(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) Publication number: **0 082 737**
A1

(12) # EUROPEAN PATENT APPLICATION

(21) Application number: **82307052.9**

(51) Int. Cl.³: **E 04 C 5/20**

(22) Date of filing: **22.12.82**

(30) Priority: **23.12.81 CA 393143**

(43) Date of publication of application:
29.06.83 Bulletin 83/26

(84) Designated Contracting States:
AT BE CH DE FR GB IT LI LU NL SE

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(54) **Concrete reinforcing rod chair.**

(57) A rod chair has a tubular body of hollow frustum shape, i.e. a tapered body (30) with open ends (35, 42) to permit mutual stacking. The body has two pairs of diametrically opposed troughs (32, 36) in one or both ends thereof, with each pair having a different depth. Larger bodies have apertures (38, 40) to permit concrete to flow therethrough. The troughs (32, 36) and apertures (38, 40) are arranged on the body (30) so that a continuous strip of body member material (43) extends in the longitudinal direction, either from end to end (35, 42) between adjacent troughs or from the bottom of each trough to the opposite end of the body. Also, some bodies have a continuous strip of material (45) provided in the circumferential direction intermediate the two ends (35, 42). The continuous strips of material (43, 45) provide strength against axial and circumferential forces respectively.

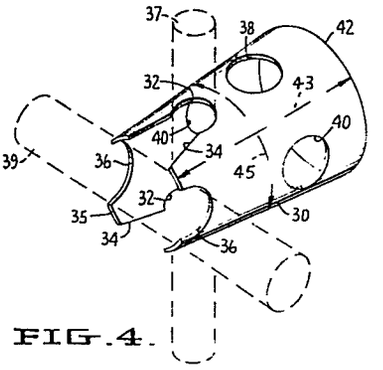

FIG.4.

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CONCRETE REINFORCING ROD CHAIR

BACKGROUND OF THE INVENTION

The present invention relates to a spacer, commonly referred to as a chair, for positioning reinforcing rods at predetermined distances from the surfaces of molding forms for concrete.

Conventional spacers used in positioning reinforcing rods a preselected distance above a base, or adjacent a vertical wall, have been formed of concrete into structures known as dobies. Dobies for use on vertical surfaces typically have a wire embedded in the concrete with its two ends projecting out on either side of the dobie. A reinforcing rod is placed on one end surface of the dobie and the two ends of the wire are wrapped around the rod to tie the rod to the end surface.

Because of the nature of its design, each concrete dobie is capable of providing only one spacing distance between a reinforcing rod and the concrete form. A typical project where reinforcing rods are used might require a number of different spacings to be provided. Consequently, a variety of different sizes of dobies must be kept on hand at the project site. For small spacing requirements concrete dobies may weight only a few ounces, but for larger spacings they may weigh several pounds. The bulk and weight of larger dobies make it

difficult for an installer to carry several dobies with him during installation. For example, a typical 100 pound bag of 4" dobies may contain a relatively small number of spacers, because of each dobie's bulk and weight. Consequently, relatively large numbers of bags are needed for any given project and large numbers of bags cost money to move. Bags of dobies are moved with manpower or, in the case where quantities of bags are required, by cranepower. On jobs where hundreds, thousands, and millions of dobies are required, the transporting/handling problems for all sizes of concrete dobie are extremely significant and add to the real, or end cost of the dobies. Furthermore, dobies must be individually handled once any package in which they are contained is broken.

The difficulty in using concrete dobies is multiplied when installations are in such an area as along the vertical face of a dam site. In such installations, it is necessary for the installer to hold the concrete dobie in place with one hand and attempt to tie the reinforcing rod to it with the other hand. This procedure is cumbersome and time consuming. Moreover, because of the weight of the dobie and the fact that it is fastened to the rod at only one end, the dobie tends to droop at its unattached end, resulting in variations from one dobie to another in spacing from the form, depending upon the amount of the droop.

Where the project site is in a remote and/or inaccessible area, the real cost of the dobies is compounded by the added requirement of fabricating the dobies at the site. The extra manpower, transportation, and crane-time costs required on such projects, because of the nature of concrete dobies, add again to the end costs of the dobies. Despite this, and the existence of several alternative forms of spacer made of material other than concrete, the concrete spacer still is the one most commonly used, because of other disadvantages inherent in the alternative forms of spacer.

One prior art attempt at providing an alternative form of spacer is disclosed in French Patent No. 1,402,975 issued to Ingeborg Schwachula K.G. The disclosed spacer is a tubular or conical structure having a number of pairs of troughs formed in each end thereof, with each pair being of a different depth than each of the other pairs. The structure further includes narrow eyelets below each set of troughs and a pair of oblique eyelets, one on each side of a deep trough and opening into the trough, to permit passage therethrough of a special tie band that is wrapped around a reinforcing rod when in place in an associated pair of troughs. The procedure suggested to attach to the tie band is to first insert it through the appropriate eyelet up to a head at one of its ends, place the rod in the desired troughs, wrap the tie band

around the reinforcing rod, and hook the tie band in one of the oblique eyelets.

While the spacer disclosed in the French patent embodies certain concepts that theoretically overcome some of the previously mentioned difficulties associated with concrete dobies, it also possesses a number of drawbacks that provide impediments to its use in a practical application. For example, it is unlikely that an ironworker on an actual job site would use the tie band associated with the spacer because of the time and dexterity required to manipulate the tie band through the eyelet, around the placed reinforcing rod, and through the second eyelet.

An objective set forth in the French patent is to provide as many troughs of different depths as possible on a single spacer body. In addition, it states that the preferred design for the troughs is a V-shape. Consequently, relatively long and narrow V-shaped legs of body material are formed between adjacent troughs, connecting the upper and lower portions of the spacer. The relative fragility of these narrow, angled legs constitutes a second impracticality of the spacer disclosed in the French patent. It is quite common for workers to walk on the mesh of reinforcing rods prior to the time the concrete is poured. Consequently, a substantial axial or longitudinal force is exerted on the spacers. It does

not appear that the relatively small amount of material provided between the bottom of a trough and the surface of a concrete form, coupled with the angular disposition of this material relative to the axial or longitudinal direction, would provide sufficient resistance to such forces. Hence, the spacer would be subject to buckling under pressure, or similar such failure.

In accordance with the previously noted objective of providing as many different troughs as possible in one spacer, the French patent discloses six individual troughs of varying depths at one end of the spacer, so as to theoretically provide for several variations of concrete slab depth. In reality, this will only be practically possible where small diameter reinforcing rods are used. Larger diameter rods would require wide troughs. Increasing the trough size, while retaining several variations of trough depth, would result in a spacer having a very large top diameter. To balance this, the overall size of the spacer would have to be increased. The resulting spacer that can be used with large-diameter rods and provide for variations of slab depth would be unreasonably large and cumbersome to use.

In addition, the use of the preferred V-shaped troughs presents a structural defect when large diameter rods are used. If the radius of curvature of the bottom of the trough is less than that of the rod, the rod will

not rest in the bottom of the trough but will rest against the converging side walls of the trough. When force is applied to the rod, for example the weight of the worker, the rod will exert pressure on the side walls having a component of force in the circumferential direction of the spacer. If sufficient, this force can cause the spacer to crack or split at the apex of the trough.

SUMMARY OF THE INVENTION

In accordance with the present invention, a spacer for positioning reinforcing rods used in molding forms for concrete includes a substantially frusto-conical body having two pairs of diametrically opposed troughs on at least one end thereof for receiving reinforcing rods and retaining them in place. The deep troughs are preferably U-shaped, and the radius of curvature, or width, of each trough is equal to that of the largest diameter rod that is expected to be positioned by the spacer. Advantageously, each pair of opposed troughs is a different preselected depth below the end of the body in which they are located so as to engage a rod at a predetermined distance from the other end of the spacer. In one embodiment of the invention, the troughs are located relative to one another so as to provide a substantially continuous strip of body material extending along the length of the body member between adjacent

troughs. The continuous strip of body material provides a spacer configuration which exhibits a high degree of strength against axially directed compressive forces.

Preferably, the body material is resilient. For spacers intended to be used on vertical faces, the troughs of at least one of the pairs of troughs on each end of the body may have a neck located away from the bottom of the trough a distance such that the neck resists entry and removal of a rod of substantially the same diameter as that of the trough and retains the rod in place in the trough. The use of the narrow neck on a pair of the troughs allows the rod to be snapped into those troughs and held in position by the tightness of the fit of the trough to the rod until a wire can be wrapped around the rod. The narrow neck thus allows the installer to snap on the spacer with one hand and then free that hand and use both hands to tie the rod to the spacer, as would be done when the spacers are installed along a vertical face of a retaining wall or dam site form.

The spacer may further include a circular or oval aperture in the body intermediate the troughs for permitting entry into the interior of the body of a fluid concrete mix.

Preferably, four troughs are located on each end so that a first imaginary line bisecting a pair of troughs

on one end of the body is displaced 90° about the body axis from a second imaginary line bisecting the other pair of troughs on the same end. This configuration may allow one end of the spacer to position two rods at right angles when one pair of troughs is recessed a depth sufficiently greater than that of the other pair.

For spacers designed to position rods short distances away from a deck and having two pairs of troughs on each end with each pair on a given end being displaced 90° relative to the other pair on that end, the troughs on one end may be displaced about the axis of the body relative to those on the opposite end so as to provide a continuous strip of body material from the bottom of each trough to the end opposite that trough. Moreover, each such strip may be thickened in order to enhance its strength. The width and thickness of the strip so formed may be such as to allow the spacer to support heavy, large diameter rods without buckling.

The location of the troughs relative to one another and to any apertures which may be incorporated into the structure is also preferably such as to ensure that there is a continuous strip of material disposed in the circumferential direction of the body between the troughs and the apertures so as to provide considerable strength in concert with the longitudinal strips of material.

The frusto-conical shape of the spacers allows efficient stacking of a plurality of spacers and enables the installer to carry with him a considerable number of spacers during installation. Optimally the spacer can be made of a relatively lightplastic material which further facilitates efficient transportation, packaging and installation of the spacers.

As used in the context of the present invention, the term "frusto-conical", as applied to the tubular body, is synonomous with a hollow frustum, i.e. a tapered tube with open ends to permit mutual stacking, and includes not only a body having a circular cross section, but other forms of hollow tapered bodies as well. For example, the body can have four or more straight sides, i.e. be a truncated pyramid, concave or convex sides, or an elliptical or oval cross-section. For those body forms having sides that intersect at corners, the corners are preferably rounded or mitred so that the poured concrete can easily fill the entire interior of the form, rather than leave spaces in the corners that can lead to subsequent erosion.

The use of troughs of different depths on both ends of a spacer provides for a greater variety of possible spacings from a concrete form to be achieved with a single spacer. For example, spacers that are designed to be

used on horizontally disposed forms, commonly known as deck chairs, can each provide four different sizes of clearance between the surface of the form and the underside of a reinforcing rod. This enables one spacer to accomodate varying concrete slab depths, rather than requiring a different spacer for each size. The additional troughs that are not used also provide apertures through which fluid concrete mix can enter the interior of the spacer. The provision in the spacer of continuous strips of body material in the longitudinal and circumferential directions for strength, a frusto-conical shaped body for permitting efficient stacking of several spacers, and pairs of troughs for both ends for enabling several different possible spacings to be achieved with a relatively small single spacer makes the present invention a more versatile, easier to install and less expensive device to produce than any hitherto known spacers.

Another advantage associated with the use of a tubular spacer, as opposed to a solid one, is the fact that a relatively small amount of the spacer material is visible on the finished concrete surface when the form is removed. Solid dobies present a substantial solid area of material on the surface of the concrete. The dobies do not always adhere well to the poured concrete, resulting in cracks or holes that can interrupt the flow of

water and in which ice can form, leading to erosion of the dobies and/or the finished surface and the formation of holes. In contrast, the relatively small amount of visible spacer material presented by a tubular spacer, combined with the fact that the interior of the spacer is completely filled with the poured concrete, substantially reduces the likelihood that interruptions to the flow of water will be formed.

In order to facilitate a greater appreciation of the present invention and the manner in which it achieves the previously noted advantages, preferred embodiments thereof are described hereinafter in greater detail with reference to the accompanying illustrations.

BRIEF DESCRIPTION OF DRAWINGS

Figure 1 is a persepctive view of a reinforcement rod spacer, or chair, constructed in accordance with the present invention;

Figure 2 is a front elevation view of the reinforcement rod spacer of Figure 1;

Figure 3 is a side elevation view of the spacer of Figure 1;

Figure 4 is a perspective view of a second embodiment of a reinforcement rod spacer according to the present invention;

Figure 5 is a front elevation view of the spacer of Figure 4;

Figure 6 is a side elevation view of the spacer of Figure 4;

Figure 7 is a perspective view of a third embodiment of a spacer implementing the present invention;

Figure 8 is a front elevation view of the spacer of Figure 7;

Figure 9 is a side elevation view of the spacer of Figure 7;

Figure 10 is a perspective view of the spacer of Figure 7;

Figure 11 is a front elevation view of the spacer of Figure 10; and

Figure 12 is a side elevation view of the spacer of Figure 10.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring to Figure 1, 2 and 3, a spacer or chair is formed from a frusto-conical tubular body 10 having a pair of dimetrically opposed shallow troughs 12 and a pair of diametrically opposed deeper troughs 14, circumferentially displaced 90° relative to the troughs 12, at one end 13 of the body 10. On the opposite end of the body 10 there are formed four additional troughs 16 and 18 that are aligned with the troughs 12 and 14, respectively. The depth of the troughs 18 is slightly greater than that of the troughs 14 and the depth of the troughs 16 is greater than that of the troughs 18. As shown in Figure 1, the diameter of the troughs is preferably approximately the same as that of the largest sized rod 15 that is expected to be positioned therein. The shallowest troughs 12 have a depth that is approximately the same as the radius of the largest rod, and therefore these troughs have the shape of a semicircle, as best seen in Figure 2. The deeper troughs 14-18 have substantially parallel side walls in addition to the semicircular bottom. In the context of the present invention, the term "U-shaped" is intended to refer to the shallower troughs 12 having the seimcircular shape as well as the deeper troughs having the substantially parallel side walls. The lower end 17 of the body 10 rests on a planar base support 19 such as the deck for a concrete slab.

The four pairs of troughs 12, 14, 16 and 18, each having a different depth, enable a single spacer to provide four different clearance distances between the surface deck form 19 and the underside of the rod 15. In other words, the clearance distance can be easily varied with the same spacer by simply rotating it 90° to position the rod in the other pair of troughs in the same end, or turning it so that its other end rests on the form and the rod is disposed in a pair of troughs of different depth on the opposite end.

Apertures 20 and 22 are formed intermediate the troughs disposed on ends 13 and 17 of the body. The apertures can be circular, as shown, oval, or some other shape, depending on space, size and strength requirements. The location of the apertures 20 and 22 are such that a maximum distance is provided between each of the apertures and each of the troughs. The alignment of the troughs on one end 13 with respect to those formed in the other end 17, and the further alignment of the apertures 20 and 22 with the troughs, provides for continuous sections 21 of body material in the longitudinal direction from one end 13 to the other end 17. These sections are joined by continuous circumferential strips 23 of body material intermediate the apertures and the troughs. The resultant structure exhibits considerable strength against compression forces applied axially with respect to the body, such as when workers walk upon a array of reinforcing rods positioned

by the spacers. If desired, reinforcing ribs (not shown) can be provided on the body along the continuous longitudinal strips for added strength.

The embodiment of the spacer illustrated in Figures 1-3 is primarily intended for use with horizontal concrete forms, wherein the base of the spacer rests upon the form surface. A second embodiment of a spacer, illustrated in Figures 4-6, is designed for use in spacing reinforcing rods from vertical form surfaces. The spacer includes a tubular frusto-conical body 30 having a wide end 42 without troughs or notches. The narrow end 35 has two pairs of diametrically opposed troughs 36 and 32 disposed 90^{o} relative to one another. The deeper troughs 32 are open towards the narrow end 35 by means of a pair of diverging spaced apart sides 34 whose intersection with the troughs 32 form necks which are narrower than the bottom diameter of troughs. The body material 30 is selected to be resilient so that when a reinforcing rod of substantially the same diameter as the diameter of the troughs 32 is pressed into the opening formed by the diverging sides 34, it can be pushed through the narrow neck into troughs 32 and be retained therein. This feature frees the hands of the worker to tie the rod to the spacer. The lower troughs 32 are preferably deeper than the upper troughs 36 by at least the diameter of a reinforcing rod, so that when a rod 37 is in place in the lower troughs, a second perpendicularly

disposed rod 39 may be supported by the upper troughs 36 above the rod 37. Thus, during assembly, when the vertical rod 37 is snapped into place in the troughs 32 of the spacer, the spacer is vertically stabilized. Thereafter, the horizontal rod 39 is secured to the spacer, for example by tying, to provide lateral stability as well.

Pairs of opposed apertures 38 and 40 are formed around the body 30 intermediate the troughs 32 and 36, respectively, and the wide end 42. The apertures are located below corresponding troughs so that continuous strips 43 of body material are formed in a longitudinal direction between the narrow end 35 and the wide end 42. The strips thus formed are joined by continuous circumferential strips 45 of material defined by the area between the troughs 32, 36 and the apertures 38, 40. The apertures are formed in order to permit entry of a fluid concrete mix into the interior of the spacer when the reinforcing rods are in place and the spacer is resting on or against a flat form. The positioning of the apertures 38 and 40 and the troughs 32 and 36 is such as to provide a maximum resistance to buckling under compressive loads.

A third embodiment of the spacer is shown in Figures 7, 8 and 9. In this embodiment, two pairs of opposed troughs, similar to those in the narrow end 35 of the embodiment of Figures 4-6, are formed in both ends of the body 50. In the narrow end 52 there is formed a shallow

set of diametrically opposed troughs 54 and a deeper set 56 opening to end 52 by means of the diverging spaced apart sides 58. At the wide end 59 are disposed shallow troughs 60 oriented to be in line with the deep troughs 56 of the narrow end, and deep troughs 62 which open by means of diverging sides 64 to the wide end 59 and are aligned with the shallow troughs 54 on the narrow end. This structure can be utilized in the same manner as that illustrated in Figure 1, with either the wide end 59 resting on or against a flat form and the rods engaged on the opposite end 52 or vice versa.

A fourth embodiment of the device, illustrated in Figures 10-12, is adapted to be positioned on a horizontal deck and to support the reinforcing rod at relatively small distances away from the deck. The spacer, made up of a frusto-conical tubular structure 70 having a narrow end 72 and a wide end 74, includes relatively shallow troughs 76 and 78 formed in the narrow end, and deeper troughs 80 and 82 formed in the wide end. The positioning of the troughs on one end relative to those on the other is such as to provide a continuous strip 79 of body material between the bottom of each trough and the opposite end of the spacer. Specifically, the troughs 80 and 82 on the bottom end are displaced 45^{o} relative to the troughs 76 and 78 on the upper end. Because of the small height of this spacer, it may be desirable to incorporate additional material for stiffening the structure

so as to provide adequate strength against the application of compressional forces exerted axially of the body 70 by larger rods. For example, the material at the wide end 74 located proximate the deep troughs can be thicker than the material at the narrow end 72. The thickening of material in this way helps to prevent buckling of the long legs formed by the deep troughs at the wide end 74.

Since this embodiment of the spacer is designed for small clearance distance, it may not be tall enough to accomodate four different depths of troughs and still provide sufficient structural strength. For example, the two upper pairs of troughs may be designed for spacing distances of 3/4 inch and one inch, respectively. In such a case, the spacer would not be reversible, and the lower troughs 80 and 82 are primarily intended to admit concrete into the interior of the spacer.

The present invention may be embodied in other specific forms without departing from the spirit or essential characteristics thereof. The presently disclosed embodiments are therefore considered in all respects as illustrative and not restrictive. The scope of the invention is indicated by the appended claims rather than the foregoing description, and all changes which come within the meaning and range of equivalency of the claims are therefore intended to be embraced therein.

CLAIMS:

1. A concrete reinforcing rod chair (10) for positioning rods (15; 37; 39) at different selectable spacings from the surface (19) of a concrete moulding, the chair comprising:

(a) a tubular body member (10; 30; 50) having a hollow frustum shape;

(b) a first pair of diametrically opposed troughs (12; 32; 54) on one end (13; 35; 52) of said body member having a first predetermined depth;

(c) a second pair of diametrically opposed troughs (14; 36; 56) on said one end (13; 35; 52) of said body member, said second pair of troughs having a second predetermined depth and being circumferentially spaced 90^{o} around said body member from said first pair of troughs (12; 32; 54);

(d) a continuous section (21;43) of a body material disposed between adjacent troughs extending continuously from said one end (13; 35; 52) to the other end (17, 42, 59) of the body member along a longitudinal line on the surface of said body.

2. A concrete reinforcing rod chair (70) for positioning reinforcing rods (15; 37, 39) at different selectable spacings from the surface of a concrete moulding form, the chair comprising:

(a) a tubular body member (70) having a hollow frustum shape,

(b) a first pair of diametrically opposed troughs (76) on one end (72) of said body member having a first predetermined depth,

(c) a second pair of diametrically opposed troughs (78) on said one end (72) of said body member, said second pair of troughs having a second predetermined depth and being circumferentially spaced 90^{o} around said body member from said first pair of troughs,

(d) a continuous strip (79) of body material extending from at least the bottom of each trough (76, 78) to the opposite end (74) of said body member.

3. A reinforcing rod chair as claimed in Claim 1 further including:

(a) a third pair of diametrically opposed troughs (16; 60) on said other end (17; 59) of said body member having a third predetermined depth,

(b) a fourth pair of diametrically opposed troughs (18; 62) on said other end (17; 59) of said body member having a fourth predetermined depth,

(c) said third (16 ; 60) and said fourth (18; 62) pairs of troughs being longitudinally aligned with said first (12; 54) and said second (14; 56) pairs of troughs respectively, to thereby provide said continuous sections (21; 43) of body member material.

4. A reinforcing rod chair as claimed in Claim 2 further including:

(a) a third pair of diametrically opposed troughs (80) on said other end (74) of said body member,

(b) a fourth pair of diametrically opposed troughs (82) on said other end (74) of said body member,

(c) said third (80) and said fourth (82) pairs of troughs being displaced 45^{o} relative to said first (76) and said second (78) pairs of troughs.

5. A reinforcing rod chair as claimed in any preceeding claim further including:

(a) an aperture (20, 22; 38, 39) disposed in said body member between at least one of the troughs (12, 14; 32, 36) in said one end (13; 35) and the said other end (17; 42).

6. A reinforcing rod chair as claimed in Claim 5 in which:

(a) the troughs (12, 14; 32, 36) and the apertures (20, 22; 38, 39) are arranged such that a continuous circumferential strip (23, 45) of body material is provided in the circumferential direction around the body member intermediate the two ends (13, 17; 35, 42) thereof.

7. A reinforcing rod chair as claimed in Claim 3 or 4 wherein:

(a) said second predetermined depth is greater than said first predetermined depth,

(b) said third predetermined depth is greater than said fourth predetermined depth.

8. A reinforcing rod chair as claimed in any preceeding claim wherein:

(a) said second predetermined depth is greater than said first predetermined depth by at least the diameter of a reinforcing rod to be positioned by the chair, to thereby enable the chair to positon two intersecting rods.

9. A reinforcing rod chair as claimed in any preceeding claim wherein:

(a) one of said pair of troughs is substantially U-shaped.

10. A reinforcing rod chair as claimed in any preceeding claim wherein:

(a) side walls (34; 58 and 64) of at least one of said pairs of troughs (32; 56, 62) define neck portions with openings that are smaller than the diameter of the openings at the bottom of the troughs to thereby resiliently hold a reinforcing rod in said troughs.

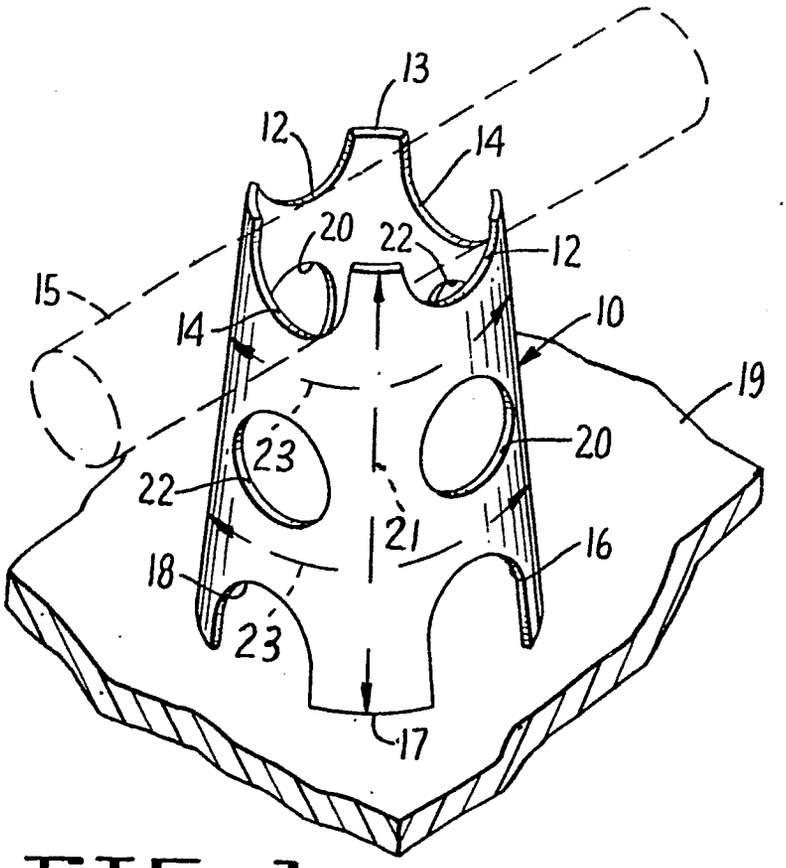

FIG. 1.

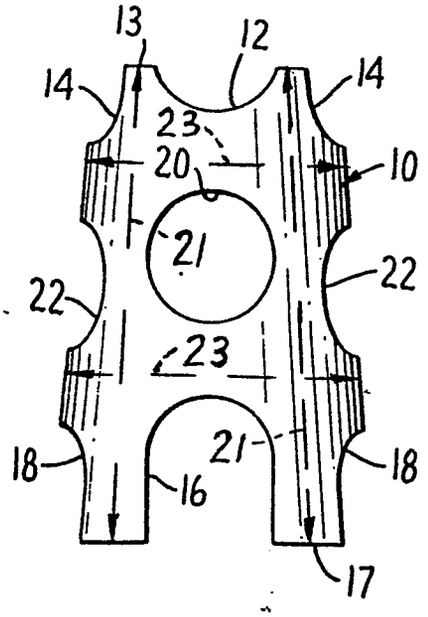

FIG. 2.

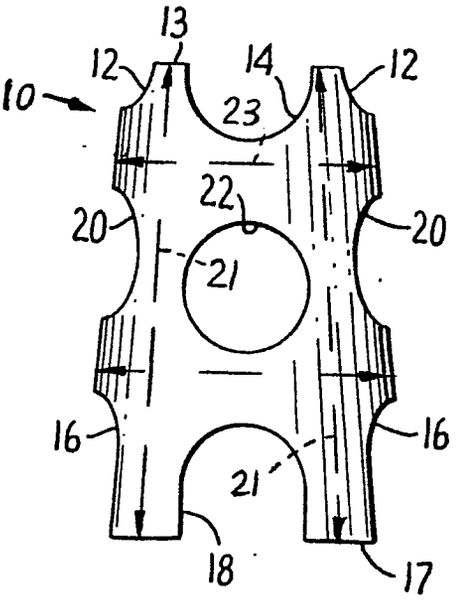

FIG. 3.

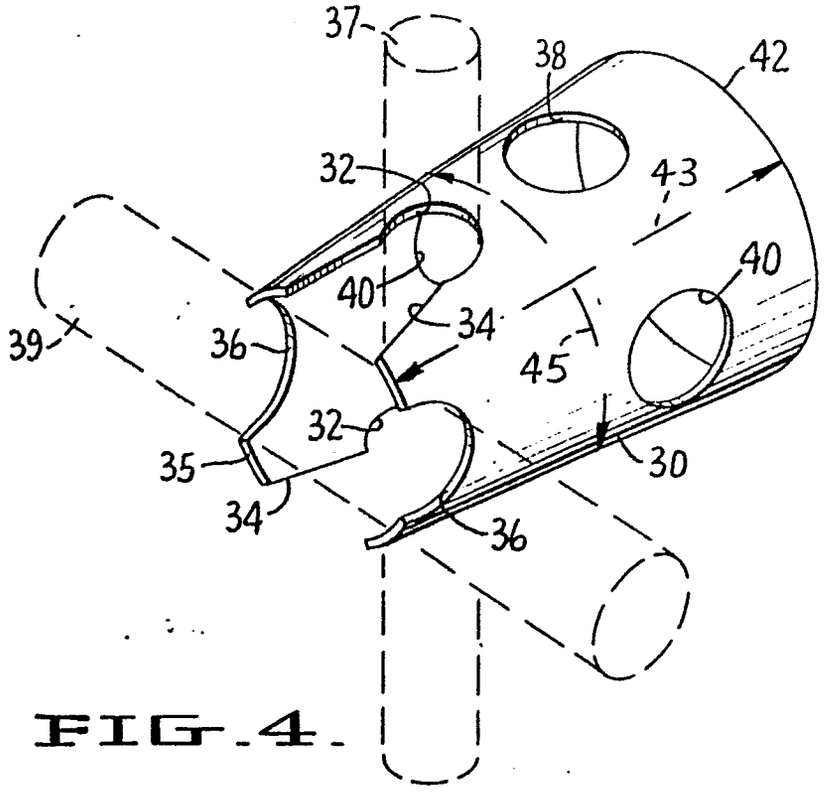

FIG.4.

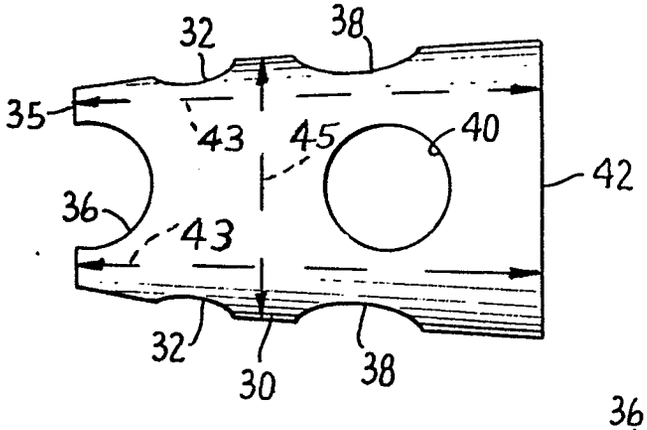

FIG.5.

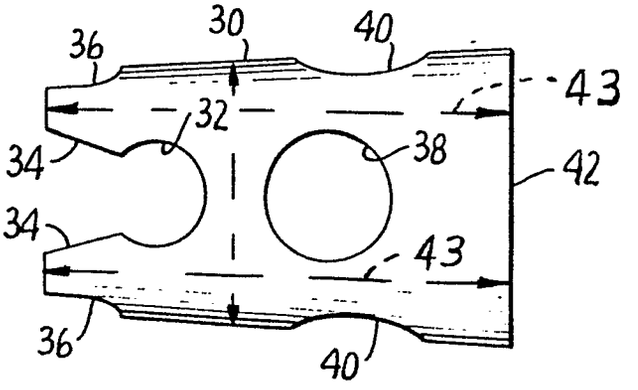

FIG.6.

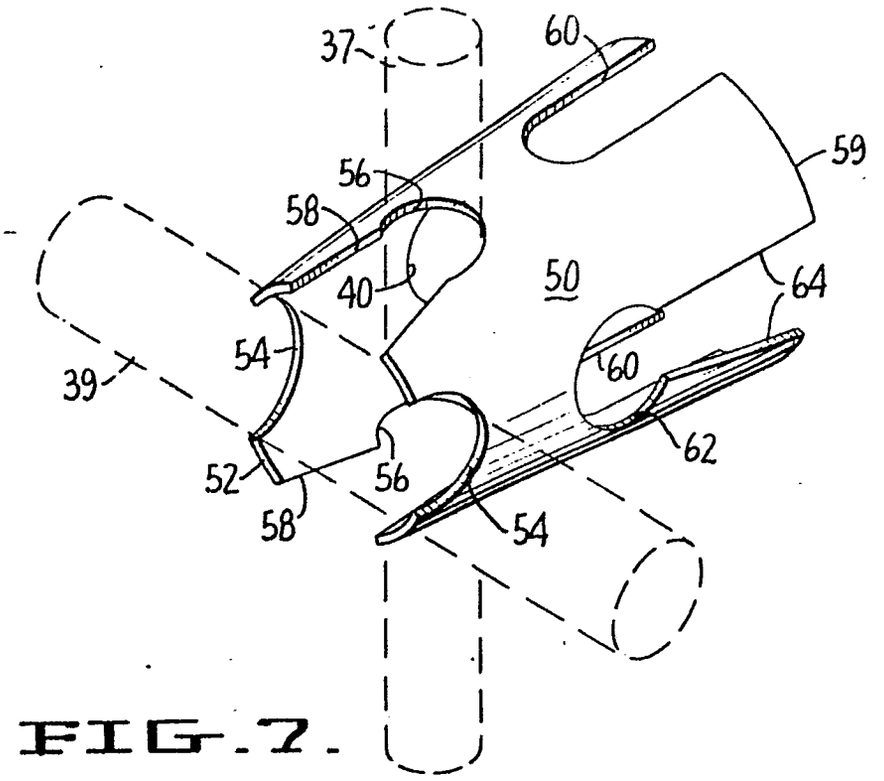

FIG. 7.

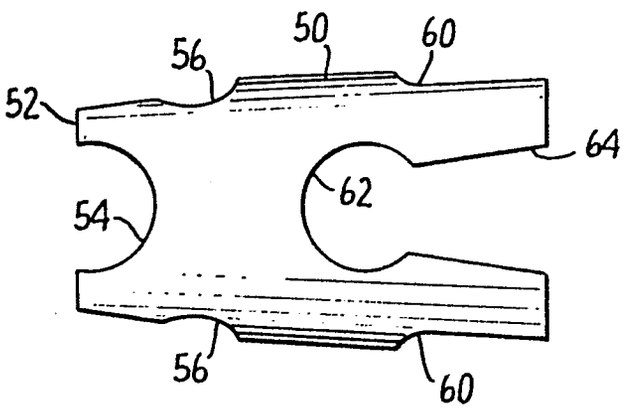

FIG. 8.

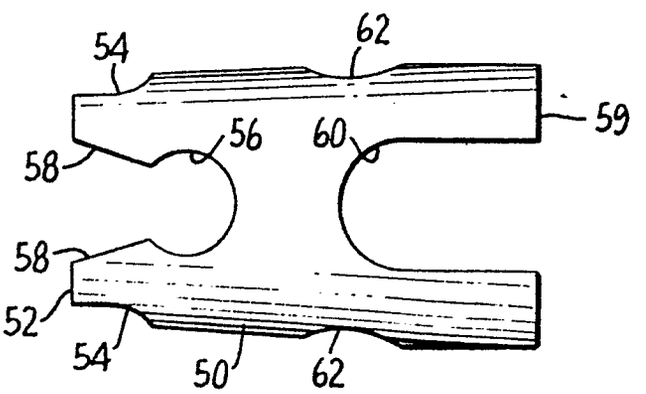

FIG. 9.

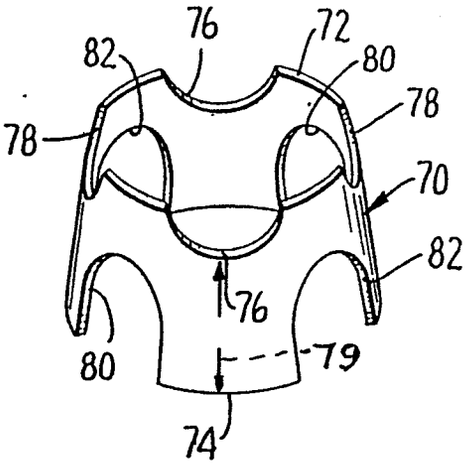

FIG. 10.

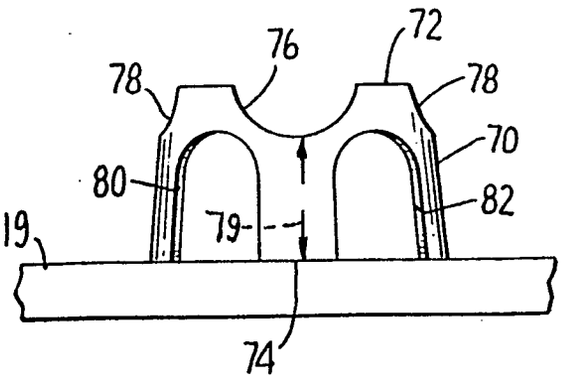

FIG. 11.

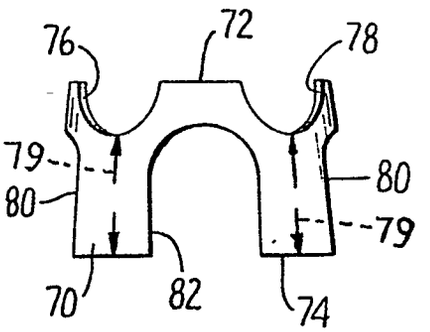

FIG. 12.

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0082737
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DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl. ³)
X	DE-A-1 659 233 (SCHWACHULA) *Page 2, paragraph 2; page 3; page 6, last paragraph; page 7, paragraphs 1,2; figures 1,2,5*	1,3,9	E 04 C 5/20
X	BETON- UND STAHLBETONBAU, vol. 64, no. 9, September 1969, page 186, Verlag Wilhelm Ernst & Sohn, Berlin (DE); "NOE-Abstandhalter - NOE-Rubin".	1,3,7, 9	
X	DE-A-1 913 104 (ALPLAST) *Page 3, paragraphs 3,4; page 4, paragraph 1; page 5, last paragraph; page 6, paragraph 1; page 7, paragraphs 1,2,3; figures 1,2,3*	2,4,7, 8,10	
X	GB-A-1 276 874 (DALE) *Page 1, line 96; page 2, lines 1-24; figures 1,2,3,4*	2,4,8, 9,10	TECHNICAL FIELDS SEARCHED (Int. Cl. ³) E 04 C
X	FR-A-2 081 758 (KELLER) *Page 1, lines 32-39; page 2, lines 1-9,16-20; page 3, lines 3-11,23-29; figures 1,3,6,7,8*	2,4,5, 8,10	

-/-

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	28-02-1983	HENDRICKX X.

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A	DE-A-2 052 100 (SEIFERT) *Page 5, last paragraph; figures 1,2*	5,6	
A	DE-A-2 024 883 (ATTEMA) *Page 2, paragraphs 2,3; page 4, paragraphs 4,5; page 5, paragraph 3; figures 1,2,3*	1,3,7, 9	
			TECHNICAL FIELDS SEARCHED (Int. Cl. ³)

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