

Oct. 24, 1967

F. W. BERRY

3,348,347

SYNTHETIC PLASTIC SPACER FOR CONCRETE REINFORCEMENTS

Filed Nov. 18, 1964

3 Sheets-Sheet 1

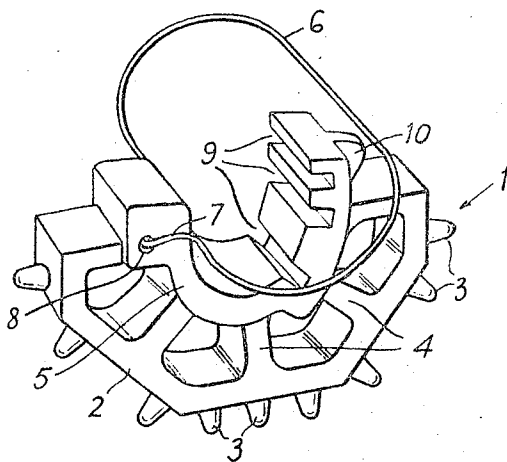


Fig. 1

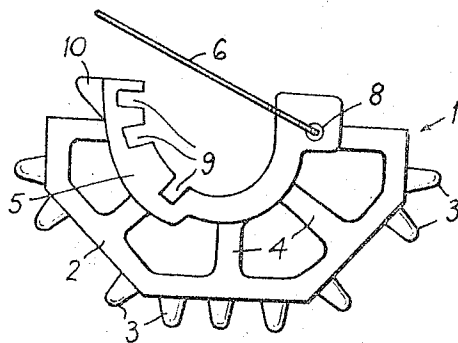


Fig. 2

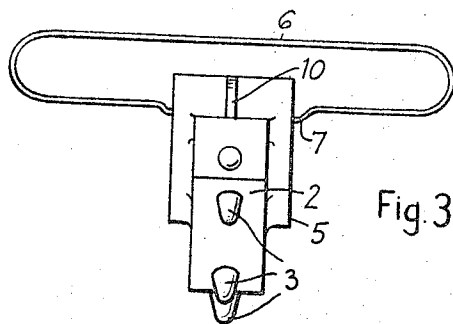


Fig. 3

Inventor

F. W. Berry

By

Robert W. Berry
Attorneys

Oct. 24, 1967

F. W. BERRY

3,348,347

SYNTHETIC PLASTIC SPACER FOR CONCRETE REINFORCEMENTS

Filed Nov. 18, 1964

3 Sheets-Sheet 2

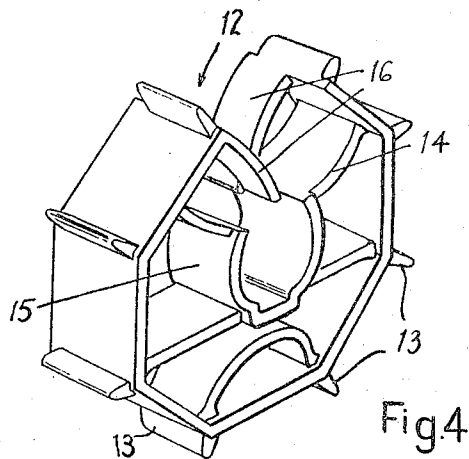


Fig. 4

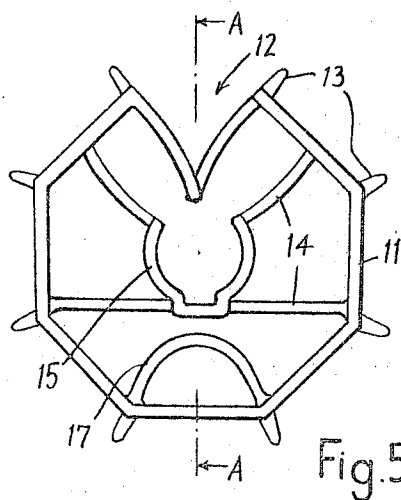


Fig. 5

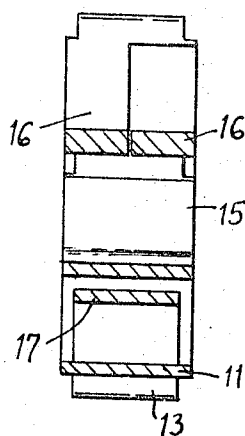


Fig. 6

Inventor
F. W. Berry
By *Herbert W. Smith & Bunch*
Attorneys

Oct. 24, 1967

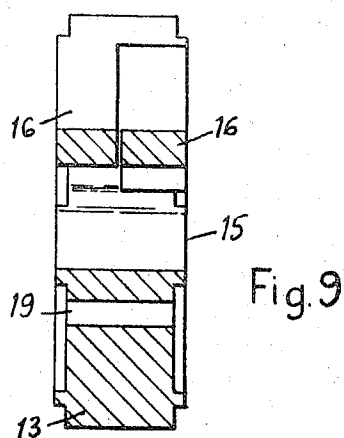
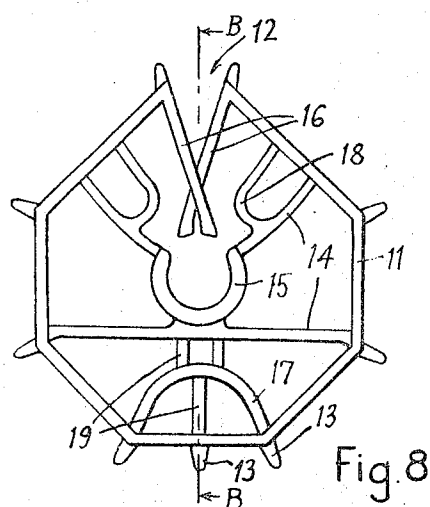
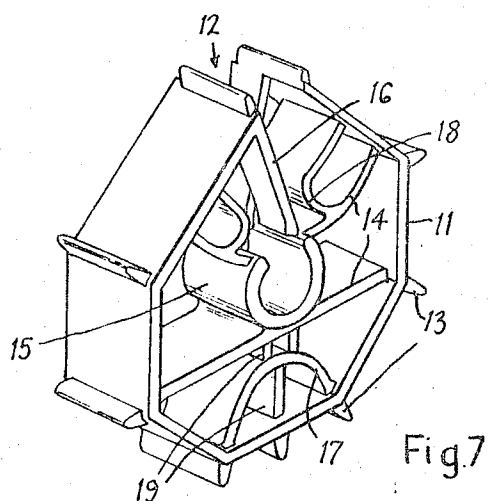
F. W. BERRY

3,348,347

SYNTHETIC PLASTIC SPACER FOR CONCRETE REINFORCEMENTS

Filed Nov. 18, 1964

3 Sheets-Sheet 3



Inventor
F. W. Berry
By *Horrocks, Wetherill & Associates*
Attorneys

1

3,348,347

SYNTHETIC PLASTIC SPACER FOR CONCRETE REINFORCEMENTS

Ferdinand William Berry, "Latchetts," 108 Woodland

Drive, Hove 4, Sussex, England

Filed Nov. 18, 1964, Ser. No. 411,985

Claims priority, application Great Britain, Nov. 21, 1963,

46,001/63, 46,002/63

5 Claims. (Cl. 52—309)

The present invention relates to spacers for use in spacing the reinforcements of reinforced concrete structures away from the shuttering or mould, or from other reinforcements of the structure, whilst the concrete is poured into the shuttering or mould, and whilst the concrete is setting.

It is an object of the invention to provide spacers moulded from synthetic plastic material.

Synthetic plastic material does not adhere or bond to the concrete, so that spacers made from such a material, likewise, do not adhere to the concrete in which they are embedded and, moreover, gaps often form between the spacers and the concrete when the concrete hardens. It has been found that moisture may seep between the spacer and the concrete and attack the reinforcements, thereby causing "blowing" of the concrete.

It is a further object of the present invention to provide a synthetic plastic spacer in which the keying of the spacer to the concrete of the structure is ensured by the provision of apertures in the spacer, through which liquid concrete may easily flow.

It is a further object to provide a spacer construction in which penetration of moisture between the spacer and the concrete, towards the reinforcement, is reduced or eliminated by the provision of a tortuous path for such moisture.

It is still a further object of the invention to provide a synthetic plastic spacer having a reinforcement-receiving opening extending inwardly from the periphery thereof, and at least one resilient closure element for retaining a reinforcement within the opening. The closure element may be formed from a length of springy wire attached to the spacer and pivotable across the opening to retain a reinforcement therein. Alternatively, the closure element may comprise one or more integral deformable flaps which extend across the opening.

In order that the invention may be more readily understood, reference will now be made to the accompanying drawings, in which:

FIGURE 1 is a perspective view of a spacer according to one embodiment of the invention;

FIGURE 2 is a plan view of the spacer shown in FIGURE 1;

FIGURE 3 is a side view of the spacer shown in FIGURES 1 and 2;

FIGURE 4 is a perspective view of a spacer according to a second embodiment of the invention;

FIGURE 5 is a plan view of the spacer shown in FIGURE 4;

FIGURE 6 is a section on the line A—A of FIGURE 5;

FIGURE 7 is a perspective view of a spacer according to a third embodiment of the invention;

FIGURE 8 is a plan view of the spacer shown in FIGURE 7; and

FIGURE 9 is a section on the line B—B of FIGURE 8.

In the embodiment illustrated in FIGURES 1, 2 and 3, the spacer comprises a disc-like member moulded in one piece from a synthetic plastic material to the configuration of one half of a generally octagonal open or apertured framework 1, to enable liquid concrete to flow easily through the spacer. This framework comprises a periph-

2

eral frame 2, having generally conical, moulded protrusions 3 spaced around the outer surface thereof, inwardly directed frame portions 4, and a generally U-shaped portion 5 defining an opening or slot for receiving a reinforcement, such as a reinforcing rod (not shown).

A resilient closure or catch element comprising a length of springy wire which is bent into an elongated loop or ellipse 6 is pivotally connected to the U-shaped portion 5 by a hinge portion 7, formed in one longer side of the loop 6, located in an aperture 8 in the outer end of one limb of the U-shaped portion 5. The inner wall of the other side limb of the U-shaped portion 5 is provided with a number of axially extending grooves 9, within either of which the free longer side of the loop 6 may be sprung. In addition a lug 10 is moulded on the outer end of the said other limb.

To secure the spacer to a reinforcing rod, the reinforcing rod is inserted into the slot defined by the portion 5, the free longer side of the loop 6 then being deformed and pivoted down into the slot until its axially spaced ends engage the top of the reinforcing rod, and the free longer side of the loop is sprung into the groove 9 which is disposed beneath a line passing through the aperture and tangential to the top of the reinforcing rod. When inserted into this groove 9, the said longer side of the loop springs into contact with the groove wall, thereby preventing the loop from being displaced, whilst the axially spaced ends of the loop are deformed by and resiliently bear against the reinforcing rod and frictionally engage it. By providing a number of grooves 9, into which the loop may alternatively be latched, reinforcing rods having different cross-sectional dimensions may be accommodated.

When the spacer is being stored or shipped, the free longer side of the loop 6 may be sprung over the lug 10, to prevent the loop 6 from swinging freely.

It will be seen that the protrusions 3 have a diameter which is less than the width of the peripheral frame 2 so that a shoulder or step is formed at the junction of each protrusion 3 and the frame 2. Likewise, the width of the frame portions 4 is less than that of the U-shaped portion 5, so that shoulders or steps are formed at the junction of each frame portion 4 and the U-shaped portion 5. With this construction, when the spacer is assembled to a reinforcing rod, and the reinforcing rod is embedded in a concrete structure, adjacent a surface thereof, any tendency for moisture to seep along the side surface of the spacer is reduced.

The spacer shown in FIGURES 4, 5 and 6 is moulded to the configuration of a generally polygonal, for example octagonal, open framework, the peripheral frame 11 of which has an opening 12 therein, and a plurality of ribs 13 projecting therefrom. Inwardly directed frame portions 14 are moulded integrally with the peripheral frame 11 and with a generally U-shaped portion 15 within which a reinforcing rod (not shown) is intended to be located. The open end of the U-shaped portion 15 faces towards the opening 12.

Moulded integrally with each edge of the opening is a resilient closure element in the form of a flap 16 which extends diagonally into the space between the opening 12 and the portion 15. These flaps 16 are staggered or offset with respect to the longitudinal axis of the opening 12 so that they are free to cross over one another. The inner free ends of these flaps 16, in the undistorted condition of the flaps 16, may be in alignment as shown. To simplify manufacture of the spacer, these free ends may initially be moulded together, and, after moulding, be separated, for example by cutting, using a hot wire, knife or flame.

The spacer is additionally provided with a semi-circular strengthening web or portion 17 integral with the peripheral frame 12, beneath the U-shaped portion 15.

3

In operation, a reinforcing rod (not shown) is pressed into the opening 12 deforming and separating the flaps 16, passing into and seating within the slot defined by the U-shaped portion 15, whereafter the flaps 16 spring back to their original position as shown. During this operation undue flexing of the portion 15 is prevented by engagement of the underside of the portion 15 with the web 17. If, during casting of the concrete structure, there is any tendency for the reinforcing rod to move out of the U-shaped portion 15, this is prevented by engagement of the rod with the lower free ends of the flaps 16. The width of the ribs 13 is less than that of the peripheral frame 11, thereby forming a step or shoulder between the two, and the inwardly directed frame portions 14 are of a different width to that of the frame 1 and 5, thereby forming steps or shoulders therebetween. With this construction, as with the construction shown in FIGURES 1 to 3, there is provided a tortuous path for moisture between the concrete and the side surfaces of the spacer.

In the embodiment shown in FIGURES 7, 8 and 9, which is similar to that shown in FIGURES 4, 5 and 6, the inner free ends of the flaps 16 cross over one another. With this construction, if there is any tendency for the reinforcing rod (not shown) to move out of the U-shaped portion 15 during casting of the concrete structure, the rod engages the lower free ends of the flaps 16 causing them to become further crossed, thus further closing the opening 12. The amount by which the free ends may be further crossed, and therefore the amount by which the reinforcing rod can move out of the portion 15, is limited by stops 18 in the form of curved ribs moulded on to the upper inwardly extending frame portions 14 adjacent said free ends.

The spacer shown in FIGURES 7, 8 and 9 is also provided with integral struts 19 connecting the bottom of the portion 15 to the web 17 and peripheral frame 11, and an additional one of the ribs 13 forms an outward extension of the strut 19. This strengthening increases the resistance of the spacer to deformation due to the weight of the reinforcing rods.

The spacer shown in FIGURES 7, 8 and 9 is provided with different width frames 11 and 15, ribs 13 and frame portions 14 to form a tortuous path as described with reference to the preceding embodiment.

It will be understood that various modifications may be made without departing from the scope of the invention as defined in the appended claims. For example, the conical protrusions 3 of the spacer illustrated in FIGURES 1 to 3 may be replaced by protrusions of other shapes, for example by transversely extending ribs as shown in FIGURES 4 to 9, and vice versa. Alternatively, the protrusions or ribs may be omitted from part or all of the peripheral surfaces of the spacers. This latter alternative is desirable when synthetic plastic shuttering is used, since protrusions tend to press into the slightly resilient surface of the shuttering during casting, and consequently these protrusions may stand proud of the surface of the concrete structure when the shuttering is removed. If the peripheral surface of the spacer is smooth, the likelihood of this happening is reduced or eliminated.

Moreover, the recesses or grooves 9 illustrated in FIGURES 1 to 3 may be replaced by other catch element retaining means, for example by shoulders provided on the wall of the slot or opening, and additionally or alternatively, the catch element may comprise a length of springy wire bent into the shape of a J instead of an ellipse. The short arm of the J may then be engaged within the aperture 8 whilst the bottom loop engages the reinforcing rod and the longer arm engages within the recess or groove 9.

The spacers hereinbefore described may be circular or part-circular instead of polygonal or part-polygonal in outline, or any other shape, and various portions of the framework may be omitted or removed. For example, the upper portion of the spacer shown in FIGURES 4 to 6 or FIGURES 7 to 9, including the opening 12, may be

4

omitted, the flap 16 then being located at the mouth of the U-shaped portion 15. Further, the free ends of the flaps 16 can, instead of being aligned or overlapping, be made of full width. They may be reinforced by webs or ribs extending, preferably centrally, along one or both of the outer and inner surfaces of the flaps.

I claim:

1. A spacer for spacing reinforcements in a reinforced concrete structure, comprising a framework moulded from a synthetic plastic material including a peripheral frame, inwardly directed frame portions integral with said peripheral frame, a generally U-shaped inner frame integral with the inner ends of said inwardly directed frame portions, said U-shaped inner frame being of different thickness than said inwardly directed frame portions to form steps at the junction of said U-shaped frame and said inwardly directed frame portions, said inner frame and said peripheral frame defining a plurality of apertures for the passage of liquid concrete, said inner frame defining at least part of a reinforcement-receiving opening extending inwardly from the peripheral frame, and a pair of closure elements for retaining a reinforcement within said opening, said closure elements comprising flaps moulded one to each side of the mouth of the reinforcement-receiving opening, staggered with respect to the longitudinal axis of the opening, extending diagonally into the opening, and with their free ends crossing one another, the flaps being deformable to an open position by engagement with a reinforcement upon insertion into the opening, and being deformable to further close the opening by engagement with a reinforcement located within the opening, stops being provided to limit the amount of cross-over of said free inner ends.

2. A spacer according to claim 1, including at least one outwardly directed projection integral with said peripheral frame, the width of each inwardly directed frame portion and said at least one outwardly directed projection being different from that of said peripheral frame thereby to form a plurality of steps across opposite side surfaces of the spacer between said at least one outwardly directed projection and said reinforcement-receiving opening.

3. A spacer for use in spacing the reinforcements of reinforced concrete comprising a peripheral frame moulded from synthetic plastic material, integrally with at least one outwardly directed projection, and with inwardly directed frame portions, the inner ends of which are moulded integrally with a generally U-shaped inner frame defining a reinforcement-receiving slot opening through the peripheral frame, the free ends of the limbs of said U-shaped inner frame projecting outwardly of said peripheral frame, an aperture through the spacer at one side of the slot and substantially parallel to the axis of the slot, a catch formation comprising a plurality of grooves in the inner wall of the limb of the U-shaped inner frame remote from said aperture, a resiliently deformable catch element made from springy wire substantially in the shape of an ellipse, one of the longer sides of the ellipse extending through and being pivotally engaged within said aperture while the other longer side of the ellipse is so spaced from said one longer side that it resiliently engages said catch formation when the catch element is pivoted in the aperture to move said other longer side into said slot to hold the catch element in a closed position, and a lug moulded integrally with the spacer remote from said aperture, the other longer side of said ellipse being capable of being sprung over said lug to releasably locate the ellipse against pivotal movement.

4. A spacer according to claim 3, including a plurality of said outwardly directed projections integral with the outer peripheral surface of said peripheral frame, the width of said projections and said inwardly directed frame portions being different from that of said peripheral frame and said inner frame, thereby to form a plurality of steps across opposite side surfaces of the spacer between said projections and said reinforcement-receiving openings.

5

5. A spacer for spacing reinforcements in a reinforced concrete structure, comprising a framework moulded from a synthetic plastic material, including a peripheral frame, at least one outwardly directed projection integral with said peripheral frame, inwardly directed frame portions integral with said peripheral frame, a generally U-shaped inner frame integral with the inner ends of at least some of said frame portions, and defining with the latter and said peripheral frame, a plurality of apertures for the passage of liquid concrete, said inner frame defining at least part of a reinforcement-receiving opening extending inwardly from the peripheral frame, and a pair of closure elements for retaining a reinforcement within said opening, said closure elements comprising flaps moulded one to each side of the mouth of the reinforcement-receiving opening, each flap being, in width, approximately one half of the length of the opening, and the two flaps being mutually staggered in the direction of the longitudinal axis of the opening, and extending diagonally into and part way across the opening, with their free inner ends at least aligned with one another, whereby said flaps are deformable to an open position by engagement with a reinforcement upon insertion into the opening, but are not deformable towards an open position by engagement with a reinforcement once it has been inserted into, and is located

6

within said opening, said inwardly directed frame portions being of different thickness both to said peripheral frame and said inner frame, and said at least one outwardly directed projection being of different thickness to said peripheral frame, thereby to form a plurality of steps across opposite side surfaces of the spacer between said at least one outwardly directed projection and the reinforcement-receiving opening.

References Cited

UNITED STATES PATENTS

3,044,217 7/1962 Berry ----- 52—677

FOREIGN PATENTS

612,486	1961	Canada.
664,932	1963	Canada.
1,375,489	9/1964	France.
1,377,179	9/1964	France.
518,524	1940	Great Britain.
715,563	1954	Great Britain.
778,918	1957	Great Britain.
881,169	1961	Great Britain.

25 JOHN E. MURTAGH, *Primary Examiner.*