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(54) Waterproofing of joints between concrete members.

(57) The waterproof sealing of a joint between two abutting concrete members formed sequentially by pouring fluid concrete mix into formwork is achieved by

(a) placing a waterstop hose on the formwork which will define one face of the joint in a first-formed concrete member ;

(b) at least partially surrounding this hose with material which prevents the fluid concrete from contacting that part of the hose which is adjacent to the formwork ;

(c) removing the formwork ;

(d) forming a second concrete member abutting against the first-formed member, thus providing the other face of the joint ; and

(e) pumping through the waterstop hose a sealing composition.

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This invention relates to a method of providing a waterproof joint between two sequentially-formed concrete members.

When concrete members such as slabs are formed sequentially by pouring fluid concrete into formwork, a joint is inevitably created between a first concrete member and a second, subsequently-formed concrete member. This joint is often not watertight, especially when the second member is formed under the first member, and this can lead to water leakage problems. One attempt to solve this problem has been the attachment of waterstop hose to the first-formed member at that surface against which the second member will be formed and which will therefore form one face of the joint. Through such a hose, an appropriate sealing composition may be pumped. However, such solutions to the problem have hitherto proved unsatisfactory because the almost complete surrounding of the hose by the second member has not permitted the achievement of good sealing.

It has now been found that good sealing may be achieved by an arrangement as hereinunder described. The invention therefore provides a method of providing a waterproof joint between a formed first concrete member and a subsequently-formed second concrete member, comprising the steps of

(a) providing formwork for the creation of a first concrete member,

(b) pouring fluid concrete into the formwork and allowing it to harden to form a first concrete member;

(c) removing the formwork;

(d) forming a second concrete member by pouring fluid concrete into formwork, such that said second concrete member abuts against said first concrete member to form a joint; and

(e) supplying a sealing composition to seal the joint by means of a waterstop hose located at the joint;

characterised in that, prior to the formation of the first member, the hose is placed on that part of the formwork which will define one face of the eventual joint with the second concrete member, the hose extending the entire length of the eventual joint and being at least partially surrounded along this length by material which contacts the formwork on both sides of the hose along this entire length and which is adapted to prevent fluid concrete poured into the formwork from contacting that part of the hose which lies adjacent to the formwork.

Waterstop hose is a commodity well known to and widely used by the art, and the hose used in the method of this invention may be selected from any of the commercial materials known to the art. It is typically a hose of a rigid plastics material with a longitudinal bore of cruciform cross section, from the arms of which cross section a series of radial perforations extend to the exterior of the hose, thus defining on this exterior longitudinal rows of perforations. These are typically covered with longitudinal bands of elastomeric material which act as valves, preventing ingress of material. A typical example is the tube sold commercially under the trade name FUKO.

The hose is placed on the formwork which defines one face of an eventual joint, such that it will extend along the entire length of this joint. If the formwork is horizontal or near-horizontal, it may be laid on the formwork. If vertical, the hose may be held in place by a material as hereinafter described.

The fluid concrete which is added to the formwork to form the first concrete element is prevented from contacting that part of the hose which lies adjacent to the formwork by the presence of material which at least partially surrounds the hose, which contacts the formwork on both sides of the hose along its entire length and which prevents concrete from contacting that part of the hose which lies adjacent to the formwork. Provided that the material complies with all of these conditions, it may be selected from any suitable material. For example, it may be strips of a concrete-impermeable material (such as plywood or plastics) affixed to the formwork on both sides of the hose, the strips having a thickness which is slightly less than the diameter of the hose. Thus, when the formwork is removed, the strips are also removed, leaving the hose partially embedded in the concrete of the first-formed member and located in a shallow, elongate trench defined by the positions once occupied by the strips. It follows from this that the hose should be embedded to an extent sufficient to enable it to be held in place by the concrete. This will in turn determine the dimensions of the strips necessary for use in the invention, but such parameters can be easily determined by the skilled person.

An alternative material is an elongate strip of a resilient material such as plastics or rubber, having a flat underside capable of attachment to formwork and bearing on its reverse surface an elongate slot which is adapted partially to surround and hold in place a waterstop hose. This achieves the same result as the strips - when the formwork is removed, the hose remains partially embedded in a trench. Rubber and foamed plastics such as polyurethanes are particularly useful in this embodiment. A further alternative is to place the hose on the formwork and surround it completely with a mortar which is impermeable to the concrete but permeable to the sealing composition to be pumped through the hose. When the concrete is poured and the formwork removed, the hose will remain with the concrete, partially surrounded by the mortar. The skilled person will appreciate that, in the case of formwork which is not substantially horizontal, the material may be used to hold the hose in position. The skilled person will also readily be able to envisage other variants not described herein but which fall within the scope of this invention.

The second concrete member is formed using appropriate formwork, such that it abuts against the first-formed concrete member, thus providing the second face of a joint. When forming this second member, any trench formed as a result of the removal of material partially surrounding the hose will remain. It is preferred to leave in the freshly-added concrete which will form the second member an opposing depression of identical length but of otherwise optional dimensions. This provides with the trench a continuous cavity at the joint, which cavity can then be filled with a sealing composition. In the case of a porous mortar, it is equally advantageous to create such a depression opposite the mortar. When the concrete has reached a sufficient degree of hardness and the formwork is removed, the cavity is filled with sealing compound. The invention therefore also provides a waterproof joint between two adjacent concrete members, which joint comprises a cavity spanning the length of the joint and filled with a sealing composition

The method of this invention results in an excellent seal. It also has the advantages of simplicity and ease of use. Protrusions such as reinforcing bars give no problems.

The invention is further described with reference to the accompanying drawings which depict a preferred embodiment.

Figure 1 is a schematic transverse cross-section through a concrete member encased in formwork, showing a waterstop hose in position.

Figure 2 is a schematic transverse cross-section through abutting first and second concrete members.

Figure 3 is a schematic transverse cross-section through a second embodiment of the invention.

Figure 4 is a schematic transverse cross-section through a third embodiment of the invention.

A concrete first member 1 is formed by pouring fluid concrete into a space defined by surface 2 and formwork 3 and 4. On formwork 4 is placed a waterstop hose 5. To the formwork 4 on either side of hose 5 are fastened two plywood slats 6 having a thickness of slightly less than the diameter of the hose. The slats are placed such that concrete cannot flow around the hose and that portion of the hose adjacent to the formwork 4 is free from concrete.

When the concrete which forms member 1 is hard, the formwork is removed and further formwork (not shown in the accompanying drawings) is erected,so that a second concrete member 8 abutting against member 1 may be formed. The removal of the formwork 4 has left hose 5 partially embedded in concrete in a shallow trench 7 defined by the former positions of the slats 6. When the concrete for the member 8 is placed, there is created opposite the trench 7 an opposing depression 9.

When the concrete of member 8 is hard and the formwork is removed, the cavity formed by trench 7 and depression 9 may be filled with sealing compound pumped into the cavity through the hose 5. The result is an excellent seal.

The plywood slats of the example hereinabove described may also be replaced by slats of other materials such as flexible plastics or rubber.

Figure 3 depicts a second embodiment of the invention wherein the waterstop hose 5 is secured to the formwork by a material which is an elongate strip 10 of foamed polyurethane (although other resilient polymeric materials may be used), having a flat underside capable of attachment to formwork and bearing on its reverse surface an elongate slot which is adapted partially to surround and hold in place a waterstop hose.

Figure 4 depicts a third embodiment wherein the hose is completely surrounded by a lean-mix mortar 11 which is impermeable to the concrete but permeable to the sealing composition to be pumped through the hose. When the concrete is poured and the formwork removed, the hose will remain with the concrete, partially surrounded by the mortar.

Claims

1. A method of providing a waterproof joint between a formed first concrete member and a subsequently-formed second concrete member, comprising the steps of
   (a) providing formwork for the creation of a first concrete member,
   (b) pouring fluid concrete into the formwork and allowing it to harden to form a first concrete member;
   (c) removing the formwork;
   (d) forming a second concrete member by pouring fluid concrete into formwork, such that said second concrete member abuts against said first concrete member to form a joint; and
   (e) supplying a sealing composition to seal the joint by means of a waterstop hose located at the joint;
   characterised in that, prior to the formation of the first member, the hose is placed on that part of the formwork which will define one face of the eventual joint with the second concrete member, the hose extending the entire length of the eventual joint and being at least partially surrounded along this length by material which contacts the formwork on both sides of the hose along this entire length and which is adapted to prevent fluid concrete poured into the formwork from contacting that part of the hose which lies adjacent to the formwork.

2. A method according to claim 1, wherein the material comprises strips of material impermeable to

concrete affixed to the formwork on both sides of the hose, the strips having a thickness slightly less than the diameter of the hose.

3. A method according to claim 1, wherein the material comprises an elongate strip of resilient material, having a flat underside capable of attachment to formwork and bearing on its reverse surface an elongate slot which is adapted partially to surround and hold in place a waterstop hose

4. A method according to claim 1, wherein the material comprises a completely surrounding layer of a mortar which is permeable to sealing compound which is to be pumped through the hose, but which is impermeable to concrete.

5. A waterproof joint between two adjacent concrete members, which joint comprises a cavity spanning the length of the joint and filled with a sealing composition.

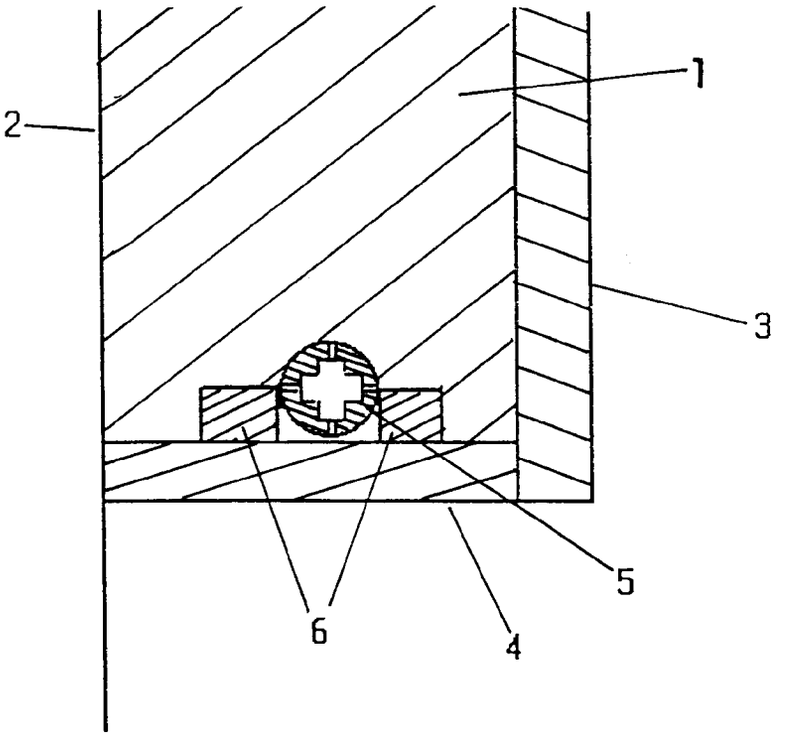

FIG. 1

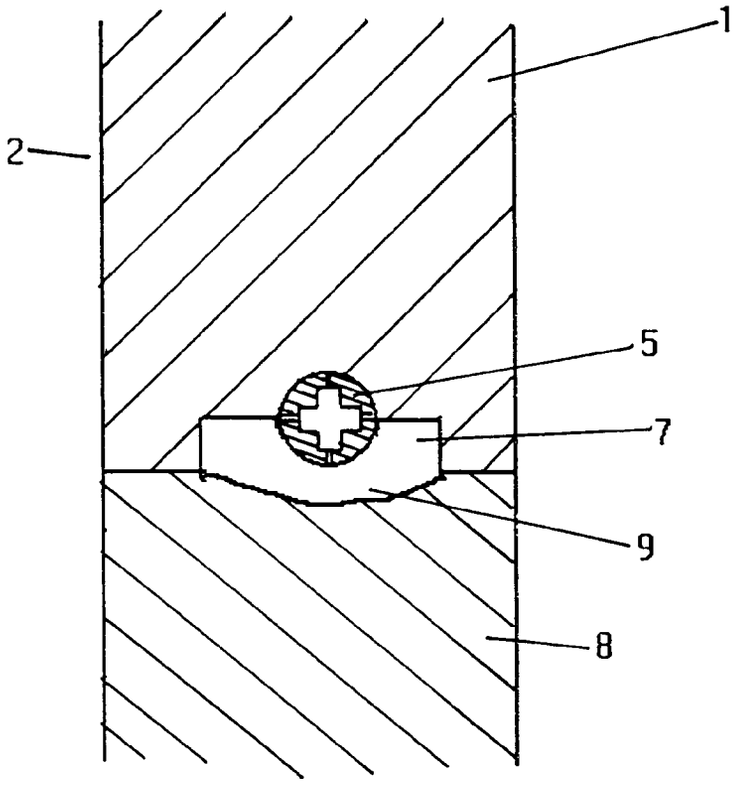

FIG. 2

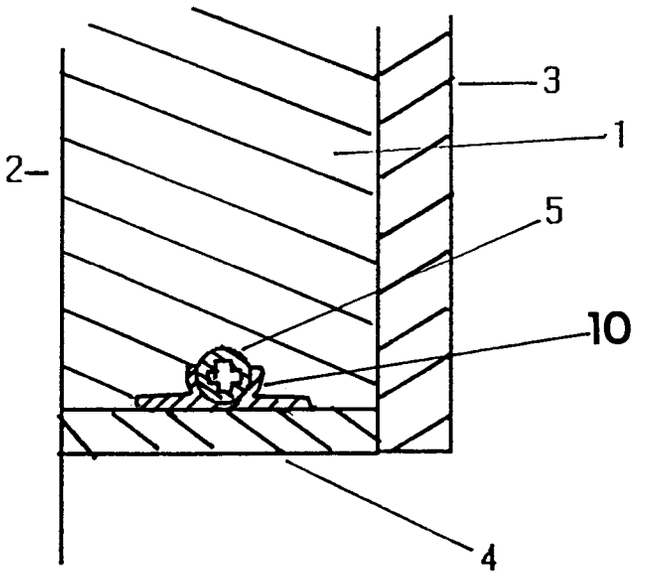

FIG.3

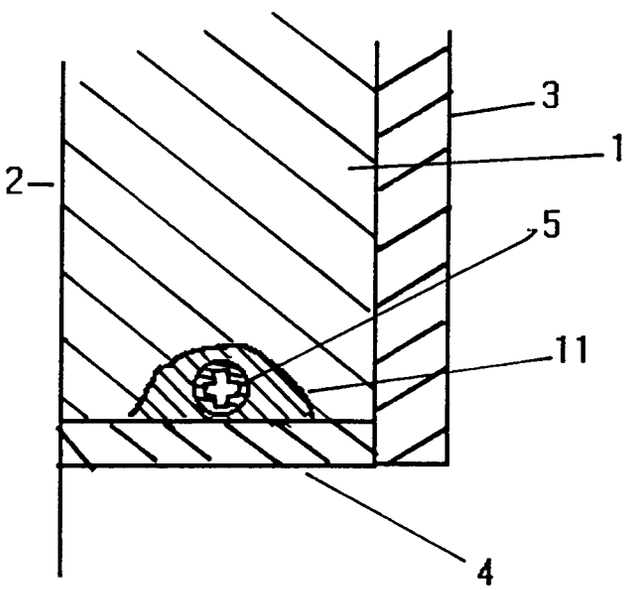

FIG. 4