



(12) **EUROPEAN PATENT APPLICATION**

(43) Date of publication:
14.12.2016 Bulletin 2016/50

(21) Application number: **16173679.8**

(22) Date of filing: **09.06.2016**

(51) Int Cl.:
E04B 1/26 (2006.01) **B27F 1/16 (2006.01)**
E04C 3/12 (2006.01) **E04C 3/17 (2006.01)**
E04C 3/42 (2006.01) **B27M 3/00 (2006.01)**
E04B 1/32 (2006.01)

(84) Designated Contracting States:
AL AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HR HU IE IS IT LI LT LU LV MC MK MT NL NO PL PT RO RS SE SI SK SM TR
Designated Extension States:
BA ME
Designated Validation States:
MA MD

(30) Priority: **09.06.2015 NL 2014940**

(71) Applicant: **C.V. Beheer B.V.**
9156 AG Bornwird (NL)

(72) Inventor: **Visser, Garnt Michaël**
9156 AG Bornwird (NL)

(74) Representative: **Verdijck, Gerardus et al**
Arnold & Siedsma
Bezuidenhoutseweg 57
2594 AC The Hague (NL)

(54) **METHOD FOR MANUFACTURING A TRUSS OR TRUSS PART FROM TWO OR MORE CONSTRUCTION PARTS, SUCH A TRUSS OR TRUSS PART AND A BUILDING PROVIDED THEREWITH**

(57) The present invention relates to a method for manufacturing a wooden truss or truss part from two or more construction parts, such a truss or truss part and building provided therewith. The method according to the invention comprises the steps of:

- determining a desired dimensioning of the truss or truss part;
- determining in accordance with the desired dimensioning of the truss or truss part a configuration for a connection between individual construction parts of the truss or truss part with connecting parts, wherein determining a configuration for the connection comprises of dimensioning a number of mutually engaging finger-like elements of the connecting parts;
- providing a clamping fit for the mutually engaging finger-like elements in the configuration;
- providing a hook-like element on at least one of the connecting parts such that a form-fitting effect is realizable with the connection; and
- realizing the connection and assembling the truss or truss part.

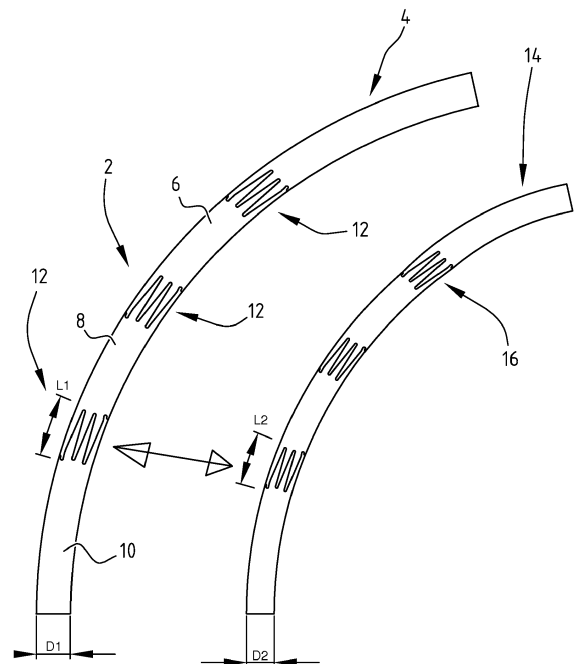


FIG. 1

Description

[0001] The invention relates to a method for manufacturing a truss or truss part. Such a truss or truss part is used for buildings or other constructions, in particular for roof parts and optionally outside wall parts as well. The method relates more specifically to the connection of two or more construction parts to form a truss or truss part.

[0002] It is known in practice to provide buildings or other constructions with a roof construction wherein use is made of trusses. Such trusses are usually manufactured in one part or as several parts which are connected to each other using connecting plates or bolts. This is relatively time-consuming and costly.

[0003] The invention has for its object to obviate or reduce the above stated problems.

[0004] This object is achieved with the method according to the invention for manufacturing a truss or truss part from two or more construction parts, the method comprising the steps of:

- determining a desired dimensioning of the truss or truss part;
- determining in accordance with the desired dimensioning of the truss or truss part a configuration for a connection between individual construction parts of the truss or truss part with connecting parts, wherein determining a configuration for the connection comprises of dimensioning a number of mutually engaging finger-like elements of the connecting parts;
- providing a clamping fit for the mutually engaging finger-like elements in the configuration;
- providing a hook-like element on at least one of the connecting parts such that a form-fitting effect is realizable with the connection; and
- realizing the connection and assembling the truss or truss part.

[0005] Determining the desired dimensioning of the truss or truss part enables the embodiment thereof to be adapted to specific requirements. These requirements relate to the distribution of forces as well as to other more visual aspects such as design, since the form of a truss or truss part will also define the overall form of the building or construction into which it is incorporated. The configuration for the connection of construction parts is determined on the basis of the desired dimensioning of the truss or truss part. The connection connects construction parts to each other using connecting parts. The individual connecting parts are provided here on the construction parts.

[0006] In a currently preferred embodiment the construction parts are provided substantially from a wooden material. This can be solid wood material. It has however been found particularly advantageous to make use of plywood material. Plywood sheet material in particular makes it possible in effective manner to realize a desired

design with associated dimensioning and configuration. It is thus possible for instance to cut truss parts in relatively simple and accurate manner from a plywood sheet.

[0007] Provided according to the invention in the configuration for the connection to the individual connecting parts are a number of mutually engaging finger-like elements, or fingers. Both connecting parts which together form a connection are preferably provided here with a number of finger-like elements. The design of the fingers/finger-like elements provides for a clamping fit. A durable connection between the individual construction parts is in this way provided as a result of a clamping fit.

[0008] In the connecting configuration at least one hook-like element is also provided on at least one of the connecting parts such that a form-fitting effect is realizable by having the hook-like element of the one connecting part engage in a correspondingly shaped recess on the other connecting part. By combining the form-fitting effect realizable with the hook-like element with the clamping fit of the finger-like elements a form fitting is provided in addition to the clamping fit. A hook-like body is understood in the context of the invention to mean any form which can realize a form fitting, for instance a shaped pin or catch. With the additional form fitting the connection becomes even more robust.

[0009] Once the configuration has been provided and formed in the material for the truss or truss part, for instance from a plywood sheet material, the connection can be realized and the truss or truss part assembled. When this connection is realized, in a currently preferred embodiment both the construction parts to be connected are clamped fixedly, after which both construction parts are moved with force toward each other as seen in length direction in order to realize the clamping fit and the form fitting. This has been found, particularly in combination with use of wooden materials, to be an effective and advantageous manner of providing the connection and thereby realizing a truss or truss part.

[0010] With the method according to the invention a truss or truss part can be manufactured in effective and efficient manner from two or more construction parts by making use of a connection, wherein mutually engaging finger-like elements are provided on the connecting parts. Providing a clamping fit and a form fitting with an additional hook-like element results in a strong and robust connection. Such a wooden truss or truss part can be manufactured particularly from a plywood material, wherein the individual construction parts are manufactured from plywood sheet material and subsequently assembled according to the method. A truss, truss part or truss construction can hereby be assembled in advantageous manner. Making use of sheet material further increases the design options in particular. It is thus possible for instance to manufacture curved trusses in effective manner. Other shapes, such as angles, corrugations, application of knee walls, overhang and the like are also possible.

[0011] According to the invention a greater freedom is

obtained in design of the truss or truss part. The truss or truss part can be provided here with a curved portion, or even be provided with a wholly curved shape. Round truss constructions are hereby expressly possible. It is also possible to provide the truss or truss part with a bend or angle such that a bent roof construction is for instance possible. The advantage here is that such a roof construction can be obtained in effective manner.

[0012] In addition to greater freedom in design, the method according to the invention provides more dimensioning options, for instance a variation in dimensioning along the length of the truss or truss part. It is thus possible for instance to vary the height of the truss along the length thereof. In addition to visual aspects, it is also possible here to take into account the distribution of forces. This option is particularly enhanced by making use of plywood material, this providing a greater freedom of design.

[0013] The method can further be applied in advantageous manner in prefab construction so that a building or other structure can be constructed in effective and efficient manner.

[0014] In a further advantageous preferred embodiment according to the present invention the dimensioning comprises the step of scaling the length of the finger-like elements of a connection on the basis of the height of the truss or truss part.

[0015] It has been found particularly advantageous according to the invention to adapt the length of the finger-like elements of the connection to the height of the construction part. The height of the construction part is the direction at right angles to the length and the thickness of the construction part. It is thus possible to keep the number of finger-like elements the same over a considerable range of dimensions by scaling the dimensions in accordance with the height. The connection is hereby scaled in accordance with the height, and thereby with the anticipated forces acting on the truss or truss part. The strength of the connection can hereby be scaled accordingly in effective manner within a relevant range, for instance from 100 to 400 mm in height. The ratio of the height of two connections is thus for instance equal to the ratio of the lengths of the finger-like elements of the connections. Other scaling ratios of the height of the connection and the length of the finger-like elements are of course also possible, depending for instance on the type of material used.

[0016] The length of the finger-like element is preferably at least equal to the height of the truss or the truss part. The height is here the dimension transversely of the length direction of the finger-like element of the material of the truss or the truss part.

[0017] The connecting parts preferably form part of the truss or the truss part. This provides a simple construction.

[0018] In an advantageous preferred embodiment according to the present invention the hook-like element is provided at or close to an outer end of at least one of the

finger-like elements.

[0019] A finger-like element can be manufactured in effective manner by providing the hook-like element at or close to an outer end thereof. It is thus possible for instance to cut the hook together with the finger-like elements, for instance from a plywood sheet material. When the finger-like elements are engaged with each other the form fitting is hereby also automatically effected using the hook-like element which engages in a recess corresponding therewith in the other connecting part to be coupled.

[0020] The connecting parts are preferably provided with a number of fingers in the range of two to four, and three finger-like elements are preferably provided per individual connecting part. It has been found that this provides a good balance between force transmission and design. It has further been found that a considerably better connection can hereby be realized than with a traditional finger joint/sawtooth principle, wherein a sawtooth configuration of connecting parts are glued to each other. This traditional method results in a considerably weaker connection than is possible with the connection according to the invention. The number of teeth is also adjusted on the basis of the height. This means that the configuration of the connection is not easily adapted to the actual requirement in respect of for instance distribution of forces. This represents a limitation to the traditional connection methods.

[0021] In an advantageous preferred embodiment according to the present invention the method comprises of glueing mutually engaging finger-like elements.

[0022] Glueing results in a further strengthening of the connection. Glueing increases the strength of the connection already obtained by the clamping fit and the form fitting.

[0023] In a further advantageous embodiment according to the present invention the method comprises of providing a connecting piece for connecting two construction parts, wherein the connecting piece is provided with two or more individual connecting parts.

[0024] Realizing connection of two construction parts to each other by means of a separate connecting piece instead of directly to each other creates additional freedoms in design and choice of material. The connecting piece can thus be made from a material other than that of the individual construction parts. A different design of the connecting piece is also possible. In a possible embodiment a connecting piece according to the invention can be provided with two connecting parts such that two construction parts are coupled indirectly to each other with the connecting piece. In an alternative embodiment the connecting piece is designed such that three construction parts are coupled using a single connecting piece. This is possible for instance in the case a type of knee wall is employed with an overhang. Further strength is hereby imparted to the whole construction.

[0025] The invention also relates to a truss or truss part comprising:

- two or more wooden construction parts provided with connecting parts;
- a connection with connecting parts configured to connect the individual construction parts, the connection comprising:
 - a configuration provided with a number of mutually engaging finger-like elements on connecting parts, wherein mutually engaging finger-like elements are provided with a clamping fit; and
 - a hook-like element provided on at least one of the connecting elements such that a form-fitting effect can be realized.

[0026] Such a truss or truss part provides the same advantages and effects as described for the method. Such a truss or truss part can be used for a building or other construction and can be applied in a particularly advantageous manner on types of roof construction.

[0027] The truss or truss part is preferably manufactured using one of the methods as discussed above such that it can be provided in effective manner, preferably wholly or partially from a plywood sheet material. The use of this material has the particular advantage that it can be manufactured in effective manner using for instance a CNC milling machine. The use of other materials and methods of manufacture are also possible.

[0028] A particular advantage of a truss or truss part according to the invention is that it offers additional freedom of form, whereby curved parts or even wholly curved trusses can be manufactured and/or can be provided with an angle or bend.

[0029] In an advantageous embodiment the truss or truss part is further provided with a connection comprising a separate connecting piece with mutually engaging finger-like elements for the purpose of thereby coupling two or more, for instance three, construction parts to each other. This has a number of advantages as already described above with reference to the method.

[0030] The invention also relates to a building or construction provided with a truss or truss part manufactured with the method as described above.

[0031] Such a building construction provides the same advantages and effects as described for the method and/or truss or truss part. Such a building is for instance a dwelling, office, flat, garage, factory premises, shed and the like.

[0032] Further advantages, features and details of the invention are elucidated on the basis of preferred embodiments thereof, wherein reference is made to the accompanying drawings, in which:

- Figure 1 is a side view of two trusses according to the invention with a round shape;
- Figure 2 shows a view of the connection of the truss of figure 1 in coupled and yet to be coupled state;
- Figures 3A-D show views of alternative embodiments of trusses and truss parts assembled with the

connection according to the invention;

- Figure 4 shows a view of alternative applications of the connection according to the invention;
- Figure 5 shows a number of exemplary views of blanks for construction parts of sheet material; and
- Figure 6 shows a part of a building making use of trusses and truss parts manufactured according to the invention.

[0033] Truss 2 (figure 1) consists of a number of construction parts 4, 6, 8, 10 which are mutually connected with connections 12. Truss 2 is provided with a height D_1 , and a length L_1 of the finger-like elements of connection 12. Alternative truss 14 is provided with alternative connection 16, wherein connection 16 is provided with a height D_2 and length L_2 . In the shown embodiment a scaling of length L_1 and L_2 is performed for the difference in height D_1 and D_2 of truss 2 and truss 14.

[0034] In the shown embodiment it is the case that the ratio D_1/D_2 is proportional to the ratio L_1/L_2 . This ratio can be 1:1, but will usually be around 1:1.5 or elsewhere in the range of 1:1 to 2. It will be apparent that another scaling ratio is also possible. Connections 16 of truss 14 and connection 12 of truss 2 are in this way related to each other.

[0035] Truss 18 (figure 2) is provided with first construction part 20 and second construction part 21 which are connected to each other by connection 22. Construction part 21 is provided with first connecting part 26 and construction part 20 is provided with second connecting part 28, which together form connection 22. First construction part 12 is further provided at the other outer end with further connecting part 24, and construction part 20 is provided at the other outer end with further connecting part 30.

[0036] In the shown embodiment the configuration/shape 32 of connection 22 is provided with notch 34 into which a corresponding protrusion or hook-like element 36 can be inserted. Connecting elements 24, 26, 28, 30 are also provided with three fingers or finger-like elements 38 and cavities or recesses 40 corresponding thereto. Cavities 40 and fingers 38 are embodied here such that a clamping fit 42 is created here.

[0037] For the manufacture of configuration 32, in the case that use is for instance made of plywood sheet material, a dimensioning is first carried out for trusses 2, 14, 18, after which construction parts 4, 6, 8, 10, 20, 21 are sawn from the sheet, for instance with a milling machine with which the shape of connecting parts 26, 28 is arranged. Construction part 20, 21 are then clamped and moved in direction A relative to each other. Construction parts 26, 28 are pressed into each other with force here in order to thereby effect clamping fit 42 and form fitting 41 with notch 34 and protrusion 36. If desired, use can be made of glue to realize glue connection 43 to finger-like elements 38 for further strengthening of connection 12, 16, 22.

[0038] Truss 44 (figure 3A) is provided with three con-

nections 46, 48, 50. Truss 44 is provided with a variable height along the length of truss 44, and connections 46, 48, 50 are scaled accordingly in the manner as discussed above..

[0039] Truss 52 (figure 3B) is provided with a bent form. In the shown embodiment construction part 54 is provided from standard solid pine building timber, construction part 56 provided from plywood sheet material and construction part 58 is provided from standard solid pine building timber. Diverse types of material can in this way be connected in simple manner to each other.

[0040] Truss part 60 (figure 3C) is provided with construction parts 62, connecting piece 64 with overhang, and construction part 66. In a further alternative embodiment of truss part 68 first construction part 70 is connected via connecting piece 72 to second construction part 74 as a type of overhang and third construction part 76 as a type of knee wall. Further constructions can also be envisaged here.

[0041] It will therefore be apparent to the skilled person that further shapes are possible, for instance combinations of curved and bent truss parts and/or the application of different types of material. Round roof truss 78 (figure 4A) can thus be provided with a knee wall as one whole, and a half finger joint connection 80 (figure 4B) or a single finger connection 82 (figure 4C) or multiple finger connection (figure 4D) for relatively greater heights can be provided.

[0042] In various shown embodiments trusses are provided of plywood sheet material, and during dimensioning the size and design can be adapted in efficient manner to sheet dimensions in the form of a blank (figures 5A-D) in order to thereby enable efficient manufacture of a truss or truss part. Examples of such blanks 86, 88, 90, 92 are numerous and intended solely as example of the possibilities of manufacturing a truss or truss part according to the invention in efficient manner.

[0043] Building 94, shown in the form of upper construction layer (figure 6), makes use of trusses 96 and truss parts or construction parts 98. Truss parts 96 are used in the shown embodiment in building 94 as main support for a type of roof construction, while construction parts 98 are used to manufacture a sloping outer side wall. It will be apparent that the invention can hereby be applied in effective manner not only for roof constructions but also for other constructions, including outer side walls, in particular sloping outer side walls.

[0044] The present invention is by no means limited to the above described embodiments thereof. The rights sought are defined by the following claims, within the scope of which many modifications can be envisaged.

Claims

1. Method for manufacturing a wooden truss or truss part from two or more construction parts, comprising the steps of:

- determining a desired dimensioning of the truss or truss part;
- determining in accordance with the desired dimensioning of the truss or truss part a configuration for a connection between individual construction parts of the truss or truss part with connecting parts, wherein determining a configuration for the connection comprises of dimensioning a number of mutually engaging finger-like elements of the connecting parts;
- providing a clamping fit for the mutually engaging finger-like elements in the configuration;
- providing a hook-like element on at least one of the connecting parts such that a form-fitting effect is realizable with the connection; and
- realizing the connection and assembling the truss or truss part.

2. Method as claimed in claim 1, wherein the dimensioning comprises the step of scaling the length of the finger-like elements of a connection on the basis of the height of the construction part of the truss or truss part.

3. Method as claimed in claim 2, wherein the number of finger-like elements remains the same during scaling and/or the length of the finger-like elements is at least equal to a height of the truss or the truss part.

4. Method as claimed in one or more of the foregoing claims, wherein the connecting parts form part of the truss or the truss part.

5. Method as claimed in one or more of the foregoing claims, wherein the hook-like element is provided at or close to an outer end of at least one of the finger-like elements.

6. Method as claimed in one or more of the foregoing claims, wherein the connecting parts are provided with a number of finger-like elements in the range of two to four, and preferably three, per individual connecting part.

7. Method as claimed in one or more of the foregoing claims, further comprising of glueing mutually engaging finger-like elements.

8. Method as claimed in one or more of the foregoing claims, further comprising of providing a connecting piece for connecting two construction parts, wherein the connecting piece is provided with two or more individual connecting parts, wherein the connecting piece is preferably provided with three or more individual connecting parts for connecting three or more construction parts.

9. Method as claimed in one or more of the foregoing

claims, wherein the truss or truss part is provided with a curved portion.

10. Method as claimed in one or more of the foregoing claims, wherein the truss or truss part is provided with a bend or angle. 5

11. Method as claimed in one or more of the foregoing claims, wherein the truss or truss part is manufactured for a substantial part from a plywood material. 10

12. Truss or truss part comprising:

- two or more wooden construction parts provided with connecting parts; 15
- a connection with connecting parts configured to connect the individual construction parts, the connection comprising:

- a configuration provided with a number of mutually engaging finger-like elements on connecting parts, wherein mutually engaging finger-like elements are provided with a clamping fit; and 20

- a hook-like element provided on at least one of the connecting elements such that a form-fitting effect can be realized. 25

13. Truss or truss part as claimed in claim 12, wherein the truss or truss part comprises a curved portion and/or wherein the truss or truss part comprises a bend or angle. 30

14. Truss or truss part as claimed in claim 12 or 13, wherein the connection comprises a connecting piece provided with two or more connecting parts with a number of mutually engaging finger-like elements such that at least two construction parts are connectable to each other via the connecting piece and/or wherein the connecting piece is configured such that three or more individual parts are connectable. 35 40

15. Building or construction provided with a truss or truss part manufactured with a method as claimed in one or more of the foregoing claims. 45

50

55

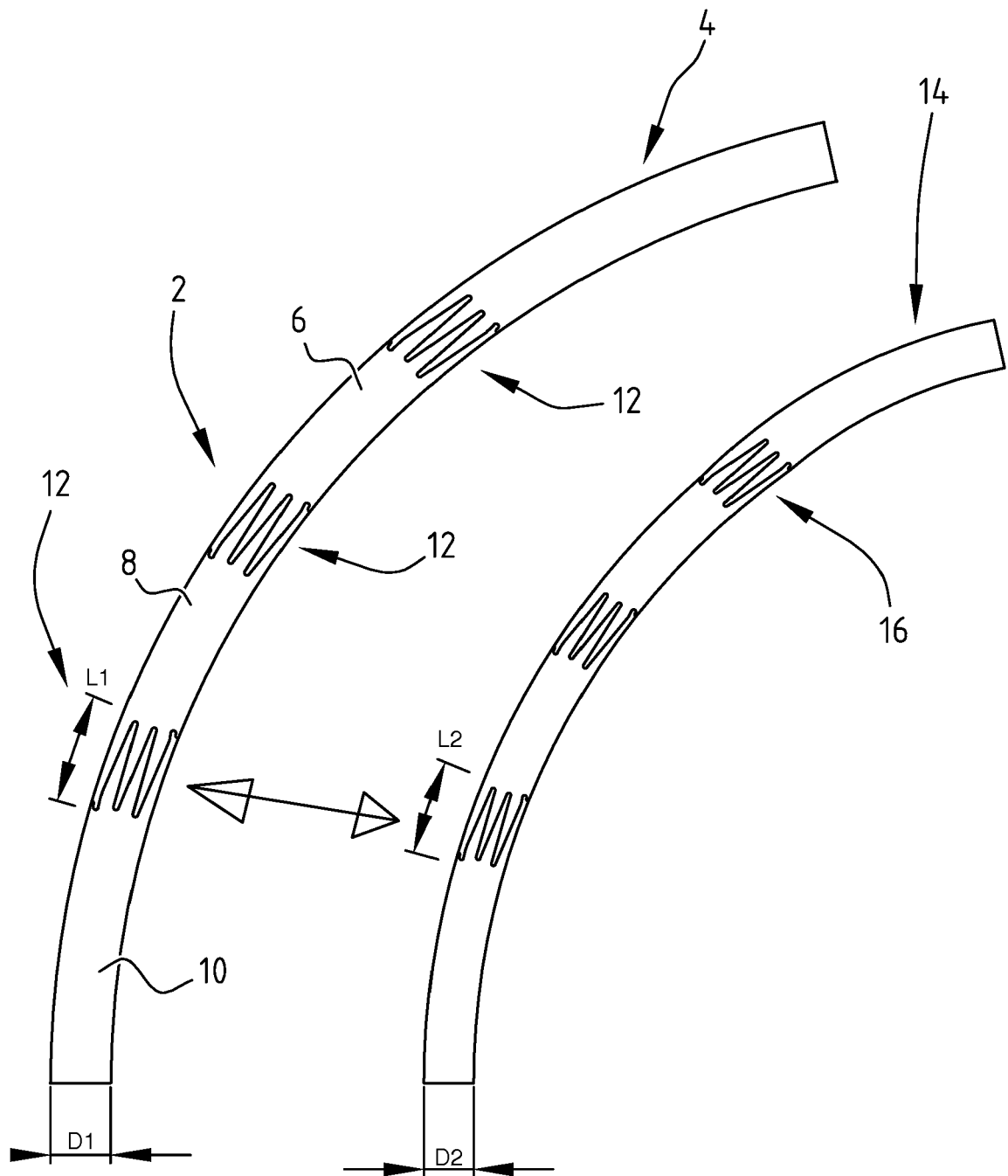


FIG. 1

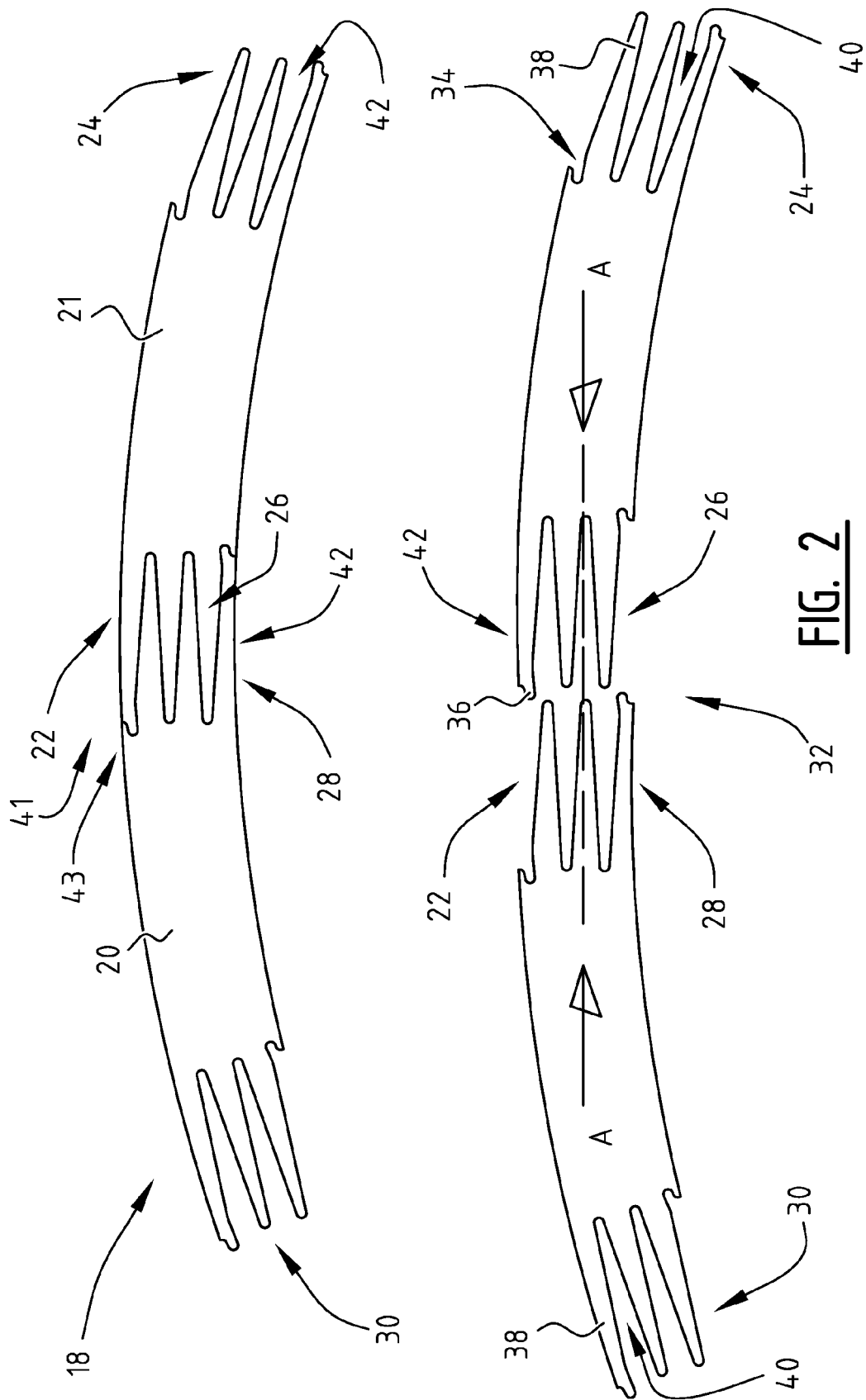


FIG. 2

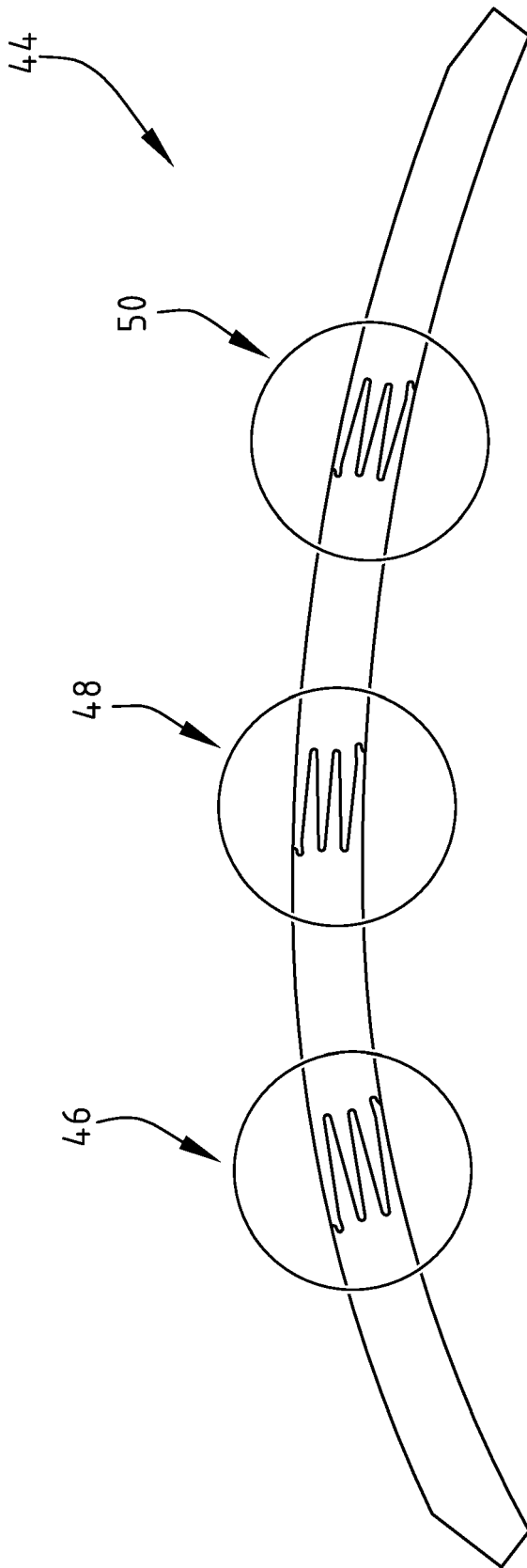


FIG. 3A

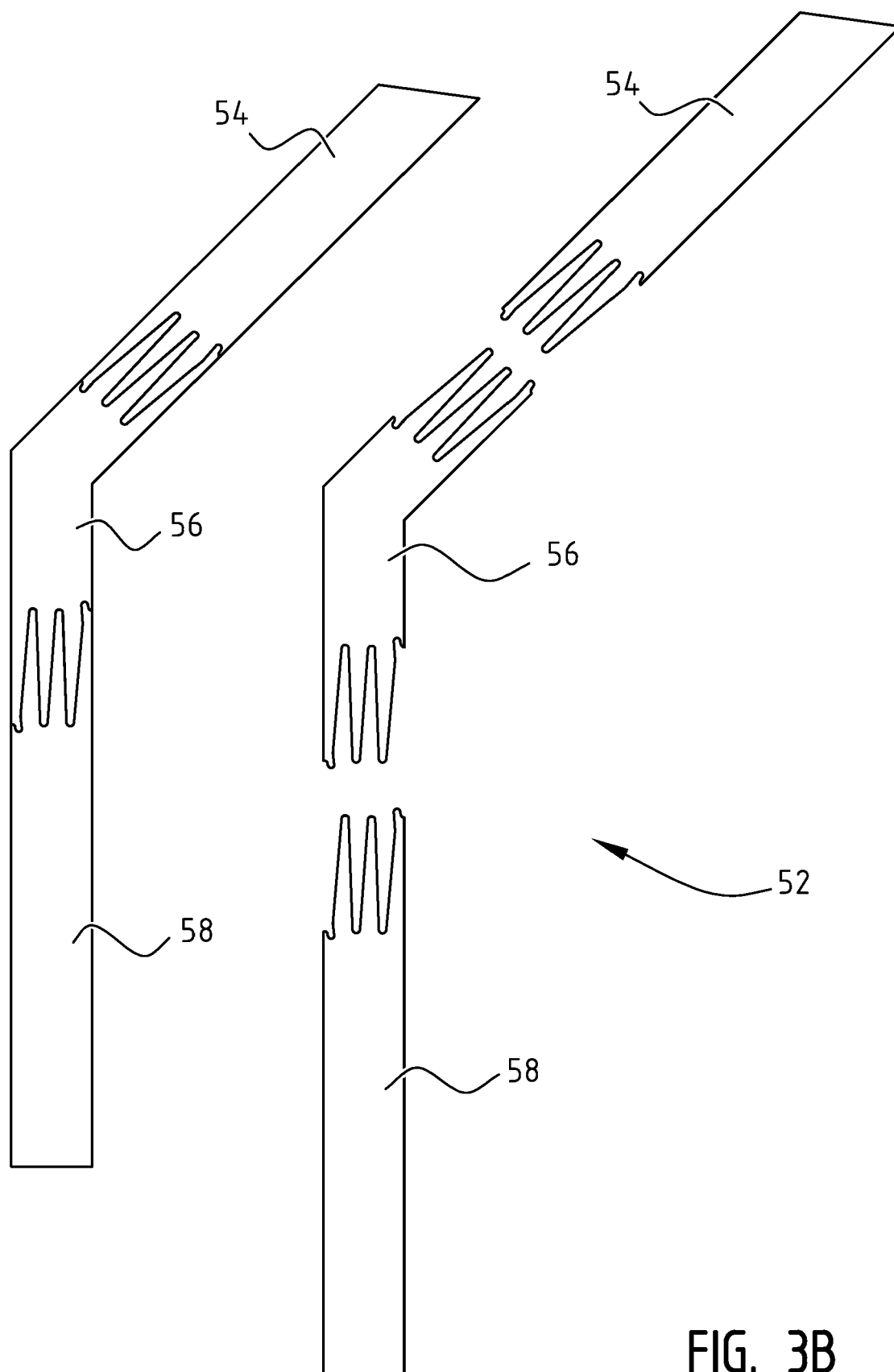


FIG. 3B

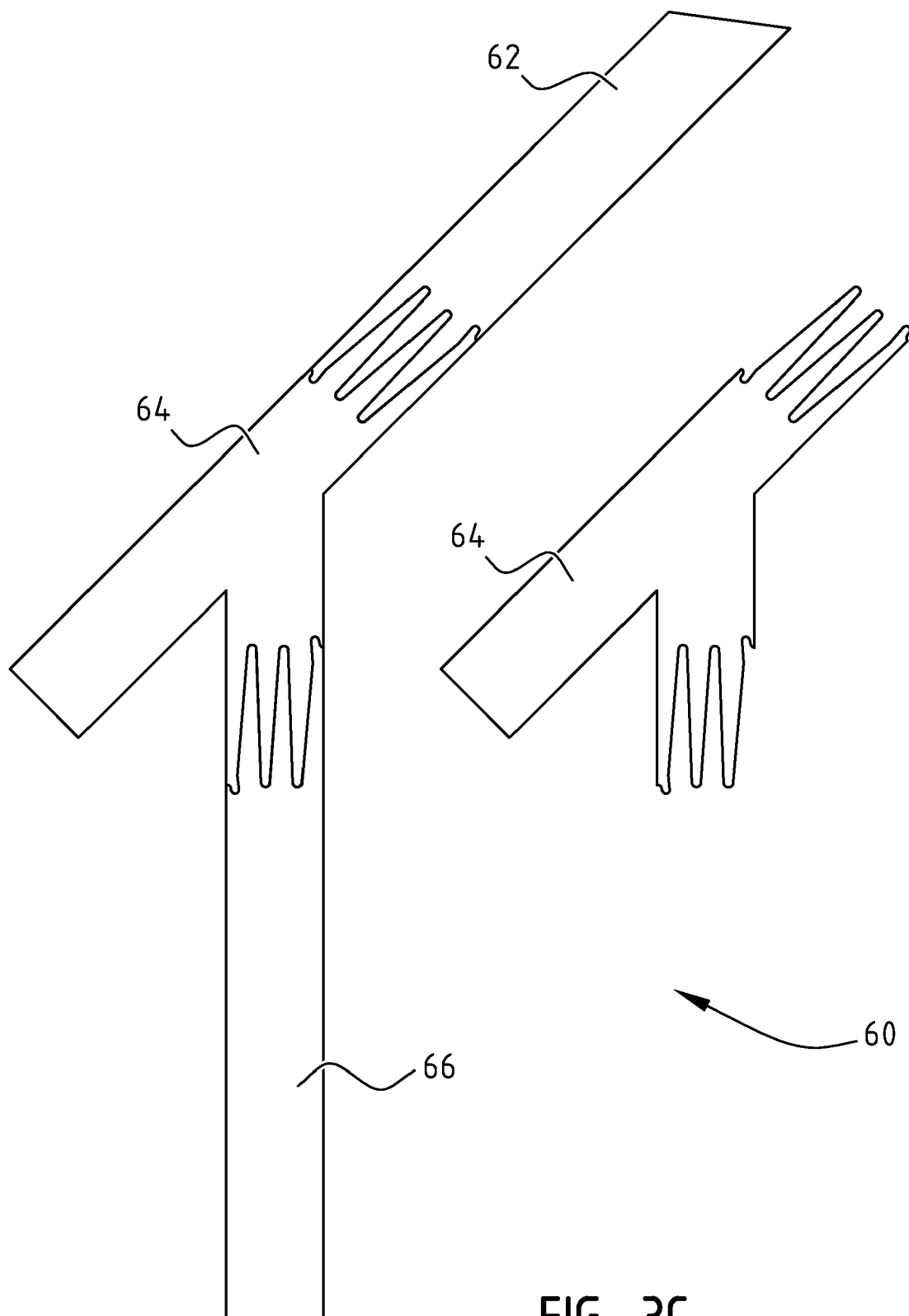


FIG. 3C

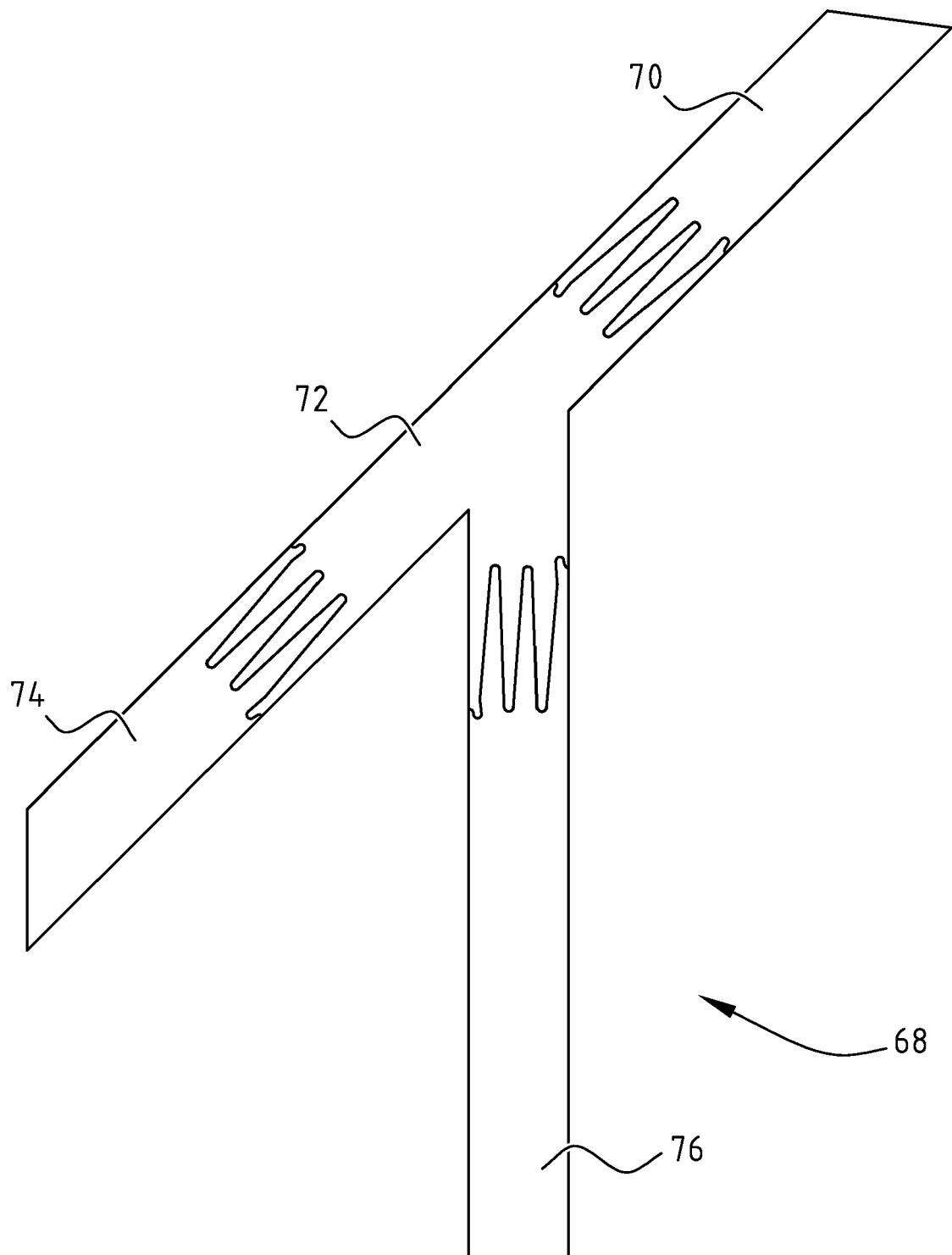
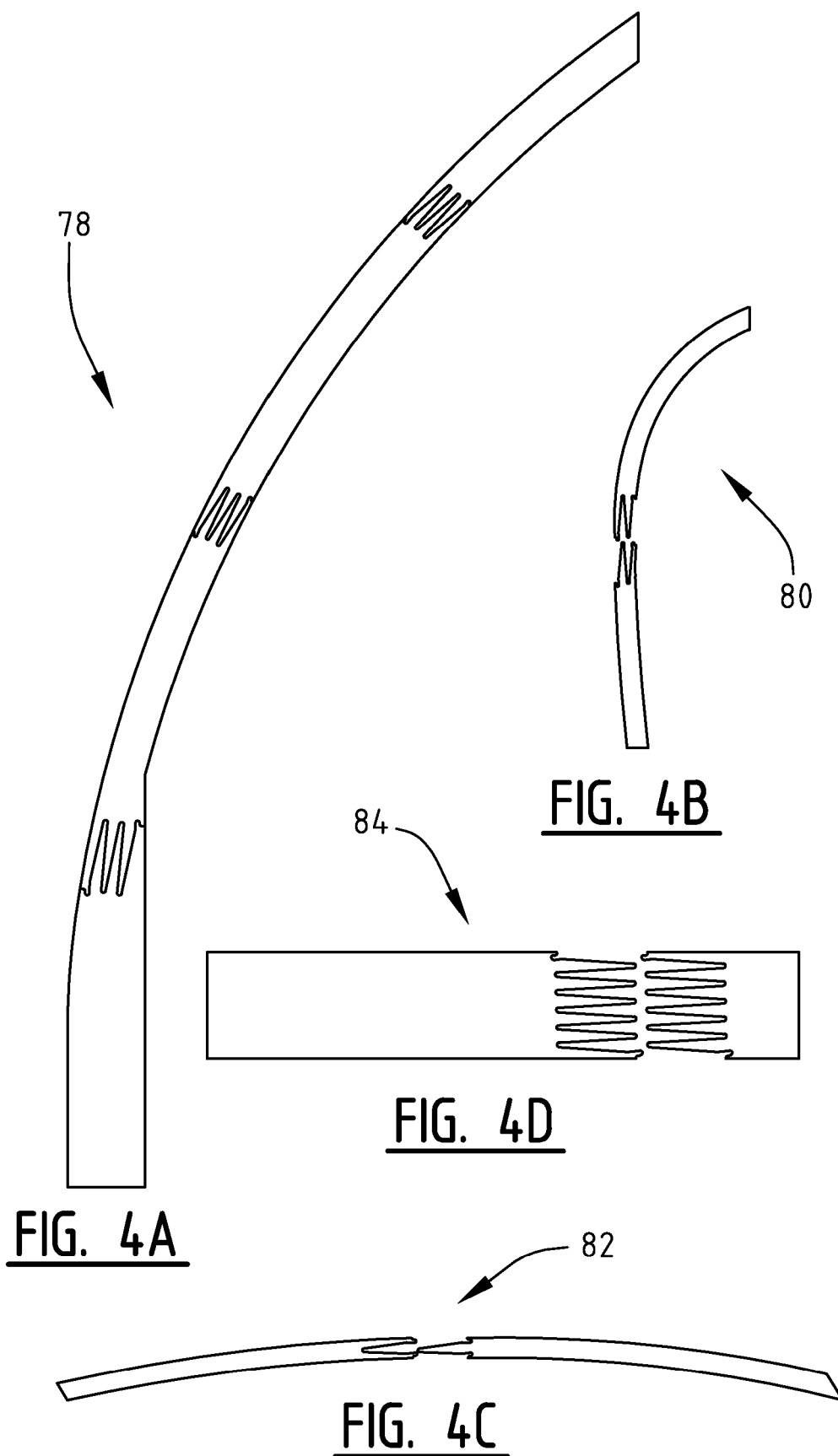
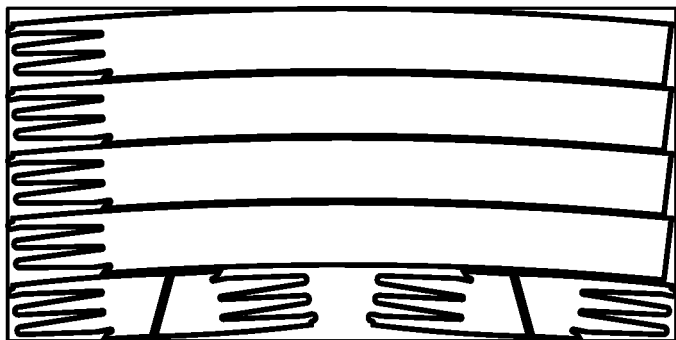


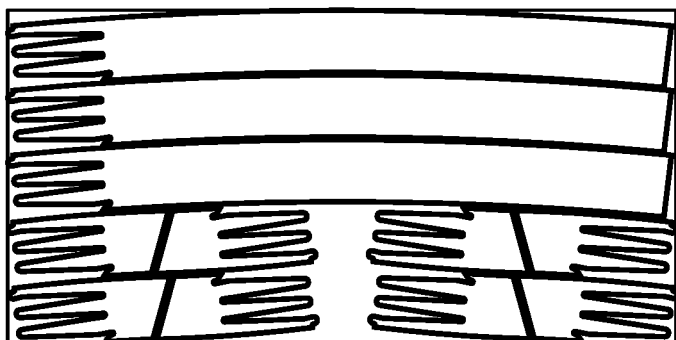
FIG. 3D





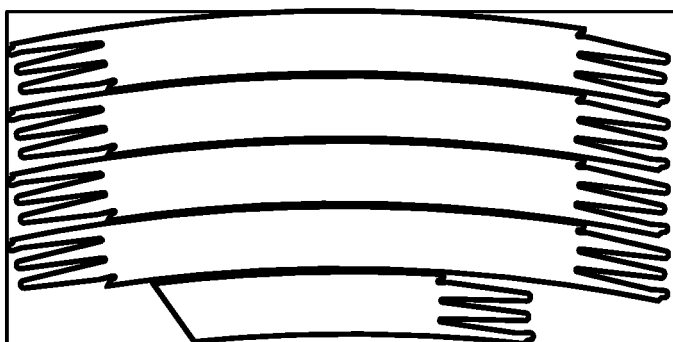
86

FIG. 5A



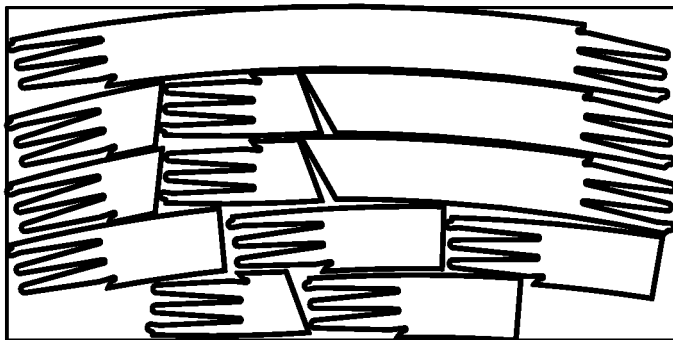
88

FIG. 5B



90

FIG. 5C



92

FIG. 5D

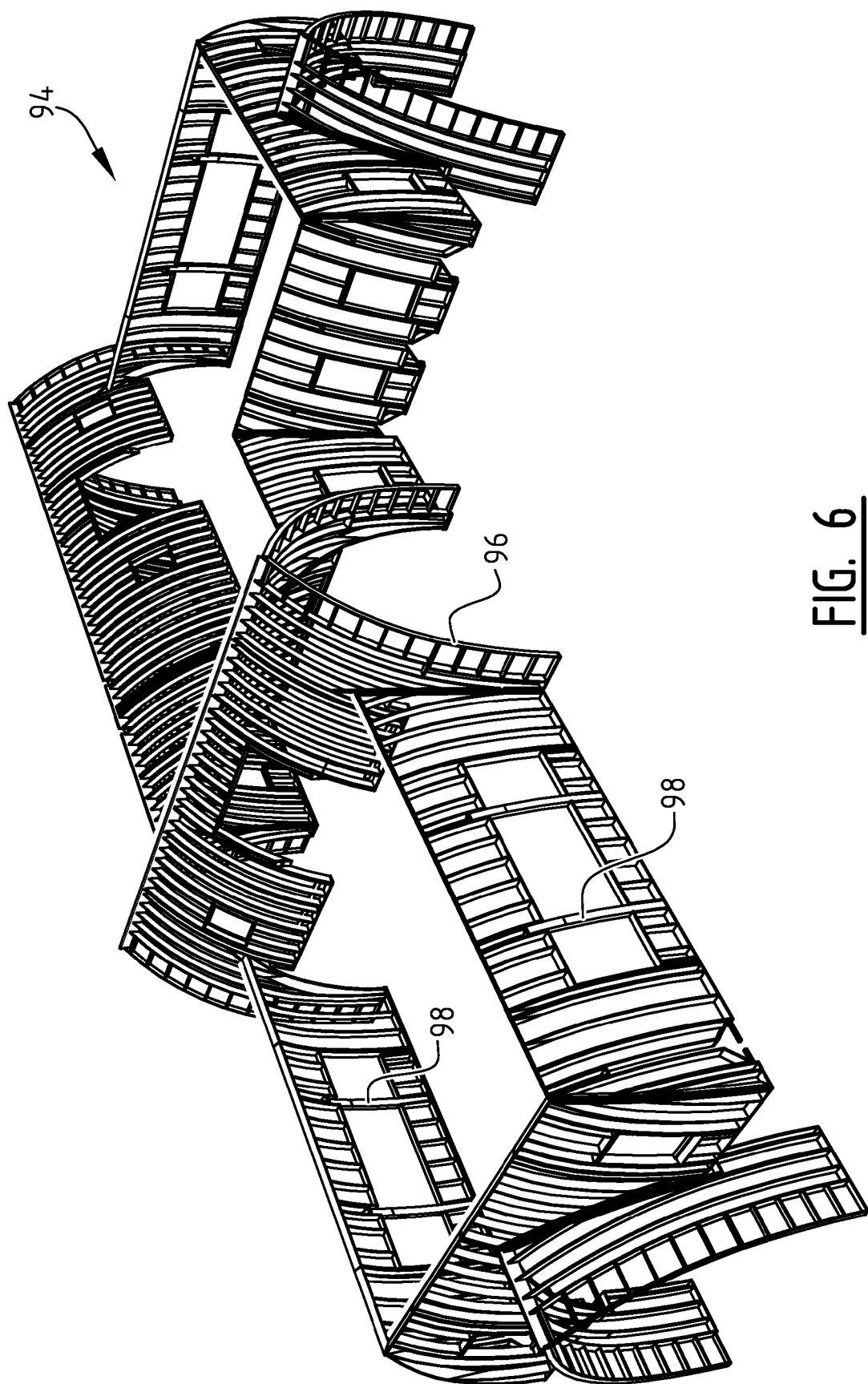


FIG. 6



EUROPEAN SEARCH REPORT

Application Number
EP 16 17 3679

5

10

15

20

25

30

35

40

45

50

55

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X	FR 2 624 536 A (J.N. THIMONIER) 16 June 1989 (1989-06-16) * page 2, line 19 - line 27; figures 1-3,7 *	1-15	INV. E04B1/26 B27F1/16 E04C3/12 E04C3/17 E04C3/42 B27M3/00 E04B1/32
A	US 3 204 300 A (W. HOFFMANN) 7 September 1965 (1965-09-07) * column 2, line 31 - column 3, line 36; figures *	1,12	
A	DE 12 76 894 B (W. HOFMANN) 5 September 1968 (1968-09-05) * claim 1; figures *	1,12	
A	DE 38 20 396 A1 (W. DREDEN) 28 December 1989 (1989-12-28) * abstract; figures *	1,12	
A	US 5 149 108 A (LEISZTER) 22 September 1992 (1992-09-22) * abstract; figures *	1,5,12	
			TECHNICAL FIELDS SEARCHED (IPC)
			E04C E04B B27M B27F
The present search report has been drawn up for all claims			
Place of search The Hague		Date of completion of the search 3 October 2016	Examiner Righetti, Roberto
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document			

EPO FORM 1503 03.82 (P04C01)

**ANNEX TO THE EUROPEAN SEARCH REPORT
ON EUROPEAN PATENT APPLICATION NO.**

EP 16 17 3679

5

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.
The members are as contained in the European Patent Office EDP file on
The European Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

03-10-2016

10

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
FR 2624536 A	16-06-1989	NONE	
US 3204300 A	07-09-1965	CH 387926 A DE 1237762 B GB 910153 A US 3204300 A	15-02-1965 30-03-1967 14-11-1962 07-09-1965
DE 1276894 B	05-09-1968	NONE	
DE 3820396 A1	28-12-1989	NONE	
US 5149108 A	22-09-1992	NONE	

15

20

25

30

35

40

45

50

55

EPO FORM P0459

For more details about this annex : see Official Journal of the European Patent Office, No. 12/82