May 11, 1937. B. F. FRIBERG 2,080,124

REENFORCED CONCRETE STRUCTURE

Filed May 17, 1935

FIG. 1.

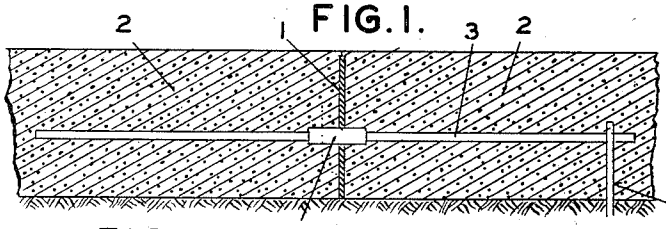


FIG. 2.

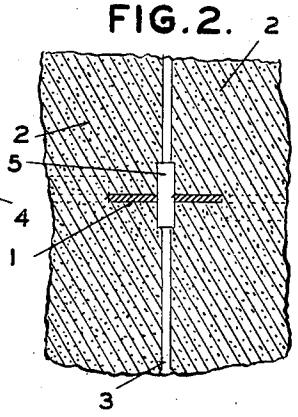


FIG. 3.

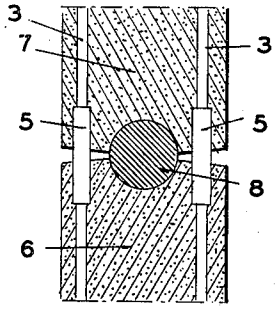


FIG. 4.

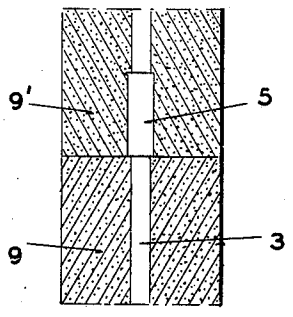


FIG. 5.

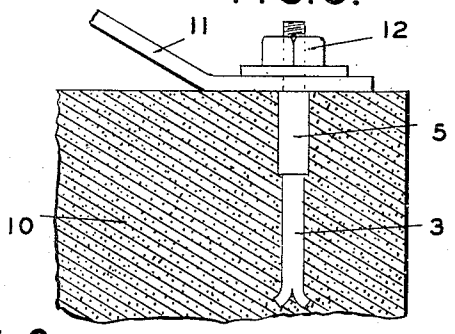
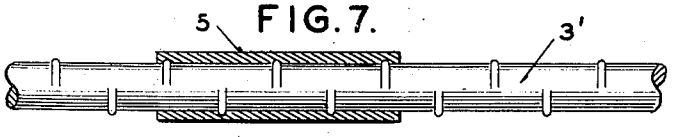


FIG. 6.

FIG. 7.



INVENTOR
B. F. FRIBERG

BY

ATTORNEY

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UNITED STATES PATENT OFFICE

2,080,124

REENFORCED CONCRETE STRUCTURE

Bengt F. Friberg, St. Louis, Mo., assignor to Laclede Steel Company, St. Louis, Mo., a corporation of Missouri

Application May 17, 1935, Serial No. 22,000

4 Claims. (Cl. 72—107)

My invention relates to concrete structures in which are embedded one or more tension rods or bars for holding together two masses of concrete, or for securing a mass of concrete to some exterior fabric. In such structures the longitudinal stress on the rod, caused, for example, by expansion and contraction of the parts or by impact, is localized at a single point in the length of the rod. The result of this concentration of stress may be either to disrupt the rod or to cause breakage of the bond between it and the concrete for such a distance that the stress is so reduced that it will cause no further rupture of the bond. Such breakage of the bond between the cement and the bar forms capillary spaces around the latter through which moisture may enter, causing rusting and final disintegration of the bar.

The object of my invention is to provide the dowels holding tightly together two such separated structures, or the re-enforcing bars in a structure, at a place where high stresses or movements may cause a structure to crack into separate parts, with bond-breaking means distributing the stress over a substantial portion of its length, the bond-breaking means being of such nature as to prevent access of moisture to the bar and its consequent rusting.

In the accompanying drawing, which illustrates some forms of doweled concrete structures made in accordance with my invention, Figure 1 is a vertical cross-section through a portion of a roadway; Figure 2 is a horizontal section through the same; Figure 3 is a vertical section through a portion of a supporting column having angular movement; Figure 4 is a similar view of a column or wall without pivoting arrangement for angular movement; Figure 5 is a sectional view showing the connection of a mass of concrete to an exterior fabric; Figure 6 is an enlarged fragmentary view of a plain dowel or reenforcing bar; and Figure 7 is an enlarged fragmentary view of a deformed dowel or reenforcing bar.

One application of my invention is to a concrete roadway provided with a crack-locating element, such for example, as that shown and described in Patent No. 1,768,555 granted to me July 1, 1930. Such application is shown in Figures 1 and 2 of the drawing in which the numeral 1 indicates the crack-locating element, 2 the masses of concrete at either side of the element, and 3 a dowel extending through an opening in the element and holding the masses 2 together. A chair 4 may be used at one or both sides of the dowel to support it while the concrete is being poured. If means is not provided for breaking the bond between the dowel and the concrete, the entire stress imparted to the dowel by an angular movement at the surface of separation of the abutting structure, will be concentrated in the extremely small portion of the device passing through the member 1. This concentration of the stress, as heretofore pointed out, will result either in rupture of the bar or breakage of the bond between the dowel and the concrete at either side of the member and consequent admission of moisture through the crack in the roadway and the capillary spaces around the bar. To prevent such action I provide the dowel, at the point of its passage through the member 1, with bond-breaking means 5 extending some distance at each side of the member. This bond-breaking means is formed of a coating of some elastic, water-proof material such as a bitumen. The stress on the dowel is thus distributed over a substantial portion of its length and consequently reduced to a value at which bond failure does not occur at the uncoated portion and access of moisture to the surface of the dowel is prevented.

In Figure 3, I have shown a construction applicable to a column comprising a lower part 6 and an upper part 7 capable of angular relative movement by reason of a cylindrical pivot member 8 interposed between them. In this construction two dowels 3 are used, one being positioned at each side of the pivot member and the bond-breaking coatings extending across the gap between the two parts of the column. The function of the bond-breaking coatings in this structure is the same as in the roadway previously described, attention being called to the fact that stresses in the bars may be in this case either tension or compression causing the bond failure and consequent rusting.

In Figure 4, I have shown a construction applicable either to a column or a wall comprising a lower part 9 and an upper part 9'. The coating 5 in this construction does not extend across the joint between the two parts but is located entirely within one part with one end abutting the other part. This construction secures the same result as when the coating extends into both parts of the structure as the necessary reduction of the stress along the bar is secured, preventing bond failure and subsequent rusting below the joint and in addition the elastic coating forms an effective seal, preventing access of moisture to the surface of the bar.

In Figure 5, I have shown a construction in

which a block of concrete 10 is secured to an exterior structure. The end of the dowel 3 projects beyond the face of the concrete and is rigidly secured, as by nut 12 or other means, to the exterior structure. Vibration, temperature stresses, or shock in the exterior structure may then set up highly concentrated stresses between the rod 3 and the concrete 10 immediately adjacent the face causing bond failure with subsequent rusting or rupture of the rod, which results are prevented by the coating 5 permitting the rod or bar to yield for some distance elastically under stress, independently of the concrete. The coating 5 extends down from the face of the block a sufficient distance to secure the stress distributing and moisture excluding functions heretofore described.

While in Figures 1 to 5, I have shown the bars as of the form known as "plain", that is, without projections, they may be of the kind known as "deformed", one type of which is illustrated in Figure 7.

Having fully described my invention, what I claim as new and desire to secure by Letters Patent of the United States is:

1. In a structure of the kind described, the combination with two adjacent members, at least one of said members comprising a body of concrete or the like, of a rod embedded in said concrete and holding the members together, a portion of the rod being unbonded to the surrounding concrete for a distance adjacent the plane of junction of the members, whereby substantial stretch is distributed in the unbonded portion of the rod without rupture of the bond in the remainder of the rod.

2. The combination with a body of concrete or the like comprising two parts, of a bar embedded in and bonded to both parts, and bond breaking means between the bar and concrete located at the point of junction of said parts, whereby substantial stretch under longitudinal stress is permitted in the portion of the bar at which the bond breaking means is located without rupture of the bond in the remainder of the bar.

3. The combination with a body of concrete or the like forming a roadway or similar construction, of a crack-locating member dividing said body into parts, a bar binding said parts together, and bond breaking means between the bar and the concrete located at the junction of said parts, whereby substantial stretch under longitudinal stress is permitted in the portion of the bar at which the bond breaking means is located without rupture of the bond in the remainder of the bar.

4. In a structure of the kind described, the combination with two adjacent members, at least one of said members comprising a body of concrete or the like, of a bar embedded in said concrete and holding said members together, and an elastic coating of water-proof material between the bar and concrete located at the point of junction of the members, whereby substantial stretch under longitudinal stress is permitted in the portion of the bar at which the coating is located without rupture of the bond in the remainder of the bar.

BENGT F. FRIBERG.