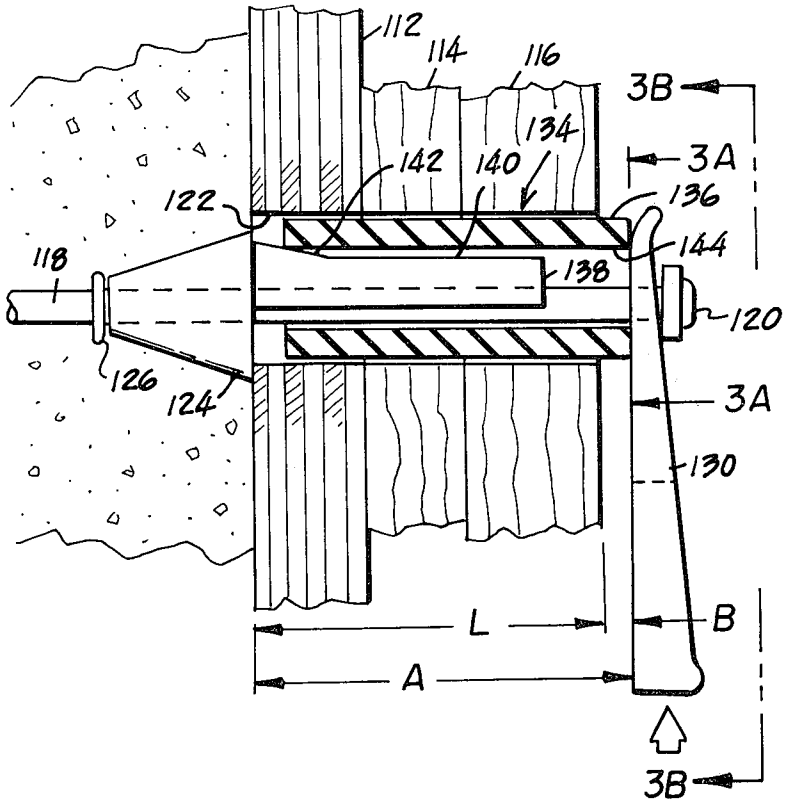
1,851,339	3/1932	Williams	249/217
2,728,127	12/1955	Armstrong	249/215
3,139,730	7/1964	Williams et al.	249/213
3,482,813	12/1969	Wells et al.	249/217
3,638,904	2/1972	Franklin et al.	249/213
3,653,628	4/1972	Shoemaker	249/214
3,801,061	4/1974	Holt	249/217

Primary Examiner—Robert D. Baldwin
Assistant Examiner—John McQuade
Attorney, Agent, or Firm—Phillips, Moore, Weissenberger Lempio & Strabala

[57] **ABSTRACT**

A seal member is provided for use in concrete wall form construction which sealingly engages with a form bore through which a tie rod supporting the seal member passes so as to prevent leakage of wet concrete from the from. The seal member comprises a cylindrical member which is radially expanded into sealing engagement with the form bore by means of a partly tapered seal element in the form of an off-set retainer core. Sealing is automatically achieved by means of the seal member to be axially moved by the form wedges during locking up of the form. Alternate embodiments provide a radially expanding seal, which is expanded by axial movement of the seal member, as well as an off-set retainer core. The offset enables the frustoconically shaped cones or insert members to function both to form a depression in the cast concrete, as well as to serve as spreaders for location of the wall forms. Additional embodiments provide a rubber ring seal, together with shield members; yet another embodiment provides a sealing sleeve.

5 Claims, 16 Drawing Figures



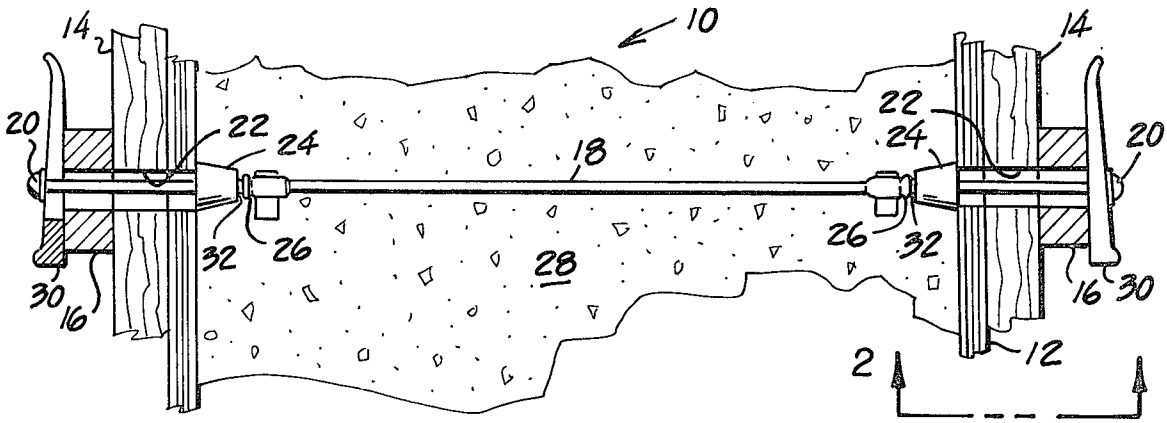


FIG. 1.

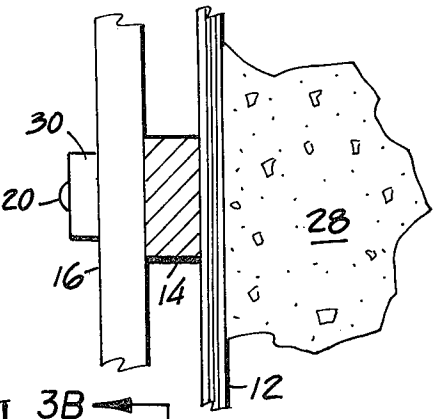


FIG. 2.

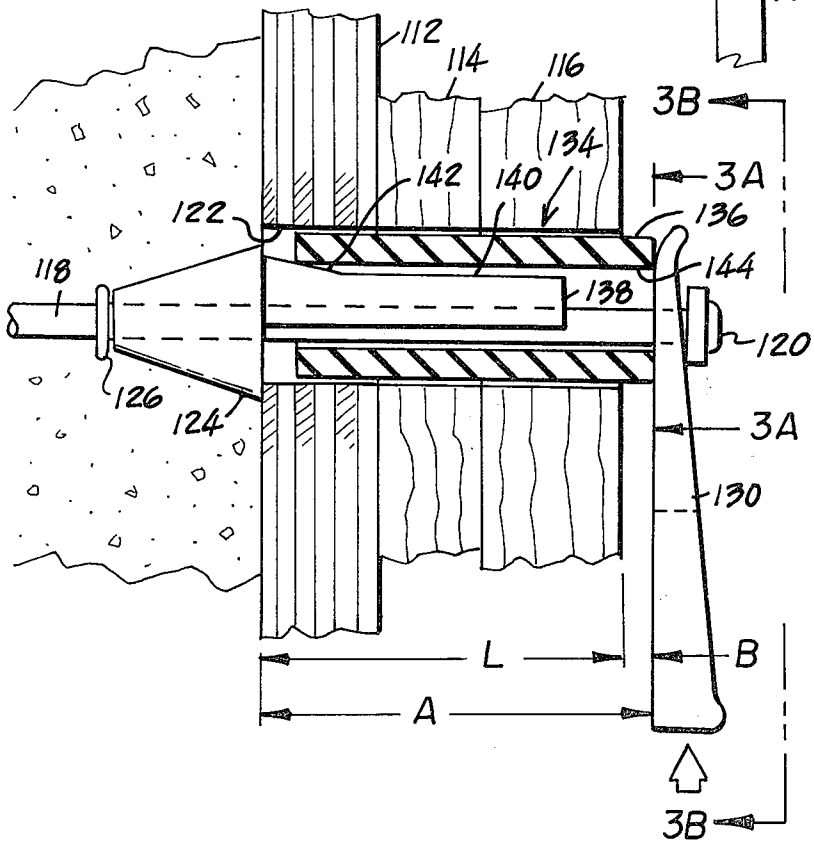


FIG. 3.

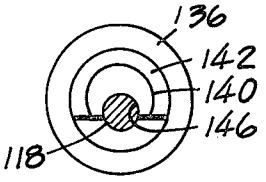


FIG. 3A

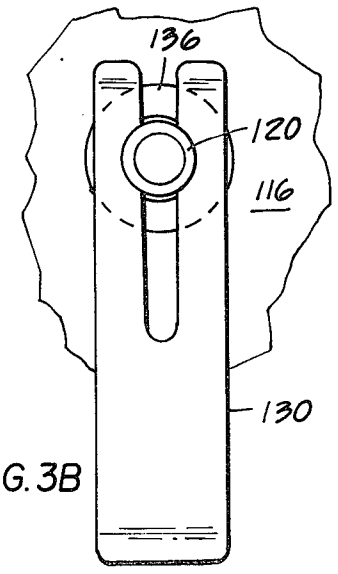


FIG. 3B

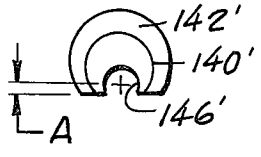


FIG. 3C

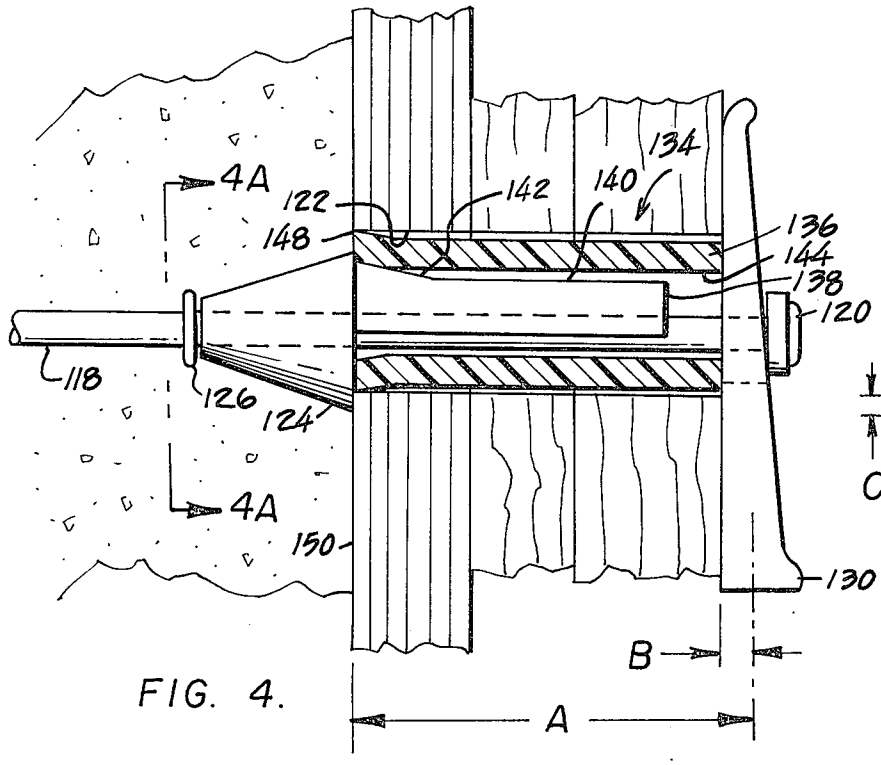


FIG. 4.

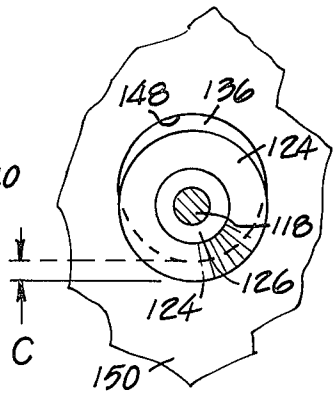


FIG. 4A

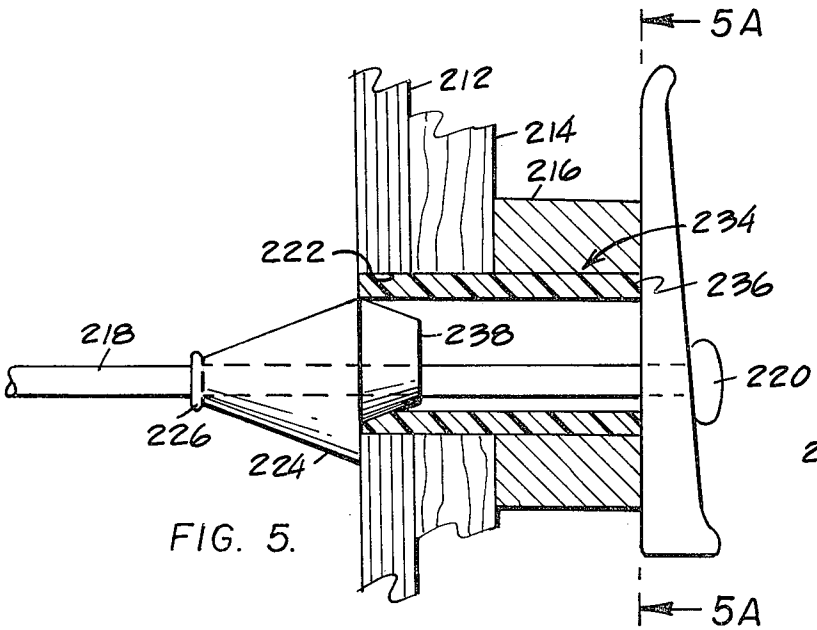


FIG. 5.

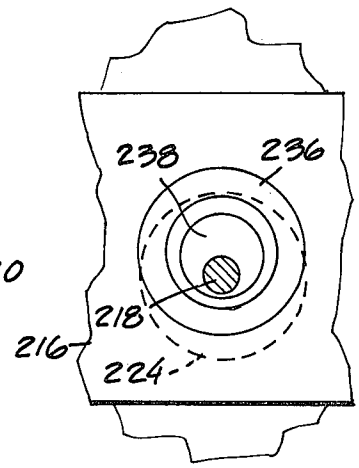
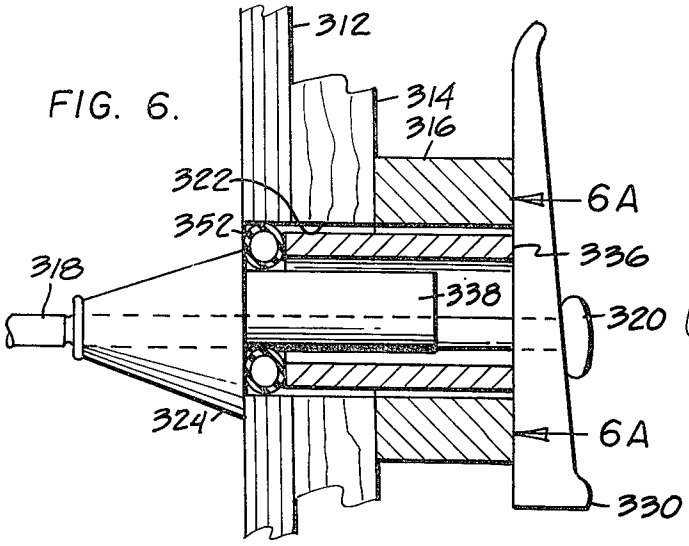


FIG. 5A

FIG. 6.



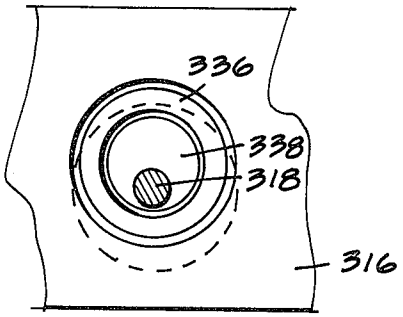
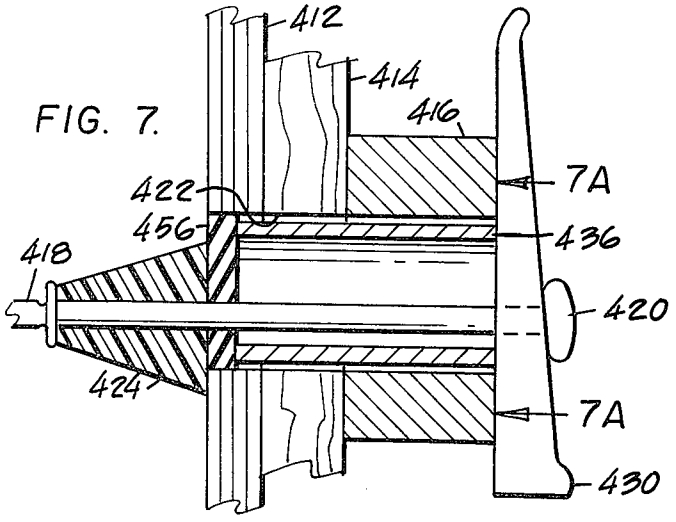


FIG. 6A

FIG. 7.



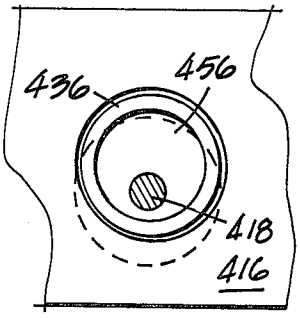
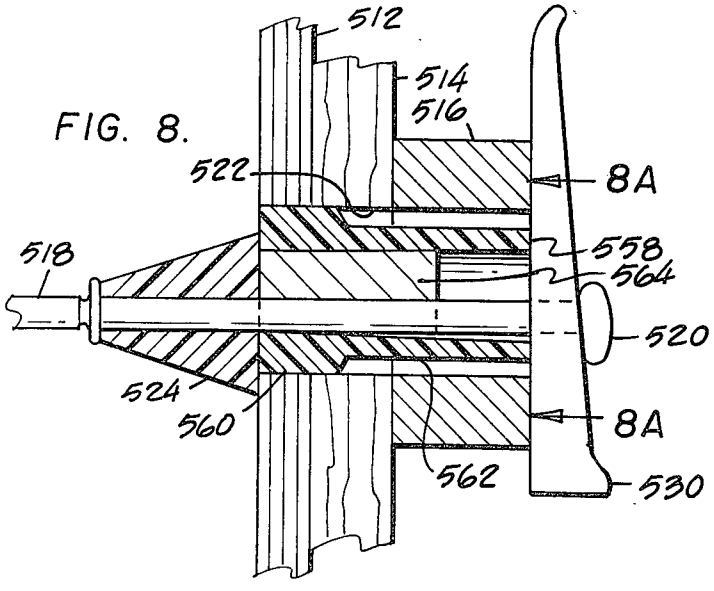


FIG. 7A

FIG. 8.



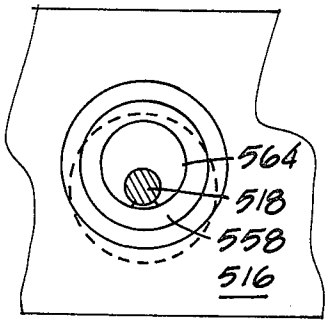


FIG. 8A

TIE ROD AND SEAL ASSEMBLY

BACKGROUND OF THE INVENTION

The present invention is concerned with seal assemblies for concrete wall forms. More particularly, the invention is directed to an improved seal assembly for sealingly engaging the wall form bore in order to prevent loss of wet concrete and moisture through wall form bores through which tie rods pass for securing on the exterior of the form.

Currently in concrete construction, tie rods and inserts in the form of frustoconical members or cones are used to temporarily position wall forms and thereby form a mold for receiving concrete. After the concrete is hardened, the wall forms are removed, and protruding ends of the tie rods are broken or snapped off along a break point which is inset from the outer wall surface and provided for that purpose. This breaking off is facilitated by the fact that a depression or cavity is formed in the hardened wall at the point of protrusion of the tie rod ends by the insert member. Subsequent to the breaking off of the tie rod ends, the wall is finished by grouting of the depressions to the level of the finished wall surface.

Some of the prior art patents which show various parts of the structure above-referred to 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.

One of the most pressing problems in the concrete wall form art is that of sealing of the wall form bores to prevent leakage of wet concrete and moisture therethrough during sealing of the forms and curing of the concrete. Leakage of wet concrete and moisture is undesirable, since it may result in degradation of wall strength, fouling of the exterior hardware, such as "dogs" or other locking devices, as well as the protection of rough and irregular edges on the wall form surface. These undesirable features require remedial work in the form of extensive post-casting operations, such as finishing and cleaning.

Attempts to solve the leakage problem have resulted in some imperfect attempts, which have accommodated themselves to tolerating some leakage. Examples may be found in U.S. Pat. Nos. 2,370,174; 3,643,909; and 3,482,813, above referenced. Other attempts may be found in co-pending applications, Ser. Nos. 357,465 filed May 4, 1973, and Ser. No. 381,806 filed July 23, 1973, to Abbott. The instant invention is designed to be an improvement thereover.

SUMMARY AND OBJECTS OF THE INVENTION

Accordingly, it is the primary object of this invention to provide an improved seal member for concrete wall form construction which prevents undesired leakage of concrete and moisture.

It is a further 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 and incident to the locking up of the forms.

It is a further object to provide such a device which includes an offset so that the tie-rod insert serves to perform a spreader function.

The invention, in a primary embodiment, takes the form of a seal assembly, wherein a seal element provides a tapered frustoconical surface which acts to radially expand the cylindrical collar into sealing engagement with a concrete wall form bore. The expansion may be readily accomplished by movement of the collar, such as by axial movement incident to locking up of the concrete wall form. An axial offset positions the cone or insert member within the wall forms to overlap the edge of the bore, and thereby provides a spreader function to desirably position the walls in spaced parallel relation.

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

BRIEF DESCRIPTION OF THE DRAWINGS

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

FIG. **2** is a fragmentary partial cross-sectional view of the same, taken along lines **2—2** in FIG. **1** and illustrating details thereof;

FIG. **3** is an elevational view and partial cross-section of a preferred embodiment of the instant invention seal member prior to engagement with the form bore;

FIG. **3A** is a partial cross-sectional view taken along the lines **3A—3A** in FIG. **3;**

FIG. **3B** is a view taken along lines **3B—3B** in FIG. **3;**

FIG. **3C** is an alternate embodiment of a portion of the structure shown in FIG. **3A;**

FIG. **4** is a view like fig. **3** showing the seal member advanced and radially expanded into sealing engagement with the form bore;

FIG. **4A** is a partial cross-sectional view taken along the lines **4A—4A** in FIG. **4;**

FIG. **5** is the first alternate embodiment shown in fragmentary partial cross-section;

FIG. **5A** is a partial cross-sectional view taken along the lines **5A—5A** in FIG. **5;**

FIG. **6** is a fragmentary partial cross-sectional view of a second alternate embodiment;

FIG. **6A** is a partial cross-sectional view taken along the lines **6A—6A** in FIG. **6;**

FIG. **7** is a fragmentary partial cross-sectional view of a third alternate embodiment;

FIG. **7A** is a partial cross-sectional view taken along the lines **7A—7A** in FIG. **7;**

FIG. **8** is a fragmentary partial cross-sectional view of a fourth alternate embodiment; and

FIG. **8A** is a partial cross-sectional FIG. taken along the lines **8A—8A** in FIG. **8.**

DETAILED DESCRIPTION

FIGS. **1** and **2** show the prior art concrete wall form environment, including tie rod, cone members, and locking devices. With particular reference to FIG. **1,** there is shown generally at **10** a concrete form which includes a pair of spaced parallel walls **12** backed up by struts **14** and walers **16.** Tie rod **18,** having a button or head **20** formed on each end thereof, extends through bores **22** formed in walls **12,** struts **14** and waler **16.** Frustoconically shaped cones or insert members **24** are dimensioned to have a maximum diameter larger than the wall form bore **22,** such that they provide a spreader function in conjunction with projections or stops **26** on tie rod **18.** This spreader function serves to position the walls **12** a fixed distance apart, for subsequent reception of the concrete **28.** Locking members

in the form of wedges or dogs **30** are inserted between buttons or heads **20** and wales **16.** The bifurcated arms of the ramp-shaped wedges or dogs straddle the rod (FIG. **3A**). Also concentrically disposed on the tie rod adjacent the projections are washers **32.** The cone or insert members which may be frusticonical or other suitable shape are provided to mold the depression or cavity in the finished concrete wall, so as to allow the rod ends to be broken off within the wall at a fracture point (not shown) on each rod within the wall. Reference may be had to aforementioned U.S. Pat. No. 2,370,174 for a more full description of the prior art device.

Turning to FIG. **3** there is shown a preferred embodiment of the instant invention wherein seal assembly shown generally at **134** is shown within the form bore **122** of wall **112.** It may be parenthetically noted that structure in this and following embodiments having numerical analogues and other embodiments will be distinguished by the addition of a prefatory number, i.e., "1" for the first embodiment, "2" for the second, etc. Also, the structure shown in FIG. **3** (and FIGS. **4–8**) is the right-hand portion of a complete structure having mirror image left-hand portion in a manner like that shown in FIG. **1.** Seal assembly **134** comprises a generally cylindrical hollow seal member or collar **136** which is positioned over the end of rod **118** and over a seal element **138,** having a cylindrical rear body portion **140** and a tapered frusticonical forward body portion **142.** As best seen in in FIG. **3A,** the rear body portion is of a diameter less than that of the hollow interior core **144** of member **136.** Forward body portion **142** tapers from a diameter equal to that of the rear body portion to a diameter which is greater than interior core **144.** As may also be seen in FIG. **3A,** a half-bore **146** running the axial length of seal element **138** is asymmetrically placed below the center line thereof such that rod **118** is asymmetrically positioned and thereby element **124** similarly positioned with respect to bore **122** when the seal assembly is fully engaged.

In operation, tie rod **118** with element **124** and seal element **138** positioned thereon is inserted through form bore **122** form the exterior portion. The maximum diameter of element **124** is set to be slightly less than that of bore **122** in order to facilitate this positioning. The collar **136** is then inserted into the bore **122** to the position shown, wherein it abuts forward body portion **142** and forms a seal assembly with seal element **138.** The outer diameter of collar **136** is set to be slightly less than the diameter of bore **122.** In addition, the length L of the collar **136** is such that when the collar is advanced axially a distance B, which is measured from its initial point distance A from element **124,** by means of the advancement of dog **130** in an arrow direction. In this manner, an automatic sealing effect is achieved incident to locking up of the form.

FIG. **4** shows the position wherein the dog **130** has been fully advanced and similary collar **136** has been fully axially advanced and radially expanded into sealing engagement along a circular line of action **148.** As best seen in FIG. **4A,** the aforementioned asymmetric offset causes an overlap of a part of element **124** over the interior surface **150** of wall **112.** This overlap may be seen as the distance C in the subject FIGURE. The overlap allows the rod **118** to function in conjunction with stop **126** to provide a spreader function such that the walls are maintained in a desired spaced relationship.

Alternatively, seal element **138** can be dimensioned so as to more fully encompass the rod as shown by distance "A" in FIG. **3C.**

Turning to FIG. **5,** there is shown a first alternate embodiment and a variation of the device shown in FIGS. **3** and **4,** which is alike in all respects except for the elimination of the rear body portion of the seal element, and in the fact that element **238** is an integral part of element **124.**

In FIG. **6** there is shown a third embodiment of the invention which is similar to the second embodiment of FIG. **5,** and having an expanding torus shaped, annular seal **352** which is bonded or otherwise fixed to the forward end of sleeve **336.** In operation, seal **352** is radially expanded by the lateral pressure thereon exerted by elements **324** and **336** when the seal is locked up. Obviously, the outer diameter of element **352** is somewhat less than that of the bore **322** prior to such radial expansion.

Turning to FIG. **7,** there is shown a fourth embodiment wherein no radial expansion is provided. Rather, a closely fitting rubber ring seal **456** is held in position by means of collar **436.**

Turning to FIG. **8,** a fifth embodiment comprises a sealing sleeve of a forward diameter portion **560** which is closely fitted to the interior of the bore **522** and a cutaway rear diameter portion **562.** The sleeve is fitted over a shortened offset retainer core **564.** Rather than radial expansion, this embodiment achieves sealing through tight fitting relationship of diameter **560** with the bore **522.** The materials of construction may conveniently be plastic for elements **124,138,** and core **560.** A resilient material such as rubber may be used for the collars **136** and **236,** seals **352** and **456,** and sleeve member **558.** Sleeve member **558** may alternatively be of rigid material.

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 limited thereto but is to be determined by the scope of the appended claims.

What is claimed is:

1. A tie rod and seal assembly in combination with a pair of spaced-apart wall forms for use in temporarily positioning said pair of spaced-apart wall forms, said tie rod and seal assembly comprising a generally elongated tie rod defining an axis and opposite ends, each of said rod ends being adapted to project through a respective bore in said spaced-apart wall forms, spreader means on said tie rod exterior to said form bores and adapted to contact the interior surfaces of the wall forms adjacent to said form bores for positioning said wall forms, and generally cylindrical seal means on each of said rod ends for positioning within and sealing against each said bore in said wall forms for preventing ingress and egress of fluid, said seal means including a generally cylindrical collar of resilient material mounted on the tie rod end and further including expansion means for radially expanding said collar in each said bore, and wherein said expansion means comprises a seal element mounted on the tie rod end adapted to be positioned within each said bore in said wall forms and having a smaller diameter portion and a larger diameter portion joined by an intermediate tapered frustoconical surface portion.

2. The invention of claim 1 wherein said collar has a hollow interior and defines an inner and an outer diameter, said smaller diameter portion of said seal element being less than and said larger diameter portion being respectively greater than said inner diameter, whereby axial advancement of said collar parallel to said rod axis over said tapered portion causes radial expansion thereof.

3. The invention of claim 2 wherein the smaller diameter portion of said seal element includes a cylindrical

extension along said tie rod in a direction opposed to the associated spreader means.

4. The invention of claim 1 wherein said spreader means comprises an insert member positioned against a stop member on said tie rod and means for axially offsetting said insert member with respect to said collar whereby said insert member is adapted to be positioned against the interior surfaces of the wall form.

5. The invention of claim 4 wherein said insert member is generally frustoconical in shape for molding depressions.

* * * * *