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(54) Title: CONNECTION BOLSTER

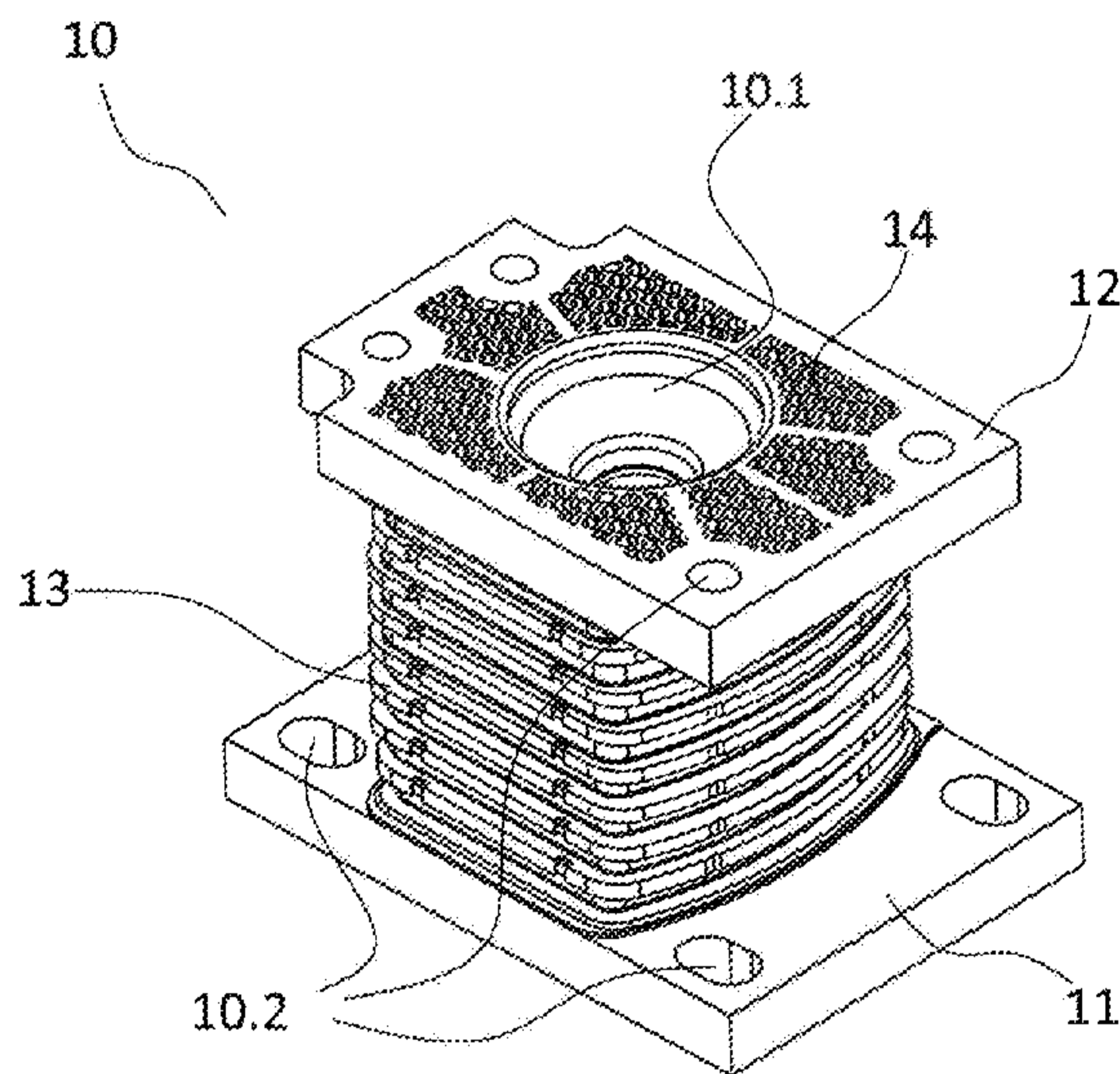


Figure 1

(57) **Abstract:** The invention relates to a connection bolster (10) which is developed by reinforcing with composite material in order to contribute to energy conservation in the vehicle. More specifically, the present invention relates to an improvement which is made for contributing to reduction in vehicle weight by lightening connection bolster (10) that is one of the heaviest components of the suspension system.



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## CONNECTION BOLSTER

### 5 **Technical Field**

The invention relates to a connection bolster which is developed by reinforcing with composite material in order to contribute to energy conservation in the vehicle.

More specifically, the present invention relates to an improvement which is made for contributing to reduction in vehicle weight by lightening connection bolster that is one  
10 of the heaviest components of the suspension system.

### **Prior Art**

With the usage of electric motors which are more eco-friendly and energy efficient, today's technology level of the automotive industry makes necessary to reduce weight in vehicles.

15 Vehicle suspension systems are structures which are convenient for re-design to fulfill this requirement. By considering the dynamic behavior of fasteners under repeated loads, they can be redesigned with lighter materials as improving their lifetime too.

In the patent document no. CA2810392A1, montage of the suspension element to  
20 the connection plate is mentioned. However, here, there is no study which is aimed neither to improve lifetime of the connection bolster or neither to reduce vehicle weight and contribute to energy conservation.

In the patent document no. CN108639087A, there is a method for improving the anti-fatigue performance of a locomotive rubber-metal block by changing thicknesses.  
25 However, here, there is no study which is aimed neither to improve lifetime of the connection bolster or neither to reduce vehicle weight and contribute to energy conservation.

In the patent document no. US5676356A, a flexible bolster which comprises a block of rubber or rubber-like elastomer sandwiched between two end plates. However,

here, there is no study which is aimed neither to improve lifetime of the connection bolster or neither to reduce vehicle weight and contribute to energy conservation.

As a result, the require for improving lifetime of the connection bolster as well as reducing vehicle weight and contributing to energy conservation has led the present  
5 innovative solution to emerge out.

### **Objectives and Short Description of the Invention**

Main purpose of the invention is to present a connection bolster which is developed by reinforcing with composite material in order to contribute to energy conservation in the vehicle.

10 Another aim of the invention is to contribute to reduction in vehicle weight by lightening connection bolster that is one of the heaviest components of the suspension system.

The present invention is a connection bolster comprising a layered region between a lower plate and an upper plate and, here mentioned lower plate, upper plate and  
15 layered section are made of composite material.

Mentioned composite material can be all kinds of metal alloys, polymer derivatives, glass-reinforced and/or carbon reinforced polymer derivatives or materials in which two or more of these materials are hybridized by being mixed in different proportions.

In a preferred embodiment of the invention, said composite material is carbon fiber or  
20 glass fiber reinforced or, polymer based.

In a preferred embodiment of the invention, the ratio of springiness in the A direction to the springiness in the B direction is between 5 and 20.

A preferred embodiment of the invention comprises a connection hole lying along said lower plate, upper plate and layered plate.

25 A preferred embodiment of the invention comprises a flexible connection piece which, passing along mentioned connection hole, does not carry momentum but can withstand very high tensile loads in the vertical direction.

In a preferred embodiment of the invention, the lower plate and the upper plate have a rib geometry.

In a preferred embodiment of the invention, the layered section includes rubber compound.

- 5 In a preferred embodiment of the invention, in order to improve the life properties of the lower plate and upper plate and to achieve the desired life properties, a friction sheet is added to both plates' middle regions where the connection hole exists.

A preferred embodiment of the invention comprises at least one mounting hole in the corner areas of the plates.

- 10 A preferred embodiment of the invention comprises bush structures that is placed inside mentioned mounting holes in order to allow the lower plate and upper plate to have a stronger form.

### **Description of the Figures**

In Figure 1, a perspective view of the present innovative connection bolster is given.

- 15 In Figure 2, the top view of mentioned innovative connection bolster is given.

In Figure 3, the left view of said innovative connection bolster is given.

In Figure 4, the bottom view of the innovative connection bolster is given.

In figure 5, a front sectional view of the innovative connection bolster is given.

- 20 In Figure 6, the exploded assembly view in which the innovative connection bolster is connected to leaf spring is given.

In Figure 7, a front sectional view of the innovative connection bolster's an embodiment that includes friction sheet is given. The thickness of the plates in this embodiment is less than the plate thicknesses in the embodiment given in the previous drawings.

In Figure 8, a perspective view of the innovative connection bolster's an embodiment including friction sheet and bushes is given.

In Figure 9, a top view of the innovative connection bolster's mentioned embodiment that includes friction sheet and bushes is given.

5 In Figure 10, a bottom view of the innovative connection bolster's said embodiment that includes friction sheet and bushes is given.

In Figure 11, a left view of the innovative connection bolster's said embodiment that includes friction sheet and bushes is given.

10 In Figure 12, a front view of the innovative connection bolster's said embodiment that includes friction sheet and bushes is given.

### Reference Numbers

- 10. Connection bolster
- 10.1. Connection hole
- 10.2. Mounting hole
- 15 11. Lower plate
- 12. Upper plate
- 13. Layered section
- 14. Rib geometry
- 15. Friction sheet
- 20 16. Bush
- 20. Connection piece

### Detailed Description of the Invention

The present invention relates to a connection bolster (10) which is developed by reinforcing with composite material in order to contribute to energy conservation in the vehicle. Mentioned connection bolster (10) has a layered structure and generally works in the shear and compression directions.

25

Different materials that can be substituted for all metal materials used has been investigated and it has been observed that carbon fiber or glass fiber reinforced composite materials can be used instead of them. Thus, a great weight advantage has been achieved in the present innovative product.

5 In the present invention, an additional contribution is provided to reduce weight of the vehicle by increasing the thickness of the composite material in the lower plate (11) and the upper plate (12) and changing the design (thickness reduction etc.) of the region where the connection bolster (10) will be mounted. This reduction in vehicle weight is possible by the reduction in the weight of mentioned region (opposite side  
10 corresponding in the vehicle) thanks to the change made in the design of said region where the connection bolster (10) will be mounted.

Since the polymer-based composite materials used in the present invention are suitable for recycling, it contributes to improvement in the important issues such as environmental protection and energy efficiency.

15 In the present innovative connection bolster (10), an additional contribution is provided to reduce weight of the vehicle by increasing the thickness of the composite material in the lower plate (11) and the upper plate (12) and changing the design of the region where the connection bolster (10) will be mounted. The preferred embodiment of the invention consists of composite materials at the top and bottom  
20 sides and consists of layered rubber compound and composite materials at the region between top and bottom sides.

The compression of present innovative connection bolster (10) differs proportionally in accordance with the force applied. The ratio of springiness in the A direction to the springiness in the B direction which are shown in Figure 3 is between 5 (minimum)  
25 and 20 (maximum).

The top view of the present innovative connection bolster (10) is given in Figure 2 and its bottom view is given in Figure 4. Between the lower plate (11) and upper plate (12) which are shown in the figures, there is a layered section (13) consisting of rubber compound and composite material. There is a reinforced rib geometry (14) on  
30 the lower plate (11) and upper plate (12) which are made of composite material.

Bolt connection is used due to the structure of the plates in the lower and upper parts and, when the vehicle wheel is idle, it carries weight by being loaded and provides the balance in this direction.

As seen in Figure 5, in the present innovative connection bolster (10), in order to the  
5 layered section (13) to not be forced in the tensile direction; it is ensured that the lower plate (11) and the upper plate (12) are connected to each other by a flexible connection piece (20) (hinged bolt, chain, steel rope, composite rope) that does not carry momentum but can withstand very high tensile loads in the vertical direction. There is a connection hole (10.1) that extends along the middle of both plates (11,  
10 12) and of layered section (13) for allowing mentioned connection piece (20) to pass through inside.

As seen in Figure 6, when the vehicle wheel is idle, the connection piece (20) in the structure of the present innovative connection bolster (10) carries weight by being loaded and provides the balance in this direction. The connection bolster (10)  
15 positioned between the leaf spring and truck axle, is exposed to the truck weight including itself and dynamic loads coming from the road. The compression of the connection bolster (10) in the vertical direction and its sliding (shear) motion relative to the connection axis reduce these effects.

The feature of the present invention is that the lower plate (11), upper plate (12) and  
20 layered section (13) are structures (composite, all kinds of metal alloys, polymer derivatives, glass-reinforced and/or carbon reinforced polymer derivatives or materials in which two or more of these materials are hybridized by being mixed in different proportions) which are produced from more rigid material than rubber. In the preferred embodiment of the invention, a suitable reinforcing rib geometry (14)  
25 design has been added to the plates in order to allow the lower plate (11) and upper plate (12) to have a stronger form. Mentioned rib geometry (14) is not essential element of the present innovative connection bolster (10) and, the usage of rib geometry (14) may be preferred in an alternative embodiment of the invention.

In the preferred embodiment of the invention, in order to improve the life properties of  
30 the lower plate (11) and upper plate (12) and to achieve the desired life properties, a

suitable friction sheet (15) is added to both plates' middle regions (where the connection hole (10.1) exists).

In the preferred embodiment of the invention, in order to allow the lower plate (11) and upper plate (12) to have a stronger form, a suitable bush (16) is placed inside  
5 each of mounting holes (10.2) located in the corner areas of the plates.

**CLAIMS**

1. A connection bolster (10) comprising a layered region (13) between a lower plate (11) and an upper plate (12) and, characterized in that; mentioned lower plate (11), upper plate (12) and layered section (13) are made of composite material.  
5
2. A connection bolster (10) according to Claim 1 and, wherein mentioned composite material is all kinds of metal alloys, polymer derivatives, glass-reinforced and/or carbon reinforced polymer derivatives or materials in which two or more of these materials are hybridized by being mixed in different proportions.  
10
3. A connection bolster (10) according to Claim 1 or Claim 2 and, wherein said composite material is carbon fiber or glass fiber reinforced or, polymer based.
4. A connection bolster (10) according to one of the preceding claims and, wherein the ratio of springiness in the A direction to the springiness in the B direction is between 5 and 20.  
15
5. A connection bolster (10) according to one of the preceding claims and, characterized by; comprising a connection hole (10.1) lying along said lower plate (11), upper plate (12) and layered plate (13).
6. A connection bolster (10) according to Claim 5 and, characterized by; comprising a flexible connection piece (20) which, passing along mentioned connection hole (10.1), does not carry momentum but can withstand very high tensile loads in the vertical direction.  
20
7. A connection bolster (10) according to one of the preceding claims and, wherein the lower plate (11) and the upper plate (12) have a rib geometry (14).
8. A connection bolster (10) according to one of the preceding claims and, wherein the layered section (13) includes rubber compound.  
25
9. A connection bolster (10) according to one of the preceding claims and, characterized in that; in order to improve the life properties of the lower plate

(11) and upper plate (12) and to achieve the desired life properties, a friction sheet (15) is added to both plates' middle regions where the connection hole (10.1) exists.

5 **10.** A connection bolster (10) according to one of the preceding claims and, characterized by; comprising at least one mounting hole (10.2) in the corner areas of the plates.

10 **11.** A connection bolster (10) according to Claim 10 and, characterized in that; in order to allow the lower plate (11) and upper plate (12) to have a stronger form, it comprises bush (16) structures that is placed inside mentioned mounting holes (10.2).

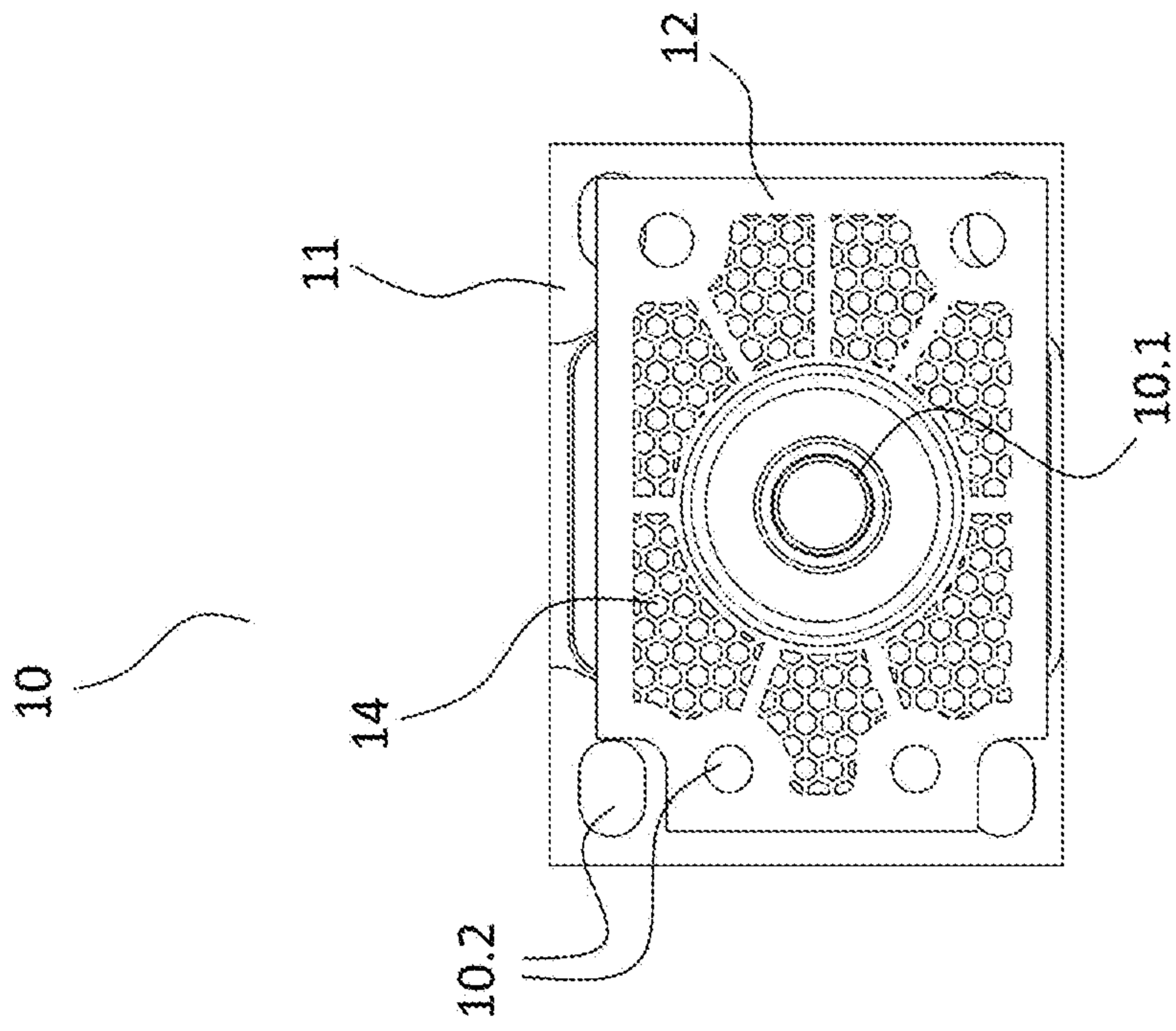


Figure 2

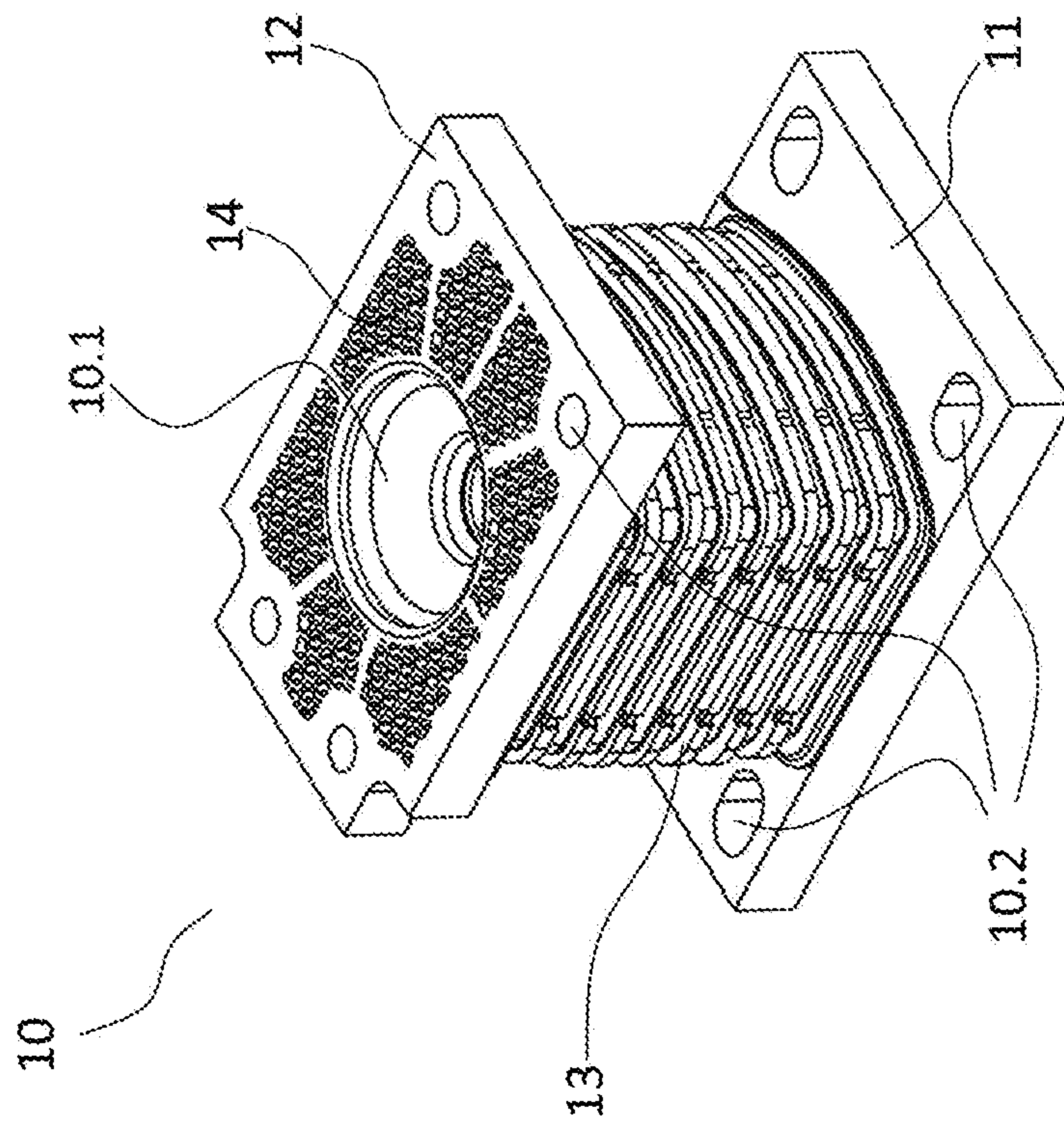


Figure 1

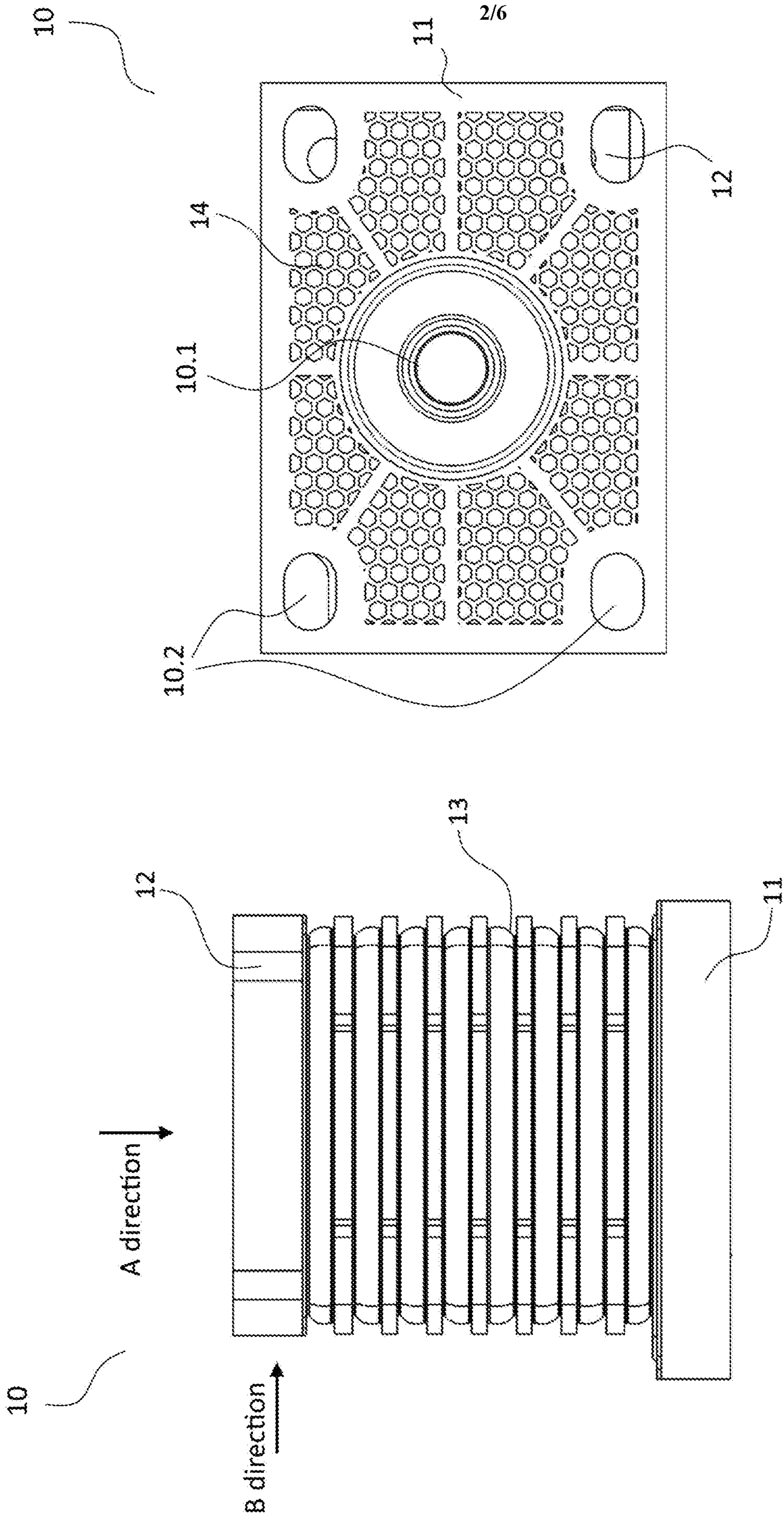


Figure 4

Figure 3

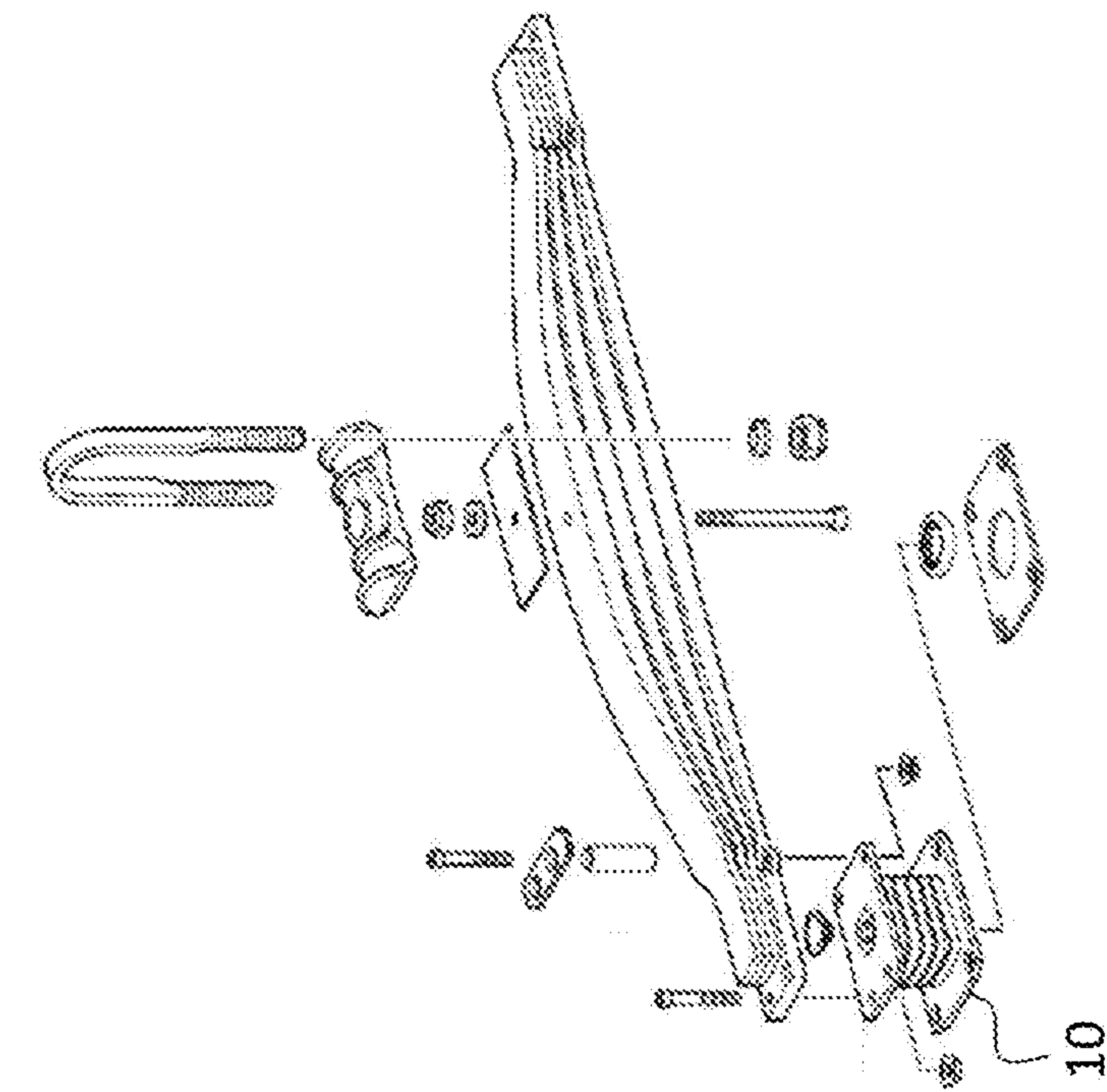


Figure 6

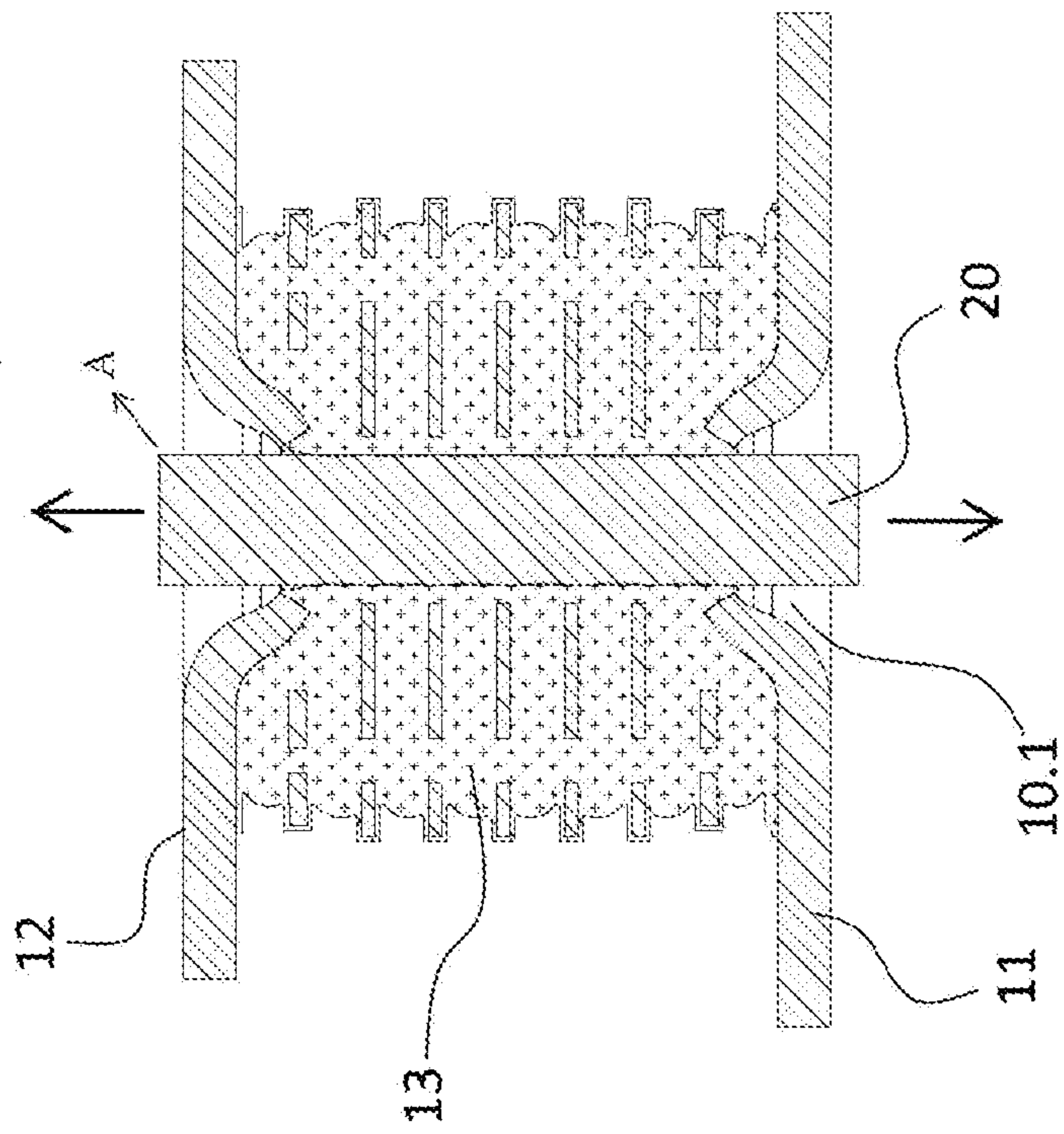


Figure 5

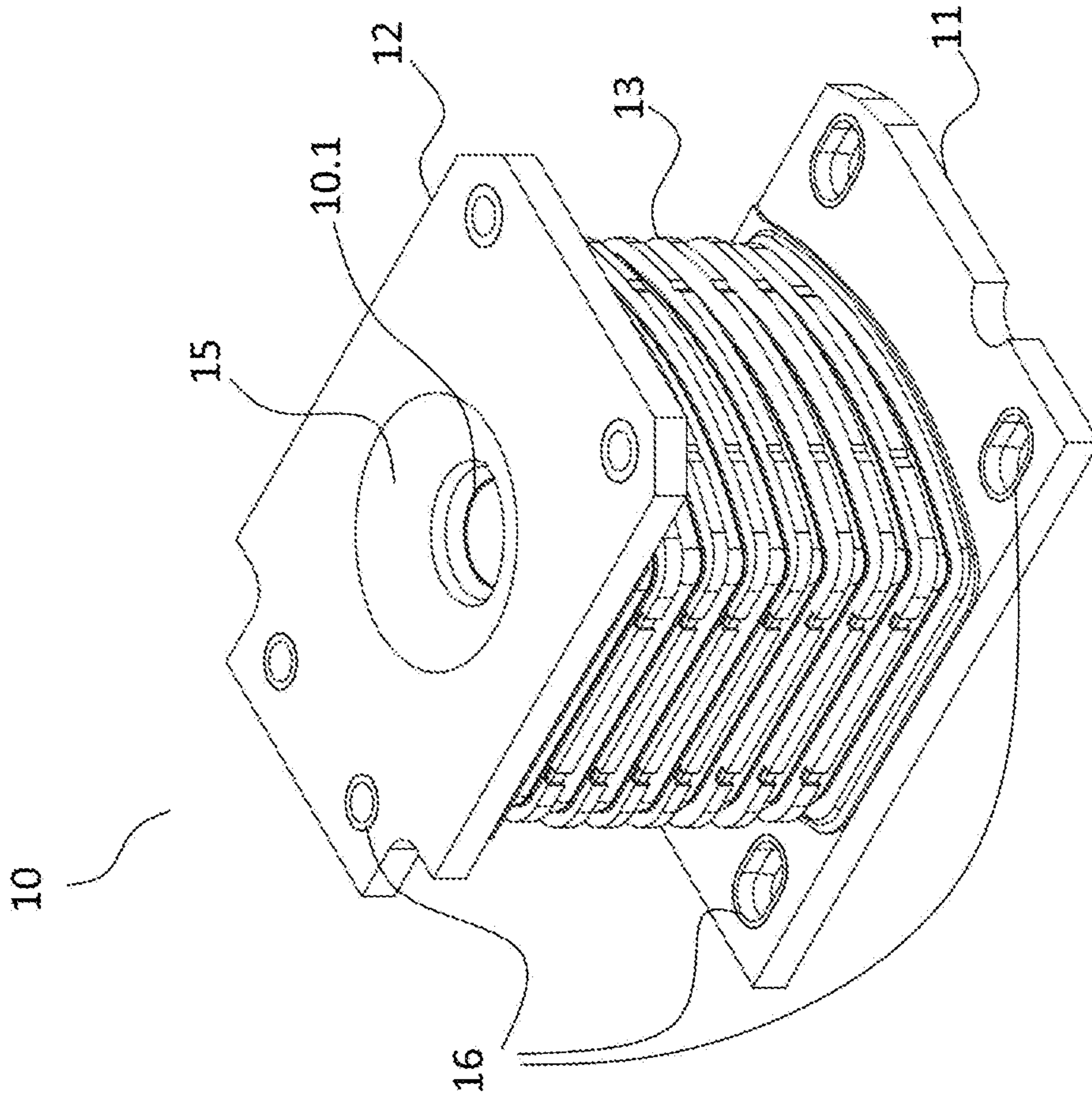


Figure 8

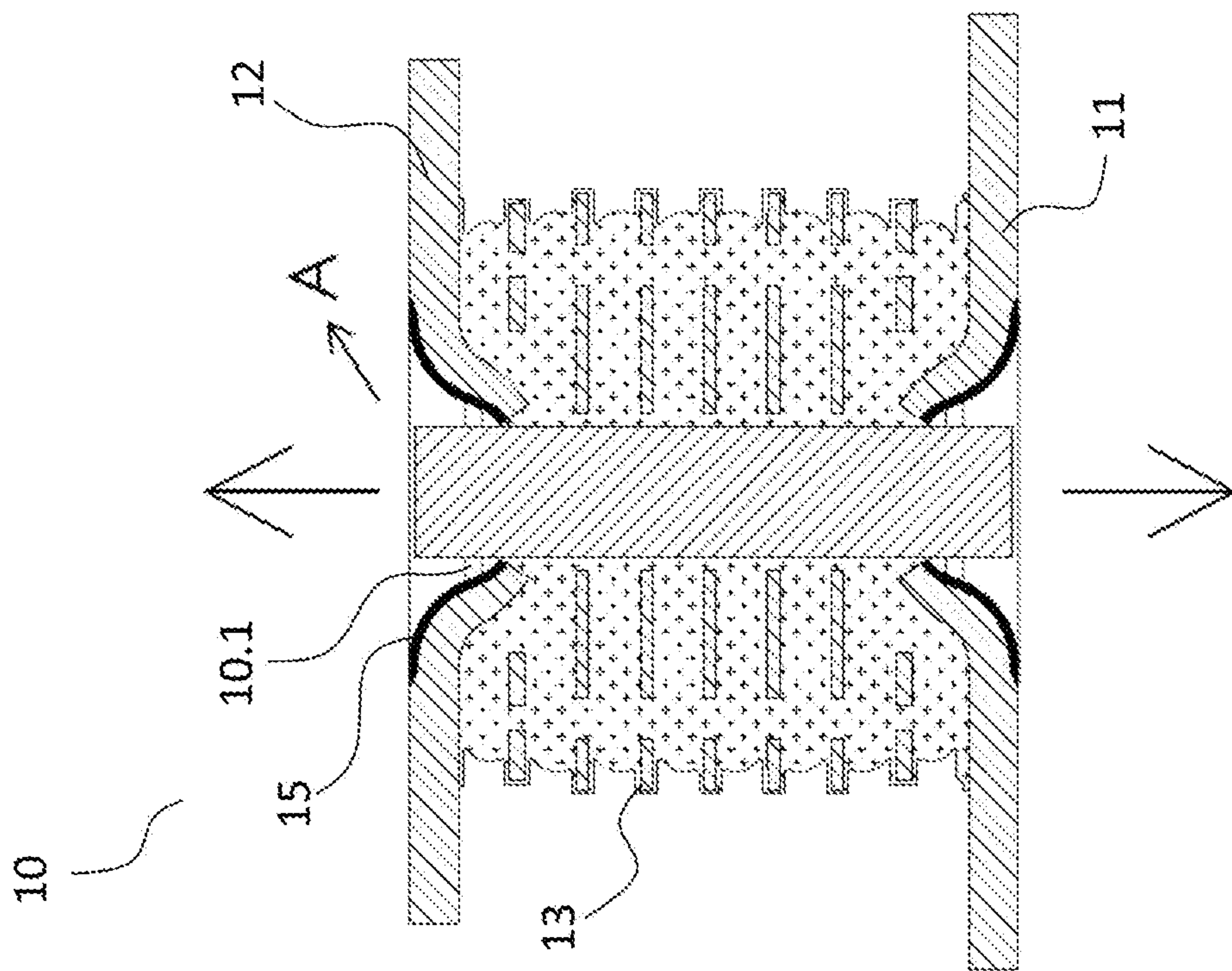


Figure 7

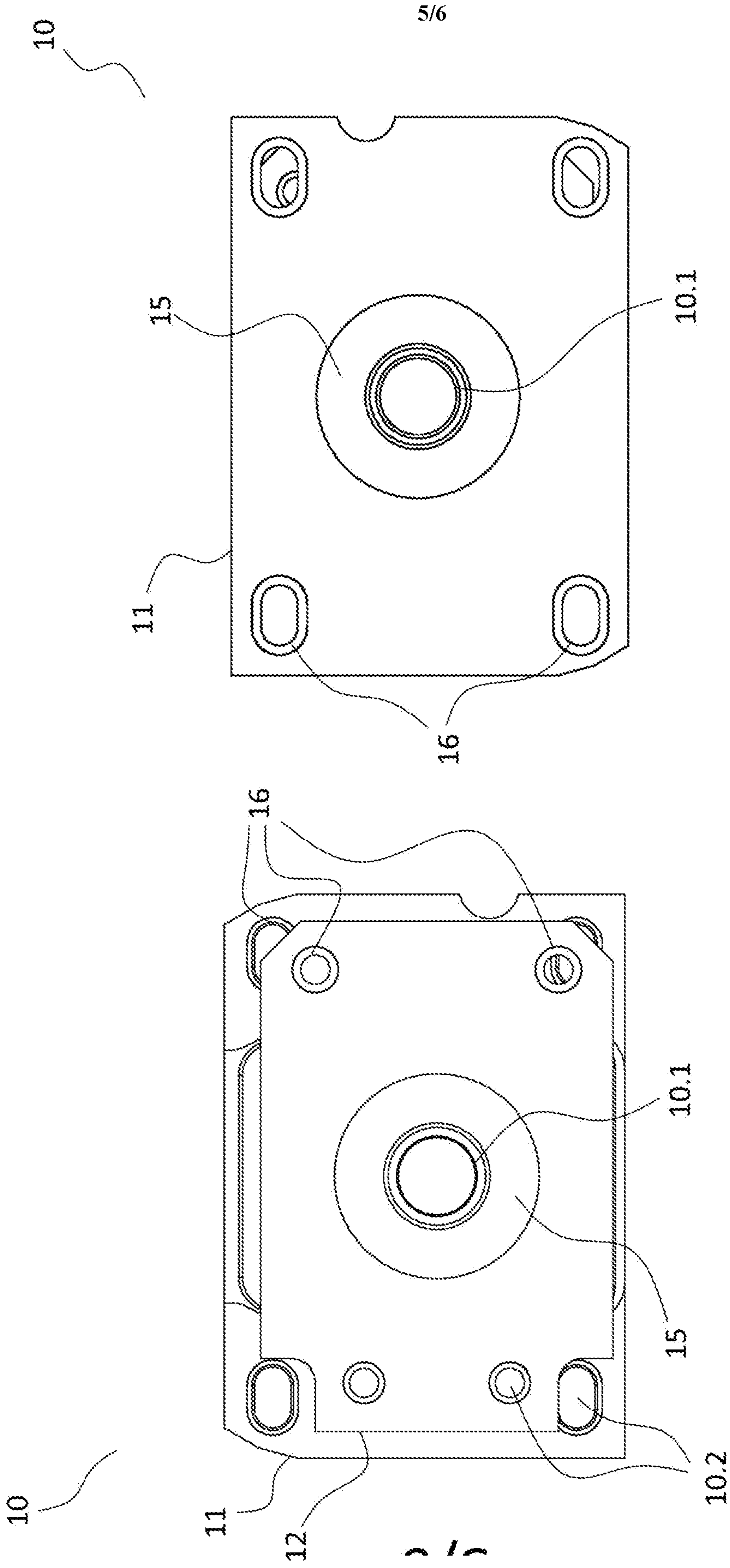


Figure 10

Figure 9

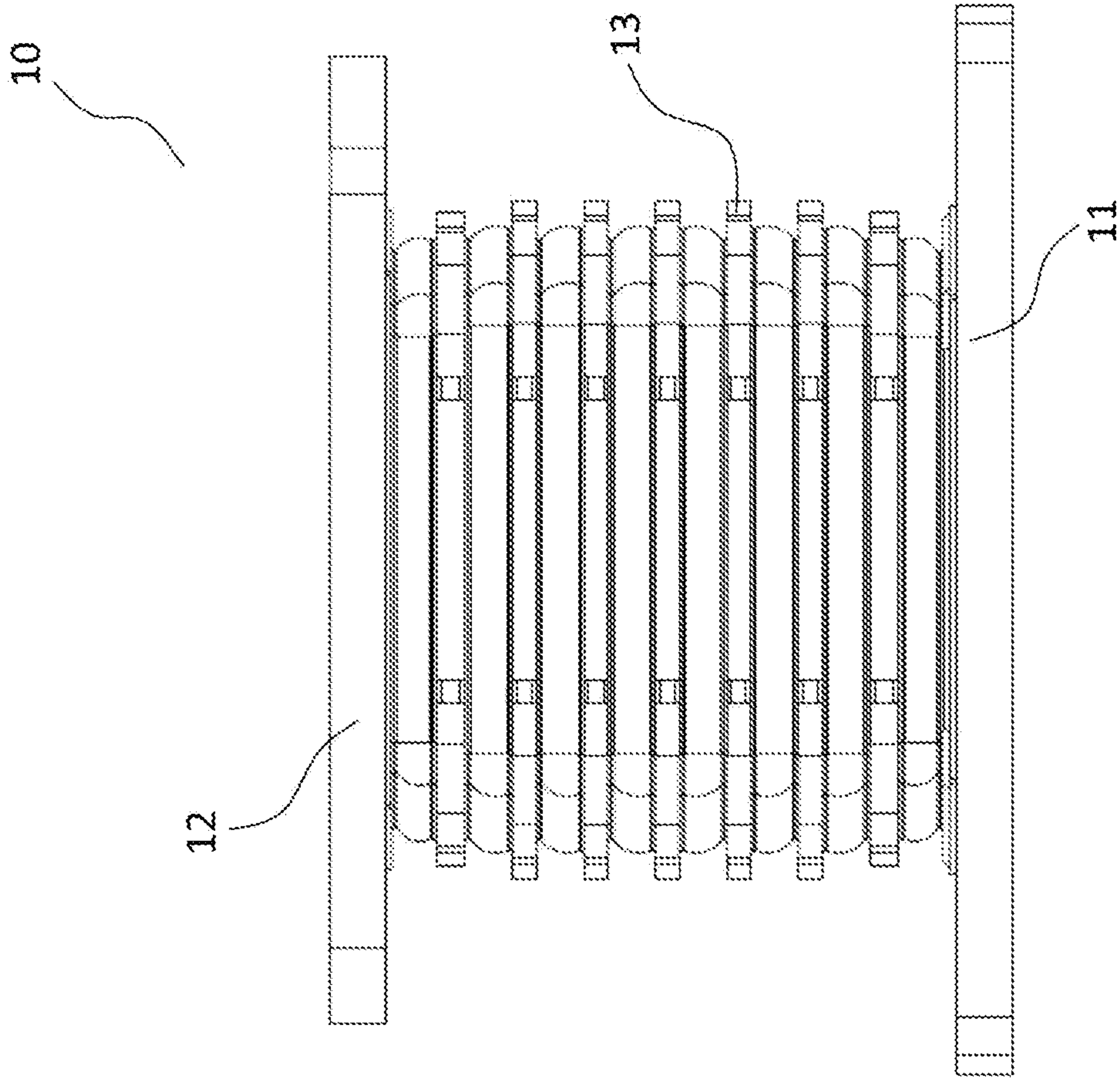


Figure 12

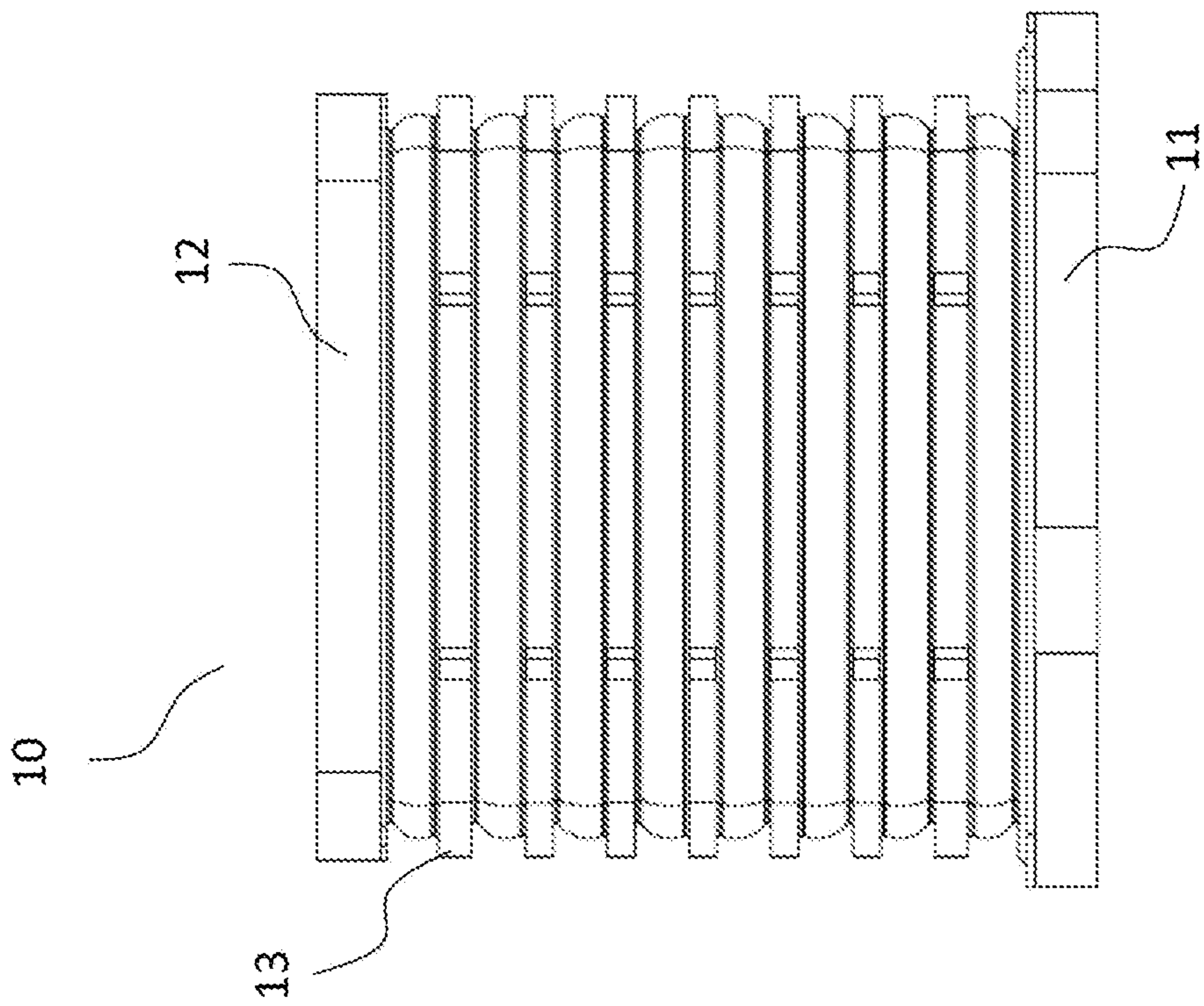


Figure 11

## INTERNATIONAL SEARCH REPORT

International application No.

**PCT/TR2020/051412**

<b>A. CLASSIFICATION OF SUBJECT MATTER</b> B60G 5/053 (2006.01)i; B61F 5/04 (2006.01)i  According to International Patent Classification (IPC) or to both national classification and IPC		
<b>B. FIELDS SEARCHED</b>  Minimum documentation searched (classification system followed by classification symbols) B60G 5/053; B61F 5/04  Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched  Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)		
<b>C. DOCUMENTS CONSIDERED TO BE RELEVANT</b>		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 4121393 A (SPIE BATIGNOLLES) 24 October 1978 (1978-10-24) column 5, line 6-15;column7,line 17-24	1-3,6-8,10-11
Y	US 4499694 A (NEW ZEALAND DEV FINANCE [NZ]) 19 February 1985 (1985-02-19) figures	5-6
Y	US 5765322 A (BRIDGESTONE CORP [JP]) 16 June 1998 (1998-06-16) figures	5-6
Y	US 2012326366 A1 (KAWADA MASAYOSHI [JP]) 27 December 2012 (2012-12-27) figures	5-6
<input type="checkbox"/> Further documents are listed in the continuation of Box C. <input type="checkbox"/> See patent family annex.		
* Special categories of cited documents: “A” document defining the general state of the art which is not considered to be of particular relevance “E” earlier application or patent but published on or after the international filing date “L” document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified) “O” document referring to an oral disclosure, use, exhibition or other means “P” document published prior to the international filing date but later than the priority date claimed		“T” later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention “X” document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone “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 “&” document member of the same patent family
Date of the actual completion of the international search <b>02 May 2021</b>		Date of mailing of the international search report <b>02 May 2021</b>
Name and mailing address of the ISA/TR <b>Turkish Patent and Trademark Office (Turkpatent)</b> <b>Hipodrom Caddesi No. 13</b> <b>06560 Yenimahalle</b> <b>Ankara</b> <b>Turkey</b> Telephone No. <b>(90-312) 303 11 82</b> Facsimile No. <b>+903123031220</b>		Authorized officer  <b>Veysel Murat ÖNAL</b>  Telephone No.