Nov. 30, 1954 C. I. WILLIAMS 2,695,513

CONTROL JOINT STRIP

Filed June 22, 1950

Fig. 1.

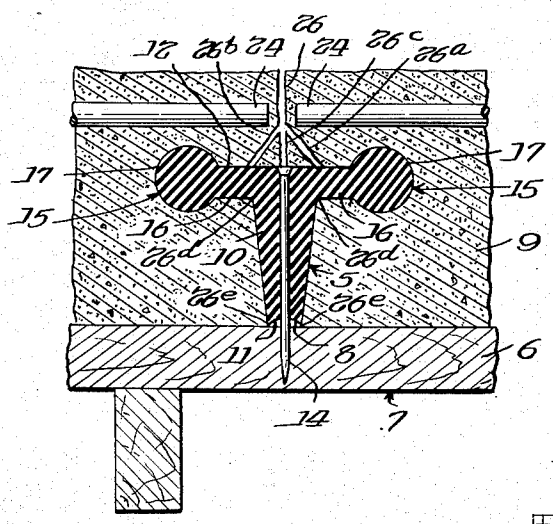


Fig. 4.

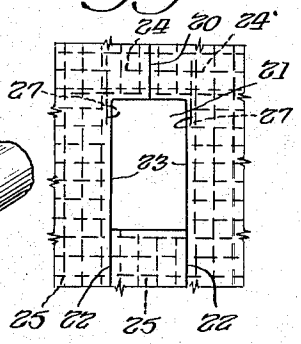


Fig 2.

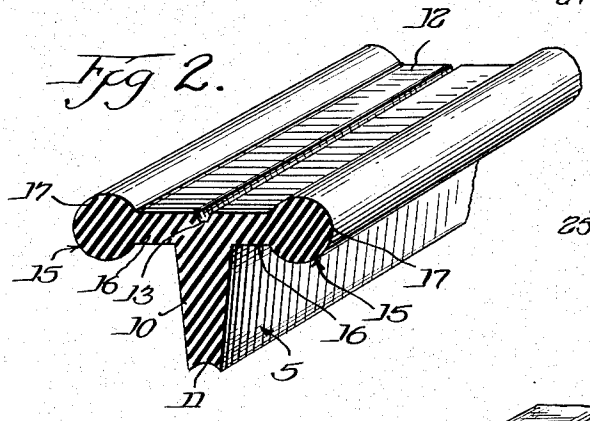
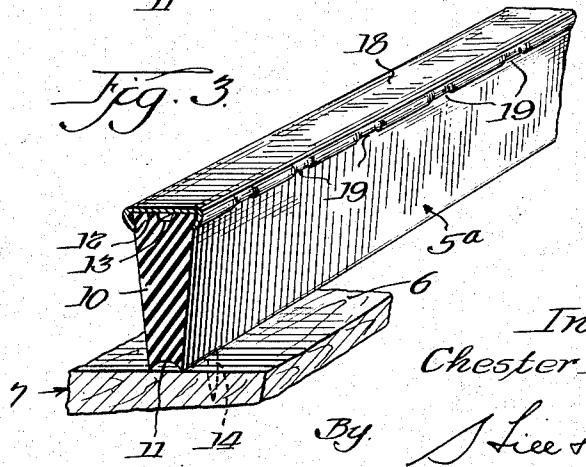


Fig. 3.



Inventor.
Chester I. Williams.
By Lee & Lee
Attys.

United States Patent Office

2,695,513

Patented Nov. 30, 1954

2,695,513

CONTROL JOINT STRIP

Chester I. Williams, Grand Rapids, Mich.

Application June 22, 1950, Serial No. 169,733

3 Claims. (Cl. 72—107)

This invention relates to improvements in construction of monolithic structures such as concrete walls, foundations, etc., by the use of forms and more particularly to an improved control joint construction and control joint strip therefor.

It is well known that all masonry materials shrink and swell upon loss and gain of moisture in much the same manner as wood, except to a lesser degree. Such volume changes set up stresses of considerable magnitude in any structure because there is always some restraint against free movement between the component parts. These stresses exist in architectural concrete buildings and should be considered in their design. In large areas, it is uneconomical and impractical to provide a sufficient amount of reenforcement to prevent cracking entirely. Practically, however, the same result may be accomplished by controlling the location of cracks and making them inconspicuous so that they do not affect the appearance of the building. This may be done effectively and inexpensively by providing control joints in the walls at proper intervals.

It is therefore a principal object of the invention to provide an improved control joint strip to overcome unsightly cracking in monolithic concrete construction due to the expansion and contraction thereof.

Another object of the invention is to provide an improved control joint strip which may be applied to concrete forms to leave narrow grooves inside and outside of the wall to accomplish the desired result of cracking the wall at a predetermined location relieving the stress in the wall.

Still another object of the invention is to provide an improved rubber control joint strip which may be left in place to prevent penetration of moisture by sealing the joint.

Another object of the invention is to provide a control joint construction on the outside of the wall so that it will seal up the crack and at the same time allow the wall to expand and contract as necessary.

A further object of the invention is to provide a control joint construction and strip therefor, which will permit the cracks to follow the line of least resistance and permit the crack to come along the side of the control joint.

Another object of the invention is to provide a reenforced control joint strip so that it will take greater side pressure of the concrete during pouring and spading thereof about the control joint strip.

Another object of the invention is to provide a reenforced control joint strip so that it has a positive stretching action as well as a compressive action depending upon whether or not the concrete is expanding or contracting.

Still another object of the invention is to provide an improved integrally molded stiffener construction for a control joint strip so that when the concrete pressure hits one side or the other of the joint, it will not have a tendency to warp the control joint strip.

The invention also has among its objects the production of an improved form of reenforced control joint strip which is simply fabricated, durable, economical, inexpensive, easily installed and satisfactory for its purpose.

In order to accomplish the various objects of the invention, I have provided as one embodiment a molded rubber trapezoidal control joint strip which when applied to a concrete form provides a concealed joint, and may be simply nailed in place on the forms after which a metal reenforcing strip may be simply applied and affixed

thereto so that the molded rubber control joint strip will take greater side pressure during the pouring and spading of the concrete in place. I have also disclosed another embodiment of my rubber control joint strip which has a trapezoidal center section and integrally molded therewith is laterally spaced circular strip members that provide the strip with a two-way action, that is, a positive stretching action as well as a compressive action depending upon whether the concrete in which it is cast is expanding or contracting.

Many other objects and advantages of the construction herein shown and described will be obvious to those skilled in the art from the disclosure herein given.

To this end, my invention consists in the novel construction, arrangement and combination of parts herein shown and described and more particularly pointed out in the appended claims.

Referring now to the accompanying drawing forming part of the specification:

Fig. 1 is a horizontal sectional view of a part of a concrete form construction illustrating one form of my improved reenforced molded rubber control joint strip applied to a reenforced monolithic concrete wall construction prior to the removal of the forms;

Fig. 2 is a perspective view, partly in section, illustrating the reenforced control joint strip used in the construction of Fig. 1;

Fig. 3 is a perspective view, partly in section, illustrating a modified form of molded rubber control joint strip assembled in place on the sheathing of a concrete form with the reenforcing strip applied, prior to pouring the concrete; and,

Fig. 4 illustrates schematically an arrangement of control joints about an opening and the location of the reenforcement therefor.

Referring now more particularly to Figs. 1 and 2 of the drawing, an improved control joint strip **5** of my invention is shown affixed to sheathing **6** of the concrete form **7** to form a concealed control joint **8** in a monolithic reenforced concrete wall construction **9** upon the stripping of form after the concrete has initially set. The control joint strip **5** is preferably formed from molded rubber or extruded, if desired, into the shape as shown having a trapezoidal-shaped portion **10** with the exterior edge **11**, affixed to the sheathing **6** of the concrete form **7**, arcuate in shape as shown to provide the narrow concealed control joint **8** at suitably spaced intervals along the outer surface of the wall. The inner edge **12** is provided with a recessed nailing groove **13** extending along the center line of the molded strip. The nailing groove is preferably trapezoidal in shape to receive the heads of 6*d* casing nails **14** suitably spaced and driven through the control joint strip to detachably affix the joint strip to the sheathing **6** during the pouring and the setting of the concrete.

The principal feature of the control joint strip of Figs. 1 and 2, is the laterally extending reenforcing members **15** integrally molded or extruded with the center trapezoidal portion **10**. The members **15** are integrally formed along opposite sides of the strip **5** at the inner end **12** of the strip with web portions **16** to which are molded members or wings **17** circular in cross-section. This construction provides for a two-way action when cast within the concrete, and thus provides for a positive stretching action as well as a compressive action depending upon whether the concrete is expanding or contracting. In either case, the purpose of this form of joint is to form a seal at the point where the concrete normally cracks.

In addition to the wings **15** acting as above described, they also act as a stiffener, so that when the concrete pressure hits one side or the other of the control strip 5 in the pouring and spading thereof along the strip, there will not be the tendency to warp the strip if the stiffener wings **17** were not provided. This is of particular advantage in concrete wall construction where the concrete usually runs down into the form and hits the control joint on one side or the other tending to dislocate it. Thus, when the form **7** is stripped, the rubber strips remain in place. A straight joint is formed and the casing nails usually pull through the rubber when the forms

are stripped. If some of the nails do not pull through the rubber strip when the sheathing is stripped, they may be easily removed with a pair of pliers.

It is preferred to fabricate the control joint strip of 70 Durometer density rubber of light grey color to match the concrete. Since the strips remain in place, caulking of the control joints is thus obviated.

Referring to Fig. 3, I have also illustrated another form of reenforced control joint strip 5*a*, attached to a concrete form 7. Since the construction of the trapezoidal section 10 is similar to that of Fig. 2, like reference characters are used to indicate the same or similar parts and therefore need not be further described. The strips 5*a* are applied in the same manner to the sheathing 6 as are the strips 5. After the strips are in place, a channel-shaped reenforcing strip of metal channel stiffener 18 of thin gauge metal is applied over the inner edge 12 of the strip after which it is crimped in place, as indicated at the crimps 19 formed by a suitable crimping tool. The stiffener 18 thus prevents, as do the wings 17 of the previously described strip 5, the strip 5*a* from warping due to the pouring and spading of the concrete. The forms 7 are stripped in the same manner and the nails 14, which do not pull through the rubber strip 5*a* with the form, may also be removed with pliers. It is to be understood that the channel shaped strip is not to be applied first to the rubber joint strip and the nails driven through the metal channel.

Referring to Fig. 4, there is illustrated a control joint 20 applied at the center above an opening 21 and control joints 22 in line with both jambs 23 below the opening 21. As also shown in Fig. 1, alternate wall reenforcing bars 24 and corner reenforcing bars 25 should be cut or stopped at the control joints. However, bars provided as beam reenforcement (not shown) over openings should be continuous through the control joints. The construction of Fig. 4 therefore merely illustrates one arrangement of a control joint utilizing the control joint strips 5 and 5*a* of my invention. Other arrangements for control joints will readily suggest themselves to those skilled in the art.

The principal feature of the control joint is that every other reenforcing bar in a reenforced monolithic concrete wall is cut to so weaken the wall to the extent that it will crack, for example, at the point 26, Fig. 1, rather than at some point which might throw an unsightly crack across the wall where it should not crack. By having these control joints every twenty five or thirty feet, it can be effectively concealed and the result is that there will be no unsightly cracks appearing in the wall.

In hot weather, concrete expands and in cold weather concrete contracts. When the control joints open up, if there is not an effective seal such as provided by my rubber control joint strips 5 and 5*a*, moisture will come into the wall from the outside and eventually of course rust the remaining reenforcing in two, or effectively reduce its strength. Therefore, by using the control joint strips 5 and 5*a* of my invention on the outside of the wall, it will not only seal up the crack but also at the same time allow the wall to expand and contract as necessary.

With the control joint strip shown in Fig. 3, for example, the cracks when they appear will follow the line of least resistance and in this instance will appear along either side of the control joint strip. The rubber construction will, however, contract and expand with the joint but there may possibly be slight seepage around this shaped control joint strip.

However, in the other form illustrated in Figs. 1 and 2, there is illustrated two possible directions 26*a* or 26*b* in which the control or expansion joint 26 will crack, either one being in the line of least resistance, or it might follow a third line 26*c* straight to the rubber control joint strip 5. In any event, however, this joint crack will follow along the side of the control joint strip from points 26*d* to 26*e*. However, it cannot crack through either of the wings 15 of the control joint strip 5. Therefore, a very effective seal is formed. At the same time, these wings 15 of the strip 5 have a tendency to stiffen the rubber as the metal channel 18 does so that it will take a greater side pressure of the concrete during the pouring. The wings 15, thus, eliminate the necessity of the metal channel 18 since the control joint strip 5, constructed in this manner, is stiff enough without it. With this construction, the cost of setting the control joints may be reduced because there is no need to assemble the stiffener strip 18 upon the joint strip.

Although the various embodiments have been preferably described as applied to reenforced concrete wall constructions and the like, these various embodiments of joint strips may also be used in pavement constructions which also have their control joints about every twenty five or thirty feet. It is also very essential to have these joints sealed off from water, otherwise water seepage down through these joints will not only disturb but wash away the sub-grade and create a hazard, which as the traffic continues over the pavement would eventually break off due to there being no support under it. In the winter time, any seepage will freeze and expand and also be very detrimental to the concrete pavement. Likewise, in the case of buildings, the moisture seepage is also harmful as it would eventually rust off the reenforcing, or come through to the interior of the building and create a nuisance.

In applying, my improved embodiments of control joint strips to control joints, there are no exact rules for the location of the control joints. Each application must be studied individually to determine where the joints should be placed, taking into account the exigencies of the structural design. It has been demonstrated in practice that control joints should be spaced not more than twenty feet apart in walls with frequent openings and a somewhat closer spacing in joints below the first story or basement windows is desirable. In walls without openings, the joint spacing may be a little greater than in walls with openings but should never be more than twenty five feet to be most effective, and it is desirable to have a joint within ten or fifteen feet of a corner if possible. Joints should also be provided at about the same spacing in any exposed cast-in-place interior walls.

Openings in walls make natural locations for control joints. Where single openings are spaced more than twenty feet apart there should be a joint in line with each jamb below the openings at first story level. Above the first story opening, a single joint on the center line of each opening will generally suffice, but joints in the jamb lines are preferable if shear in the spandrel wall will permit. Joints should also be provided in the solid wall between openings so the maximum spacing will not be more than twenty five feet. In the case of single openings closer than twenty feet apart or where several windows are grouped together with narrow concrete mullions between them, joints should be provided as described above at not more than twenty feet intervals.

Sometimes, in buildings of modern design, single window openings may be very wide. If such openings are separated by shallow spandrels and narrow piers so the wall becomes essentially a frame of columns and spandrels, control joints are not necessary. If such an opening is more or less isolated and the height of the wall above the opening is at least one-fourth of the width of the opening, or if the spandrel can be satisfactorily designed as a cantilever, a control joint should be located at the center of the opening unless the opening is in the first story in which case there should be joints in line with the joints below the opening.

Scuppers or other small holes through the walls should be in line with centers or jambs of window openings where control joints are located. Where there are steel columns embedded in the walls which may weaken the wall section even more than nearby openings, joints should be placed in the planes of the columns and at intermediate sections in line with openings if the columns are more than twenty five feet apart. The band of the concrete to the steel columns at control joints should be broken by coating the columns with an asphaltic paint and no mesh or other reenforcing should pass through the joint. At such locations, if there is a pilaster encasing the column, the wall reenforcement should extend into the pilaster.

Joints should begin at the top of the wall footing and should extend on the outside of the wall to the top of the parapet, thence over the top of the parapet and down the back of the parapet to the raggle strip. On the inside face, the joint extends from the floor to the ceiling.

It has not been customary to provide control joints in the floor or roof slabs where they joint the walls. In some instances where ceilings are to be left exposed, joints have been provided in the floor slabs, and in those buildings they have been located in line with the wall joints.

In buildings of several stories with a set back at one or more floors, the joints need not be continuous from one floor level to another, but may be offset at each roof line in order to locate the joints at the best sections in the respective walls.

Except where needed for structural strength, one-half of the horizontal reenforcement must be stopped off or cut at control joints to further facilitate cracking at these sections, as described with reference to Figs. 1 and 4. When cutting the bars, they should be cut exactly on the line of the joint and not at one side or the other. It is important that there is no lapping of the reenforcing bars at the control joints. At openings where control joints are located, the extra reenforcement normally provided around openings to prevent cracking must be stopped off at the joints or omitted altogether depending on whether the control joints are at the center or the jambs of the openings, Fig. 4.

When the control joint is at the center of an opening, the extra bars for the reenforcement at the sill and head are usually stopped two inches from the joint. If the opening is, for example, less than 4'6" wide, the ends of these bars at the joint should be hooked. In Fig. 4, there is shown a control joint at the center above an opening **21** and in line with both jambs **23** below the opening. Under such conditions, the arrangement at the head is the same as previously described above except that the extra vertical bars **27** extend only two feet below the head as well as above. At the sill, the extra bars are not needed because the control joints **22** are at the jambs **23**. In an opening with the control joints at the jambs above the head and below the sill, all extra bars normally provided around the opening may be omitted.

In erecting either form of the control joint strips to sheathing **6** of the concrete forms, the strips **5** or **5***a* must be fastened to the surface of the sheathing in a way that will hold them securely against impact from the concrete being placed and from spades in the hands of the puddlers. In Figs. 1 and 4, a suitable method of attaching the strips **5** or **5***a* to the sheathing is shown. Thus, the rubber control joint strip when nailed down, as shown, will remain in proper position during the placing of concrete if reasonable care is used in spading to avoid hitting the strip a hard blow from one side. In erecting the joint strips, the wall section at the joint strip should be reduced at least 20 percent and the sum of the depths of the inside and outside grooves should not be less than two inches. For example, the overall size of the joint strip of Fig. 3 should be approximately 1¼" from the inner edge to the outer edge, and the inner edge should be approximately ½" wide. Upon the concrete setting, the forms are stripped as described and the control joint strips are cast in place, sealing the control joints and permitting expansion and contraction of the wall sections.

The inner wall surfaces may also be provided with control joint strips as described above. However, where unexposed or plastered surfaces are formed on the inner wall, trapezoidal wooden furring strips may be mounted opposite the molded rubber control joint strips to provide the control joint at the inner wall surface.

Although I have described my invention particularly with reference to control joints for concrete walls, paving and the like, it is to be understood that the control joint strips are equally adapted for other forms of plastering or wall constructions where it is desirable to overcome unsightly wall cracks by providing ornamental control joints in predetermined arrangements. It is also to be understood that the control joint constructions of this invention may be wholly obscured by fluting the wall, as for example, providing a fluted spandrel over windows in which a control joint is located. Other arrangements will likewise suggest themselves to those skilled in the art.

It is thus evident that there has been disclosed a simple and inexpensive form of control joint strip for providing control joints in various forms of wall constructions. Although the control joint strip has been preferably disclosed as molded or extruded from natural rubber, it may also be formed of any other elastomeric material, such as a suitable synthetic rubber or resilient plastic material which will take a stretching or compressive action. The improved control joint strip particularly described with reference to vertical walls is equally adapted for floor and ceiling constructions and also for battered walls.

Having thus described my invention, it is obvious that various immaterial modifications may be made in the same without departing from the spirit of my invention; hence, I do not wish to be understood as limiting myself to the exact form, construction, arrangement and combination of parts herein shown and described or uses mentioned.

What I claim as new and desire to secure by Letters Patent is:

1. A control joint strip of yieldable material and of substantially trapezoidal shape in cross-section to be embedded in a concrete structure, means in the wider of the trapezoid bases for aligning a series of nails which can be driven through the strip for its attachment to a form with its narrower base against said form, whereby upon removal of the form the nails can be pulled from the strip and removed therefrom, the lower base being arcuate to form an arcuate joint surface in the face of the structure after the form is removed, and elongated reinforcing means on the wider portion of said body to maintain alignment of said body during the pouring process.

2. A control joint strip as claimed in claim 1, wherein said reinforcing means are laterally projecting ribs which also act as a water seal.

3. A control joint strip as claimed in claim 1, wherein said reinforcing means is a channel cap which is secured along the edges thereof to anchor the channel cap to the strip.

References Cited in the file of this patent

UNITED STATES PATENTS

Number	Name	Date
Re. 20,376	Fischer	May 25, 1937
639,961	De Man	Dec. 26, 1899
1,739,102	Strauss	Dec. 10, 1929
1,770,361	Fischer	July 8, 1930
1,890,954	Snyder	Dec. 13, 1932
1,953,846	Briggs	Apr. 3, 1934
2,139,465	Robertson	Dec. 6, 1938
2,228,052	Gardner	Jan. 7, 1941
2,230,303	Leguillon	Feb. 4, 1941
2,282,335	Methven	May 12, 1942