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Johnson

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[45] **Jan. 1, 1974**

[54] **JOINT FORMING AND SEALING DEVICE**

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[21] Appl. No.: **229,828**

Related U.S. Application Data

[63] Continuation-in-part of Ser. No. 35,315, May 7, 1970.

[52] **U.S. Cl.** **404/48,** 404/64

[51] **Int. Cl.** **E01c 11/04**

[58] **Field of Search** 404/48, 47, 64, 68, 404/69, 65, 66, 50, 51, 49

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[57] **ABSTRACT**

A joint forming and sealing device is provided comprising essentially three parts, a flexible seal member including an expandable loop and end portions, a top cap having a portion engageable with the expandable loop and a slot forming carrying means engaged with the end portions of the flexible seal member. The device is adapted to be inserted into the upper surface of freshly poured concrete with the slot forming carrying means forming a slot and transporting the seal member and top cap into position with the upper surface of the top cap flush with the upper surface of the concrete and with the seal member substantially below the surface. Particles of aggregate are adhered to the end portions of the flexible seal member and grip the concrete as the concrete contracts to form the joint. The top cap may be removed at any time after the concrete has cured leaving the flexible seal in position beneath the concrete surface.

8 Claims, 6 Drawing Figures

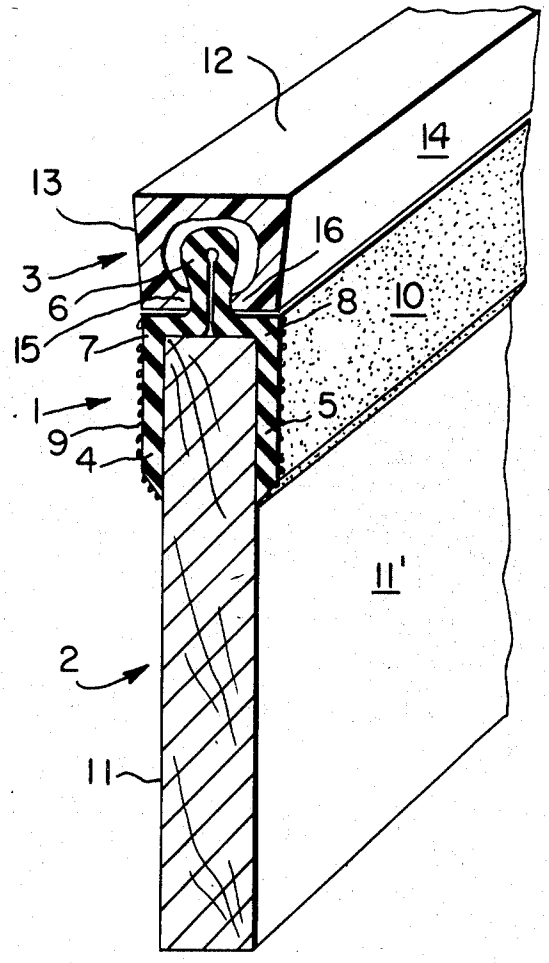


FIG. 2

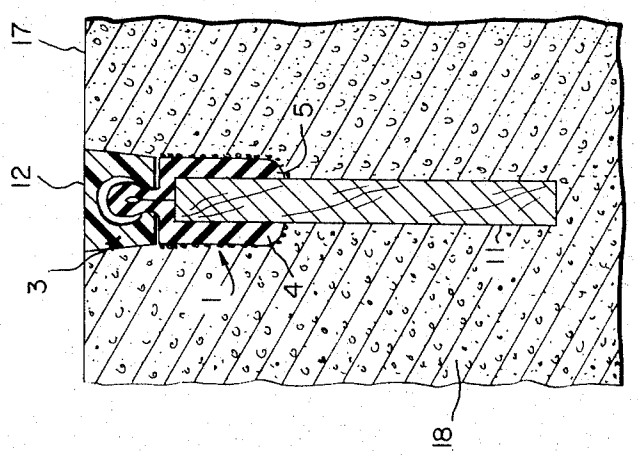


FIG. 1

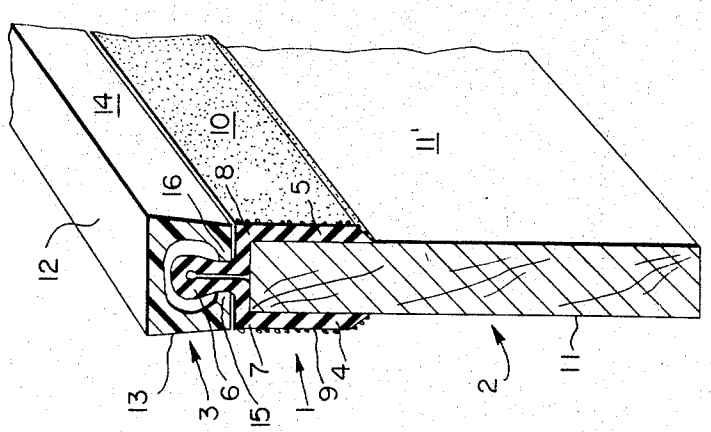


FIG. 5

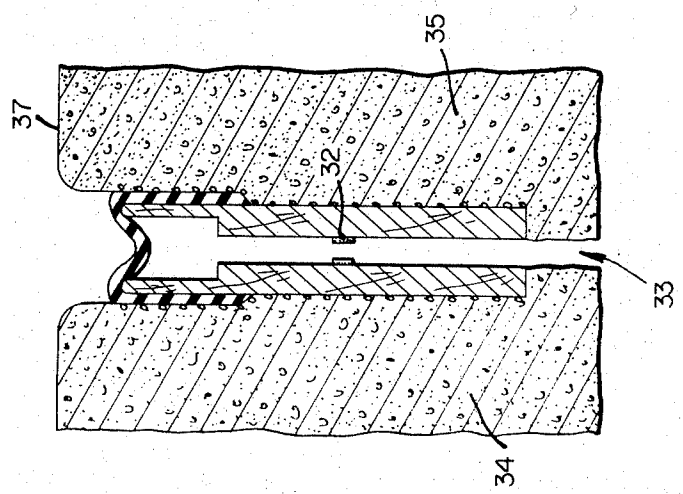


FIG. 4

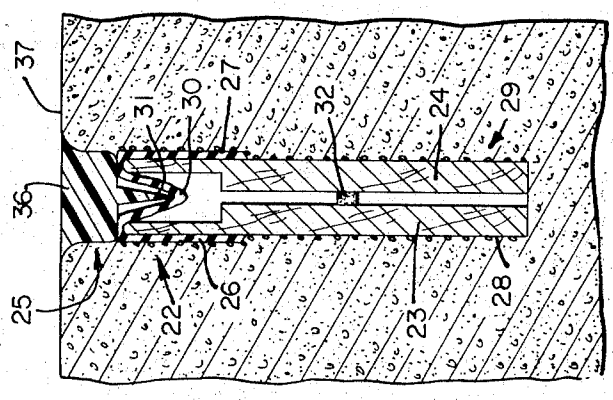
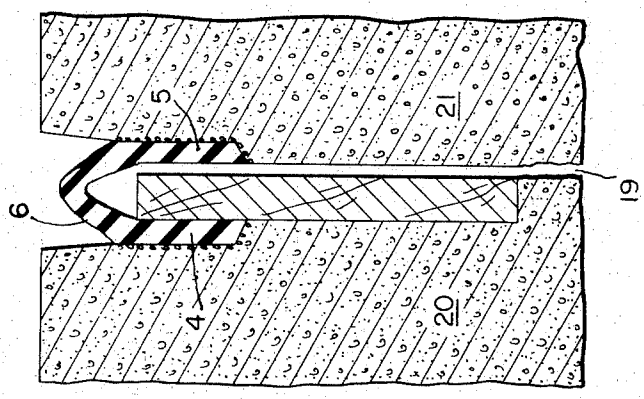


FIG. 3



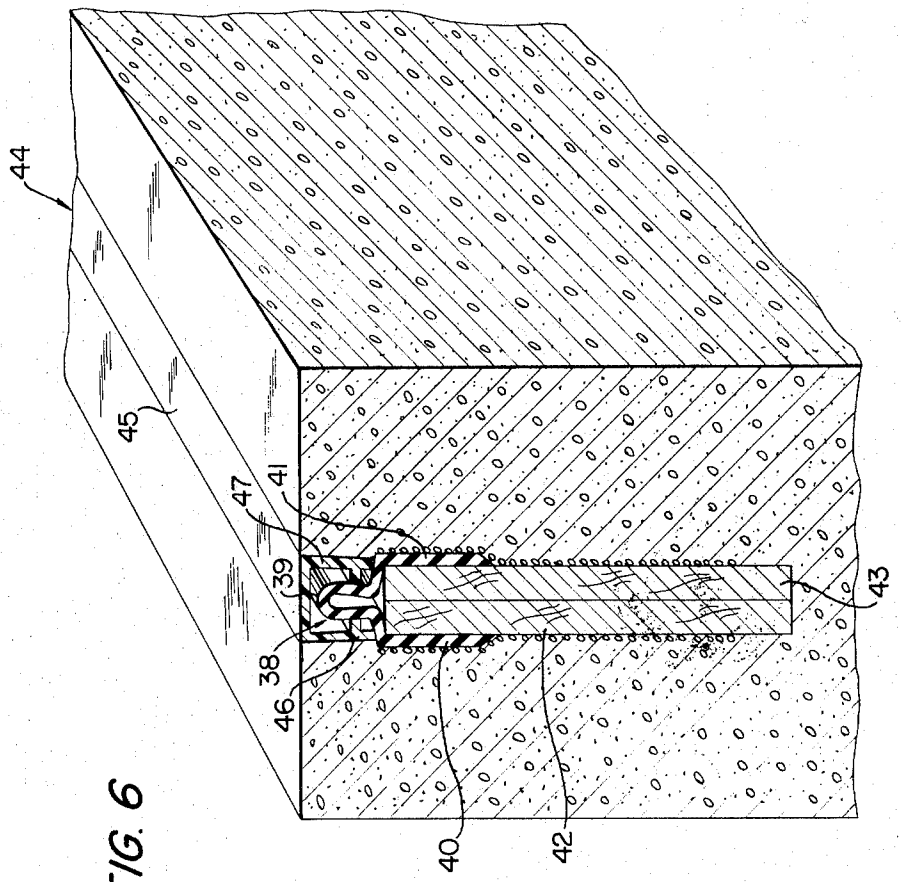


FIG. 6

JOINT FORMING AND SEALING DEVICE

RELATED APPLICATIONS

The present application is a continuation-in-part of U.S. application Ser. No. 35,315 filed May 7, 1970, Robert J. Johnson, applicant.

BACKGROUND OF THE INVENTION

The present invention relates to a device for forming and sealing a joint in a settable composition. The invention particularly relates to forming and sealing such joints in concrete surfaces, particularly substantially horizontal concrete surfaces such as roadways, airfields, parking lots, floors, and the like.

Devices for forming sealing joints in concrete are known, for example, the device shown in U.S. Pat. No. 3,276,335. However, such prior art devices suffer from several disadvantages. In particular the devices are generally complex, requiring restraining means to hold a resilient sealing member under compression prior to use, and requiring the use of hooks, projections, and the like to engage the concrete and overcome the restraining means, which hooks and projections provide edges from which undesirable secondary concrete cracking can occur. Furthermore, the resilient seal members are located at the concrete surface and subjected to wear, and to the action of traffic which tends to separate the seal members from the concrete. It is an object of the present invention to form an improved joint-forming and sealing device, free from the disadvantages mentioned above.

BRIEF SUMMARY OF THE PRESENT INVENTION

The foregoing and other objects which will become apparent to those having ordinary skill in the art are achieved by providing a joint forming and sealing device comprising an elongate seal member comprising first and second side portions and a flexible portion interconnecting said side portions extending between said side portions, each of said side portions comprising an outer surface provided with a bondable material which bonds the side portions to the settable composition with which each comes in contact when the device is imbedded therein, a slot forming carrying means engageable with said seal member and extending downwardly from said seal member, and an elongate removable cap member releasably attached to said seal member on the upper side of said seal member and including an upper surface alignable with a surface of said settable composition, said alignable surface being spaced from the uppermost portion of said seal member a distance sufficient such that the seal member is located beneath said surface of said settable composition when said rigid member is imbedded in said settable composition and said alignable surface is in alignment with said surface of said settable composition. In use, the device is inserted into a settable composition to induce a crack upon the setting thereof. The device is inserted and the alignable surface of the cap member is aligned with the composition surface to locate the seal member of the device entirely beneath the composition surface. The cap member is subsequently removed leaving the implanted seal member to seal the induced crack beneath the surface of the composition.

The top cap performs the function of insuring that the flexible seal member is disposed at the proper location beneath the surface of the concrete. Additionally

the top cap fills the void space between the flexible seal member and the upper surface of the concrete so as to provide a form or mold for proper formation of the concrete surfaces adjacent thereto and to prevent ingress of foreign material during the curing process. The engagement between the top cap and the flexible seal is such that the expandable loop of the flexible seal can open as the concrete contracts and the top cap can be removed at any time after the curing of the concrete is completed.

In one embodiment of the present invention the top cap is made of a semi-rigid material and is extruded in a channel shape with the legs of the channel biased towards each other. Thus, when the top cap is used with a flexible seal and carrying means comprising a pair of rigid members, the biased legs of the channel shaped top member fit over the expandable loop of the flexible seal, tending to retain the loop in an unexpanded condition and to retain the pair of rigid members together to permit the unit to be inserted in concrete without separation of the rigid members or expansion of the loop. However, when the device is in the concrete and the seal bonds to the concrete, the loop will slip out from engagement with the top cap as the concrete contracts.

DETAILED DESCRIPTION

There follows a detailed description of preferred embodiments of the present invention, together with accompanying drawings. However, it is to be understood that the detailed description and the accompanying drawings are provided solely for the purpose of illustrating preferred embodiments, and that the invention is capable of numerous modifications and variations apparent to those skilled in the art without departing from the spirit and scope of the invention.

FIG. 1 is a perspective view of a joint forming and sealing device according tthe invention;

FIG. 2 is a cross sectional view of the device of FIG. 1 shown imbedded in fresh concrete;

FIG. 3 is a cross sectional view of the device of FIG. 2 shown after the concrete has contracted;

FIG. 4 is a cross sectional view of an alternative joint forming and sealing device according to the invention shown imbedded in fresh concrete;

FIG. 5 is a cross sectional view of the device of FIG. 4 shown after the concrete has contracted and

FIG. 6 is a cross sectional view of still another joint forming and saling device according the invention.

With reference to FIG. 1, a joint forming and sealing device according to the present invention comprises an elongate seal member 1, a slot forming and carrying means comprising an elongate rigid member 2, and an elongate removable cap member 3. The device is generally elongate and extended in the form of a slat so as to extend across a slab of concrete and each of the members making up the device is extended longitudinally several orders of magnitude more than the height or thickness of the device. The term "elongate" is utilized herein to describe this characteristic of the device and of each of the members making up the device according to the present invention.

The seal member shown in FIG. 1 is generally inverted U shaped in section as shown in FIGS. 1–3 and comprises a first downwardly extending side leg portion 4, a second downwardly extending side leg potion 5, and a flexible central loop portion 6 interconnecting

the side portions. The flexible portion 6 extends between the upper end 7 of the side portion 4 and the upper end 8 of side portion 5. The expressions "upper," "downwardly" and the like are used herein in the sense of the drawings and in the sense of normal use of the device in substantially horizontal surfaces, the rigid member 2 being lowermost and the cap member 3 being uppermost.

The flexible portion of a seal member 1 includes at least one loop of resilient material, and in the embodiment of FIG. 1, a single loop is provided. This loop permits expansion and contraction of the seal member and of the joint-forming device in a manner to be described in more detail hereinafter. Side leg portion 4 of seal member 1 presents a generally planar outer surface 9 and side leg portion 5 presents a generally planar outer surface 10. Each of these outer surfaces is provided, according to the present invention, with a bondable material which bonds each leg portion to the settable composition with which it comes in contact when the device is imbedded therein. The device shown in FIG. 1, which is useful in concrete compositions, is provided with a layer of sand as shown. The sand is bonded to the resilient member in any convenient manner. For example, sand may be partially imbedded into the material making up the side portion of the seal member or may be adhered thereto by a conventional adhesive such as a Neoprene, urethane or epoxy resin adhesive. When the device is imbedded in fresh concrete, the sand is tenaciously adhered to by the setting concrete and, in fact, becomes an intimate portion of the concrete. Thus, the side portions of the seal member are firmly and tenaciously adhered to the composition in which the device is imbedded.

The device of FIG. 1 includes a single relative outward member 2 attached to the seal member 1 and extending downwardly between downwardly extending side leg portions 4 and 5 of seal member 1. The rigid member is rectangular in cross section and has generally planar outer surfaces 11, 11' adjacent planar surfaces 9, 10, respectively, of seal member 1. The rigid member is attached to the seal member in a manner which holds the members such that the leg portions are retained in the position shown in FIG. 1 prior to and during insertion of the deviqe in the settable composition. However, the manner of attachment also permits related outward movement of at least one of the side portions to permit flexing of flexible portion 6. Thus, seal member 1 can be temporarily attached to rigid member 2 by frictional engagement or weak adhesives such as a fine line of hot melt adhesive as, for example, USM "Thermogrip." Where the side portions of the seal member are themselves flexible and tend to be disengaged from the rigid member on insertion of the device into the settable composition, it is preferred to adhere both of the side portions to the rigid member. In that event, at least one side portion is adhered by means of a temporary adhesive which parts when the side portions move outward as will be described hereinafter. In the embodiment shown, the downwardly extending leg side portions are flexible and, upon insertion of the device into the concrete, would tend to separate from the rigid member. Therefore, each side leg portion is secured to the rigid member 2 by means of a temporary, weak, adhesive between the inner surface of each leg portion 4 and 5 and the adjacent outer surfaces of the rigid member 2.

The upper portion of the device is provided with an elongate removeable cap member 3 which extends generally across the device from one side portion to the other adjacent the flexible portion of the seal member and the cap member includes upper surface 12, which is alignable with a surface of the settable composition. The side walls 13, 14 of the cap member are preferably smooth and the lower ends thereof are preferably in alignment with outer surfaces 9 and 10 of the side portions 4 and 5 of seal member 1. The side walls 13, 14 are shaped to form a suitable shape for the channel or slot formed in the settable composition above the sealing member. The upper surface 12 is spaced from the uppermost part of the seal member a distance sufficient such that the seal member is located entirely beneath the surface of the settable composition when the upper surface 12 is aligned with the surface of the settable composition. In its simplest form, upper surface 12 is generally horizontal. However, it will be understood that the surface could be non-planar. For example, the surface could be dish-shaped, terminating in side edges alignable with the surface of the settable composition. However, it is preferred that the cap member be free of any material projecting above the upper surface which could interfere with a concrete finishing operation.

The releasable cap member shown in FIG. 1 is releasably secured to the device by means of inward projections 15 and 16 which grip loop 6 of resilient material of seal member 1. In order to provide a tight grip on loop 6, projections 15 and 16 may include temporary adhesive means to temporarily hold the cap member on top of seal member 1 as shown in FIG. 1.

The use of the device is illustrated in FIGS. 2 and 3. The device is inserted into the surface 17 of a settable composition such as concrete 18. The device is inserted generally perpendicularly to surface 17 with slot forming and carrying means 2 inserted first. Member 2 forms the slot to receive the seal and transports and seal and top cap to the position shown in FIG. 2 The device is inserted until seal member 1 is located a suitable distance beneath surface 17 of the concrete. It is preferred that all portions of the seal member are located at least 1/16 inch below the surface 17. This is readily accomplished by aligning surface 12 of cap member 3 with the upper surface 17 of the concrete. By aligning the surfaces in this matter, and by designing cap member 3 such that surface 12 defines a plane spaced at least 1/16 inch from the uppermost portions of seal member 1, it is assured that the seal member will be properly located a predetermined distance below the surface 17 of the concrete. Thus, when removable cap member 3 is subsequently removed, the seal member of the joint forming device will be located below the concrete surface. The seal member will thus not be subjected to traffic wear, or traffic forces tending to separate the seal from the concrete. Furthermore, the seal will not be affected by the normal spalling of the top edges of the concrete joint with time.

As the concrete sets, the concrete forms a tenaciously adherent bond to the bondable material provided on the side portions of the seal member. The cap member may be removed at any time after the concrete has cured leaving the device at the depth shown in FIG. 3. Due to the presence of the joint forming and sealing device in the concrete a crack 19 as shown in FIG. 3 is induced to form in the concrete beneath the joint

forming and sealing device. As the concrete cures, it shrinks, thus moving the newly-formed concrete pieces **20** and **21** apart. Due to the tenacious bond between the planar bondable surfaces of the seal member and the concrete according to the present invention, the side portion **4** is tenaciously adhered to concrete portion **20** and moves therewith. Similarly, side portion **5** is tenaciously secured to concrete piece **21** and moves therewith. The bond strength between the planar surfaces of the seal member and the concrete is far greater than the temporary weak bonding strength between the seal member and the rigid member **2.** Accordingly, the side portions **4** and **5** are free to move apart to an extent permitted by the flexible portion **6** of member **1** interconnecting side portions **4** and **5.** Flexibility of portion **6** can be achieved by any conventional means such as by the use of a resilient material, a hinged construction, and the like. Conveniently, the seal member is made flexible by forming portion **6** as a loop of resilient material. The loop can, of course, be of any suitable size to permit expansion to any predetermined necessary amount. Seal member **1** is bonded to the concrete and thus the device forms an effective seal between the adjacent concrete pieces **20** and **21.** Since the device is located well below the surface **17** of the concrete by the cap which had been placed flush with the surface, the seal member **1** is subjected to minimum wear and the resulting riding surface is free of bumps.

An alternative device according to the present invention is shown in FIGS. **4** and **5.** This device comprises a seal member **22** attached to the slot forming and carrying means comprising two rigid members **23** and **24,** and topped by a removeable cap member **25.** Rigid member **23** is secured by means of an adhesive to the inner surface of side portion **26** of seal member **22,** and extends downwardly therefrom. Rigid member **23** presents a generally planar outer surface **28** which is provided with bondable material, such as sand, which secures the rigid member to the settable composition with which it comes in contact when the device is imbedded therein. Second rigid member **24** is similarly secured to the inner surface of side portion **27** of seal member **22,** and also extends downwardly therefrom. Second rigid member **24** has a generally planar outer surface **29** which is also provided with bondable material which secures the rigid member to the settable composition with which it comes in contact when the device is imbedded therein. In the embodiment shown in FIGS. **4** and **5,** the outer surfaces **28** and **29** of the rigid members are provided with bondable material which may be conveniently the same as that utilized on the surfaces **26** and **27** of the seal member, and may be adhered thereto in the same manner described above in connection with FIGS. **1–3.** For example, the bondable material may be sand conveniently adhered to the outer surfaces of the rigid members and the side leg portions of the seal member by means of an adhesive such as a Neoprene, urethane or epoxy resin adhesive. The seal member **22** includes a flexible loop portion **30** of resilient material as in the device of FIGS. **1–3.** However, in this embodiment, the loop is oriented downwards in the sense of FIG. **4** and releasable cap member **25** includes a projection **31** which fits into downward loop **30** of seal member **22.** In order to provide a tight grip on projection **31** of top cap **25,** rigid members **23** and **24** are temporarily held together in the position shown in FIG. **4** by temporary adhesive means such as spot bonds **32.** These spot bonds may be formed by a hot melt adhesive such as USM "Thermogrip." In this embodiment, the releasable cap member **25** is also widened in its uppermost portion, to form beveled corners on the resulting top edges of the settable composition for added strength. When the concrete cures, a crack **33** as shown in FIG. **5** forms adjacent the lower end of the joint forming and sealing device and the two newly formed pieces of concrete **34, 35** separate as shown in FIG. **5.** Due to the bonding action of the bondable material, side portions **26** and **27** of the seal member and outer surfaces **28** and **29** of the rigid members are secured, respectively, to concrete pieces **34** and **35** and move therewith releasing the temporary spot bonds **32.** Accordingly, the flexible portion of the resilient member automatically forms a seal between the concrete pieces.

As in the embodiment shown in FIGS. **1–3,** the cap element **25** of the embodiment shown in FIGS. **4** and **5** includes a plane such as defined by upper surface **36,** which is alignable with the upper surface **37** of the concrete to ensure that the seal member **22** is located below concrete surface **37.** Thus, cap **25** includes a portion extending a distance above the uppermost portion of thq seal member **22.**

In FIG. **6** there is shown a further embodiment of the present invention. A seal member **38** is provided with a central expandable loop **39** and a pair of depending leg or end portions **40** and **41.** A slot forming and carrying means in the form of a pair of rigid members **42** and **43** is provided, the outer surface of member **42** being adhesively secured to the inner face of end portion **40** of the seal member and the outer surface of rigid member **43** being adhesively secured to the inner face of end portion **41** of the seal member.

The top cap **44** has a top surface **45** and depending legs **46** and **47.** The top cap is formed of a semi rigid material and is extruded with the legs **46** and **47** extending inwardly towards each other so that when the legs are in the position shown in FIG. **6** the legs are biased towards each other, tending to retain the loop **39** in is unexpanded position and to retain the rigid members **42** and **43** together.

The seal member **38** is formed of a resilient material and is extruded with the free ends of the legs **40** and **41** in engagement with each other so that when the rigid members are inserted between the legs and secured in position, the legs **40** and **41** are biased towards each other and therefore tend to retain the rigid members **42** and **43** together.

The outer surfaces of the depending leg or end portions **40** and **41** of the seal member have aggregate such as sand bonded thereto so that when the device is inserted into concrete the end portions of the flexible seal will cling tenaciously to the adjacent concrete. The inwardly biased legs **46** and **47** of the top cap retain the rigid members **42** and **42** together while the joint forming device is being inserted into the concrete. As the concrete contracts the expandable loop will slop out from within the legs **46** and **47** of the top cap so that the top cap may be removed at a later time.

It is preferred that the seal member is located below a concrete surface to protect it against damage from traffic. Accordingly, the distance from the top surface **45** of the top cap to the top of the expandable loop **39** is approxiamately 1/16 inch, and to the top edge of the end portion **40** and **41** is approximately 3/8 inch. For

most roadway and similar applications, it is preferred that the bonded portion of the seal member be located at least an 3/8 of an inch below the concrete surface. The maximum depth of the seal emmber can vary widely but is preferably not more than about 1/2 inch.

The seal member according to the present invention is conveniently fabricated from an impervious material such as rubber or plastic. Neoprene rubber is preferred since this has outstanding resistance to weathering, and oil and other materials likely to be present on pavement surfaces.

The nature of the bondable material utilized to secure the side portions of the seal member to the settable composition can vary widely. It is preferred to utilize a material which becomes an intimate part of the settable composition. For example, where the settable composition comprises concrete, sand may be used as the bondable material since the sane forms a portion of the concrete and becomes intiamately associated therewith.

As mentioned above, the seal member may include one or more loops of the resilient material. By providing a plurality of loops, it is, of course, possible to provide a greater degree of expansion for a given loop size. Under ordinary circumstances, the joint-forming or sealing devices of the present invention are imbedded in fresh concrete to form longitudinal hinge joints, the transverse contraction joints spaced generally less than 40 feet apart. However, for some special applications, the transverse contraction joints are spaced apart at greater distances and it is preferred to employ a plurality of loops to provide for a greater degree of expansion and contraction where the devices are to be spaced at these greater distances.

The rigid member extending below the seal member in the settable composition is secured to side portions of the seal member by any convenient means. For example, the rigid member can be adhesively bonded to the seal member as shown in the drawings. Alternatively, an upper portion of the rigid member could be imbedded into a side portion of the seal member. In that event, the rigid member could be secured thereto by means of an adhesive or the rigid member could simply be inserted into a recess in the seal member or the seal member could be formed about the upper portion of the rigid member such as by molding or the like.

As shown in FIGS. **1–3,** only the outer surfaces of the side portions of the seal member are provided with bondable material. However, the embodiment shown in FIGS. **4–5** has bondable material on the outer surfaces of the two rigid members as well as on the side portions of the seal member. Where the device includes means such as spot bonds **32** to hold the two rigid members in close proximity, the outer surfaces of the rigid members may be provided with the bondable material in order to facilitate rupture of the temporary spot bonds.

The rigid members are conveniently fabricated from any suitable material such as wood, fiberboard, metal, plastic, or the like, and a hard fiberboard is a preferred material. The members are sufficiently rigid to be inserted into the settable composition without substantial deformation. In normaluse, a slot is formed in the wet concrete and the device is inserted therein. Accordingly, the members are sufficiently rigid to resist substantial deformation at least when the device is used in this matter. The device, including the rigid member, induces a crack in the setting composition by establishing a plane of weakness in the concrete. In order to induce the crack, the device must be inserted generally vertically into the composition and the rigid member is sufficiently rigid to resist substantial deformation when the device is so utilized.

The flexible portion of the seal member of the device according to the present invention may comprise a resilient material which may be provided under compression or free from compiession. However, a seal member which is free from compression has been found to provide an excellent seal in the device according to the present invention. This greatly simplifies the construction of the device in that restraining means to hold the seal under compression are not required. The device is further simplified in construction in that the outer surfaces of both the side portions of the seal member and the rigid member or members may be planar and free from projections, hooks, or other cement-engaging devices which are usually employed to assist in overcoming the restraining means and which complicate the structure.

The device is operable with a wide variety of settable compositions which shrink upon curing. When the composition, such as concrete, cures, it shrinks, causing cracks to be induced therein. The present devices are set at predetermined distances in the concrete to induce cracks at the joint-forming and sealing device. The distances will vary depending upon the particular settable composition and such distances are known per se.

The removeable cap member according to the present invention can be releasably secured to the seal member in any convenient manner. The cap member is conveniently a plastic material such as polyvinyl chloride or polyethylene, which is readily gripped by a loop of resilient material formed in the seal member but which is easily removed therefrom.

The cap member includes a top surface which is alignable with the concrete surface. By providing the cap with a portion extending above the uppermost portions of the seal member, and by providing the cap member with an upper surface alignable with the concrete surface to indicate proper location of the seal member, it is possible to precisely locate the joint-forming and sealing device beneath the concrete surface in a simple matter.

What is claimed is:

1. A joint forming and sealing device adapted to be imbedded in the top surface of freshly poured concrete to induce the formation and automatic sealing of a joint on setting thereof comprising, in combination, a flexible seal member having an expandable central loop and a pair of substantially vertically extending depending end portions, a top cap having means thereon in engagement with the central loop of said seal member, and slot forming carrying means in engagement with the depending end portions of said seal member, particles of aggregate bondable with concrete adhered to the outer faces of said depending end portions of said seal member whereby when said joint forming device is inserted in freshly poured concrete, said slot forming carrying means forms a slot in the concrete and transports said seal member and said top cap to a position wherein the upper face of said top cap is substantially level with the upper surface of the concrete and with the flexible seal member disposed substantially below the upper surface of the concrete, and the particles of

aggregate bond the end portions of said seal member with the concrete, said means on said top cap engageable with the expandable central loop on the seal member permitting the expandable loop to expand as the concrete shrinks and the removeable cap may be later removed from the joint leaving the seal member disposed beneath the upper surface of the concrete preventing entry of foreign matter into the joint beneath the seal member and with the expandable central loop disposed beneath the upper surface of the concrete so as to be free from wear due to traffic on the concrete surface.

2. A joint forming and sealing device according to claim **1** wherein said expandable central loop extends upwardly and said means on the removable top cap includes a channel having walls engageable with said loop.

3. A joint forming and sealing device according to claim **1** wherein said slot forming carrying means comprises a rigid member disposed between said depending end portions of said seal member.

4. A joint forming and sealing device according to claim **1** wherein said slot forming carrying means comprises a pair of rigid members disposed between said depending end portions of said seal member, one of said rigid members being secured to one of the depending end portions of the seal member and the other of said rigid members being secured to the other depending end portion of the seal member.

5. A joint forming and sealing device adapted to be imbedded in the top surface of freshly poured concrete to induce the formation and automatic sealing of a joint on setting thereof comprising, a flexible seal member, a pair of rigid members, one substantially vertically extending end portion of said flexible seal member being secured to the side face of one of said rigid members, the other substantially vertically extending end portion of said flexible seal member being secured to the side face of the other of said rigid members, that portion of said flexible seal between said end portions forming an expandable loop and extending continuously along the length of said members, particles of aggregate bondable with concrete adhered to the outer side face of said rigid member and on the outer end portions of said flexible seal member, and a removable cap member disposed on the upper surface of said flexible seal member. and including inwardly biased legs engageable with said expandable loop to assist in retaining said loop in an unexpanded position and said rigid members together while said joint forming device is being inserted into concrete whereby said device is adapted to be inserted in freshly poured concrete with the upper surface of said removable cap member substantially level with the upper surface of the concrete and with the expandable loop disposed substantially below theupper surface of the concrete, and the particles of aggregate tenaciously bonding the vertically extending end portions of said flexible seal member to the concrete so that when the concrete shrinks said rigid members move with the concrete and said inwardly biased legs on said removable cap engageable with the expandable loop permit the expandable loop to expand and the removable cap may be later removed from the joint leaving said seal member disposed beneath the upper surface of the concrete and together with said rigid members bonded to the concrete preventing the entry of foreign matter into the joint beneath the seal member.

6. A joint forming and sealing device adapted to be imbedded in the top surface of freshly poured concrete to induce the formation and automatic sealing of a joint on setting thereof comprising, a flexible seal member, a pair of rigid members, temporary bonding means between the inner faces of said rigid members, one substantially vertically extending end portion of said flexible seal member being secured to the side face of one of said rigid members, the other substantially vertically extending end portion of said flexible seal member being secured to the side face of the other of said rigid members, that portion of said flexible seal between said end portions forming an expandable loop and extending continuously along the length of said members, particles of aggregate bondable with concrete adhered to the outer side faces of said rigid members and on the outer end portion of said flexible seal member, and a removable cap member disposed on the upper surface of said flexible seal member and including emans engageable with said expandable loop whereby said device is adapted to be inserted in freshly poured concrete with the upper surface of said removable cap member substantially level with the upper surface of the concrete and with the expandable loop disposed substantially below the upper surface of the concrete, and the particles of aggregate tenaciously bonding the side faces of said rigid members and the vertically extending end portions of said flexible seal member to the concrete so that when the concrete shrinks said temporary bonding means ruptures and said rigid members move with the concrete and said means on said removable cap engageable with the expandable loop permits the expandable loop to expand and the removable cap may be later removed from the joint leaving said seal member disposed beneath the upper surface of the concrete and together with said rigid members bonded to the concrete, preventing the entry of foreign matter into the joint beneath the seal member.

7. A joint forming device according to claim **6** wherein said expandable loop extends upwardly and said means on the vertically removable cap member includes a channel having walls engageable with said loop.

8. A joint forming device according to claim **6** wherein said expandable loop extends downwardly and said means on the removable cap member includes a projection engageable with said loop.

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