# United States Patent [19]

**Beutler**

[11] **3,824,025**

[45] **July 16, 1974**


[54] **EXPANSION GAP SEALING DEVICE**


[75] Inventor: **Hans Beutler,** Munich, Germany

[73] Assignee: **Friedrich Maurer Soehne,** Frankfurter Ring, Germany



[22] Filed: **Apr. 19, 1972**

[21] Appl. No.: **245,506**

[52] **U.S. Cl.** ..... **404/48,** 404/68

[51] **Int. Cl.** ..... **E01c 11/12**

[58] **Field of Search** ..... 404/64, 65, 66, 67, 68, 404/69, 74, 87, 48



[56] **References Cited**

UNITED STATES PATENTS

| | | | |
|---|---|---|---|
| 2,042,408 | 5/1936 | Lawrence | 404/69 |
| 2,076,505 | 4/1937 | Schaffert | 404/69 |
| 3,324,775 | 6/1967 | Crone | 404/65 X |
| 3,411,260 | 11/1968 | Dill | 404/48 X |
| 3,722,379 | 3/1973 | Koester | 404/68 |
| R20,378 | 5/1937 | Hall et al. | 404/69 |



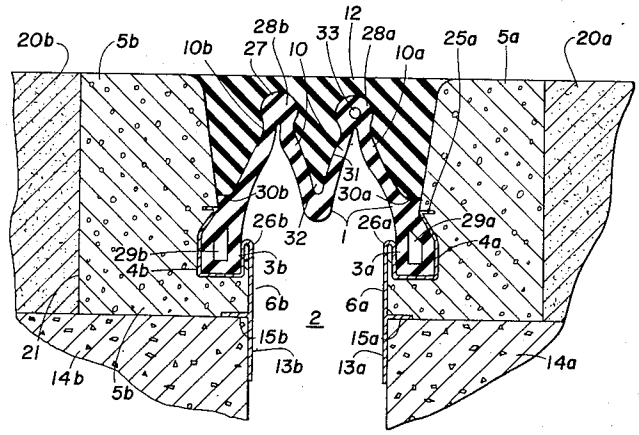
*Primary Examiner*—Ramon S. Britts
*Assistant Examiner*—Thomas J. Holko
*Attorney, Agent, or Firm*—W. G. Fasse



[57] **ABSTRACT**

The present sealing device for expansion gaps between adjacent structural members is connected to the side walls forming the gap by poured, hardening synthetic resin concrete. The sealing strip proper is anchored in lost casing means embedded at least partially in said synthetic resin concrete. The lost casing means are formed so that the sealing strip proper may act as an anchor for a removable form body or core which is used to give the poured synthetic resin concrete the shape in which it is supposed to harden. Once the resin is hardened, the form body may be removed. Preferably, the sealing strip has an M-sectional shape or an inverted V-sectional shape whereby preferably the free ends are anchored to the lost casing and the tips are anchored to the form body.


**16 Claims, 3 Drawing Figures**



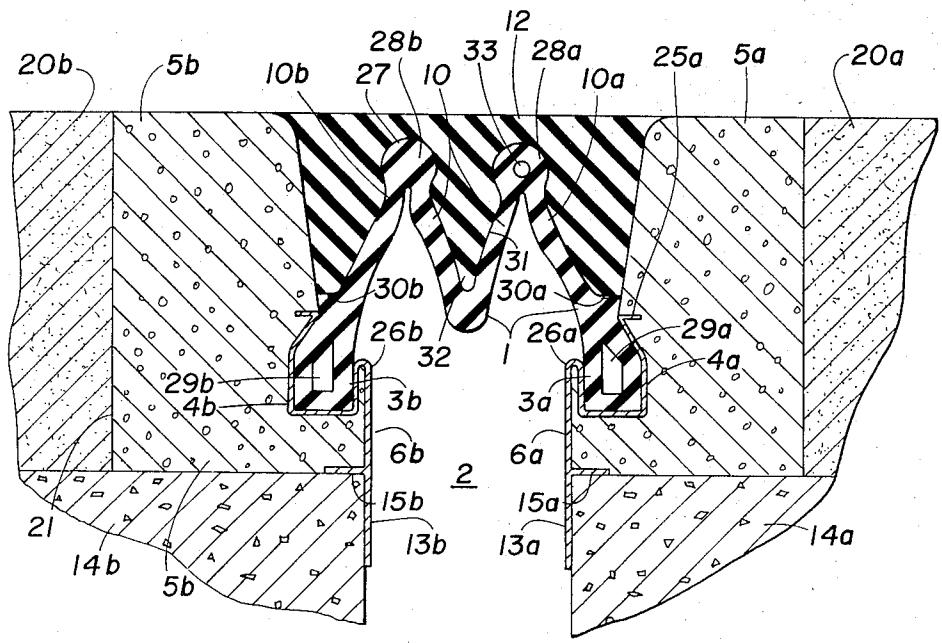



FIG. 1

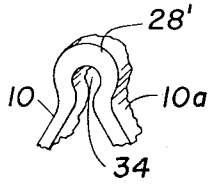



FIG. 3

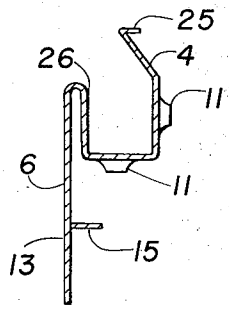



FIG. 2

# EXPANSION GAP SEALING DEVICE

## BACKGROUND OF THE INVENTION

The present invention relates to an expansion gap sealing device, more specifically, to casing means for securing the sealing strip proper to the side walls of structural members forming the gap, by means of poured, hardening synthetic resin concrete. The invention also relates to a sealing strip and to a form body for such expansion gap sealing device.

Generally, the present invention is used in the environment described in U.S. patent application Ser. No. 122,788 filed on Mar. 10, 1971 by Waldemar Koester for a "METHOD OF CONSTRUCTING AN EXPANSION GAP DEVICE AND LOST CASING FOR SUCH EXPANSION GAP", now U.S. Pat. No. 3,722,379 assigned to the present assignee.

According to the method described in the above mentioned patent application, expansion gap sealing devices are constructed in road surfaces, bridges, runways, parking decks or the like, in the following manner. First concrete slabs are constructed whereby a gap is maintained between adjacent slabs. The concrete slabs are then covered by a surface layer, for example, in a continuous pouring process. In the next step, strips are cut out of the top surface above the gap whereby the width of the strip is wider than the gap itself. Thereafter, a lost casing, for example of sheet metal, is inserted into the gap and into the space previously occupied by said removed strip of top surface material. The lost casing is adapted for holding the sealing strip proper in position after the casing has been secured to the gap forming side walls by means of poured, hardenable synthetic resin concrete which forms an intimate bond between the lost casing, the concrete and the top surface material. In order to initially keep the poured concrete synthetic material in the desired shape, a form body is placed on top of the lost casing. After the synthetic resin concrete has set or hardened, the form body is removed and a portion of the lost casing is also removed in the range bridging the gap in order to permit for the free movement of the sealing strip.

The method just described is especially economical and it takes into account the special conditions prevailing in the construction of bridges, road surfaces, parking decks and the like. It is an advantage of the above described method that the road surface forming layer may be poured onto the concrete base layer by respective machines without any interruption. The subsequent installation of a lost casing permits a rather simple and quick assembly or mounting of the expansion gap sealing device proper, even if rather wide expansion gaps must be bridged and which could not be sealed without the use of an elastic sealing strip or body. As mentioned, the pourable, synthetic resin concrete has the characteristic to form an intimate bond with the concrete base layer as well as with the top surface which may, for example, be a bituminous asphalt layer, and also with the casing which may, for example, be made of sheet metal. This intimate bond in combination with the substantial toughness and elasticity of the synthetic resin concretes prevents the danger of crumbling in the area of the surface adjacent to the gap.

In addition, the lost casing makes it possible to secure the sealing strip or body without any difficulties between the gap forming side walls of the structural members. The sealing strip may be brought into its final position simultaneously with the positioning of the lost casing in the gap area bcause the sealing strip may be constructed as an integral unit with the lost casing. This integral unit may be installed in the gap in the field in any desired manner prior to the pouring of the synthetic resin concrete.



According to the above mentioned application, the lost casing comprises a gap bridging portion which is to be removed after the setting of the synthetic resin concrete. The bridging portion of the lost casing is suitable for supporting a form body or core, especially, when the sealing strip is to be placed in a position below the top surface of the surface layer. This form body assures that the synthetic resin concrete will harden in the desired shape above the lost casing. Thus, the form body will have such a size or height that its top surface will be flush with the top surface of the adjacent surface layers. In this manner, it is possible to place the sealing strip proper in any desired depth within the gap. However, as mentioned, it is necessary to subsequently remove the bridging portion of the lost casing once the synthetic resin concrete has set.

## OBJECTS OF THE INVENTION

It is the aim of the invention to achieve the following objects singly or in combination:

to provide a lost casing for performing the above described method whereby the subsequent removal of a portion of the lost casing may be avoided;

to assure that the form body which actually forms part of the casing means will be held in a precise position during the pouring and hardening of the synthetic resin concrete;

to assure that the form body may be easily removed after the synthetic resin concrete has hardened; and

to provide means whereby the lost casing, the sealing strip proper, and the form body may be preassembled into a structural unit which after such assembly is easily installed in an expansion gap sealing device.

## SUMMARY OF THE INVENTION

According to the invention there is provided an expansion gap sealing device having a lost casing, a gap bridging sealing strip and a form body. Both, the form body as well as the sealing strip are provided with anchoring means so that the form body may be secured in the desired position relative to the sealing strip when the sealing strip and the lost casing are secured to the gap forming side walls by means of poured, hardenable synthetic resin concrete. The gap bridging sealing strip is further provided with anchoring means, for example, snap-in lateral bulging edges which tightly fit into respective channels of the lost casing members. Either, the form body or the sealing strip may be provided with recesses or respective bulging anchoring means which fit into the opposite recess in a form locking manner.

The present invention has the advantage that the lost casing, the sealing strip and the form body or core may be preassembled as a structural unit in the factory and such structural unit may then be installed into the gap in the field. After the synthetic resin concrete has set, the form body may easily be stripped off the sealing strip whereupon, depending on the particular type and material of the form body, the latter may be used again for producing another gap sealing device.

Since the shape of the side walls of the form body determines the shape in which the synthetic resin concrete will harden above the sealing strip proper, it is suggested according to the invention to taper the side walls of the form body in such a manner inwardly, that these side walls define a wedge shape whereby the subsequent removal of the form body after the hardening is facilitated.

If the form body is made of a material such as rubber to which the synthetic resin concrete may form a bond, the side walls should be provided with a separating layer to prevent such bonding. This may be accomplished, for example, by a grease or oil film. If it is desired to re-use the form body, it is preferable to make it entirely of a material with which the concrete will not form a bond. However, the form body may be made of any material, for example, polyurethane whereby the form body would be destroyed upon removal after hardening of the concrete.

## BRIEF FIGURE DESCRIPTION

In order that the invention may be clearly understood, it will now be described, by way of example, with reference to the accompanying drawings, wherein:

FIG. 1 is a sectional view through an expansion gap sealing device according to the invention;

FIG. 2 illustrates a section through a lost casing member according to the invention; and

FIG. 3 shows a perspective end view of a portion of a modified anchoring ridge forming part of a sealing strip.

## DETAILED DESCRIPTION OF EXAMPLE EMBODIMENTS

Referring to FIG. 1, the right and left hand portions or elements of the entire structure are substantially mirror symmetrical to each other with regard to a vertical center plane. Corresponding right and left hand members are designated by the same reference numerals. However, to distinguish the members from each other, the right hand members are designated by the letter *a* and the left hand members are designated by the letter *b*.

The elastic sealing strip **1** may be made, for example, of rubber or neoprene and bridges the gap **2** between two concrete structural members **14***a* and **14***b*. The lateral edges of the sealing strip are provided with bulges **3***a* and **3***b* which fit into channels **4***a* and **4***b* of respective lost casing members **6***a* and **6***b* to be described more fully with reference to FIG. **2.** Both lost casing members **6***a* and **6***b* rest on lugs **15***a* and **15***b* which may be bent out of the plane of the lost casing members which are preferably made of sheet metal. These lugs **15***a* and **15***b* are supported by the ledge formed by the upper edges of the concrete slabs **14***a* and **14***b* respectively.

The sealing strip **1** in the shown example, has an M-sectional shape which is formed by wall sections **10, 10***a*, and **10***b*. However, the sealing strip **1** may also have, especially where narrower gaps are to be bridged, just one inverted V-sectional shape or, a plurality of such V-shapes may be connected to each other to form the shown M-shape or even to form a plurality of folds in the manner of a bellows where wider gaps are to be bridged.

A form body **12** is anchored to the sealing strip **1** in order to complete the casing means and thus define a shape in which the synthetic resin concrete members **5***a* and **5***b* are supposed to set or to harden.

It will be noted that the upwardly facing top surface of the sealing strip **1** has a contour which corresponds to the downwardly facing bottom surface of the form body **12.** These contour surfaces are provided with anchoring means which cooperate for securing the position of the form body **12** relative to the sealing strip **1** prior to the pouring and hardening of the synthetic resin concrete members **5***a* and **5***b*. The mentioned contours provide a large supporting surface for the form body **12.**

In the shown embodiment, the wall sections **10, 10***a*, and **10***b* of the sealing strip **1** merge at their top ends into ridges **28***a* and **28***b* which may be snapped into respective recesses **27** in the form body **12** in a form fitting manner. To assure a secure connection between the form body **12** and the sealing strip **1,** the recesses **27** are provided with backtapers whereby the effect of a dovetail connection is achieved. Preferably, the recesses **27** may have the shape of a hollow cylinder whereby the downwardly facing side of the cylinder is open so that the cylinder side walls merge into downwardly tapering walls of the form body **12** corresponding in their contour to the contour of the top surface of the sealing strip **1.**

As in the above described copending application, a groove **21** is cut into the top surface in order to separate the top surface layers **20***a* and **20***b* from each other. The groove has a width larger than the width of the gap **2.** After the formation of the groove **21,** the lost casing members **6***a* and **6***b*, the sealing strip **1,** and the form body **12** are inserted into the gap and groove, preferably as a preassembled structural unit whereby the downwardly extending legs **13***a* and **13***b* of the lost casing members assure a parallel fit relative to the gap forming side walls of the concrete slabs **14***a* and **14***b*. The downwardly extending legs **13***a* and **13***b* secure the just mentioned structural unit against a lateral displacement and the lugs **15***a* and **15***b* hold the structural unit against a downward displacement. Thus, the synthetic resin concrete may now be poured to form the members **5***a* and **5***b* as shown in FIG. **1.**

Referring further to FIG. **1,** the support of the form body **12** on top of the sealing strip **1** is improved by shoulder means **30** extending along the top surface of the sealing strip **1** where the respective wall sections **10***a* or **10***b* merge into the lateral anchoring bulges **3***a* and **3***b*. The channels **4***a* and **4***b* of the lost casing members **6***a* and **6***b* are provided by respective backtapers **4** which reach upwardly to provide substantial support for the shoulder means **30***a* and **30***b* whereby the latter are substantially prevented frpm being deformed. This feature has the advantage that the weight of the form body **12** is transmitted through the shoulders **30***a* and **30***b* to the lost casing members and the sealing body **1** proper will thus substantially retain its desired shape, especially during the setting of the synthetic resin concrete.

Another advantage of the shoulders **30***a* and **30***b* is seen in that they bear laterally against the respective synthetic resin concrete member **5***a* or **5***b* whereby a proper seal is formed between the synthetic resin concrete and the sealing strip **1.** Accordingly, the portion of the sheet metal casing members which is not covered by the synthetic resin concrete are sealed against the road surface and the entering of moisture or dirt into

the gap proper below the sealing strip **1** is prevented.

The lost casing according to the invention comprises two mirror symmetrical members. The right hand member is shown in FIG. **2.** However, the designating letters *a* have been omitted in FIG. **2.** These lost casing members **6** are preferably formed of sheet metal with a downwardly facing leg **13** out of which lugs **15** may be punched at suitable spacings along the length of the lost casing member. The leg portions **13** extend upwardly into an inverted U-bend **26** which then continues to form an anchoring channel including a back-taper **4** which extends into a reinforcing edge **25.** The reinforcing edge **25** is bent horizontally and away from the sealing strip so that the reinforcing edge **25** will be surrounded by the synthetic resin concrete. The outer surfaces of the channel member are provided with anchoring lugs **11** which may also be punched or bent out of the 2heet 4etal forming the thannel. These lugs **11** still further increase the intimate bond between the channel member and the surrounding synthetic resin concrete whereby the entire lost casing **6** is reliably secured in the synthetic resin concrete. Incidentally, the inverted U-bend **26** as well as the downwardly extending leg **13** and the reinforcing edge or rib **25** all contribute to the dimensional stability of the lost casing **6.**

The wall sections **10** of the sealing body **1** form a recess **31** into which fits the downwardly pointing ridge **32** of the form body **12.**

Incidentally, the anchoring ridge **28***a* differs, for example, from the anchoring ridge **28***b* of the sealing strip **1** in that the anchoring ridge **28***a* has a hollow **33** therein. The modification of the anchoring ridge **28'** shown in FIG. **3** comprises a hollow **34** which opens downwardly. The hollows **33** and **34** will facilitate the snapping in of the anchoring means relative to each other. Incidentally, this applies also to the hollows **29***a* and **29***b* provided in the bulges at the free ends of the wall sections **10***a* and **10***b* of the sealing strip **1.** Nevertheless, these hollows do not interfere with assuring the desired form fitting interlocking between the respective anchoring means.

Although arranging the anchoring bulges **3***a* and **3***b* at the lower free ends of the wall sections **10***a* and **10***b* of the sealing strip **1** is preferred, it is also possible to place these bulges in another location along the shape of the sealing strip, whereby the shape of the respective lost casing members would be adapted to the position of the anchoring bulges. In any event, it is desirable to place the shoulders **30***a* and **30***b* in a location where they can provide a proper seal with the synthetic resin concrete members whereby to protect the sheet metal of the lost casing members against corrosion by moisture which might otherwise be able to reach those portions of the lost casing members which are not covered by the synthetic resin concrete.

The invention may be further modified in that initially a form body is used for the hardening of the synthetic resin concrete, which form body has the shape corresponding to that of the desired sealing strip and to that of the form body proper. Such an integral structure would be removed after the synthetic resin concrete has set and would be replaced by a sealing strip having the appropriate shape for anchoring in the lost casing members. The sealing strip proper may then have a size that it reaches with its top all the way to the surface of the surface layer.

Although FIG. **1** illustrates the arrangement of the anchoring bulges at the lower extremeties of the sealing strip, it would also be possible to provide these anchoring bulges at the upper extremeties of the sealing strip. Similarly, these anchoring strips may be placed laterally relative to the side walls of the sealing strip. Further, the anchoring means need not necessarily be continuous bulges but it would also be possible to use spaced snap-in anchoring means which act much like a snap-on button.

In view of the foregoing it will be appreciated that the present invention is not limited to the specific examples shown and described, but that it is intended to cover all modifications and equivalents within the scope of the appended claims.

What is claimed is:

**1.** An expansion gap sealing device for sealing an expansion gap comprising an elastic sealing strip adapted to be anchored by means of synthetic resin concrete, said sealing strip comprising first anchoring means for securing a form body to said elastic sealing strip, said first anchoring means including a contoured top surface having shoulder means at the edges thereof on said elastic sealing strip to provide a supporting area for said form body, said supporting area providing for an intimate contact between the sealing strip and said form body substantially over said entire top surface of said elastic sealing strip, and second anchoring means for anchoring said sealing strip in the expansion gap, whereby said first and second anchoring means and said supporting area combine for rigidly supporting said form body during the setting of said synthetic resin concrete.

**2.** The sealing device according to claim **1,** wherein said first anchoring means comprise longitudinal ridges protruding from said top surface of the elastic sealing strip.

**3.** The sealing device according to claim **1,** comprising a plurality of wall sections extending longitudinally of said strip, two each of said wall sections merging into each other to form anchoring ridge means as part of said contoured top surface.

**4.** The sealing device according to claim **3,** wherein two adjacent wall sections merging into said anchoring ridge means form an inverted V-sectional shape.

**5.** The sealing device according to claim **3,** wherein said wall sections form an M-sectional shape whereby the two tips of said M-sectional shape comprise said anchoring ridge means.

**6.** The sealing device according to claim **1,** wherein said second anchoring means comprise bulging edges.

**7.** The sealing device according to claim **6,** wherein said bulging edges are hollow.

**8.** The sealing device according to claim **1,** wherein said first anchoring means comprise longitudinal hollow ridges.

**9.** The sealing device according to claim **8,** wherein said hollow ridges are open downwardly.

**10.** The sealing device according to claim **1** wherein said shoulder means is located adjacent to and above said second anchoring means.

**11.** The expansion gap sealing device of claim **1,** comprising a form body having a bottom surface with third anchoring means therein, said first and third anchoring means cooperating with each other for directly securing said form body to said sealing strip, said third

anchoring means comprising recess means in said bottom surface of said form body, said first anchoring means comprising snap-in means which fit into said recess means in a form locking manner, said recess means comprising recess defining walls, and an entrance opening of given width and an inner diameter of greater width.

**12.** The expansion gap sealing device of claim **11**, wherein said bottom surface of said form body has acute angled wall sections positioned to merge into said recess means at the entrance opening thereof, said acute angled wall sections of said bottom surface having a given surface area, said top surface of said sealing strip having a contoured area corresponding substantially in surface area to said given surface area and being shaped to closely fit the acute angled wall sections of said form body, whereby said form body is held in hugging contact on said sealing strip.

**13.** The expansion gap sealing device of claim **11**, wherein said form body comprises means positioned to rest on said shoulder means of said sealing strip.

**14.** The expansion gap sealing device of claim **1**, further comprising casing means for anchoring said sealing strip to gap forming walls in concrete members by means of said synthetic resin concrete, said casing means comprising lost casing sections, said lost casing sections being anchored to said second anchoring means of said sealing strip.

**15.** The expansion gap sealing device of claim **14**, wherein said second anchoring means comprise contoured edged portions on said edges of said sealing strip, said lost casing sections comprising channel means having an open side and a wall portion inclined toward said open side, said contoured edged portions of said sealing strip being fitted into said channel means in a form locking manner with the inclined wall portions of said casing sections holding the contoured edged portions of the sealing strip inside said channel means, said shoulder means of said sealing strip being above and outside of said channel means.

**16.** An expansion gap sealing device for sealing an expansion gap, comprising an elastic sealing strip adapted to be anchored in said expansion gap by means of synthetic resin concrete, said sealing strip comprising first anchoring means for securing a form body to said elastic sealing strip, said first anchoring means including a contoured top surface to provide a supporting area for said form body and an intimate contact between the sealing strip and said form body substantially over said entire top surface of said elastic sealing strip, and second anchoring means for anchoring said sealing strip in the expansion gap, said contoured top surface having lateral edges extending above said second anchoring means, whereby said first and second anchoring means and said supporting area combine for rigidly supporting said form body during the setting of said synthetic resin concrete, said lateral edges providing a seal above said second anchoring means.

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