

[54] **METHOD AND MEANS FOR REINFORCING CEMENTATORY MATTER**

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[52] U.S. Cl. **52/659; 52/741**

[51] Int. Cl.² **E04C 5/00; E04B 1/00**

[58] Field of Search **52/659, 653, 663, 671, 52/660, 741, 633; 161/13, 14, 17**

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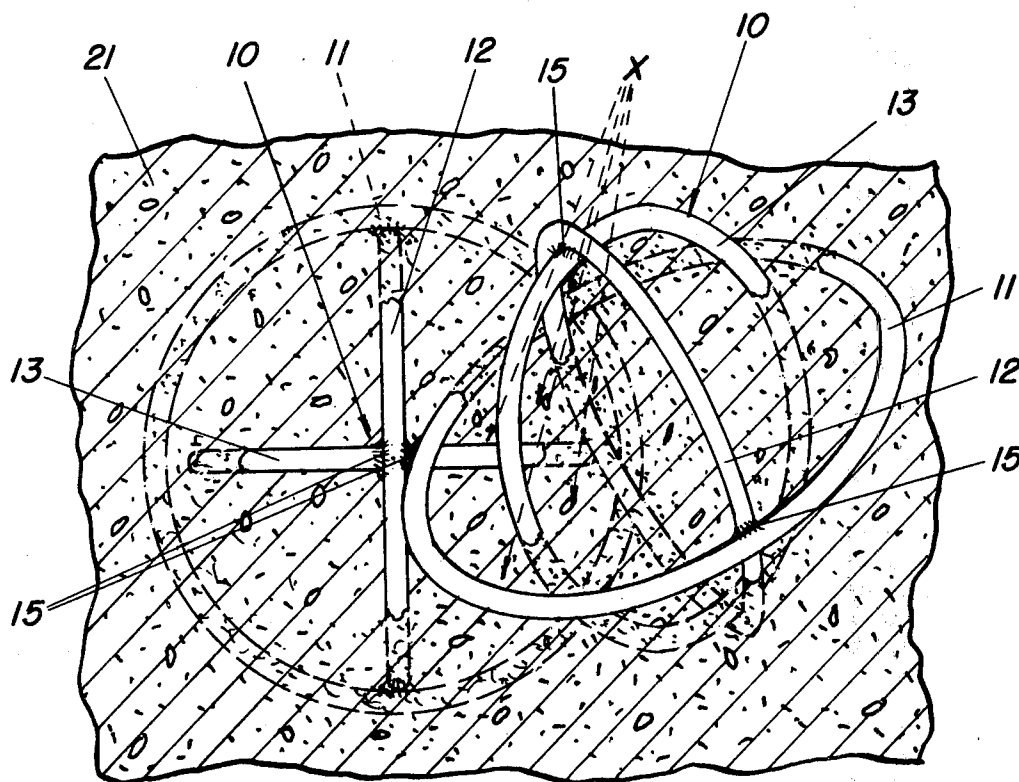
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[57]

ABSTRACT

A method and means for reinforcing concrete and the like cementatory matter wherein preformed skeletonized three dimensional bodies shaped to randomly interrelate to define interconnecting voids are thoroughly mixed into the plastic material in sufficient quantity to necessarily insure their said interrelation whereupon hardening, the tensil, shear and/or compression properties of the bodies reinforces the mass.

2 Claims, 5 Drawing Figures



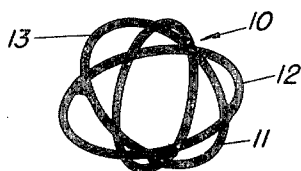


FIG. 1

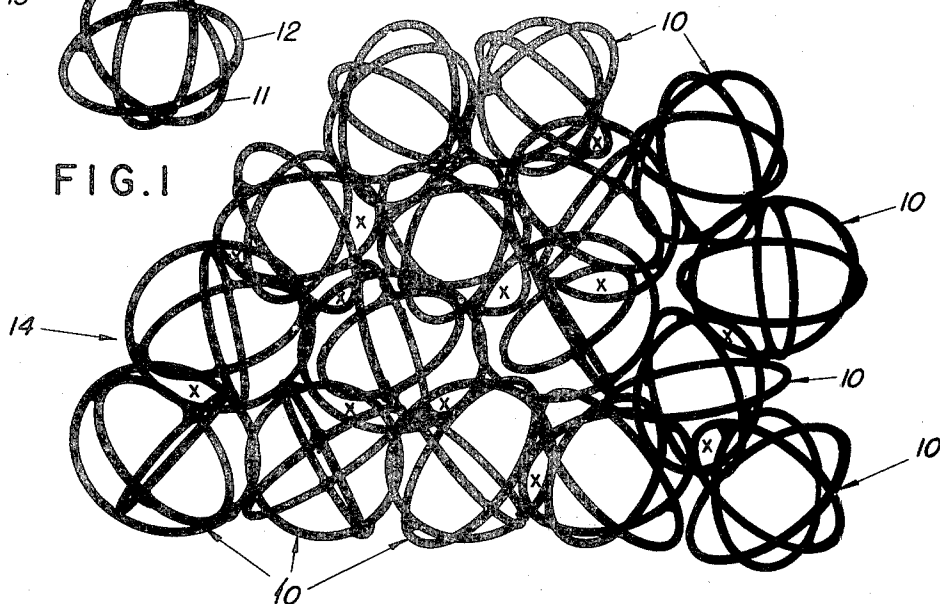
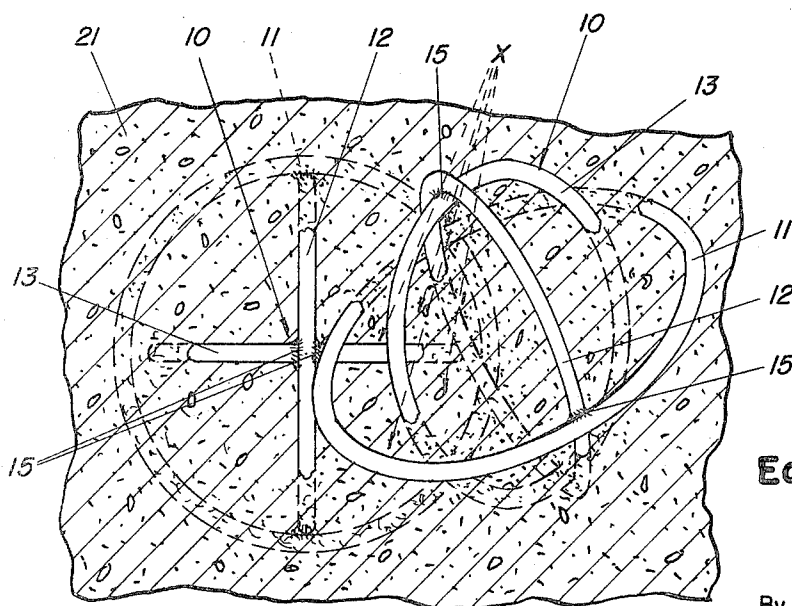


FIG. 2

FIG. 3



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FIG. 4

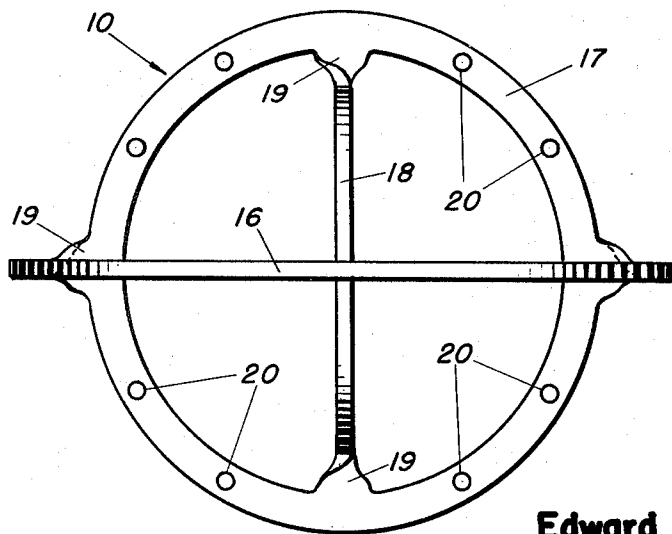
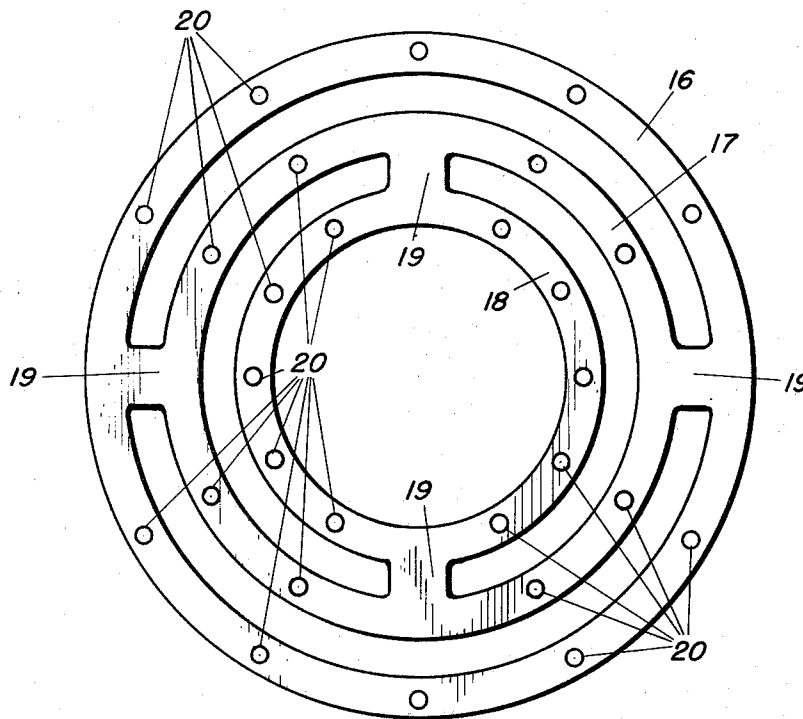


FIG. 5

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METHOD AND MEANS FOR REINFORCING CEMENTATORY MATTER

My present invention is a unique method and the means for reinforcing cementatory mater, i.e. materials that are liquid or viscous and are caused to harden to one degree or another by chemical action, dehydration, heat setting or the like.

The concept is broadly usable with a wide range of substances for example, molding plastics, rubber, concrete, asphalt, or any substance that is sufficiently viscous to flow and fill existing voids and then harden and requiring a reinforcement to increase its tensil and or shear strength. It could conceivably enhance its resistance to compression also, if this is the need.

In forming cementatory materials, it is well known to increase desired physical properties by incorporating reinforcing materials. This often takes the form of strands of wire or fibre glass, parallel and woven, about which the cementatory matter is formed. In larger functions, such as concrete work, the wires are found to be steel rods, pre-stressed or relaxed and/or tied within the forms to be filled in intricate patterns. Each of the foregoing is time consuming and therefore costly.

The following description is made in relationship to concrete because more of the variables occur in this area. But, it is not intended to so limit the scope of the invention; a patent for which is sought for every use of which it is now known or may hereafter be found to be susceptible.

It is a principal object of my present invention to provide a method and means for reinforcing cementatory matter which eliminates entirely the necessity for expending labor to install reinforcing materials in a form or mold adapted to receive said matter.

A further object of this invention lies in the provision of a method of reinforcing said matter by incorporating in the matter while viscous, a sufficient quantity of a strong skeletonized enmeshment to substantially fill the void proposed, that is until no substantial additional enmeshment will be accomodated even though there are many voids defined thereby to receive and contain the cementatory matter.

Yet another object lies in providing plural skeletonized free bodies adapted to randomly interrelate with each other to form interconnecting voids adapted to contain cementatory matter which is reinforced by said bodies.

To this end I have disclosed a preferred physical embodiment suitable for the practice of my invention. However, it should be abundantly clear from the choice of terminology that the invention is to be broadly construed to correspond to the state of the art as presently known.

To facilitate a quick understanding of the invention, the preferred embodiment is graphically portrayed in the accompanying drawings wherein:

FIG. 1 is a line drawing of one three dimensional skeletonized body;

FIG. 2 is a line drawing of a group of 16 skeletonized bodies randomly interrelated and lying upon a single plane;

FIG. 3 is a view showing a pair of randomly interrelated bodies partially imbedded in concrete;

FIG. 4 is a blanked-out modified body stamped from sheet material; and

FIG. 5 is the finished three dimensional form of the blanked-out skeletonized body of FIG. 4.

The material used in forming the skeletonized bodies will be compatible for use in the cementatory matter. To this end it will have greater tensil and shear strength than the hardened matter. Steel is found to be practical in association with concrete but not exclusively so.

Referring now in detail to the several view of the drawings, the numeral 10 indicates one preferred form of skeletonized body which has three rings or circular enframements 11, 12 and 13 successively of smaller diameter to fit one within another, in close tolerance. The enframements may be other configurations than circular so long as their shapes and sizes are such as to permit their random inter-relationship to define plural voids as at $x-x$ of FIG. 2; it being understood that many more voids may be observed from other angles. Also it will be obvious that whereas the enframements are continuous or unending, this configuration is not essential to the successful practice of the invention. Any enframement configuration that will result in voids formed by the inter-relationship of bodies 10 wherein tension to separate the bodies 10 is expressed as a compression force on the hardened matter in the void x will effectively function.

The inter-related bodies 10 are termed a skeletonized enmeshment 14 (FIG. 2) and corporately defines plural voids $x-x$.

The three rings are preferably welded 15 or otherwise secured with each circular enframement 11, 12 and 13 disposed at right angles to each other and having a common center.

To simplify formation of the skeletonized bodies, I propose to stamp them from sheet material in the form seen in FIG. 4 with three concentric circles 16, 17 and 18 connected to their adjacent circle(s) by diametrically opposed webs 19 with the webs of the outer 16 and central ring 17 disposed 90° from the webs of the inner 18 and central rings 17. Each of the rings will also have annularly spaced axially parallel holes 20—20 to further increase the engagement or attachment to the cementatory matter, as concrete 21. The enframements 16, 17 and 18 may thus be disposed in planes at right angles to each other by twisting the webs 19—19.

The circular and unending configuration for the enframements 10, 11, 12, 16, 17 and 18 and the specific recited angularity has been chosen because it admits of randomly placing a calculated predetermined quantity of the skeletonized bodies 10 together and they will fill the cubic capacity for which they are calculated and provide the great number of voids x . That is to say, the bodies 10 need not be manually arranged to fulfill this function, but they will automatically do so. For example, say 100 bodies 10 are placed in a cubic foot square mold and fill it so that no additional bodies 10 may be added within the limits of the cubic foot. Then add this 100 bodies to one cubic foot of viscous cementatory matter and mix as is conventional and pour the mixture containing the bodies 10 into the one cubic foot mold and, without seeing any of the bodies 10, one knows they are interrelated to form the enmeshment 14 having the voids x and all of the voids are filled with the cementatory matter. Of course, the quantity of matter displaced by the actual volume displaced by the bodies material will be excess. Under normal practice this amount of cementatory matter is reduced to eliminate waste.

Preferably a measured quantity of bodies 10 will be added while the cementary matter is being mixed in the same manner as the sand, gravel and cement are added so that no additional time and labor are involved. However, they may be first filled into the form and then the cement filled around them, or they could conceivably be added after the cement has been poured by forcing them into the viscous mass. The latter would be less practical, however.

It is also contemplated that the location of the enmeshment 14 could be stratified by employing bodies 10 of a material having a widely different specific gravity than the viscous concrete. By using fewer than those required to fill the cubic capacity, say one-half, and then vibrating or jiggling the viscous matter, the bodies would tend to rise or sink as the case may be and thus stratify them in an upper or lower fraction of the finished concrete.

The bodies 10 may be of any practical size sufficient to form the said enmeshment 14 and facilitate flow of the liquid or viscous cementary matter into the voids x. In respect to concrete, it is preferable that none of the aggregate particles be larger than the central hole of the smallest ring 13 or 18. Smaller particles, in-so-far as this invention is concerned facilitate proper flow of the matter into all of the voids x.

Having thus described my invention, I desire to secure by Letters Patent of the United States the follow-

ing:

1. A reinforced concrete structure comprising: a plurality of relatively small skeletonized three dimensional bodies of material, having desired tensile and shear strength, constructed with more than two substantially planar elements, whose planes angularly intersect, each planar element having unitary peripheries defining medial voids, the said bodies interfitting with each other and defining intercommunicating voids between and about the bodies, said voids containing hardened cementary matter which is reinforced by said bodies; wherein, the angularly intersecting substantially planar elements are substantially circular and three such elements are disposed in three different planes at substantially right angles to each other.

2. The invention according to claim 1 wherein: the angularly intersecting substantially planar elements are each formed from thin sheet material with three concentric flat rings each interconnected to its adjacent ring by diametrically opposed webs, the webs connecting any two adjacent rings being disposed substantially 90° from each other, the whole structure being configured with the angularly intersecting substantially planar elements in three perpendicular planes.

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