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(54) Title: CONCRETE PRODUCT CAGE SPACER

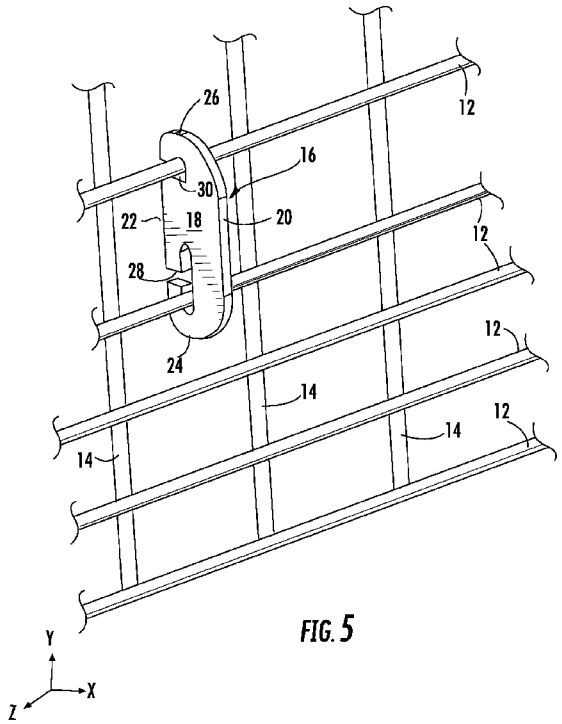

FIG. 5

(57) Abstract: A spacer for spacing the reinforcing cage from the forms used in making concrete products. The spacer is made of concrete or a geopolymer material and has a pair of spaced-apart notches, one T-shaped and one L-shaped that provide for simple, quick installation on adjacent horizontal wires of the reinforcing cage. When locked into place, the shape of the spacer provides the desired cover, the amount of which depends upon the size of the spacer when formed.

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Declarations under Rule 4.17:

— *as to the identity of the inventor (Rule 4.17(i))*

— *as to applicant's entitlement to apply for and be granted a patent (Rule 4.17(ii))*

— *as to the applicant's entitlement to claim the priority of the earlier application (Rule 4.17(iii))*

Published:

— *with international search report (Art. 21(3))*

— *before the expiration of the time limit for amending the claims and to be republished in the event of receipt of amendments (Rule 48.2(h))*

APPLICATION UNDER UNITED STATES PATENT LAWS

CONCRETE PRODUCT CAGE SPACER

This is a:

- ☐ Provisional Application
- ☐ Regular Utility Application
- ☐ Continuing Application
  - ☐ The contents of the parent are incorporated by reference
- ☒ PCT Application
- ☐ Design Application
- ☐ Reissue Application
- ☐ Plant Application

SPECIFICATION

[0001] This application claims priority under 35 USC 119 to Provisional Patent Application Serial No. 61/812,503 filed on April 16, 2013, the contents of which are hereby incorporated by reference.

BACKGROUND OF THE INVENTION

[0002] It is well known in the art of manufacturing concrete pipe and other similar structures, such as manholes, box sections, catch basins, septic tanks and the like (hereinafter simply "product" or "products"), that a reinforcing wire cage is provided as reinforcement to produce a product of the required strength. In order to produce a quality concrete product, the reinforcing cage must be positioned within the concrete forms used to produce the product so that the cage will be a predetermined distance from the inside and outside walls of the finished product. Since the cage will be subjected to various forces during the manufacturing process, it is important that the cage be properly positioned from the walls of the forms and that the required distance from the forms be maintained throughout the casting process. In order to accomplish the proper spacing, there are commonly provided spacing elements, called spacers, which can be fastened to the cage to space it from and maintain it the proper distance from the form walls.

[0003] These spacers must also be designed so as to resist the forces that occur during the casting process, which can create voids in the finished product, resulting in the finished product not meeting specifications that require resistance to hydrostatic pressure. The two commonly used methods of producing concrete products create different forces on a reinforcing cage and thus upon the spacers used in connection with the cage. In one such method of casting concrete products, an annular space is provided by an inner core and an outer jacket which comprise the form set. One of the common casting methods involves lowering the jacket over the core after the cage is in place. Unless the spacers used are capable of resisting the downward axial forces applied as the jacket is lowered in place, the spacers can be dislodged or distorted. Another commonly used method of producing concrete products is the packer head

process. In this process, the spacers for the reinforcing cage must be capable of resisting not only the axial forces that occur, but also the forces upon the spacers as the cage tends to twist during rotation of the packer head.

[0004] There are known a number of different spacers which have been designed in an attempt to resist all of the forces exerted upon the spacers during the casting process. Many spacers are formed from spring steel with an open hook at each end to provide for attaching the spacer to the reinforcing cage. Between the attaching hooks there is typically formed a spacing nose. These steel spacers work well in most instances but they require special tools to install them on the cage, and occasionally some of the spacers can become dislodged from the cage. Also, because of the forces applied to them during the casting process, these spacers can move causing improper spacing of the cage from the concrete forms.

[0005] Some attempts have been made to improve the design of the steel spacers by forming them from concrete. However, all know spacers of this type must have a means of attaching the spacer to the cage. Therefore, these concrete spacers have cast into them an attachment wire or plastic tie that can be used to secure the spacer to the cage. Compared to the steel spacers, these concrete spacers require a relatively longer time to attach to the cage, and if not properly secured, the spacing function is lost. Also, casting these attachment wires or ties into the spacer adds to the cost of the spacer, and since the spacers cannot be reused, even a minor cost increase is significant.

[0006] There is therefore a need for an improved spacer useable in any of the known casting processes and designed so as to be capable of resisting forces in all directions so that the spacer will not become dislodged, bent or stressed during the casting process resulting in voids or other defects in the finished product. There is a further need for a spacer that will permit easy and quick installation, preferably without the use of any special tools. Such an improved spacer should also be inexpensive since large quantities are necessarily used during the production of each concrete product.

SUMMARY OF THE INVENTION

[0007] The spacer of the invention provides a unique element formed of concrete or a geopolymer mateial. The spacer has a pair of spaced-apart notches, one elongated T-shaped notch and one L-shaped notch that provide for simple, quick installation on adjacent horizontal wires of the reinforcing cage. Using the T-shaped notch, the spacer is hooked onto a horizontal wire and then rotated upwardly until the L-shaped notch is aligned with the next horizontal wire. The spacer is then further rotated until the wire is in the L-shaped notch after which the spacer is pushed downwardly and released to positively lock the spacer onto the cage. When locked into place, the shape of the spacer provides the desired cover, which is the distance between the cage and surface of the outside form or jacket. The amount of cover depends upon the size of the spacer when formed.

BRIEF DESCRIPTION OF THE DRAWINGS

[0008] FIG. 1 is a perspective view of a portion of a reinforcing cage and showing a spacer of the invention inserted between a pair of wires of the cage;

[0009] FIG. 2 is a perspective view of a portion of a reinforcing cage and showing the spacer positioned so that a wire can be inserted into the T-shaped notch of the spacer;

[0010] FIG. 3 a perspective view of the spacer being rotated vertically so that the L-shaped notch is in alignment with the adjacent wire of the cage;

[0011] FIG. 4 is a perspective view showing the wire positioned in the L-shaped notch of the spacer; and

[0012] FIG. 5 is a perspective view showing the spacer in place on the reinforcing cage.

DESCRIPTION OF THE PREFERRED EMBODIMENT OF THE INVENTION

[0013] The drawings show a representative form of a portion of a reinforcing mesh cage 10 that consists of a plurality of relatively uniformly spaced wires 12 and 14 that are typically welded at their intersections to provide a unitary product. In a typical cage, the nominal spacing between the wires is 2" or 3" although it may be more or less. As is well known to those skilled in the art, during the process of producing a concrete product, the cage 10 will be positioned in the concrete form with some wires 12 oriented horizontally, while the other wires 14 are oriented vertically. The spacer of the invention, indicated generally by the reference numeral 16, is formed from concrete, a geo-polymer or other suitable material. The spacer 16 has a main body 18 that is generally rectangular in shape with a front edge 20, a back edge 22 and rounded ends 24 and 26. Near the end 24 there is formed in the back edge 22 a T-shaped notch 28. Similarly, near the end 26 there is formed in the back edge 26 an L-shaped notch 30. In the illustrated embodiment of the invention, the spacing between the notches 28 and 30 is such that the spacer 16 can be installed on both 2" and 3" mesh cages and would provide 1" of cover, which is the distance between the cage and surface of the outside form or jacket. Obviously, the exact dimensions of the spacer and the notches will depend upon the size and spacing of the wires of the cage, but with the design of the spacer of the invention, a spacer of one size will fit cages having different wire spacing.

[0014] In Fig. 1, the spacer 16 is shown as it would be positioned by the installer between a pair of adjacent horizontal wires 12, with the end 24 extending inside the cage 10 and the T-shaped notch 28 adjacent and just beneath a wire 12. The spacer 16 is then rotated horizontally (as shown by the arrow in Fig. 1) and then lifted so that the wire 12 is inside the T-shaped notch 28 as shown in Fig. 2. With the wire 12 fully engaged in the notch 28, the installer then swings the spacer 16 upwardly as shown by the arrow in Fig. 3 until the L-shaped notch 30 is adjacent the next upper wire 12. Fig. 4 shows the spacer 16 positioned with the wire 12 inside the L-shaped notch 30 at which time the installer can release or push the spacer 16 down to lock it place on the two adjacent wires 12 as shown in Fig. 5. Once the spacer 16 is locked in place and after the cage 10 is placed in the form set, the spacer 16 is trapped between the cage 10 and

the jacket of the form. Therefore, during the casting process, it is practically impossible for the spacer 16 to become dislodged from the cage 10, and the slight movement of the spacer 16 that may occur as the wires 12 move in the notches 28 and 30 will not alter the spacing effect provided by the spacers 16.

[0015] It will be understood by those skilled in the art that a considerable number of spacers 16 are installed on the cage 10 at selected intervals before the cage is inserted into the concrete forms. It will be evident from the above description that the spacers 16 can be quickly and easily installed without any tools. The quick installation will save considerable time and thus labor cost. When locked in place as described above, the spacer 16 is trapped so that it will not fall off the cage 10. Although the spacer 16 may move slightly during the casting process, the degree of movement is limited by the size and shape of the notches 28 and 30. Such small movement is not sufficient to cause the spacer 16 to fall off the cage 10 and will not alter the amount of cover or the spacing effect. The spacer 16 has no sharp edges, and the rounded ends 24 and 26 provide for a "shoe horn" effect when the outer-form or jacket is slipped down over the cage 10 preliminary to the casting process. Once locked into place, the spacer 16 can withstand the considerable amount of all forces exerted during the entire casting process.

[0016] Having thus described the invention, it will be evident to those skilled in the art, that various other revisions and modifications can be made to the invention disclosed herein without departing from the spirit and scope of the invention. It is my intention however, that all such revisions and modifications that are obvious to those skilled in the art will be included within the scope of the invention.

CLAIMS

1. A spacer used in making concrete products such as pipes, the spacer maintaining a desired distance between the wire reinforcing cage having spaced-apart horizontal wires and the concrete forms used for forming the concrete product, the spacer comprising:

a generally rectangular-shaped main body having a front edge, a back edge and rounded ends, the back edge having a pair of spaced-apart notches, the notches being spaced apart a distance so as to be engageable with two adjacent horizontal wires on the cage to lock the spacer onto the cage.

2. The spacer of claim 1 in which one of the notches in the main body is somewhat L-shaped and the other notch is somewhat T-shaped.

3. The spacer of claim 2 in which the L-shaped notch is above the T-shaped notch when the spacer is positioned on the wire cage.

4. The spacer of claim 3 in which the T-shaped notch is elongated so that the spacer is capable of being used on wire cages with different spacing between horizontal wires.

5. The spacer of claim 1 that is made of concrete.

6. The spacer of claim 1 that is made of a geopolymer material.

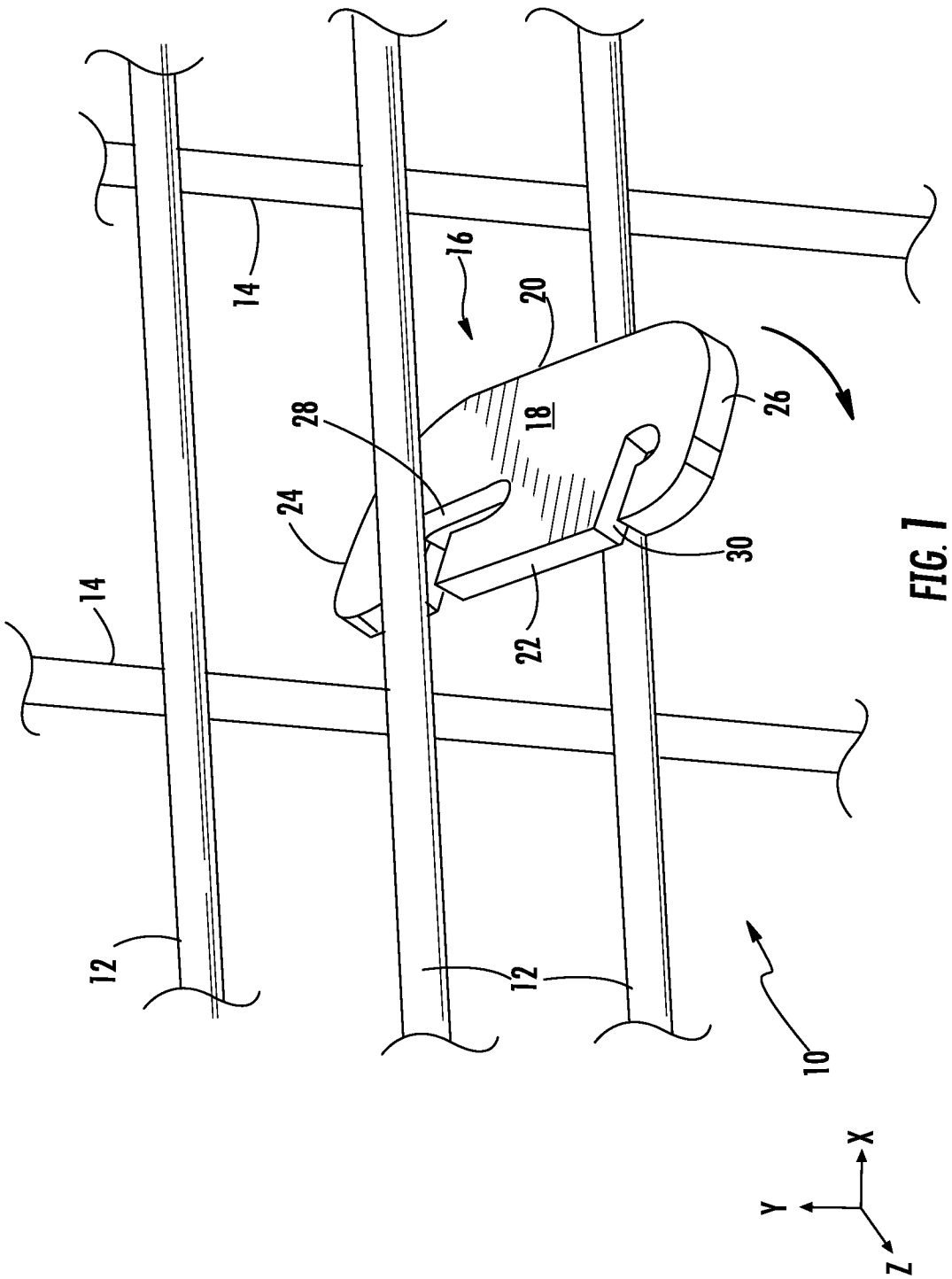

FIG. 1

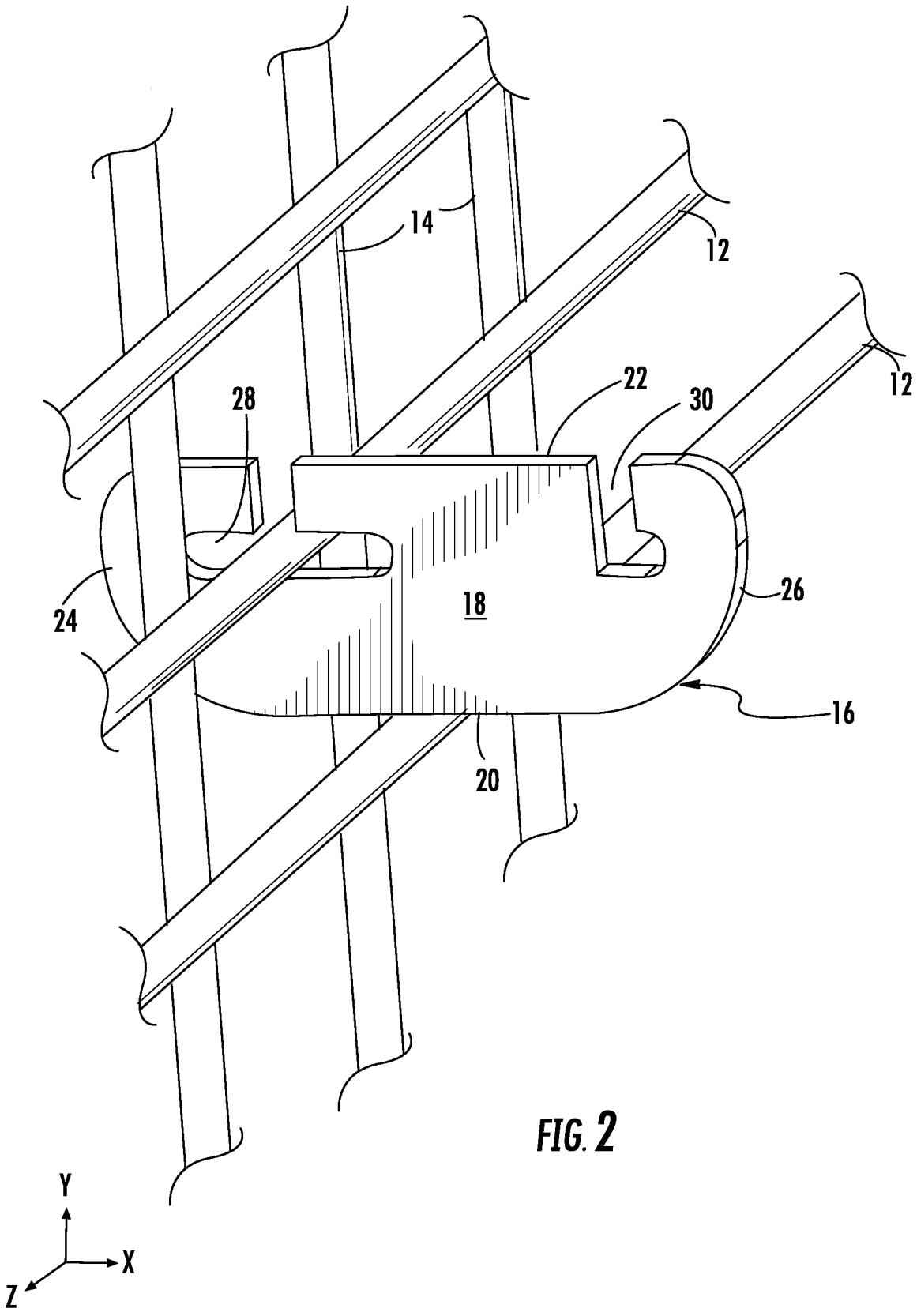

FIG. 2

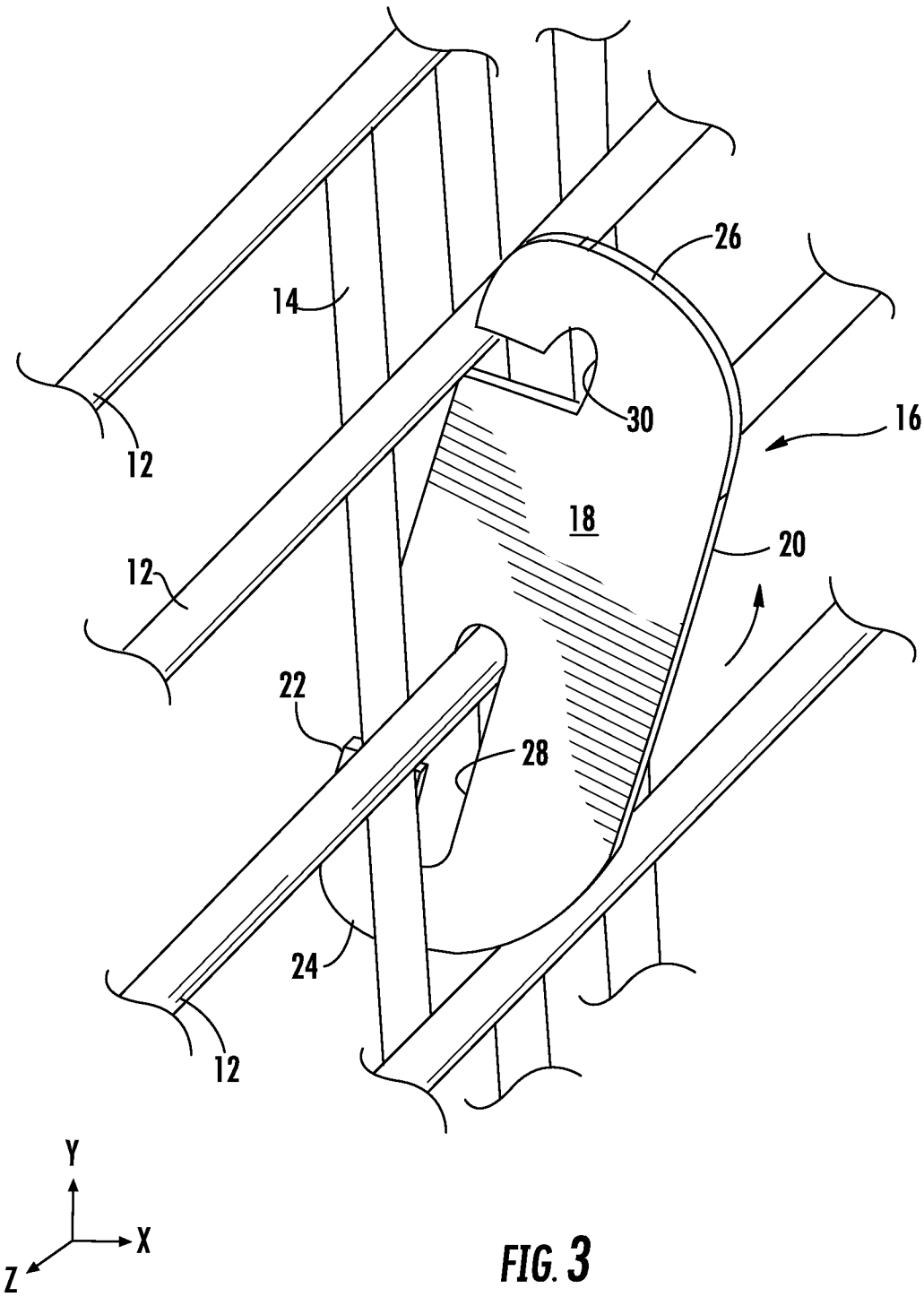

FIG. 3

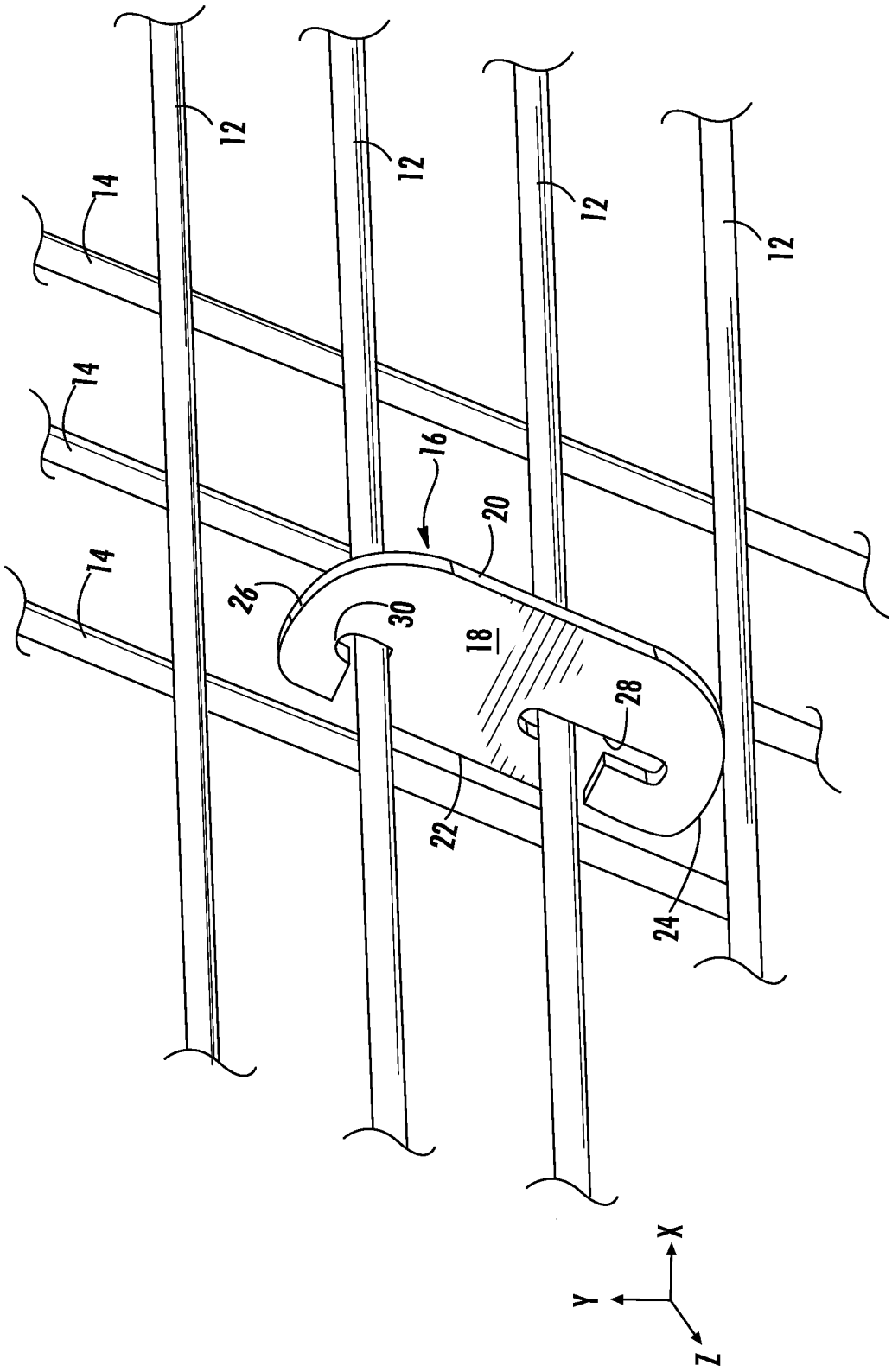

FIG. 4

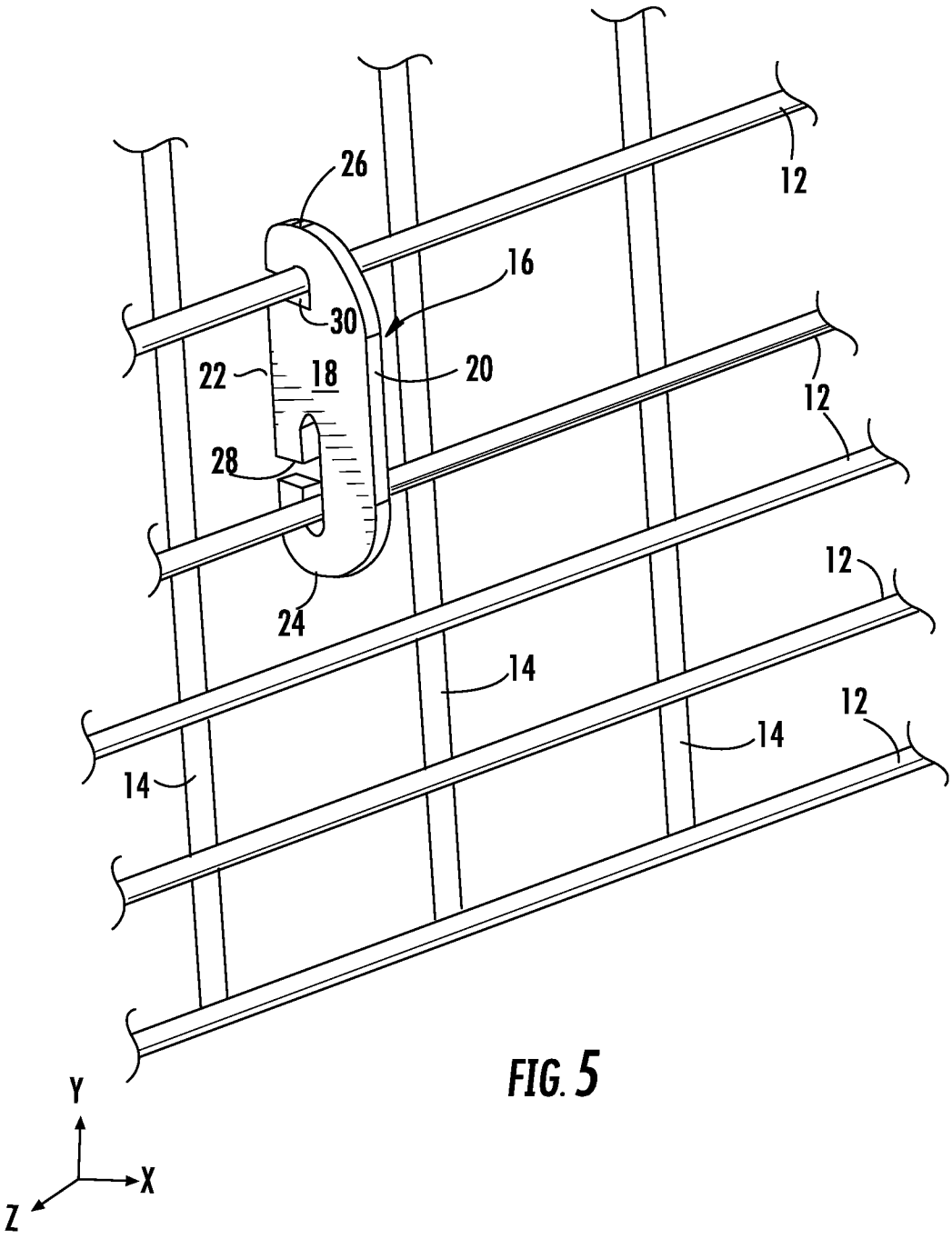

FIG. 5

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US2014/034192

A. CLASSIFICATION OF SUBJECT MATTER
IPC(8) - E04C 5/16 (2014.01)
USPC - 52/677
According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC(8) - E04C 5/00, 5/16 (2014.01)
USPC - 52/677, 687; 248/316.7, 316.8

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched
CPC - E04C 5/168, 5/20 (2014.07)

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)
Orbit, Google Patents, Google

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	US 6,899,310 B1 (TRANGSRUD) 31 May 2005 (31.05.2005) entire document	1-6
Y	US 2007/0101672 A1 (GUNTHER) 10 May 2007 (10.05.2007) entire document	1-6
Y	US 5,269,113 A (DREIZLER) 14 December 1993 (14.12.1993) entire document	5, 6
A	US 2011/0219721 A1 (DENSMORE) 15 September 2011 (15.09.2011) entire document	1-6
A	US 871,210 A (CUMMINGS) 19 November 1907 (19.11.1907) entire document	1-6

☐ Further documents are listed in the continuation of Box C. ☐

* Special categories of cited documents:
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"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
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Date of the actual completion of the international search	Date of mailing of the international search report
05 August 2014	28 AUG 2014

Name and mailing address of the ISA/US	Authorized officer:
Mail Stop PCT, Attn: ISA/US, Commissioner for Patents P.O. Box 1450, Alexandria, Virginia 22313-1450 Facsimile No. 571-273-3201	Blaine R. Copenheaver PCT Helpdesk: 571-272-4300 PCT OSP: 571-272-7774

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