United States Patent

Shoemaker

[15] **3,693,928**

[45] **Sept. 26, 1972**

[54] **CONCRETE WALL FORM WITH ADJUSTABLE BULKHEAD**

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[22] Filed: **Nov. 4, 1970**

[21] Appl. No.: **86,729**

[52] **U.S. Cl.** **249/18,** 249/9, 249/30, 249/97

[51] **Int. Cl.**.....**E04g 11/38**

[58] **Field of Search**.....249/9, 20, 21, 30, 18, 33, 249/95, 97, 101, 194, 210; 25/118 H, 118 W

[56] **References Cited**

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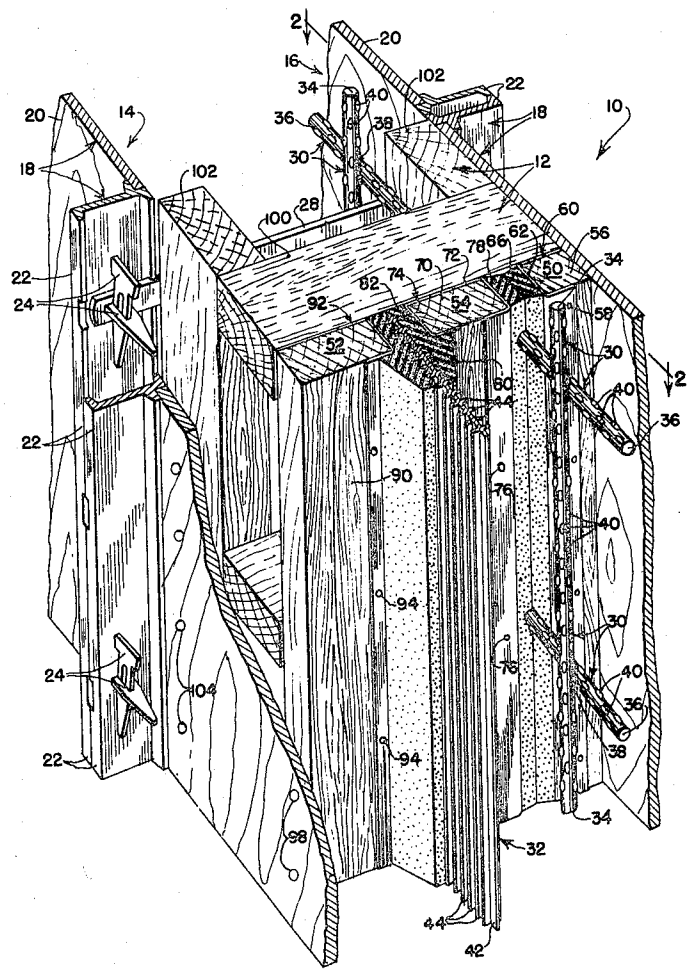
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[57] **ABSTRACT**

A concrete wall form having an adjustable bulkhead in which a variety of bulkhead components cooperate with one another in sealing relationship to exclude the passage of concrete past any reinforcing rods, water seals, conduits or other residual concrete-embedded members which traverse or bridge the interfacial surfaces between adjacent concrete pourings.

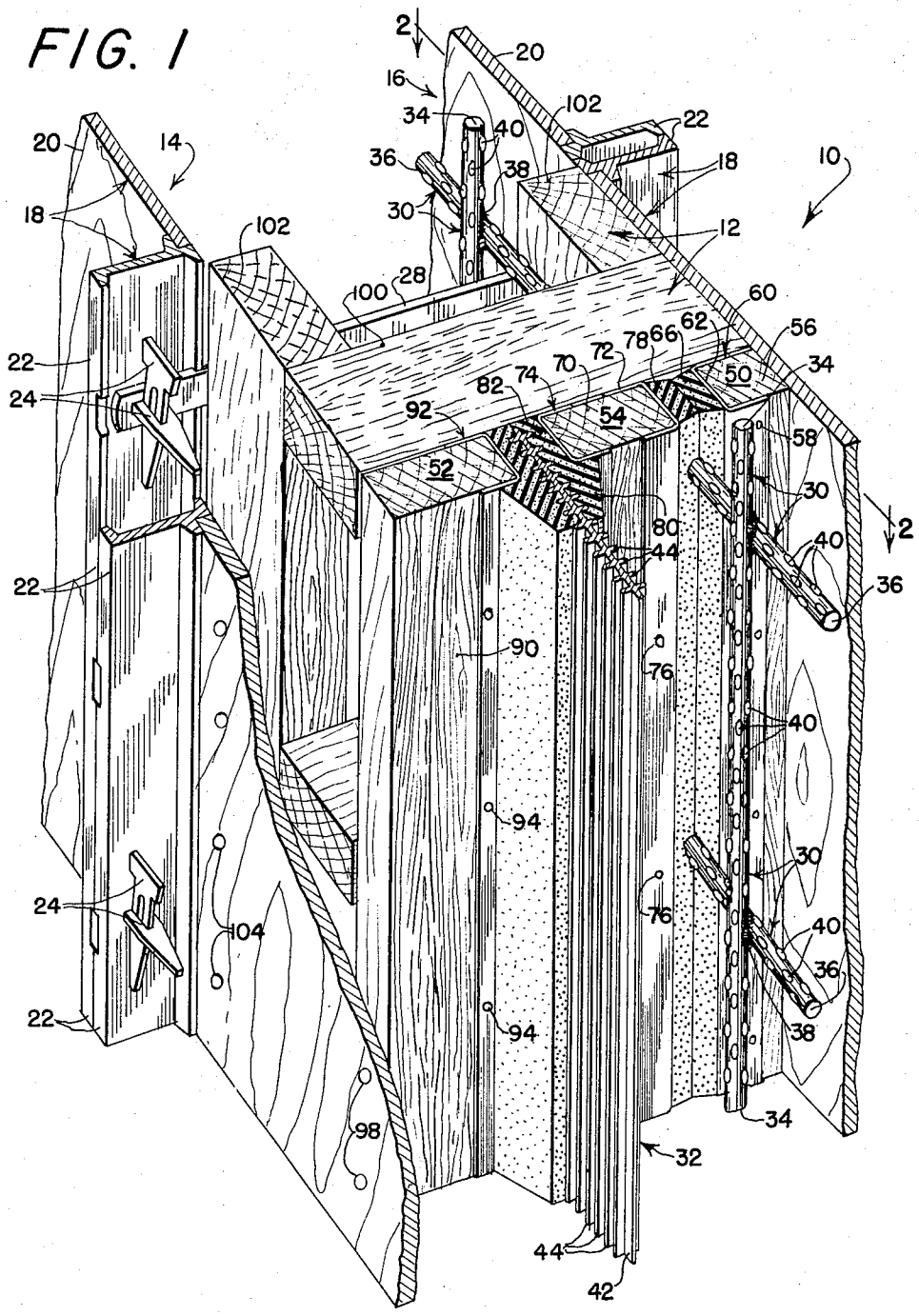
6 Claims, 8 Drawing Figures



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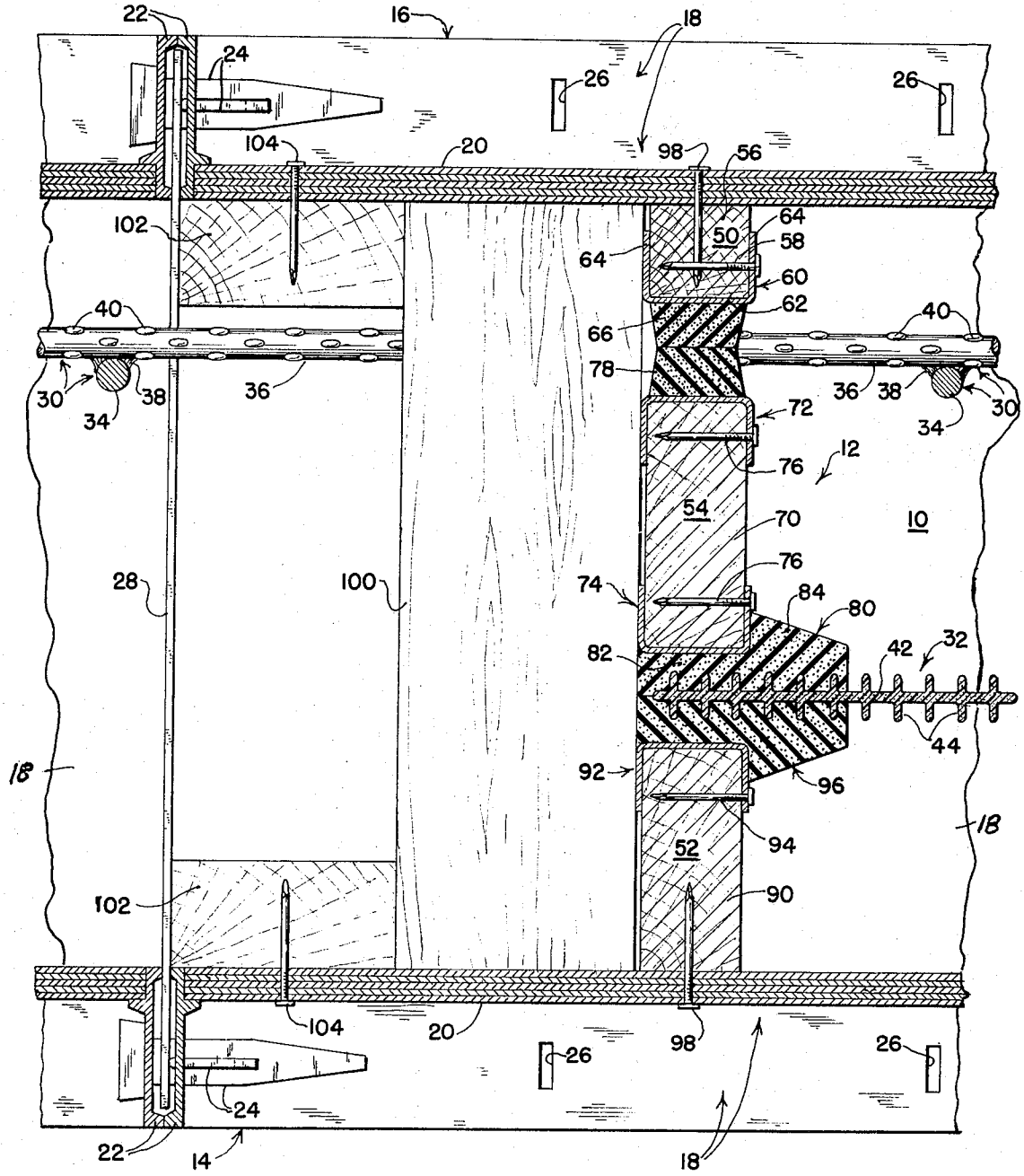
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FIG. 1



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FIG. 2



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FIG. 3

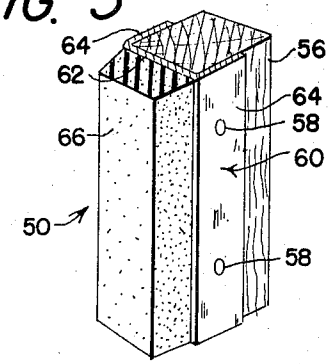


FIG. 4

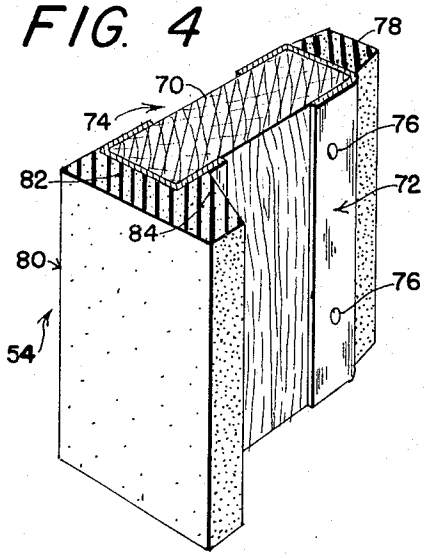


FIG. 5

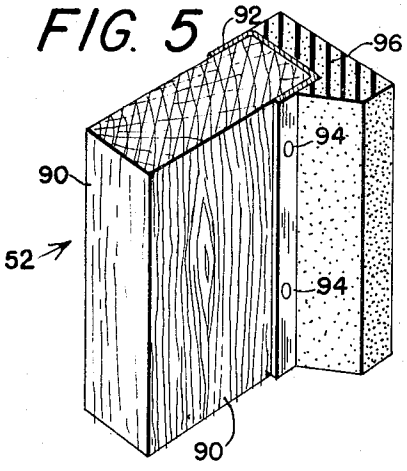
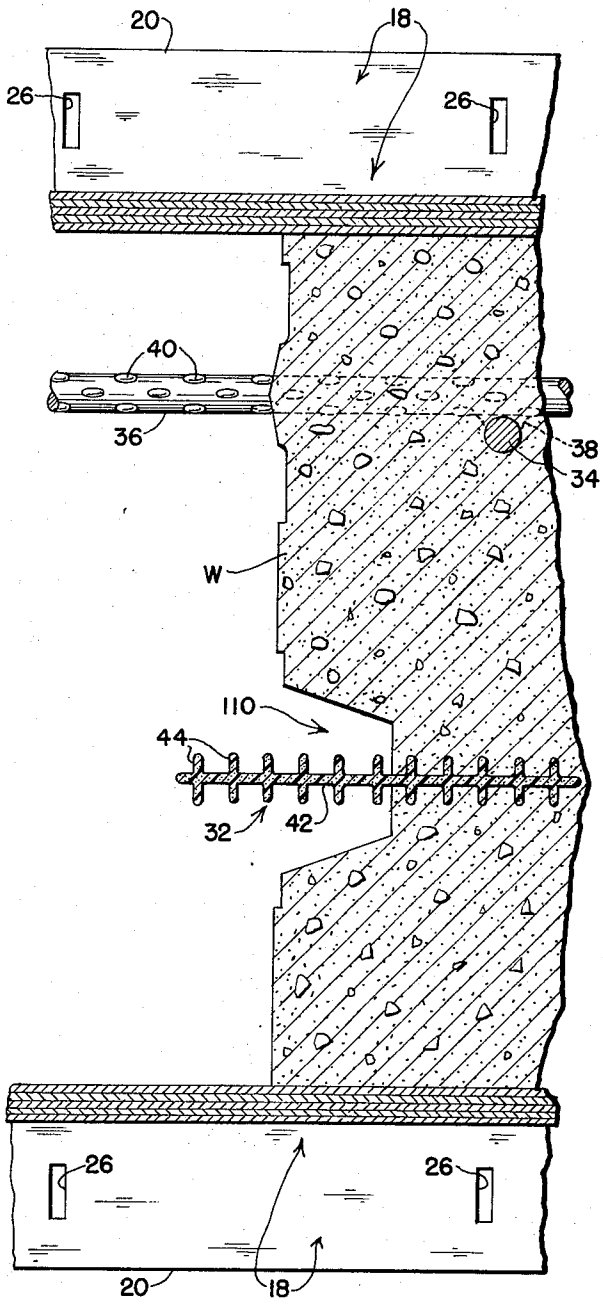


FIG. 6



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FIG. 7

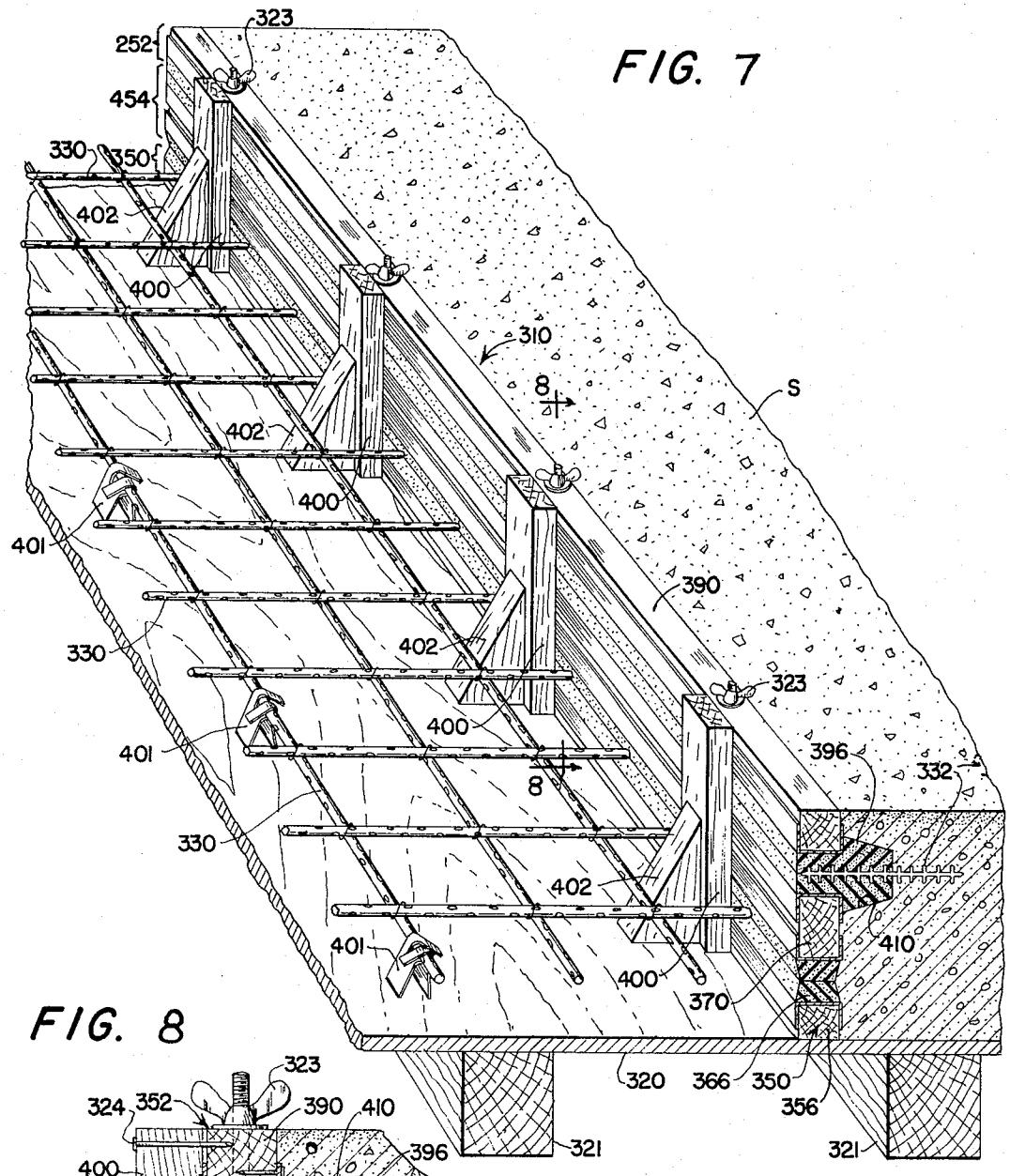
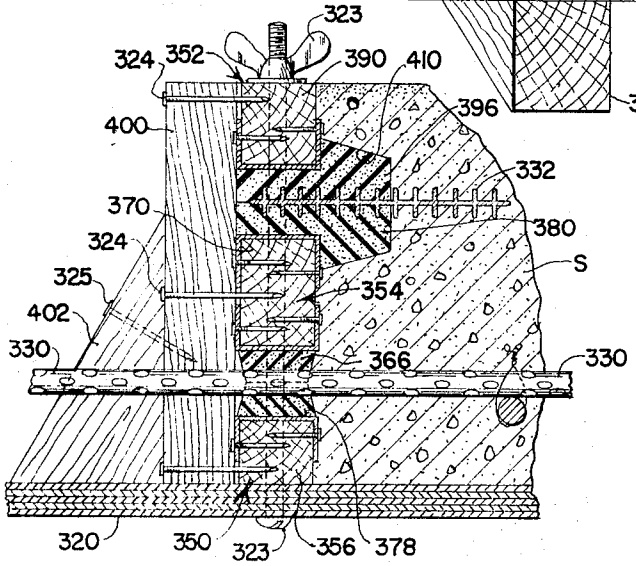


FIG. 8



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CONCRETE WALL FORM WITH ADJUSTABLE BULKHEAD

The present invention relates to an adjustable bulkhead of the type which is installed across the space between the opposed but spaced apart sides of a conventional concrete wall or slab form and serves to retain on one side thereof the poured wet concrete during the interim between successive concrete pouring operations.

In concrete construction work where, in connection with use of an extremely long concrete wall form or an expansive slab form, it is necessary to terminate a given concrete pouring operation for any reason whatsoever, as, for example, until a subsequent batch of concrete can be prepared, it is customary to erect a concrete barrier or bulkhead across the form in order to hold the poured concrete while the same becomes set or hardened and produces an individual finished wall or slab section. When a subsequent concrete pouring is resorted to in the space between the sides of the form, the bulkhead is dismantled and removed from its position between the two opposed form sides and the next pouring operation is performed alongside the first and hardened concrete section in order to produce a second concrete section which is a continuation of the first poured and hardened section. Progressive erection of a wall or slab in this manner is frequently resorted to, especially when a given wall or slab form is of great length or area.

Heretofore, especially where such items as reinforcing rods, water seals, conduits or the like must bridge the interfacial seam between adjacent concrete sections, i.e., extend from one section across the seam and project into the next adjacent section, considerable difficulty has been encountered in effecting a concrete seal for such items, it being necessary to prevent concrete seepage past the bulkhead since such seepage, if allowed to remain on the end face of a given concrete section, will render the seam or joint between adjacent sections not watertight even though the second poured concrete batch will envelop such seepage. This is particularly important in the construction of such walls or slabs as those which are employed in connection with swimming pools, concrete dams, airplane runways, and the like. Such difficulty has arisen largely because it is invariably the practice to erect a bulkhead in piecemeal fashion, cutting lumber and fitting it in place around the various reinforcing rods, water seals and other such bridging items. Furthermore, the cost of such piecemeal erection of a bulkhead is extremely high, a recently erected bulkhead for a 4-foot wide concrete wall form 25 feet in height having entailed a cost of approximately 225 dollars in labor and materials. Still further, a bulkhead which is erected in empirical fashion as described above is seldom reusable although some of the lumber which is employed may be salvaged and re-cut to serve in a subsequent bulkhead installation. In any event, labor costs remain high.

The present invention is designed to overcome the above-noted limitations that are attendant upon the piecemeal erection of a concrete wall or slab form bulkhead of the character under consideration and, toward this end, the invention contemplates the provision of a variety of prefabricated bulkhead components which may be constructed at the factory and assembled

in the field to accommodate such exigencies as may arise, usually without requiring any special carpentry work or other on-the-job operations such as the installation of concrete seals or the like, the only operations required being the fitting of parts or components together after a proper selection of such components has been made. Insofar as concrete sealing operations are concerned, according to the present invention such components of the bulkhead assembly as are to be fitted together in contiguous relationship are provided with mating or counterpart sealing strips which are formed of a resilient elastomeric material and mate throughout their entire length in coextensive fashion. Thus, any bridging item such as a reinforcing rod, a waterseal, a conduit or the like, regardless of its height in the concrete wall or slab form, will automatically become sealed at the point where it passes between the two adjacent bulkhead components, the mating seals which are associated with such components being displaced at their region of contact with the reinforcing rod or other bridging item in order to allow the same to pass through the bulkhead in sealing relationship with respect thereto. After the bulkhead has served its purpose and the poured concrete on one side thereof has become set or hardened, the entire bulkhead assembly may be dismantled and removed from the form for subsequent reuse of the components thereof in the same or in a different concrete form installation.

The provision of a bulkhead assembly such as has been briefly outlined above and possessing the stated advantages constitutes the principal object of the present invention.

Numerous other objects and advantages of the invention, not at this time enumerated, will readily suggest themselves as the nature of the invention is better understood from a consideration of the following detailed description.

The invention consists in the several novel features which are hereinafter described and are more particularly defined by the claims at the conclusion hereof.

In the accompanying four sheets of drawings forming a part of this specification, the invention is shown as being applied to both a concrete wall form and a concrete slab form.

IN THESE DRAWINGS

FIG. 1 is a fragmentary perspective view, partly in section, of a portion of a concrete wall form, showing an exemplary form of bulkhead embodying the present invention operatively installed therein;

FIG. 2 is a horizontal sectional view taken substantially on the horizontal plane indicated by the line 2—2 of FIG. 1 and in the direction of the arrows;

FIG. 3 is a fragmentary perspective view of one of the components of the particular bulkhead assembly of FIGS. 1 and 2;

FIG. 4 is a fragmentary perspective view of another bulkhead component;

FIG. 5 is a fragmentary perspective view of a third bulkhead component;

FIG. 6 is a horizontal sectional view similar to FIG. 2 but showing the bulkhead removed from the concrete wall form after an initial concrete pouring operation and hardening of the poured concrete;

FIG. 7 is a fragmentary perspective view of a concrete slab form and illustrating the application thereto of a bulkhead embodying the present invention; and

FIG. 8 is a vertical transverse sectional view taken substantially on the vertical plane indicated by the line 8—8 of FIG. 7.

Referring now to the drawings in detail and in particular to FIGS. 1 and 2, a concrete wall form to which an exemplary form of bulkhead is applied is designated in its entirety by the reference numeral 10, the bulkhead as a whole being indicated at 12. The wall form 10 is purely conventional in its construction and no claim is made herein to any novelty therein, the invention residing rather in the details of the bulkhead which will be described in detail presently.

The concrete wall form 10 is made up of two upstanding, spaced apart sides 14 and 16, each side being comprised of a series of vertically disposed wall form panels 18 which are disposed in edge-to-edge relationship. The two form sides are supported on a suitable foundation which may be the ground, a prepared deck or other pouring surface. The panels which have been selected for illustration herein are of the "Steel-Ply" type such as are manufactured and sold by Symons Corporation of Des Plaines, Illinois, and each panel is comprised of a plywood facing 20 which is surrounded by a rectangular marginal steel reinforcing frame 22. Although only the vertical frame members are shown herein, it will be understood that the frame of each panel 18 includes top and bottom frame members which extend horizontally between the vertical frame members in order to complete the marginal "studding type" frame for the panel. The adjacent panels 18 are connected together by conventional fastening devices (concrete hardware) in the form of T-bolt and wedge assemblies 24, the bolts of the assemblies passing through aligned slots 26 in the various members of the frames 22, and the wedges extending through slots in the shanks of the bolts and serving to draw the adjacent panels hard against each other in edge-to-edge relationship. Horizontally and transversely extending tie rods 28 have their opposite ends attached to the juncture regions between the frame members of the reinforcing frames of adjacent panels by means of the T-bolt and wedge assemblies 24, extend across the space between the sides 14 and 16 of the form 10, and serve to maintain the said form sides in their proper spaced apart relationship.

It will be understood, of course, that it is intended that wet concrete will be poured between the two form sides 14 and 16 in order to produce a concrete wall. It will also be understood that the concrete wall form 10 is of such length that a single batch pouring of the wet concrete will not suffice to produce the entire wall, and hence, it is necessary to resort to successive concrete pouring operations, one such operation taking place on the right-hand side of the bulkhead 12 as viewed in FIG. 2, and a subsequent pouring operation taking place on the left-hand side of the hardened concrete wall section W (see FIG. 6) resulting from the initial concrete pouring operations and after the bulkhead 12 has been dismantled and removed from the concrete wall form 10.

Considering now the nature of the bulkhead 12, this bulkhead projects completely across the space between the two sides 14 and 16 of the concrete wall form 10 and is made up of prefabricated components which, for exemplary purposes herein, are selected from a stock of such components and serve to accommodate the placement within the concrete wall form 10 of a conventional reinforcing mat 30 and a conventional plastic water seal 32. The reinforcing mat 30 is comprised of a rectangular checkerboard arrangement of vertical reinforcing rods 34 and horizontal reinforcing rods 36, the various rods being welded together at their crossover points as indicated at 38. The particular type of reinforcing rods 34 and 36 which are illustrated herein are known as "Havermeyer" bars and are manufactured by Concrete Steel Co. of New York, N. Y. However, other forms of reinforcing bars and the mats which are constructed therefrom are widely used in the concrete industry for concrete reinforcing purposes within a concrete wall form. Among such bars are "Diamond" bars as manufactured by Concrete Steel Engineering Co. of New York, N. Y. and ribbed bars as manufactured by Trussed Concrete Steel Co. of Youngstown, Ohio. Irrespective, however, of the particular form of reinforcing bars which are used for mat forming purposes, the mat 30 is readily susceptible to the sealing function of the herein described bulkhead in a manner that will be made clear presently. The "Havermeyer" bars which are illustrated herein are of elongated steel rod stock and the outer surfaces thereof are provided with a multiplicity of small generally elliptical outwardly extending protuberances 40. "Diamond" bars are formed with similar protuberances but of diamond shape, while the ribbed bars are provided with small circumferentially arranged thin ribs on the outer surfaces thereof.

The illustrated water seal 32 is likewise purely conventional and is sold by various manufacturers too numerous to mention. The illustrated water seal is formed of extruded plastic material and presents a flat body portion 42 from which there project laterally in opposite directions a horizontal series of transversely extending ribs 44. The water seal material is sold in sheets and may be cut to any desired configuration, the present seal being in the form of an elongated strip of full bulkhead height and of a width on the order of ten or twelve inches.

The bulkhead which is illustrated herein for exemplary purposes is comprised of three principal components, each of which is in the for of an assembly of parts. These three components consist of a pair of side components 50 and 52 which are positioned adjacent to the form sides 14 and 16 and abut against the plywood facings 20, and a medial or central component 54 which is interposed between the two side components in edge-to-edge relationship. The components 50 and 54 of the bulkhead 12 cooperate with each other to accommodate passage through the bulkhead of the various horizontal reinforcing bars 36 of the reinforcing mat 30, while the components 52 and 54 of the bulkhead cooperate with each other to accommodate projection of the water seal 32 from the right-hand side of the bulkhead as viewed in FIG. 2. The components 52 and 54 also serve the purpose of providing or forming the left-hand end face of the first poured concrete

wall section W (see FIG. 6) a vertical keyway **110** which is designed for interlocking with the second poured concrete wall section which is to be poured against said left-hand end face of the first wall section as previously described.

Considering now the side bulkhead component **50**, this component comprises a bean **56** in the form of a length of 4 inches × 4 inches lumber (see FIG. 3) to which there is applied by nailing as indicated at **58** a steel channel member **60**, the web portion **62** of the channel member lying in coextensive face-to-face contact with one side of the beam **54** and the side flanges **64** of the channel member closely hugging the adjacent opposite sides of said beam. The web portion **62** of the channel member **60** has applied thereto by a suitable adhesive an elongated sealing strip **66** which is formed of resilient sealing material and is of symmetrical trapezoidal configuration in transverse cross section, the large base of the strip being adhered to the web portion **62** of the channel member **60**. Various materials may be employed in manufacturing the sealing strip **66**, one such material being a "Neoprene" foam elastomer which possesses such a high degree of resiliency and restorative properties as to enable it to become restored to its original shape after it has been deformed and the deforming pressure released. Various adhesives are suitable for bonding the sealing strip **66** to the web portion **62** of the channel member **60**, one such adhesive being "Pliobond" which is manufactured and sold by Goodyear Tire and Rubber Company of Akron, Ohio. The bulkhead component **50** is positioned at the desired location within the concrete wall form **10** with the uncovered side of the beam **56** lying flush against the plywood panel facing **20** of the adjacent wall form panel **18** which is associated with and forms a part of the wall form side **16**.

The central bulkhead component **54** is comprised of a beam **70** (see FIG. 4) in the form of a length of 4 inches × 8 inches lumber to the opposite edges of which there is applied a pair of steel channel members **72** and **74** which are secured in position by nails **76**. A sealing strip **78** which is formed of "Neoprene" foam elastomer and is identical to the sealing strip **66** is adhered to the channel member **72** of the central bulkhead component **54**, while a sealing strip **80** is adhered to the channel member **74** of said component. The sealing strip **80** is formed of "Neoprene" foam elastomer and is provided with a rectangular body portion **82** from which there projects laterally a side flange **84**, the latter being of non-symmetrical trapezoidal shape in transverse cross section. The body portion **82** is adhered to the web portion of the channel member **74** while the side flange **84** is adhered to one of the side flanges of said channel member **74**.

The bulkhead component **52** is comprised of a beam **90** (see FIG. 5) to which there is applied a single steel channel member **92** which is secured in position by nails **94**, the web portion of the channel member **92** lying flush with one side edge of the beam **90** and the flanges of said channel member straddling the front and back faces of said beam. A sealing strip **96** which is identical to the sealing strip **80** is applied to the channel member **92**. The bulkhead component **52** is disposed at the desired longitudinal location within the concrete wall form **10** with the uncovered edge of the beam **90** lying flush against the plywood panel facing **20** of the adjacent wall form panel **18** which is associated with the wall form side **14**.

As clearly shown in FIG. 2, the two bulkhead components **50** and **54** are disposed in transverse alignment with the two elongated sealing strips **66** and **78** in contiguity and coextensive sealing relationship, the various horizontal reinforcing rods **36** of the reinforcing mat **30** passing between these two strips and displacing the material of the strips at the region of entry of the rods therebetween. The strips thus closely hug the rods **36** and effect the desired concrete seal. Similarly, the two bulkhead components **52** and **54** are disposed in transverse alignment with the two elongated sealing strips **80** and **96** in contiguity and coextensive sealing relationship and in straddling relationship with respect to the water seal strip **32** which they serve to support. The opposed faces of the two strips **80** and **96** are displaced by the water seal strip **32** with the ribs **44** of the latter penetrating deep into the material of the sealing strips so that these latter strips afford the desired concrete seal. The side flanges of the strips **80** and **96** cooperate with each other to provide a keyway pattern in a manner that will be set forth subsequently. Approximately one-half of the water seal **32** projects outwardly from the two sealing strips **80** and **96** for embedment in the concrete which is to be poured between the forms during the first concrete pouring operation as previously described.

The bulkhead **12** is erected within the concrete wall form **10** by positioning the three components in their proper transverse alignment and securing the components **50** and **52** in position against the plywood facings **20** by nails **98**. The water seal **32** is placed in position between the sealing strips **80** and **96** at the time the two components **54** and **52** are initially brought into contiguity.

In order to lend support to the three assembled bulkhead components **50**, **52** and **54**, there is provided appropriate backing lumber such as a series of horizontal backboards **100** which bear against the components **50**, **52** and **54**. Vertical backboards **102** for reinforcing the backboards **100** may, if desired, be secured by nails **104** in position against the inside faces of the plywood facings **20**.

As previously stated, after the bulkhead **12** has been erected in the manner previously set forth and the concrete poured in the portion of the concrete wall form **10** to the right of the bulkhead as viewed in FIG. 2, and the concrete has become hardened to produce the first wall section W (see FIG. 6), the bulkhead consisting of the three components **50**, **52**, and **54**, as well as the backing lumber **100** and **102**, is removed, thus producing the concrete structure which is shown in FIG. 6 and wherein the various horizontal reinforcing rods **36** of the reinforcing mat **30** project outwardly from the concrete wall section W and continue along the unpoured portion of the form. Similarly, the voids which are established by withdrawal of the mating side flanges of the sealing strips **80** and **96** from the concrete of the concrete wall section W establish the aforementioned keyway **110** in said wall section. Through such keyway projects the portion of the water seal **32** which formerly was embedded, so to speak, between the two sealing strips **80** and **96**. Subsequent

pouring of wet concrete to produce the next adjacent concrete wall section (not shown) causes the protruding portions of the rods **36** and the protruding portion of the water seal **32** to become embedded in the concrete of such pouring.

It is to be distinctly understood that the concrete wall form bulkhead **12** which is illustrated and described herein is merely an exemplary form of bulkhead which embodies the principles of the present invention. Depending on the width of the concrete wall form to which the bulkhead is to be applied, additional bulkhead components, variously fashioned to suit the exigencies of the situation, may be employed either for coextensive sealing therebetween or for sealing against various articles of concrete hardware. For example, under certain circumstances, it may be desired to provide two keyways, two reinforcing mats, or two water seals within the concrete wall form. In such an instance, component duplication may be resorted to. Similarly, under certain circumstances, it may be found desirable to utilize a pair of bulkhead components such as the components **52** and **54** to provide only a keyway such as the keyway **110**, but the water seal **32** omitted. In such an instance, the contacting faces of the two sealing strips **80** and **96** will establish the necessary concrete seal in the absence of the water seal **32**. It will be understood, of, course that all of the bulkhead components **50**, **52**, and **54** are of full concrete from height.

The bulkhead components **50**, **52** and **54** are, with modification only as far as size is concerned, capable of use in connection with a concrete slab form installation such as in illustrated in FIGS. **7** and **8**. Where a large area slab is being formed by successive concrete pourings, it is necessary to erect a bulkhead to hold the concrete of each pouring until work on the next successive pouring has commenced, just as it is in connection with the previously described wall form bulkhead and for the same reasons. In forming a relatively thin slab, for example, a slab having a thickness of one foot or so, if only a keyway between slabs is required, a pair of components, each of which is similar to the previously described component **54**, may be employed and the water seal **32** may be omitted so that the two sealing strips make coextensive face-to-face contact throughout their entire length and width. If, in addition to the keyway, a sealing strip is required, it is inserted between the two sealing strips. If only a reinforcing mat is required for the slab, a pair of components, each of which is similar to the component **50**, may be employed.

In forming a relatively thick slab, it may be found desirable to employ a bulkhead which contains all of the components which are associated with the previously described wall form bulkhead **12**, in which case the completed slab will have a keyway, a water seal, and a reinforcing mat. A slab of this type is commonly used in connection with airplane landing fields where it is not uncommon for the concrete runways to have a thickness of 4 or even 5 feet. Such a slab may be poured upon the ground, or when there is to be underground facilities, portions of such a slab may be poured on a prepared deck. Such a slab, in the process of undergoing formation, is illustrated in FIGS. **7** and **8**, one of the bulkheads which is associated therewith being designated in its entirety by the reference numeral **310**. The components of the bulkhead **310** are similar to the components which are employed in connection with the bulkhead **12** and, therefore, in order to avoid needless repetition of description, similar reference numerals but of a higher order have been applied to the corresponding parts as between the disclosures of FIGS. **7** and **8** on the one hand, and FIGS. **1** and **2** on the other.

The deck **320** is supported on horizontal stringers or beams **321** and the bulkhead **310** is supported on the deck and is reinforced by vertical backboards **400** and triangular bearing blocks **402**. The reinforcing mat **330** is maintained in its proper spaced relationship above the deck **320** by conventional sheet metal chairs **401**. In view of the foregoing description of the bulkhead **12**, it is believed that the disclosure of FIGS. **7** and **8** will be obvious. It is to be observed that the bulkhead components **350** and **354** accommodate the position of the reinforcing mat **330** while the components **352** and **354** accommodate both a keyway **410** in the hardened slab section S as well as a water seal **332**. It will be understood that all of the bulkhead components are of full concrete form width.

It is, of course, necessary that in order to attain the desired sealing effect between the mating elastomeric sealing strips **366** and **378**, and **382** and **396**, the bulkhead **310** be placed under compression in a vertical direction. In the case of the bulkhead **12**, horizontal compression of the bulkhead components is attained by causing them to be wedged, so to speak, between the wall form sides. In the bulkhead **310** bulkhead compression in a vertical direction is attained by the use of vertical bolt and nut assemblies **323** which not only hold the components under such vertical compression but also serve to anchor the bulkhead **310** to the deck **320**. The backboards **400** are secured by nails **324** to the wooden beams **356**, **370** and **390** of the components **350**, **354** and **352**, respectively, while the triangular bearing blocks **402** are secured by nails **325** to the backboards **400**.

The invention is not to be limited to the exact arrangement of parts shown in the accompanying drawings or described in this specification as various changes in the details of construction may be resorted to without departing from the scope of the invention as defined in the following claims.

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

1. In a concrete form including a horizontal pouring deck, a pair of upstanding opposed form sides and a horizontal reinforcing rod disposed between said sides and extending longitudinally of the form, a bulkhead mounted on said deck, bridging the distance between said form sides, and adapted for interim end sealing during the interval between successive concrete pouring operations, said bulkhead comprising a plurality of bulkhead components disposed in edge-to-edge relationship, each component being in the form of an elongated wooden beam, the opposed edges of one pair of adjacent beams being reinforced by coextensive steel members which are fixed thereto, said members having effectively and coextensively adhered thereto a pair of resilient elastomeric sealing strips which make coextensive sealing contact with each other and thus define an interfacial sealing area therebetween, said reinforcing

rod projecting through said sealing area and displacing the elastomeric material of the strips so that the latter closely hug the rod in sealing relationship.

2. In a concrete form, the combination set forth in claim 1 and wherein the steel members are provided with web-like portions, and the sealing strips are adhered to said web-like portions by an

3. In a concrete form, the combination set forth in claim 4 and wherein the sealing strips are of symmetrical trapezoidal configuration in transverse cross section with the large bases of the strips adhered to the web portions of the steel members and the small bases thereof disposed in abutting sealing relationship.

4. In a concrete form, the combination set forth in claim 1 and wherein the opposed edge regions of a second pair of adjacent beams likewise have effectively and coextensively adhered thereto a pair of resilient elastomeric sealing strips which make coextensive sealing contact with each other and thus define a second interfacial sealing area therebetween, the combination further including a flat sheet-like water seal projecting into said second interfacial sealing area and effectively retained in position by the pressure of the sealing strips of said second pair of adjacent sealing strips on opposite sides thereof, and said water seal being of full concrete pouring height and having a portion thereof projecting outwardly from said sealing area for embedment in a first concrete pour.

5. In a concrete form, the combination set forth in claim 2 and wherein the opposed edge regions of a second pair of adjacent beams likewise have effectively and coextensively adhered thereto a pair of resilient elastomeric sealing strips which make coextensive sealing contact with each other and thus define a second interfacial sealing area therebetween, said latter pair of sealing strips having portions thereof projecting laterally beyond the confines of the associated beams and, in combination with each other, defining a keyway-forming pattern by means of which successive concrete pourings are keyed to each other, the combination further including a flat sheet-like water seal projecting into said second interfacial sealing area and effectively retained in position by the pressure of the sealing strips of said second pair of adjacent sealing strips on opposite sides thereof, said water seal having a portion thereof projecting outwardly from said sealing area for embedment in a first concrete pour.

6. In a concrete form, the combination set forth in claim 2 and wherein said steel members are in the form of structural channels having side flanges which straddle the opposed edges of the adjacent beams.

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