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W. ERNST ET AL
REINFORCING MAT STRUCTURE WITH RING SPACERS FOR USE
IN CONCRETE CONSTRUCTION

3,331,179

Filed July 6, 1964

2 Sheets-Sheet 1

FIG.1

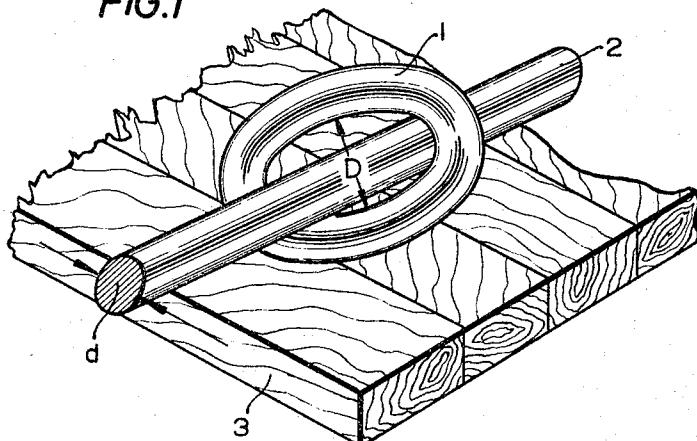
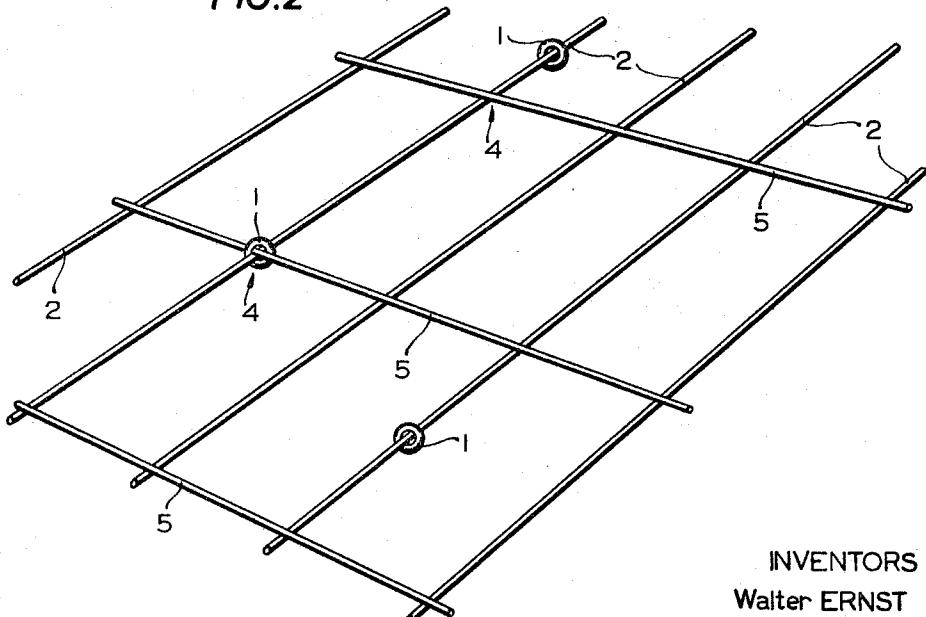


FIG.2



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FIG. 3

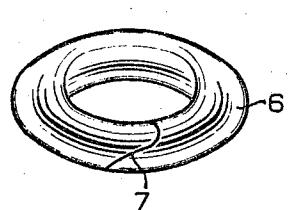


FIG. 4

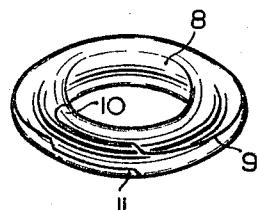
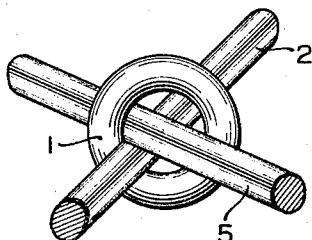


FIG. 5



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REINFORCING MAT STRUCTURE WITH RING SPACERS FOR USE IN CONCRETE CONSTRUCTION

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The present invention relates to reinforcing structures and a method of manufacturing the same, more particularly to steel mats for use in reinforced concrete constructions, such as floors, walls and the like, consisting essentially of superposed longitudinal and cross bars of rods joined at their intersection points. In the use of reinforcing structures of the foregoing type, accuracy in the positioning of the steel bars or mats within the concrete formwork is highly essential, inasmuch as any error in the proper position or spacing of the bars from the walls of the formwork is likely to alter the character and strength of the final concrete constructions after pouring of the concrete.

Accordingly, an important object of the present invention is the provision of an improved supporting or spacing element for use in connection with and/or structural embodiment in the prefabricated mats or the like reinforcing structures, to ensure accurate and positive fixation or spacing of the mats or the like structures in relation to the concrete formwork in accordance with the structural and design considerations or requirements for the particular concrete construction or work at hand.

Numerous spacing means or devices have been proposed in the past to effect the spacing or positioning of the reinforcing bars or mats in concrete constructions being designed to ensure adequate coverage by the concrete, on the one hand, and to provide a concrete structure having the desired useful or effective height or resistance in compliance with existing dimensional and design considerations.

Accordingly, a further object of the present invention is the provision of an improved spacing or supporting element of the referred to type for use in connection with concrete rod or mesh reinforcing structures which is both simple in design, economical in fabrication and use, and which will ensure a positive fixation, or spacing of the structures, in relation to or from the concrete framework, respectively, both prior to and during the pouring of the concrete.

There are already known spacing means of this type designed to encircle the reinforcing rods in the form of a disk or rosette. These spacing elements which must be applied during the manufacture of the structures all lack the rigidity necessary to ensure an exact positioning or spacing of the reinforcements both prior to as well as during the pouring of the concrete. Besides, the known arrangements suffer from the defect that the mounting of the spacing elements upon the reinforcing rods is generally inadequate, to avoid displacement or canting liable to impair the exact fixation or positioning of the reinforcing structures in the poured concrete structures. Besides, special tools and operations are required for the mounting of the elements at the construction site, or site of the walls, roofs or the like concrete structures.

Accordingly, a further object of the invention is the provision of a spacing element of the type referred to, especially for use in connection with reinforcing concrete mats, by which any additional operations or work at the construction site, or after the fabrication of the reinforce-

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ing structures, are reduced to a minimum or eliminated.

The invention, both as to the foregoing and ancillary objects as well as novel aspects thereof, will be better understood from the following detailed description, taken in conjunction to the accompanying drawings forming part of this specification and in which:

FIG. 1 is a perspective view of a spacing element constructed in accordance with the principles of the invention, being shown in mounted position upon the rods of a mat or the like reinforcing structure;

FIG. 2 shows in perspective a prefabricated reinforcing mat structure fitted with a plurality of spacing or supporting elements of the invention;

FIGS. 3 and 4 illustrate alternative improved constructions of the spacing element according to FIG. 1, suitable especially for mounting upon the completed mats, such as at the construction site; and

FIG. 5 shows a spacing element according to the invention mounted at an intersection point of the longitudinal and transverse bars or rods of a reinforcing mat structure.

Like reference numerals denote like parts in the different views of the drawings.

With the foregoing objects in view, the invention involves generally the provision of a spacing element of the type referred to for reinforcing mats and the like structures, consisting essentially of a toroidal or ring-shaped body having a circular cross-section, the ring or toroid being adapted to be threaded upon or to encircle the rod or bar of a reinforcing mat or the like structure, to act as a spacing or supporting element therefor. For the latter purpose, the spacing ring has an inner diameter which is substantially in excess of the diameter of the rod supported thereby, or in excess of the sum of the diameters if the ring encircles the intersection point of a pair of longitudinal and transverse rods of a mat structure, respectively.

According to a preferred embodiment of the invention, the spacing element may be a solid ring completely closed upon itself, or it may be slit, preferably along an oblique line or cut. Finally, the ring may be slit to provide a pair of spiral parts interengaging one another. In the first case, the ring or rings are preferably mounted or threaded upon the rods of a mat structure during the fabrication of the latter, while in the latter cases, the rings may be mounted subsequently, such as at the construction site, by spreading and insertion of the rods to be supported and closing by virtue of the elasticity of the material. Other means to effect opening and closing of the rings for the mounting or removal of same, will readily suggest themselves to those skilled in the art.

The spacing rings of the invention may consist of steel or any suitable equivalent material, such as a synthetic and preferably moldable material. In the former case, it is advantageous to coat the rings with a suitable rust-proofing material.

In the manufacture of prefabricated reinforcing mats or the like structures, the spacing rings may be applied by an improved method according to the invention comprising the steps of threading the rings upon the component rods or bars of one type that is, either the longitudinal or transverse bars of a mat structure whichever will be in the lower position, or position adjoining the wall of the concrete formwork, in the final mounting position of the structures, whereupon the bars are connected at their intersection points by spot welding or in any other suitable manner. As a consequence, the rings threaded upon one type of component bars, such for instance, the longitudinal bars of the mat, though in sliding relation thereto, will be retained by the adjacent coordinated component bars, that is, the crossbars in the example

referred to, whereby to facilitate the transport of the mats to the construction site and mounting in the final position within the concrete framework, substantially without any additional spacing or mounting operations or positioning of separate spacing elements. In this manner, it is possible to provide the correct number of spacers during the manufacture of the mat structures, as well as to distribute the spacers over the mats in accordance with the special requirements of the work at hand.

According to an alternative embodiment of the invention, the spacing rings may be constructed to enable a separate mounting upon the completed mats or the like reinforcing structure, such as for use at the construction site, to suit existing conditions and operating requirements.

If a ring-shaped spacer is mounted or threaded upon a longitudinal bar of a reinforcing mat, that is, between two adjacent cross bars of said mat, it may be displaced within the limits corresponding to the spacing distance between said cross bars, that is, its position may be varied or adjusted at the construction site and adapted to any existing obstruction, such as an electric power line located within the formwork in which the mat or mats are to be mounted.

If the spacing rings are provided at or arranged to encircle the intersection points of the longitudinal and cross rods of a mat structure, they act, aside from their main function as improved spacing and positioning means for said structure, to provide additional support for or to stabilize the positions of the intersecting points of the rods.

Referring more particularly to FIG. 1 of the drawings, the spacing element 1 takes the form of a toroid or ring of circular cross-section. In the example shown, the ring 1 may encircle the longitudinal rod or bar 2 of a reinforcing mat structure, whereby to fix the distance of said rod or structure from the bottom wall 3 forming part of a concrete framework. The inner diameter D of the ring 1 is substantially in excess of the diameter d of the rod 2 supported thereby. For practical purposes, diameter D is at least 1.5 to 2 times the diameter d, in such a manner that rings may be readily displaced and positioned within the range of the adjacent cross-bars 5 of the mat structure, FIG. 2, of which rod 2, FIG. 1, forms a part. Besides, the rings, being threaded upon or suspended from the bar 2 during the transport of the prefabricated mats or structures, will assume, upon mounting of the mats in the concrete framework, an oblique or inclined position relative to said bar as shown in the drawing, in such a manner as to ensure an exact and constant spacing distance between the mats and the framework in all positions and under all circumstances.

Ordinarily, the ring-shaped spacers according to the invention may be made of steel and threaded upon the lower rods of the mats or the like reinforcing structures during the fabrication of the reinforcing structures, advantageously during the welding operations for connecting the longitudinal and cross bars of the structures. In such a case, care should be taken to place the mats in such a manner that the bars fitted with the spacer rings are in the lower position or position adjacent to the formwork wall in the final mounting arrangement.

The spacing elements of the type according to the invention practically ensure a point-to-point contact with the concrete formwork. This has the further advantage that the rings will be adequately covered by the concrete and that there will be practically no interference with the surface of the concrete structure (wall, roof, etc.) after removal of the formwork. If desired, however, the necessary rustproofing of the spacers may be achieved by the application of a suitable proofing material.

Although the spacing elements according to the invention are primarily designed or intended for mounting upon or embodiment in prefabricated reinforcing mats or the like structures in the manner described hereinbefore, they may be modified, in accordance with an improved feature of the invention, for subsequent applica-

tion to the mats or rods of any reinforcing structure, to suit any existing operating conditions or requirements. Examples of modified spacing rings of the latter type are shown by FIGS. 3 and 4 and described in the following.

FIG. 3 shows a ring 6 cut along an oblique separating line 7, to enable spreading of the ring portions adjoining the line or cut 7 for the mounting of the rings upon a reinforcing rod or bar in the spread position. After mounting, release of the spread ring will result in reclosing and threading of the ring upon said rod by virtue of the elasticity of the material.

The ring 8 shown in FIG. 4 is provided with an overlapping or spiral cut 9 extending over and beyond the entire circumference of the ring from point 10 to point 11 shown in the drawing. Again, the resultant ends of the ring may be spread for the insertion of the reinforcing rod and the ring closed by release of the spread end portions. If necessary, special tools or implements may be provided for the mounting of the rings.

FIG. 5 shows an alternative mounting position of the spacing rings of the invention upon a reinforcing mat or the like structure. According to this modification, the ring 1 encircles both the longitudinal and cross bars 2 and 5, respectively, of a mat structure at the intersection point of said bars. In the latter case, the inner diameter of the ring should, in accordance with the invention, be in excess of the sum of the diameters of the bars or rods 2 and 5. In other words, in the arrangement shown, both intersecting rods are supported equally by the spacing ring, in such a manner as to make it possible to mount the mat with either of the rods 2 or 5 adjoining the wall of the concrete framework. Besides acting as spacing elements, the rings in FIG. 5 provide additional support or stability of the intersecting points of the bars.

The spacing rings according to the present invention do not necessarily have to consist of metal, but may be of any suitable material, such as, for instance, a synthetic and easily moldable plastic having the necessary characteristics (strength, elasticity, etc.), of a suitable ceramic porcelain, or the like setting material capable of casting or molding.

In the foregoing the invention has been described in reference to a specific illustrative device. It will be evident, however, that variations and modifications, as well as the substitution of equivalent parts or elements for those shown for illustration, may be made in accordance with the broader scope and spirit of the invention as set forth in the appended claims. The specification and drawings are accordingly to be regarded in an illustrative rather than in a restrictive sense.

We claim:

1. In combination with a mat structure for use in reinforced concrete construction comprising sets of spaced and superposed intersecting longitudinal and transverse rods joined at their intersection points to form a reinforcing mat structure; spacing means to maintain and structure at a constant distance from the wall of the concrete formwork in which said structure is to be mounted being comprised of a plurality of ring-shaped spacing elements having a circular cross-section and being loosely threaded upon the rods of at least one of said sets, said elements having an inner diameter substantially in excess of the cross-sectional dimension of the component rods of said structure encircled thereby whereby said elements assume a fixed inclined position relative to said rods upon mounting of said mat upon said wall.

2. In a reinforcing mat structure as claimed in claim 1, said elements encircling the rods of one of said sets located adjacent to said wall in the mounted position of said structure and having an inner diameter in excess of the diameter of said last-mentioned rods.

3. In a reinforcing mat structure as claimed in claim 1, said elements encircling the rods of both said sets at the intersection points thereof and having an inner diameter in excess of the sum of the diameters of the rods of said sets.

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