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 (54) Title: SHUTTERING IN BUILDING CONSTRUCTION
 (57) Abstract

A LINK ROD FOR USE WITH SHUTTERING COMPRISES A BOLT-LIKE MEMBER (12) AND A NUT-LIKE MEMBER (14). THE BOLT-LIKE MEMBER (12) COMPRISES AN ELONGATED SHANK (13) HAVING A HEAD FORMATION (16) AT ONE END THEREOF AND THREADED SEGMENT (24) ADJACENT THE OPPOSITE END THEREOF. THE SHANK TAPERING FROM A SPACED LOCATION FROM THE HEAD FORMATION (16) TOWARDS THE THREADED SEGMENT. THE NUT-LIKE MEMBER COMPRISES A CYLINDRICAL BODY (32) HAVING A THREADED BORE (34) PASSING AXIALLY THERE THROUGH, WHICH PERMITS THE NUT-LIKE MEMBER TO SCREW ONTO THE BOLT-LIKE MEMBER. THE CYLINDRICAL BODY HAVING A FLANGE FORMATION (36) PROJECTING RADIALLY THEREFROM AT ONE END THEREOF. THE CONFIGURATION OF THE LINK ROD PARTICULARLY IS SUCH THAT IT CAN LOCATE OPPOSING SHUTTERING WALLS OF A SHUTTERING STRUCTURE IN A FIXED SPACED RELATIONSHIP WITH RESPECT TO ONE ANOTHER

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(56) Documents cited: EP - 123264 EP - 399114 FR - 1268173
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ABSTRACT

A link rod for use with shuttering comprises a bolt-like member (12) and a nut-like member (14). The bolt-like member (12) comprises an elongated shank (18) having a head formation (16) at one end thereof and a threaded segment (24) adjacent the opposite end thereof, the shank tapering from a spaced location from the head formation (16) towards the threaded segment. The nut-like member comprises a cylindrical body (32) having a threaded bore (34) passing axially therethrough, which permits the nut-like member to screw onto the bolt-like member, the cylindrical body having a flange formation (36) projecting radially therefrom at one end thereof. The configuration of the link rod particularly is such that it can locate opposing shuttering walls of a shuttering structure in a fixed spaced relationship with respect to one another.

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THIS INVENTION relates to shuttering for use in building construction. More particularly, the invention relates to a link rod for use with such shuttering.

A known problem associated with the use of shuttering for constructing, for example, walls of building structures, relates to the location of the opposite walls of a shuttering structure with respect to one another, whereby a space is created that can be filled with a settable material for forming the said walls. It has been proposed to use rods, hereinafter referred to as link rods, which can span the space between the opposing shuttering walls and which can act on the said walls to limit the maximum spacing between the walls and thereby determine the thickness of walls to be constructed.

Known link rods are, however, difficult to locate in position and after the construction of a wall, are difficult to remove, thus complicating the disassembly of the shuttering.

Accordingly, it is an object of this invention to provide a link rod for use with shuttering, the use of which will at least partially alleviate the above problems associated with known link rods.

According to the invention there is provided a link rod for use with shuttering, which comprises

a bolt-like member having an elongated shank and a head formation at a first end of the shank, the shank tapering along at least a part of the length thereof towards its second end, opposite to the first end, and defining a threaded segment immediately adjacent the said second end; and

a nut-like member comprising a cylindrical body having a flange formation projecting radially therefrom and defining a threaded bore extending axially therethrough, the threaded bore permitting the body to screw onto the threaded segment of the shank of the bolt-like member.

In use, shuttering elements forming the opposing shuttering walls of a shuttering structure can be provided with aligned apertures through which the bolt-like member of the link rod, in accordance with the invention, can pass, so that by screwing the nut-like member and bolt-like member together, the shuttering walls can bear against the head

formation of the bolt-like member and the flange formation of the nut-like member to fix the maximum spacing between the said walls. With the use of a plurality of link rods of the above type located at spaced locations, the spacing between shuttering walls of a shuttering structure can thus be effectively fixed.

The shank of the bolt-like member of the link rod of the invention may have a cylindrical segment immediately adjacent the head formation, the length of the said cylindrical segment being equal to the effective thickness of a shuttering wall of shuttering with which the link rod is to be used, and in which the shank tapers from the end of the cylindrical segment remote from the head formation to the end of the threaded segment remote from the second end of the shank. Furthermore, the flange formation of the cylindrical body forming the nut-like member may be disposed at one end of the cylindrical body and the length of the cylindrical body from the said flange formation to the opposite end thereof may be equal to the effective thickness of a shuttering wall of shuttering with which the link rod is to be used. The maximum diameters of the shank of the bolt-like member, being the diameter of the cylindrical segment thereof, and of the cylindrical body of the nut-like member, respectively, preferably are equal. As such, by fitting snugly into equal diameter holes in opposing shuttering walls of a shuttering structure, no space is created between the link rod and the shuttering wall that can receive any settable material when the shuttering structure is filled, thus ensuring that the outer surfaces of a wall formed will be relatively smooth.

Further according to the invention, the shank of the bolt-like member, at a location near the head formation, may define a locating formation that can cooperate with a formation on a shuttering wall of a shuttering with which the link rod is to be used, for preventing axial displacement of the bolt-like member with respect to the shuttering wall when the bolt-like member is located in its operative configuration with respect to the shuttering wall. Similarly, the cylindrical body of the nut-like member may define a locating formation that can cooperate with a formation on a shuttering wall of a shuttering with which the link rod is to be used, for preventing axial displacement of the nut-like member with respect to the shuttering wall when the nut-like member is located in its operative configuration with respect to the shuttering wall.

Still further according to the invention, one of the bolt-like member and the nut-like member may have a locating formation that can cooperate with a complementary formation defined by a shuttering wall of shuttering with which the link rod is to be used, for preventing rotation of this member with respect to the shuttering wall. Also, the one of the bolt-like member and the nut-like member not having a locating formation for preventing rotation of this member with respect to a shuttering wall, may have engagement formations to facilitate engagement thereof by a tool for rotating the said member. Preferably, the bolt-like member has the said engagement formations, the said engagement formations being defined by the head formation at the first end of the elongated shank of the bolt-like member.

The link rod of the invention and, particularly, the bolt-like member and the nut-like member may be of any suitable material and, particularly, may be of a suitable synthetic plastic material, or a like material having suitable strength qualities. Typically, the bolt-like member and the nut-like member forming the link rod may be of nylon, or a nylon composite material such as glass filled nylon.

The exact configuration of the bolt-like member and the nut-like member forming the link rod of the invention may be determined by the configuration of a shuttering wall of shuttering with which the link rod is to be used. As such, the link rod of the invention may be adapted specifically for use with synthetic plastic shuttering elements that are inter-engageable and can be releasably locked together for forming a shuttering wall of a shuttering structure.

As such, the invention extends also to a shuttering element which comprises a synthetic plastic body having formations permitting inter-engagement and releasable locking together with similar bodies for forming a shuttering wall of a shuttering structure and which defines formations adapted to cooperate with a link rod, in accordance with the invention, for locating the link rod with respect thereto.

Still further, the invention extends to a shuttering system, which includes

link rods, in accordance with the invention; and

shuttering elements for forming two opposing shuttering walls and that are adapted to cooperate with the said link rods for holding the shuttering walls in a required spaced configuration with respect to each other.

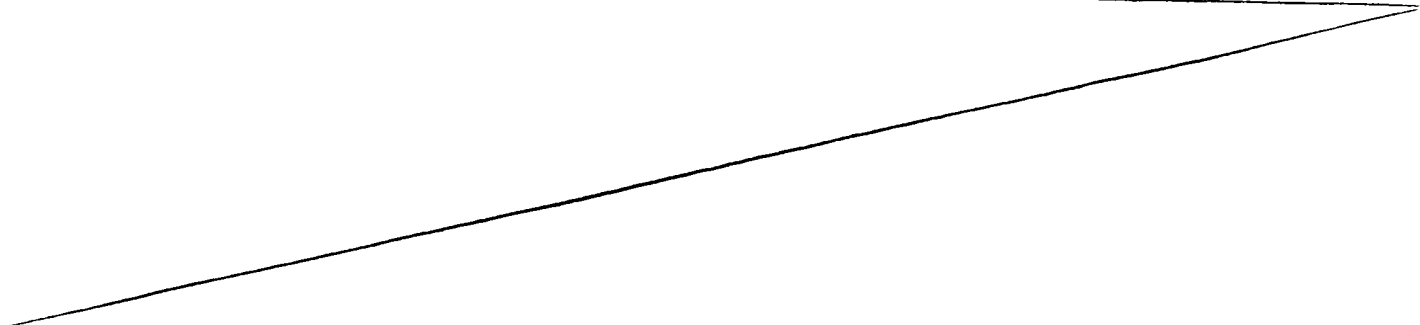
Further features of the link rod of the invention, including the mode of use thereof, are described in more detail hereinafter with reference to an example of the invention, illustrated by way of drawings. In the drawings:

Figure 1 shows an elevational side view of a link rod for use with shuttering, in accordance with the invention, having its bolt-like member separated from its nut-like member;

Figure 2 shows an end view of the nut-like member of the link rod of Figure 1;

Figure 3 shows an end view of the bolt-like member of the link rod of Figure 1;

Figure 4 shows schematically in side view and partially sectioned a part of a shuttering structure having shuttering walls held in a predetermined spaced configuration

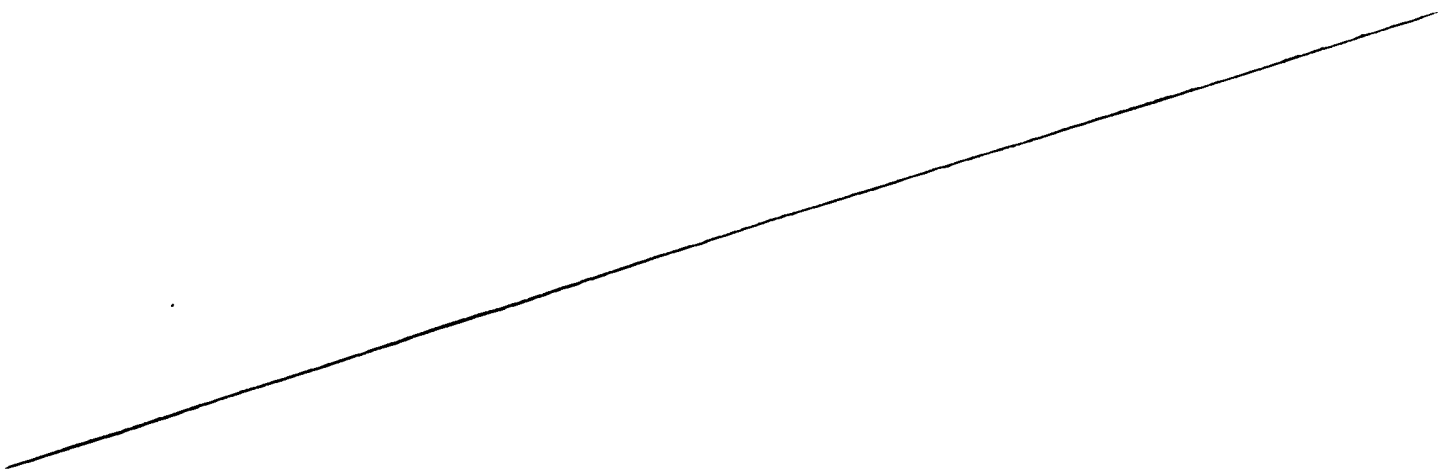


with respect to one another by means of link rods as shown in Figure 1 (only one link rod shown); and

Figure 5 shows a corner region of a shuttering element that can cooperate with the link rod of the invention.

Referring initially to Figures 1 to 3 of the drawings, a link rod for use with shuttering, in accordance with the invention, is designated generally by the reference numeral 10. The link rod 10 includes a bolt-like member 12 and a nut-like member 14.

The bolt-like member 12 of the link rod 10 is of glass filled nylon and has a head formation 16 at one end thereof, with a shank 18 extending from the head formation 16 as shown. The shank 18 defines a cylindrical segment 20 immediately adjacent the head formation 16, and then tapers towards the free end 22 thereof with a threaded segment 24 being defined immediately adjacent this free end 22. The length of the tapering segment of the shank will in practice determine the thickness of walls being constructed, as will become apparent from the description of the use of the link rod hereafter. The length of this tapering segment may thus be different for different link rods.



Adjacent the head formation 16 within the cylindrical segment 20 of the shank 12, and on opposite sides thereof, there are provided two recesses 26, the purpose of which is described in more detail hereinafter.

Two notches 30 are defined within the head formation 16 as shown, the notches being formed to permit mechanical engagement by a suitably formed spanner, or the like, in order to permit rotation of the bolt-like member for the purpose described in more detail hereafter.

The nut-like member 14 also is of glass filled nylon, or a like suitable material, this member 14 comprising a cylindrical body 32 defining a threaded bore 34 axially therethrough, permitting the body to screw onto the threaded segment 24 of the bolt-like member 12. The said body 32 defines further a radially projecting flange formation 36 at one end thereof, the head formation 16 of the bolt-like member 12 and the flange formation 36 of the nut-like member 14 thus defining opposing shoulder formations whereby predetermined opposing shuttering elements of a shuttering structure can be held in a desired spaced configuration.

The body 32 of the nut-like member 14 also has two recesses 38 formed therein on opposite sides thereof and adjacent the flange formation 36, the purpose of the recesses 38 again being described hereafter. Still further, between the flange formation 36 and

recesses 38 there are provided two projecting formations 40, the purpose of which also is described hereafter.

The link rod as shown in the drawings and described above is particularly adapted for use in conjunction with a shuttering system which includes the use of a plurality of modular synthetic plastic shuttering elements that include complementary inter-engagement and locking formations along opposite sides thereof for inter-engaging and locking the elements together to form a shuttering surface. The shuttering elements used in this system comprise a rectangular, usually square, planar shuttering wall having peripheral side walls projecting in one direction from opposite side edges of the wall, inter-engagement and locking formations defined along opposite sides of the element permitting similar elements to be inter-engaged and locked together in a configuration in which the shuttering walls form an extended continuous planar shuttering surface.

Figure 4 illustrates generally a part of a shuttering structure 50 for forming the walls of a building structure, the shuttering structure including two opposing shuttering surfaces 52 that are defined by the shuttering walls of shuttering elements 54 of the type described above, the effective thickness of the shuttering elements 54 being clearly apparent and being determined by the peripheral side walls of the shuttering elements.

In particular, the individual shuttering elements are substantially hollow elements including the shuttering wall for forming the shuttering surfaces 52, with the said side walls projecting perpendicularly to the said shuttering wall. Additional reinforcing ribs (not shown) are provided between the said side walls

As shown in Figure 5, each shuttering element 54 includes cylindrical walls 56 forming apertures within the shuttering element 54, the said walls 56 being shown also in respect of two opposing shuttering elements 54 in Figure 4.

In use to fix the spacing between the shuttering surfaces 52, the nut-like member 14 of a link rod 10 is located within a hole through one of two opposing shuttering elements whereafter the bolt-like member 12 is passed through the opposing hole in the opposing shuttering element, the bolt-like member 12 hence being screwed into the nut-like member 14 so that the head formation 16 of the bolt-like member 12 and the flange formation 36 of the nut-like member 14 act against the shuttering elements 54 for holding them in a required spaced configuration. This is clearly apparent from the drawings and is not described in any further detail herein.

It will also be appreciated that each pair of opposing shuttering elements 54 can be associated either with a single link rod or a plurality of link rods that can fit through holes provided therefor within the shuttering elements, it also being envisaged that some

shuttering elements may be provided without such holes, where it is not deemed necessary to hold opposing shuttering surfaces in their required spaced configuration.

In order to facilitate further the use of the link rod 10, the wall 56, defining the hole through the shuttering element 54 in which the nut-like member 14 is located, is provided with two opposite projecting clipping formations 58 (see Figure 5) that are resiliently displaceable and that will engage in the recesses 38 in the body 32 of the nut-like member 14 when the nut-like member 14 is located in position, this engagement preventing axial displacement of the nut-like member with respect to the shuttering element 54. Also when so located, the projecting formations 40 will be received within complementary receiving formations 60 defined therefor by the shuttering element 54, thus preventing rotation of the nut-like member with respect to the shuttering element. Although apparent, this is not clearly shown in Figure 4 of the drawings.

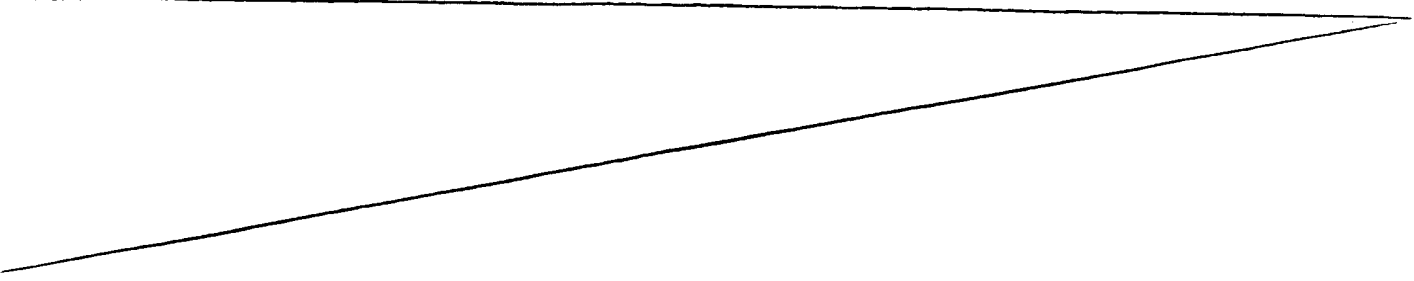
Similar clipping formations 58 will be defined by the hole 56 in the shuttering element 54 through which the bolt-like member passes, these clipping formations 58 engaging in the recesses 26 in the shank 18 of the bolt-like member, so that when the bolt-like member 14 is properly located with respect to its shuttering element 54, axial displacement of the bolt-like member with respect to the shuttering element 54 is inhibited while rotation of the bolt-like member can still occur. The engagement of the

clipping formations 58 with the bolt-like member and nut-like member clearly will fix the spacing between opposing shuttering elements 54.

For practical use, therefore, when erecting shuttering structures, the nut-like members 14 will be placed in their required shuttering elements, whereafter the shuttering elements forming opposing shuttering walls will be brought together to permit the bolt-like members to be screwed into the nut-like member, thereby positioning the shuttering elements in their required spaced configuration and the bolt-like members in their required configuration with respect to their shuttering elements.

One advantage of the above engagement between the members of the link rod 10 and their shuttering elements is that screwing of one member into the other is facilitated, whereas upon unscrewing of the bolt-like members the shanks 18 of the bolt-like members 12 will simultaneously be axially displaced with respect to walls formed, i.e. the shanks 18 will be simultaneously released.

As is also apparent from Figure 4 of the drawings, the cylindrical segment of the bolt-like member 12 fits snugly into the hole in its shuttering element so that no space is defined between the shank of the bolt-like member and the walls defining the hole, thus ensuring that no settable material can enter such a space and, as such, ensuring that the surface of a wall formed is smooth. Similarly, the body 14 of the nut-like member 14 is



cylindrical and fits snugly into its hole in its shuttering element, thus fulfilling its same function.

The tapering configuration of the shank 18 of the bolt-like members, upon disassembly of a shuttering structure facilitates release of the bolt-like members from a wall after formation thereof and as described, thus facilitating removal of the bolt-like members and thus permitting re-use of the link rods.

It will be appreciated that the link rod 10 as described is particularly suitable for use with shuttering of the type described above. For different configurations shuttering, link rods with similar features but defining a different specific configuration can be provided in order to provide the same mode of use and the same benefits as described above. For example, the shanks and cylindrical bodies of the bolt-like and nut-like members may have different configuration formations for their location with respect to shuttering elements and these formations may be associated with guide channels in order to facilitate engagement. Insofar as shuttering elements are concerned, for example, holes for receiving link rods may be defined by formations defined by adjacent inter-engaged elements.

One other benefit of the inter-engagement between the members of the link rod 10 and their shuttering elements is that the spacing between opposing shuttering surfaces 52

is fixed, inward bulging of said shuttering surfaces not being permitted with the use of the link rods 10.

It is submitted by the Applicant that use of link rods 10 will greatly facilitate the use of shuttering in association with building construction, further facilitating the use of synthetic plastic shuttering elements having features as described above, which will render the use of shuttering even more practical. The exposed ends of link rods 10, in their operative configuration, either as shown or by being suitably adapted, also can serve various other functions, typically locating other components with respect to a shuttering structure. For example, in the operative configuration of the link rod as shown, the nut-like member 14 may provide a threaded bore section that can be engaged for attachment of any other component therewith, i.e. the threaded segment of the bolt-like member 12 does not extend through the bore of the nut-like member completely.

Still further, the tapering profile of the shank of the bolt-like member can permit the frictional location of collar elements therein that can serve to locate reinforcing mesh, pipes, or the like, within a shuttering structure between the opposing shuttering walls thereof.

CLAIMS

1. A link rod for use with shuttering, which comprises

a bolt-like member having an elongated shank and a head formation at a first end of the shank, the shank tapering along at least a part of the length thereof towards its second end, opposite to the first end, and defining a threaded segment immediately adjacent the said second end; and

a nut-like member comprising a cylindrical body having a flange formation projecting radially therefrom and defining a threaded bore extending axially therethrough, the threaded bore permitting the body to screw onto the threaded segment of the shank of the bolt-like member.

2. A link rod as claimed in Claim 1, in which the shank of the bolt-like member has a cylindrical segment immediately adjacent the head formation, the length of the said cylindrical segment being equal to the effective thickness of a shuttering wall of shuttering with which the link rod is to be used, and in which the shank tapers from the end of the cylindrical segment remote from the head formation to the end of the threaded segment remote from the second end of the shank.

3. A link rod as claimed in Claim 1 or Claim 2, in which the flange formation of the cylindrical body forming the nut-like member is disposed at one end of the cylindrical body and the length of the cylindrical body from the said flange formation to the opposite end thereof is equal to the effective thickness of a shuttering wall of shuttering with which the link rod is to be used.
4. A link rod as claimed in any one of the preceding claims, in which the maximum diameters of the shank of the bolt-like member and of the cylindrical body of the nut-like member, respectively, are equal.
5. A link rod as claimed in any one of the preceding claims, in which the shank of the bolt-like member, at a location near the head formation, defines a locating formation that can cooperate with a formation on a shuttering wall of shuttering with which the link rod is to be used, for preventing axial displacement of the bolt-like member with respect to the shuttering wall when the bolt-like member is located in its operative configuration with respect to the shuttering wall.
6. A link rod as claimed in any one of the preceding claims, in which the cylindrical body of the nut-like member defines a locating formation that can cooperate with a formation on a shuttering wall of shuttering with which the link rod is to be used, for preventing axial displacement of the nut-like member with respect to the



shuttering wall when the nut-like member is located in its operative configuration with respect to the shuttering wall.

7. A link rod as claimed in any one of the preceding claims, in which one of the bolt-like member and the nut-like member have a locating formation that can cooperate with a complementary formation defined by a shuttering wall of shuttering with which the link rod is to be used, for preventing rotation of this member with respect to the shuttering wall.
8. A link rod as claimed in Claim 7, in which the one of the bolt-like member and the nut-like member not having a locating formation for preventing rotation of this member with respect to a shuttering wall, has engagement formations to facilitate engagement thereof by a tool for rotating the said member.
9. A link rod as claimed in Claim 8, in which the bolt-like member has the said engagement formations, the said engagement formations being defined by the head formation at the first end of the elongated shank of the bolt-like member.
10. A link rod as claimed in any one of the preceding claims, in which the bolt-like member and the nut-like member are of a synthetic plastic material.



11. A link rod as claimed in Claim 10, in which the bolt-like member and the nut-like member are of a nylon composite material.
12. A link rod as claimed in any one of the preceding claims, in which the exact configuration of the bolt-like member and the nut-like member is determined by the configuration of a shuttering wall of shuttering with which the link rod is to be used.
13. A link rod as claimed in Claim 12, which is specifically adapted for use with synthetic plastic shuttering elements that are inter-engageable and can be releasably locked together for forming a shuttering wall of a shuttering structure.
14. A shuttering element which comprises a synthetic plastic body having formations permitting inter-engagement and releasable locking together with similar bodies for forming a shuttering wall of a shuttering structure and which defines formations adapted to cooperate with a link rod as claimed in any one of Claims 1 to 13, for locating the link rod with respect thereto.
15. A shuttering system, which includes

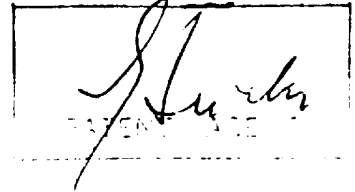
link rods as claimed in any one of Claims 1 to 13; and



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shuttering elements for forming two opposing shuttering walls and that are adapted to cooperate with the said link rods for holding the shuttering walls in a required spaced configuration with respect to each other.

Dated this 30 Day of September 1992.



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