ADJUSTABLE BULKHEAD FOR A CONCRETE WALL FORM

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An adjustable bulkhead for interim end sealing in a concrete wall or slab form during an interval between concrete pouring operations. 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 concretepourings.

5 Claims, 8 Drawing Figures
ADJUSTABLE BULKHEAD FOR A CONCRETE WALL FORM

This application is a division of my copending patent application Ser. No. 86,729, filed on Nov. 4, 1970 and entitled "ADJUSTABLE BULKHEAD FOR A CONCRETE WALL FORM."

The present invention relates to an adjustable bulkhead of the character which is installed across the space between the opposed but spaced apart sides of a conventional concrete wall form 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 two hundred and twenty 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, Ill., 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 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 form 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 in 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 beam 56 in the form of a length of 4 x 4 inch lumber (see FIG. 3) to which there is applied by mailing 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 "Phibond" 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 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 76 in contiguity and co-extensive 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 therebetwixt. 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 co-extensive 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 strip 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, 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 un poured 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 with 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 form 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 is 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 42 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 four or even five 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 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. For use in a concrete form which embodies a pair of spaced form sides and within which concrete is adapted to be poured by successive batch pourings, a bulkhead adapted to extend transversely between the form sides and including a pair of components each of which is comprised of a wooden beam and a relatively thick resilient elastomeric sealing strip secured to and coextensive with at least one longitudinal edge of the beam, the beams being adapted for contiguous placement under transverse compression between the form sides and with the sealing strips disposed in contiguity whereby said strips may be caused sealingly to encompass an article of concrete hardware which passes between the two beams, said beams having their op-
posed edges reinforced by coextensive metallic members which are fixedly attached to the beams and have web-like portions to which the sealing strips are adhered.

2. A bulkhead as set forth in claim 1 and wherein the sealing strips are adhered to the web-like portions of the steel members by an adhesive.

3. A bulkhead as set forth in claim 1 and wherein the sealing strips are of symmetrical trapezoidal configuration in 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. A bulkhead as set forth in claim 1 and wherein there is a third beam in parallel and opposed spaced apart relation with one of the pair of beams and said third and one beams have effectively and coextensively adhered to the opposed portions thereof coextensive resilient elastomeric sealing strips which make coextensive sealing contact with each other and are adapted yieldingly to receive therebetween a sheet-like water seal.

5. A bulkhead as set forth in claim 4 and wherein the sealing strips on the opposed edge portions of the third and first beams have portions thereof projecting laterally beyond the confines of said beams and, in combination with each other, defining a keyway-forming pattern by means of which successive concrete pourings between the form sides are keyed to each other.