United States Patent [19]

Koch

[11] **3,838,930**

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

[54] **TWO-PIECE JOINT-FORMING DEVICE FOR HARDENABLE, AREA-COVERING STRUCTURAL MATERIAL**

[76] Inventor: **Vergil W. Koch,** 105 Hobart Ave., San Mateo, Calif. 94402

[22] Filed: **Nov. 8, 1972**

[21] Appl. No.: **304,664**

Related U.S. Application Data

[63] Continuation-in-part of Ser. No. 202,261, Nov. 26, 1971, abandoned.

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

[51] **Int. Cl.** **E01c 11/02**

[58] **Field of Search** 404/48, 47, 65, 66, 68, 404/74, 72; 52/396; 49/475, 488, 498

[56] **References Cited**

UNITED STATES PATENTS

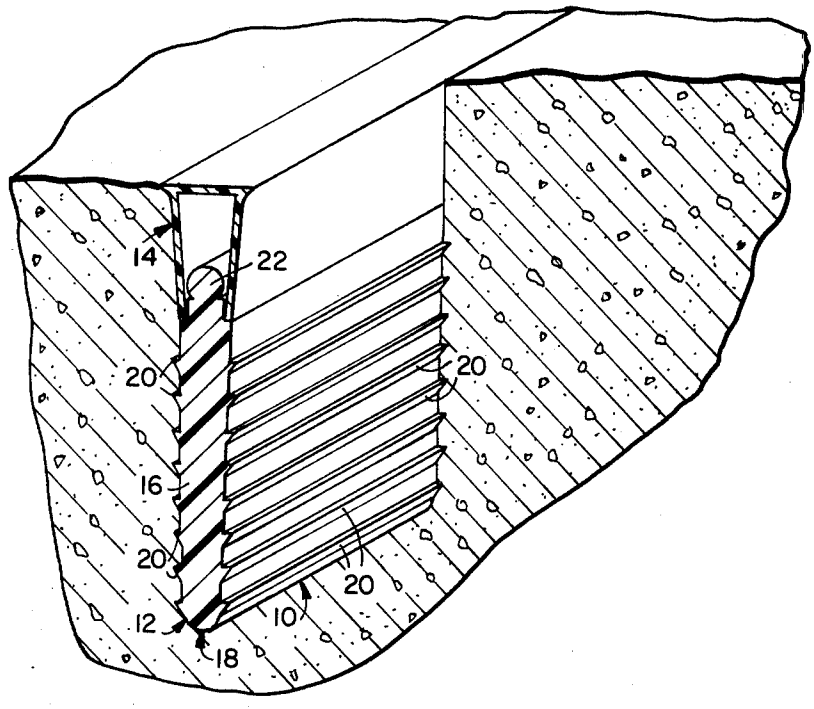
1,730,067	10/1929	Fischer	404/47
2,042,524	6/1936	Hall	404/48
2,540,251	2/1951	Fischer	404/47
2,949,828	8/1960	Carnes	404/74
3,323,426	6/1967	Hahn	404/48
3,330,187	7/1967	Kohler	404/65
3,411,260	11/1968	Dill	404/48 X
3,782,846	1/1974	Johnson	404/48

Primary Examiner—Nile C. Byers, Jr.
Attorney, Agent, or Firm—Owen, Wickersham & Erickson

[57] **ABSTRACT**

An elongated device for forming surface joints in hardenable area-covering structural material such as freshly poured concrete comprising a bottom section and a top section that are temporarily coupled together when the device is forced into the initially soft material. The top section couples to the bottom section in such a manner as to transmit sufficient downward force on the bottom section to install it in the soft material. The bottom section has means for retaining itself within the material after it has cured or hardened so that the top section can be uncoupled and stripped from the bottom section.

6 Claims, 4 Drawing Figures



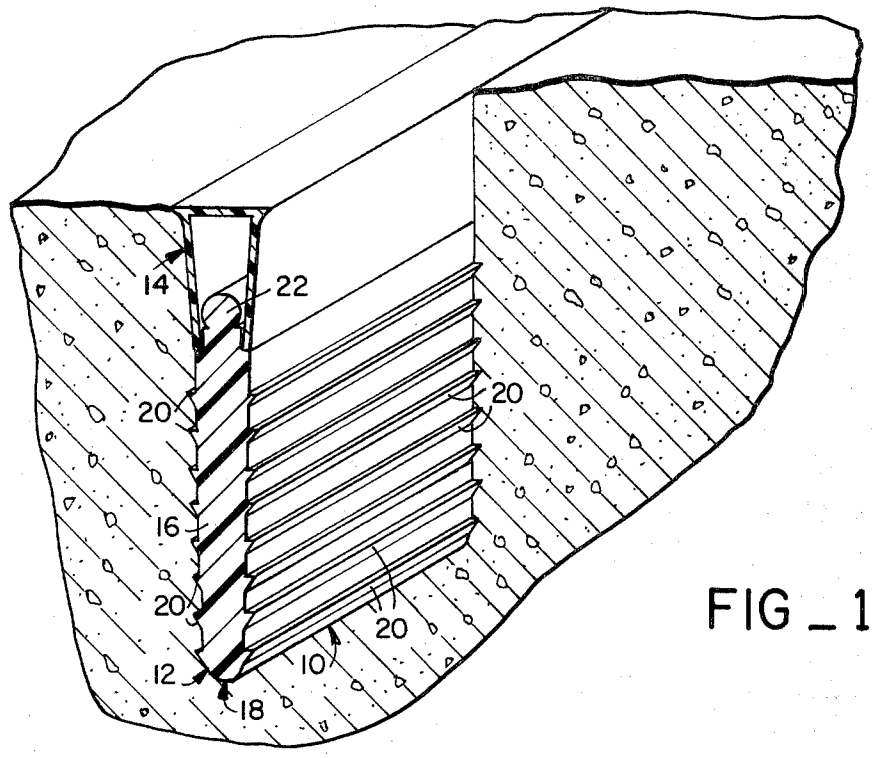


FIG _ 1

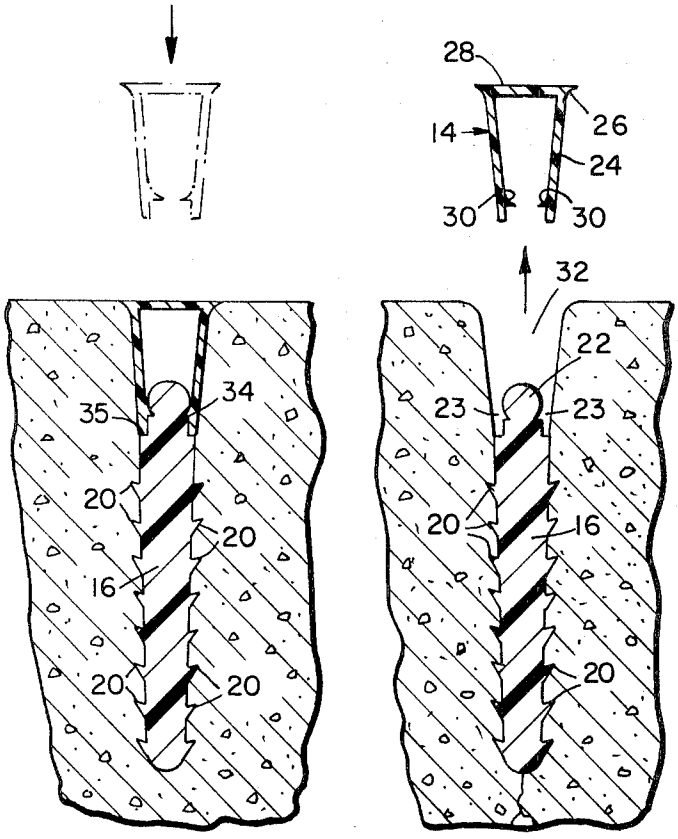


FIG _ 2

FIG _ 3

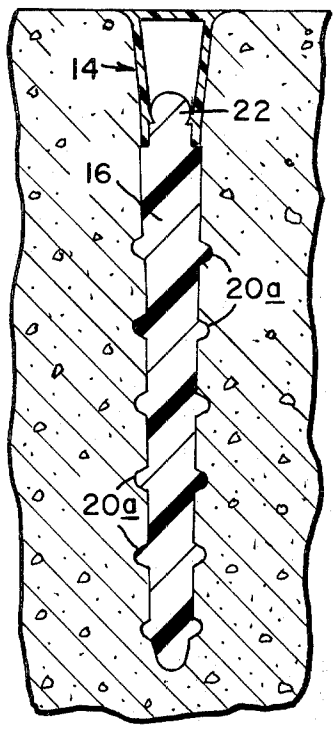


FIG _ 4

TWO-PIECE JOINT-FORMING DEVICE FOR HARDENABLE, AREA-COVERING STRUCTURAL MATERIAL

BACKGROUND OF THE INVENTION

This application is a continuation-in-part application of Ser. No. 202,261, filed on Nov. 26, 1971 now abandoned.

This invention relates to the formation of expansion joints in a settable, surface covering composition such as concrete as commonly used in the construction airport runways and taxiways, roadways, building floors and masonry or terrazzo decks such as plazas, walkways and patios. More particularly, it relates to a two-piece joint forming device that can be inserted into a settable composition in its plastic stage such as freshly poured concrete, so that one piece can be removed to form the completed joint with a surface groove after the concrete has set or cured.

Such joints in most settable compositions such as concrete are necessary in order to prevent surface cracks due to expansion or contraction of the composition during curing and later on due to environmental temperature variations. In the prior art it has been known to use a joint forming structure made of a plastic material formed as two portions connected by a severable web. Such a structure, as shown in U.S. Pat. No. 3,330,187 was inserted in freshly poured concrete mix and when the concrete had hardened an upper portion was severed from the lower portion buried in the concrete, thereby forming a surface groove. Although the aforesaid structure provided good results in many installations, as when used between masonry or terrazzo tiles, it was difficult to use with efficiency in the construction of large concrete slabs, such as roadways, aircraft runways and the like. The problem arose because this prior joint forming structure was too flexible and would bend or flex when forced vertically into freshly poured concrete. Thus, it became very difficult to maintain adequate straightness for the joint grooves without the use of additional equipment, time and labor. Also, in the aforesaid joint structure the top portion once severed from the bottom portion became a waste product and was not reuseable. This not only increased its relative cost but also created a waste disposal problem.

A general object of the present invention is to provide an improved joint forming structure for settable compositions that overcomes the problems and disadvantages of prior joint forming structures.

Another object of my invention is to provide a joint forming structure for settable compositions comprised of two coupled but separable parts, one of which may be made of a harder and less flexible material than the other.

Another object of my invention is to provide a two-piece joint forming structure for settable compositions comprised of mechanically coupled but easily separable top and bottom parts wherein the top part couples to the bottom part so as to enable a relatively large downward force to be applied to it without any slippage and thereby enabling the structure to be buried rapidly and in a uniform manner in the composition.

Another object of my invention is to provide a joint forming structure for settable compositions that is comprised of mechanically coupled but easily separable top and bottom parts wherein the top part is reuseable after being removed from a bottom part buried in the cured or hardened composition.

Still another object of my invention is to provide a joint forming structure for settable compositions which can be easily installed to form straightline joints without the need for extra equipment or installation procedures.

Yet another object of my invention is to provide a joint forming structure for settable compositions which will form a clean, uniform groove with predetermined dimensions in the surface of the hardened composition when the upper part has been removed therefrom.

SUMMARY OF THE INVENTION

The aforesaid objects are accomplished by an elongated joint-forming structure comprising a bottom section of flexible plastic material having a vertically elongated cross section with horizontally extending serrations or fin-like portions on opposite sides and an upper coupling means. The latter, in one preferred form, is an integral bulbous portion that extends continuously along the top of the bottom section. A top section formed of a rigid plastic or metal has a generally inverted U-shape in cross section with downwardly extending leg portions that grip the bulb-like portion of the bottom section and transmit uniform downward pressure to it when the elongated structure is forced vertically into the soft, settable composition such as freshly poured concrete. When the composition has cured, the top section is held at one end and pulled from the bottom section which remains locked within the hardened composition by its side fins or serrations.

Other objects, advantages and features of the invention will become apparent from the following detailed description of one embodiment thereof which is presented with the accompanying drawings, in which:

FIG. **1** is a view in perspective showing a section of my two-piece joint-forming device as it appears when installed in a mass of concrete and before the top section has been removed;

FIG. **2** is a view in elevation and in section of my joint forming device shown just after it has been forced into freshly poured concrete with portions in phantom showing it before fully installed;

FIG. **3** is an exploded view in elevation and in section similar to FIG. **2** showing the concrete in its hardened state with the top section of the device removed; and

FIG. **4** is a view in section showing another embodiment of my joint forming device with a modified form of fins on the lower section.

With reference to the drawings, FIG. **1** shows a joint-forming structure **10** embodying the principles of the present invention as it appears when installed in a section of concrete such as may be used for a roadway, airport runway or other slab-type concrete structures. Generally, my joint former may be made in elongated sections of any convenient length having a constant cross section. Essentially, it is comprised of a lower section **12** and an upper section **14** which are normally coupled together after they are manufactured, but before the product is ready for use. The lower section as seen in cross section has a vertically elongated main body portion **16** with a width that preferably tapers downwardly a relatively small amount and has a curved

or more abruptly tapered bottom edge **18.** Vertically spaced apart and extending along both sides of this main body portion are a series of fin-like portions **20** that taper from a fairly thick root to a narrower outer edge. These fin-like portions tend to extend generally outwardly from the sides of the main body portion only a short distance (e.g. one-sixteenth to one-eighth inch), but far enough so that even before the concrete has set or hardened, they act like barbs or stops which prevent the lower member from "floating" outwardly. After hardening, these fins or fin-like portions **20** help to hold the joint former in place and they also coact with the concrete to reduce the leakage of water into the joint if the sealant should fail. Although the fins shown are fairly long and sharp in cross section, other forms of fin-like portions with a different or more blunt cross section could be utilized within the scope of the invention. For example, as shown in FIG. **4,** a series of horizontally extending bead-like portions **20***a* are provided which accomplish the same retaining function as the portions **20.**

Extending along the top of the lower section **12** is an integral bulbous projection **22** having generally a circular shape which forms a pair of small grooves **23** along its opposite sides. These latter grooves serve as a means for connecting the upper section **14** to the lower section **12** as will be seen. The integral projection **22** must be sufficiently soft and compressible so that it will compress to permit the removal of the upper section **14** after the concrete or other composition has set or hardened.

The lower section **12** including the main body portion **16,** the fins **20,** and the top projection **22** is preferably formed as an integral extrusion or molded product from a plastic material such as plasticized polyvinylchloride (PVC), rubber, or neoprene. Plasticized polyvinylchloride having a specific gravity of around 1.3, and a Shore A hardness of around 70 to 85, is a very suitable material since it can be formulated to be very durable. The specific gravity provides sufficient product weight to help prevent the joint former from "floating" out of the freshly poured concrete. This material is firm enough to withstand the weight of the freshly poured concrete, and is sufficiently compressible to respond to expansion of the hardened concrete without damage to the concrete at the joint.

Now, the upper section **14** of my joint-former **10,** as shown in the drawing has generally an inverted U-shape with spaced apart downwardly extending and convergent legs **24** that grip the projecting top portion **22** on the lower section **12.** This upper member is preferably made from a relatively hard and somewhat resilient plastic material such as rigid (unplasticized) polyvinylchloride (PVC). If desired, extruded aluminum or some other suitable metal can be used. Rigid PVC is a very suitable material since it is tough, smooth, and releases from the hardened concrete without the use of oils, greases, or other release agents which would later interfere with the adhesion of the caulking compound to the hardened concrete. The leg portions **24** curve outwardly at their upper ends to form fillets **26** on opposite sides and are interconnected by a flat transverse portion **28.** Extending downwardly from this transverse portion **28** these leg portions tend to converge toward each other although their resiliency will allow them to be easily spread apart. Near the lower ends of the leg portions **24** are a pair of inwardly extending ridge-like projections **30.** These latter projections are shaped so as to fit snugly within the grooves **23** formed by the bulbous projection **22.** The upper surface of projections **30** is beveled or curved to facilitate removal of the upper section **14** after the concrete has hardened, and the lower surface of the projections **30** is flat and rests on shoulders **34** of the lower section **12** so as to transmit at least part of the force of insertion in the concrete to the lower section **12.** The lower ends of the legs **24** of the upper section **14** rest on a pair of elongated shoulders **35** formed just below and on opposite sides of the projection **22** of the lower section **12.** These shoulders help to transmit even more of the force of insertion into the concrete from the upper section to the lower section. The aforesaid normal tendency of the leg portions **24** to extend toward each other therefore causes the ridgelike projections **30** to actually grip the bulbous projection **22.** The legs **24** of the upper section, when assembled with the lower section, are slightly closer together at their lower extremities so as to form a recess **32** in the concrete which is slightly more narrow at the bottom, thereby providing a "draft angle" that facilitates the removal of the upper section **12** from the hardened concrete.

As shown in FIG. **2,** when a section of my joint-former **10** is to be installed the upper and lower sections are coupled together and a vertical force is applied to press it into the freshly poured concrete or plastic composition. The upper section **14** is sufficiently strong and rigid so as to accept the downward force and transmit this force to the lower section.

FIG. **3** shows the joint-former **10** after it has been properly installed and the composition or concrete has cured and solidified. When this occurs, the upper cap section **14** is easily removed from the lower section **12** to leave a clean, well-formed groove **32** above it. This groove is now normally filled with a suitable sealant (not shown). The removed upper cap section is reuseable with another piece of lower section.

From the foregoing, it is seen that the present invention provides a substantially improved joint-former over similar products of the prior art. The increased rigidity which can be provided by the upper cap section **14** makes it possible to install my joint-former along straight lines without using special equipment or expensive, time consuming procedures. Yet, the lower section **12** can be more flexible and provide the compressibility required to accommodate expension factors. When coupled together the upper and lower sections are handled as a unitary structure and yet the removal of the upper member from this structure after its installation can be performed quickly without the need for special tools or labor. The groove **32** formed by the upper section is clean, straight and dimensionally precise and since it is reuseable, a substantial saving in material is provided.

To those skilled in the art to which this invention relates, many changes in construction and widely differing embodiments and applications of the invention will suggest themselves without departing from the spirit and scope of the invention. The disclosures and the description herein are purely illustrative and are not intended to be in any sense limiting.

I claim:

1. A two-piece elongated joint-forming structure for use with settable compositions used for slab-like installations comprising:

a lower section of relatively flexible material with a main body portion having a vertically elongated cross-section and a tapered or rounded lower edge, a plurality of spaced apart members projecting outwardly from opposite sides of said body portion and a coupling member extending along the top edge of said body portion;

an upper section comprising a cap member of generally harder material than said lower section, having a transverse top portion that is wider than the maximum cross-sectional width of said lower section and including leg portions extending downwardly from said top portion;

said leg portions and coupling member having interlocking means at fixed locations thereon for releasably retaining them in assembled relation;

and means on said lower section forming elongated bearing surfaces for the ends of said leg portions so as to transmit a driving force applied to said cap section to said lower section.

2. The joint forming structure as described in claim **1** wherein said coupling means further comprises an elongated bulbous projection having a substantially uniform cross-section and the interlocking means comprises a pair of grooves on one of said members and cooperating detent means on the other of said members.

3. The joint forming structure as described in claim **2** wherein said bulbous projection has a generally circular cross-section.

4. The joint-forming structure as described in claim **1** wherein said lower section is made from a rubber-like material having a Shore A hardness of around 70 to 85 and said upper cap member is made from relatively rigid material having a substantially greater hardness than said lower section.

5. The joint-forming structure as described in claim **1** wherein said coupling member on the upper end of said body portion has a generally circular cross-section forming grooves on its opposite sides and said leg portions of said upper section includes elongated projections that fit within said grooves.

6. The joint-forming structure as described in claim **1** wherein said means forming bearing surfaces comprise a pair of elongated shoulders near the upper end of said lower section that extend along opposite sides of and just below said coupling means, said leg portions of said cap member having lower edges that engage said bearing surfaces to thereby transmit a driving force applied to said cap section to said lower section.

* * * * *