Aug. 6, 1968 R. M. BARTON 3,395,627

CONTRACTION JOINT STRIP AND METHOD AND APPARATUS FOR INSTALLING THE SAME

Filed March 30, 1966

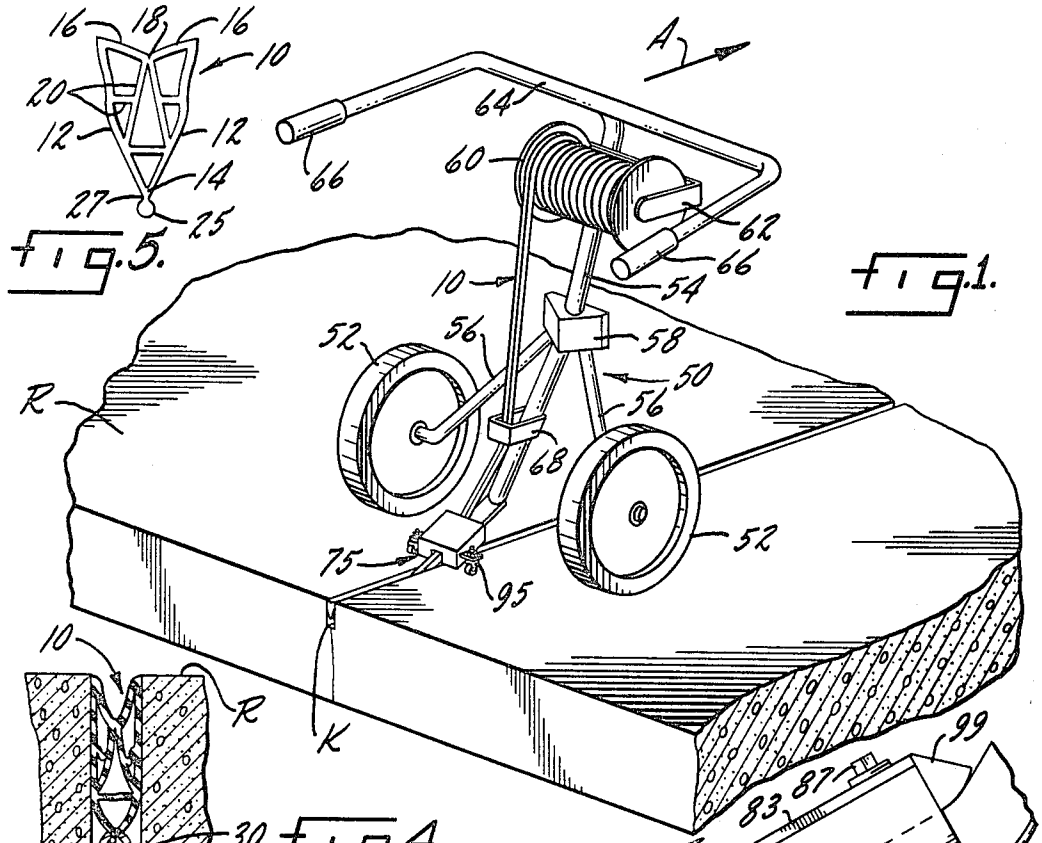


fig. 1.

fig. 5.

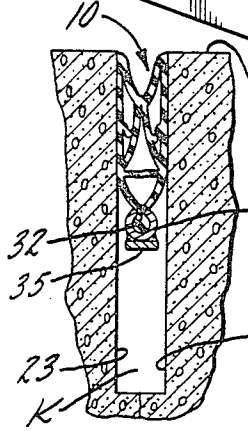


fig. 4.

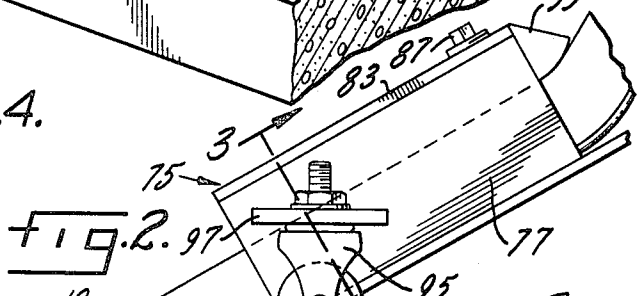
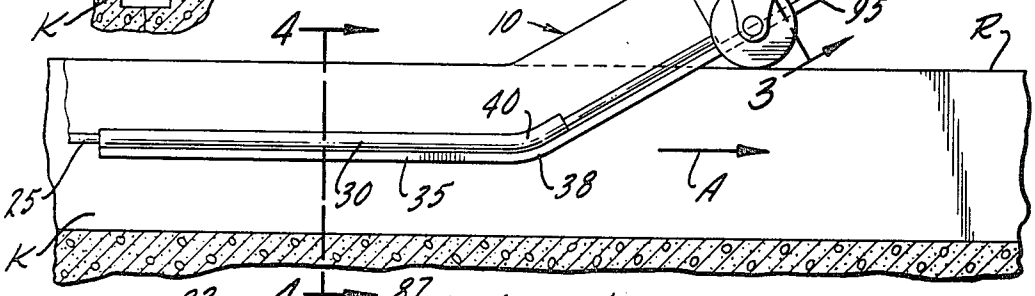


fig. 2.



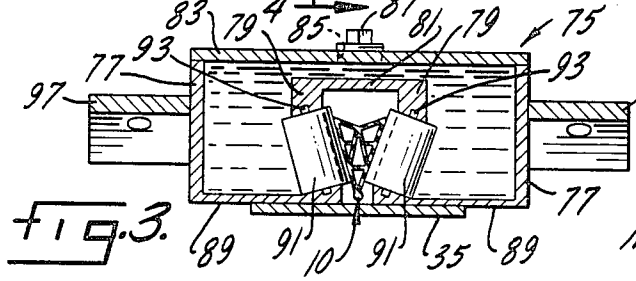


fig. 3.

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CONTRACTION JOINT STRIP AND METHOD AND APPARATUS FOR INSTALLING THE SAME

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ABSTRACT OF THE DISCLOSURE

Sealing strip apparatus and a method for installing the sealing strip in the expansion joint of concrete slabs wherein a tube slidably engages a bead on the bottom of the sealing strip so as to progressively pull the strip into an expansion joint.

The present invention pertains generally to seals for use in joints formed in concrete roads or the like, to permit expansion and contraction of the concrete with changes in weather conditions. The invention pertains particularly to an improved pre-formed sealing strip and novel method and apparatus for properly inserting or installing the same.

It is well known practice in road construction to pour long ribbons of concrete at one time, and when the concrete is cured or partially cured, suitably spaced joints are formed therein by making a saw cut two to three inches deep spanning the width of the road at predetermined intervals. While the saw penetrates to a depth of only about 25% of the total thickness of the pavement, it establishes a line of weakness, which takes the form of a generally vertical crack, through the uncut concrete emanating from the bottom of the kerf or saw cut. This cut, and associated line of weakness, serves to permit the concrete, which has a significant coefficient of expansion, to expand and contract without buckling or crumbling by compression.

While the saw cut is often no more than ⅜ of an inch wide, it is sufficiently wide that non-compressible elements such as dirt, sand and like debris quickly collect in the slot if it is not somethow protected against access by such elements. The presence of such foreign matter in the slot would, of course, have a deleterious effect on the pavement in the immediate area of the slot itself, and would eventually result in excessive wear and ultimate destruction of the concrete, thereby necessitating expensive repairs.

Likewise, water, which has a know coefficient of expansion as it freezes, would be expected to fill an open saw cut and seep through the crack formed as a result of the slotting of the concrete. It is well known that the seepage of water into such a crack will result in the widening of the crack upon freezing of the water, which, by sheer compressive force, would pulverize the concrete. Thus, the need for providing a satisfactory seal in the slot itself is apparent.

While there are a variety of seals presently employed for this purpose, preformed neoprene rubber sealing elements have been used with satisfactory results in the road construction art.

While, however, this preformed sealing strip has demonstrated satisfactory results once properly installed, it has been found that, as a practical matter, proper installation rendering a reliable degree of permanency is very difficult Even though appropriate lubrication and adhesive is used prior to insertion, it has been shown to be very difficult to insert the strip, at the proper depth, and with even distribution of lateral pressures on the side walls. In many cases, it has been found that the top portion of the strip tends to protrude above the level of the road after insertion, or one side of the strip will deform and curl, resulting in an imperfect seal. Furthermore, installation is a tedious and time consuming process which negatives, to a substantial extent, the otherwise desirable charactertics of the strip once installed.

Foreseeing potential merit in preformed sealing strips of the type referred to hereinabove, it is an object of the present invention to provide such a strip, embodying substantial improvements which render proper installation of the strip itself a relatively simple, accurate, and economical procedure.

Another object of the invention is to provide inexpensive yet readily operable apparatus for the facile insertion of the strip of the type described in a proper and permanent position, taking maximum advantage of the sealing characteristics of the strip itself.

Still another object, related to the foregoing, is the provision of a method of insertion of a preformed sealing strip of the type described, being of such a nature that no particular skill is required of the installer, and further requiring a minimum of installation time, while at the same time providing great accuracy of installation.

These and other objects and advantages of the present invention will be apparent from the following detailed description, taken in conjunction with the appended drawings, wherein:

FIG. 1 is a perspective of an exemplary set up for the installation of the improved sealing strip of the present invention;

FIG. 2 is a side elevation, enlarged and fragmented to illustrate the specific installation of the strip herein disclosed;

FIG. 3 is a section taken along line 3—3 of FIG 2;

FIG. 4 is a section taken along line 4—4 of FIG. 2, demonstrating the sealing strip of the present invention in a compressed condition as properly installed by the apparatus of FIGS. 1 and 2; and

FIG. 5 is a section taken through an improved sealing strip of the present invention illustrating the details of the supporting structure.

While the invention is susceptible of various modifications and alternative constructions, a particular illustrative embodiment has been illustrated in the drawings and will be described below in considerable detail. It will be understood that the invention is not necessarily limited to the specific form disclosed, the intention being to cover all modifications, alternative constructions and equivalents falling within the spirit and scope of the invention as expressed in the appended claims.

With reference now to the drawings, it will be appropriate first to observe the overall construction of the sealing strip to which the present invention relates. Accordingly, and with reference to FIGS. 4 and 5, an improved preformed sealing element or strip indicated generally at **10**, is shown. The strip, in cross section, has a generally isosceles triangular configuration which includes side walls **12** which converge to an intersection **14** at the lower end of the strip, and an upper wall comprising a pair of converging wall portions **16** which intersect at **18** at the approximate midpoint between the two side walls **12** at their uppermost edge. Within the sealing strip are reenforcing members **20** which intersect within the strip and engage the side walls and top wall portions of the strip to add and distribute compressive strength to the same. Thus, a satisfactory lateral sealing pressure is generated by the side walls **12** against the walls **23** which define a saw cut or kerf K.

The strip itself may be readily extruded, or formed in any other suitable manner, and is conveniently constructed of neoprene rubber. It will be readily apparent that the coefficient of friction of the concrete side walls **23** with respect to the neoprene rubber, even when a suitable lubri-

cant such as a silicone lubricant is employed, is substantial. As a consequence, presently known and accepted procedures for installing the strip, i.e., forcing the same downward into the saw cut from the top by means of hand manipulation and the use of a roller across the top, have proved to be unsatisfactory.

Numerous instances are recorded of uneven buckling of the side walls **12** of the sealing strip, with a consequent imperfect sealing, and more often, subsequent expansion of the rubber seal above the level of the road, indicated R for purposes of description. In such instances, it is necessary to attempt to reseat the strip, or if the defective installation is not immediately observed, the strip will be worn excessively on those parts protruding above the road, resulting in the need for complete replacement of the strip before damage to the road by means of water or other foreign matter occurs. The difficulty of insertion by pushing the strip downward is even more understandable when it is appreciated that the strip itself, though highly flexible, must be evenly compressed to a width of approximately one-half its free width, as seen in FIG. 5. Furthermore, the strip may be more than an inch long, and the area of the wall to wall contact with the kerf is, therefore, substantial.

In keeping with the invention, I provide an improved unitary preformed sealing strip being so constructed as to be capable of insertion by pulling the same downward into the saw cut or kerf rather than attempting to force the same therein by pushing downward on it. More particularly, and referring to FIG. 5, there is provided a sealing strip **10** having, at the bottom thereof, an enlargement capable of being gripped for the purpose of pulling the strip downwardly into a slot or groove. Specifically, the invention provides a bead **25** of any suitable diameter at its lower extremity, depending from the strip **10** by means of a necked down portion **27** defining an extension of the side walls **12** at their intersection **14**. The bead **25** is centrally located and longitudinally extending with respect to the strip, and is readily formed integrally therewith, although there is no intention of precluding the possibility of vulcanizing or otherwise fastening a bead or strip of like, or dissimilar, material to the bottom of the strip for an equivalent purpose.

The specific diameter of the bead **25** depends, to a certain extent, on the size of the strip **10**, itself, and the amount of force necessary to urge the same into a proper position, as seen in FIG. 4, in the saw cut. The neck portion **27** is required to be of such thickness as to resist separation of the rib from the main body of the seal, while at the same time providing an economical use of material involved.

Having thus provided means for gripping the bottom of the seal, there is further provided, in accordance with the present invention, apparatus for installation of the strip into a kerf, capable of being inserted therein to a desired depth such that the seal may be pulled in, as distinguished from attempting to force the same in from the top.

Again referring to FIG. 4, a tubular member **30** is illustrated, having a longitudinal slot **32** formed in the side wall thereof along the top. The tube **30**, as is shown, is of such a diameter as to comfortably receive the bead **25**, and the slot **32** is sized to permit relatively unrestricted passage of the neck portion **27** of the strip therein. Thus, the tube effectively embraces the bead **25**, which is inserted from the end of the tube with the neck **27** passing through the slot.

In order to place the tube at the appropriate depth within the kerf, a lever **35** is fixed to tube **30** and is of sufficient width to readily pass within the confines of the walls **23**, and of sufficient strength to permit the exertion of the necessary force to pull the strip into the saw cut. The lever **35**, as seen more readily in FIG. 2, curves upwardly as at **38** and passes above the level of the road R. In order to provide a suitable guide for the flexible strip, the tubular portion **30** may be likewise curved as at **40**, in order to maintain control over the strip as it passes, at a suitable inclination, from a position above the level of the road to the horizontal position which it assumes when properly inserted in the kerf.

Having thus provided basic apparatus for insertion of the strip by pulling the same into the saw cut, it is an additional feature of the invention to provide the necessary apparatus for installing the strip in the described manner with the greatest possible efficiency. To this end, and referring to FIG. 1 in particular, installation is readily accomplished by securing the rod **35** to a readily movable cart, indicated generally at **50**.

It will be understood that the chart, as illustrated, is merely exemplary of any number of portable devices which might accomplish the same general end. Manual application of the principles of the invention by an appropriate hand tool constructed as described above, is envisioned. The illustrated structure, however, is particularly attractive in terms of its economy of construction, high portability and storage capability, and the ease with which it may be used. Thus, a pair of wheels **52** support the main stem **54**, by means of axle struts **56** extending from a joint **58** at an appropriate position on the stem **54**. The wheels, of course, may be collapsible for storage purposes, in a manner not unlike that of conventional golf carts.

Strip material **10**, by virtue of its flexibility, is readily storable on a reel **60**, which is removably held in an appropriate bracket **62** of any known construction, and clamped at some suitable place on the stem **54**. As seen, the stem terminates in a handle bar **64** having grips **66** thereon for hand manipulation. The strip material **10** passes downwards towards the slot and is threaded through an appropriate guide member **68** which not only helps to control the strip material, but also disposes it at a suitable angle for entry into the tube **30**, and thus into the slot.

There is an acknowledged need, in installation of strip material of the kind described, to lubricate the side walls **12** thereof, so as to minimize friction during installation. This same lubricant, which may be of a silicone derivative, often contains a suitable adhesive so that once the side walls are properly engaged, adherence is assured. To this end, and for the purposes of providing accurate and complete lubrication of the side walls **12** of the sealing strip with a minimum of waste and effort, there is provided, in accordance with the invention, a lubricator **75**, a cross section of which is illustrated in FIG. 3. Referring to FIG. 3, the lubricator comprises a box-like construction having terminal side wall **77** and internal side wall **79** and top wall **81** together defining a central groove. The side walls **77** are capped by means of a lid **83** having an aperture **85** therein which is normally closed by means of a plug **87**. The plug is removable for filling of the chamber. A bottom wall section **89** connects the side walls **77** and **79** respectively to define a fluid tight chamber into which the lubricant and adhesive material is placed.

In order to obtain a thin, evenly applied, layer of lubricant and adhesive, a pair of rollers **91** disposed on axles **93** mounted in suitable apertures formed in the side walls **79**, are provided. The rollers are canted as seen in FIG. 3, and are spaced apart so that when a sealing strip **10** is pulled through the groove defined between the side walls **79**, the rollers engage the side walls **12** of the strip with a sufficient pressure to apply a thin layer of material which is picked up by the roller as it passes through the reservoir or chamber defined by the lubricator itself.

With reference to FIG. 2, the lubricator is preferably disposed at a position on the stem **54** so that it is just above the level of the road R. In such a position, the lubricator serves, in accordance with the invention, as a depth gauge for proper insertion of the strip within the slot or groove defined in the roadway. Thus, a pair of ad-

justable casters **95** are provided, one on either side of the lubricator, where they are mounted in brackets **97**. The casters are of any known construction, and may be adjusted to provide the desired depth of the tube within the slot. Thus, the cart **50** sets on a four point stance provided by the casters **95** and the wheels **52**, and as such, may be pulled along in a direction of the arrow A, while applying the necessary downward force to achieve proper insertion of the strip.

It will be observed in FIGS. 1 and 2 that the strip material is guided smoothly, at an inclination, down to its lateral position within the slot. To this end, a shoe comprising an arcuate guide member **99** is provided at the leading edge of the lubricator box to complete the bend of the strip material through the lubricator box and to the tube **30**. The groove defined between the side walls **79** maintain the strip centered so that it flows readily to and through the tube into its sealed position in the groove.

The foregoing discussion exemplifies both apparatus and the method of insertion of a strip of the improved type indicated in FIG. 5 of the drawings. It will be appreciated that by pulling the strip into the slot rather than trying to push the same, the frictional drag on the side walls **12** of the strip, combined with the slanting disposition of the side walls, tend to collapse the strip or compress the same in an even pattern as the same is pulled into the slot. As a result, the strip is properly seated in the side walls in perfect sealing engagement with the edges **23** of the strip.

I claim as my invention:

1. In combination, a continuous preformed sealing strip for sealing a joint constructed of resilient compressible material, said strip having a free width greater than the width of the joint into which it is fitted in sealing relation, said strip comprising in cross-section downwardly converging side walls and a top wall, means defining a bead on said strip, a reduced neck portion interconnecting said strip and said bead so as to dispose said bead in depending relation from the area of convergence of said

side walls, a cart formed and adapted for movement along a concrete joint strip, a tube connected to the cart and slidably embracing said bead, said tube being slotted to permit insertion of said bead therein while providing unrestricted space for said neck portion, said cart and tube being movable longitudinally of and relative to said strip for thereby pulling said strip into a compressed seated relation in a concrete joint, a lubricator on said cart for applying a layer of lubricant material to the side walls of said strip, said cart having means for maintaining the depth of the tube in a joint at a predetermined level.

2. The method of securing a continuous preformed sealing strip in a joint comprising the steps of forming a continuous bead of predetermined diameter on the bottom of an expansible and contractable joint sealing strip, inserting said bead in a tube with the tube being in sliding, embracing engagement with the bead, said tube engaging a predetermined minor portion of the length of the strip and bead, moving said tube into a joint to a predetermined depth such that the top of said sealing strip is generally coplanar with the upper edges of the joint, and moving said tube longitudinally relative to said bead and strip and along the length of the joint to thereby remove said tube from portions of said bead while guiding and pulling successive portions of said bead and said strip into said joint.

3. The method set forth in claim **2** including the additional step of applying lubrication and adhesive material in a uniform layer to the side walls of said strip prior to insertion thereof into said joint.

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JACOB L. NACKENOFF, *Primary Examiner.*