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

(11) EP 2 036 461 A1

(12) EUROPEAN PATENT APPLICATION

(43) Date of publication:
18.03.2009 Bulletin 2009/12

(51) Int Cl.:
A47C 23/00 *(2006.01)*

(21) Application number: **08014831.5**

(22) Date of filing: **21.08.2008**

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

(30) Priority: **12.09.2007 US 900500**
22.02.2008 TW 97106171

(71) Applicant: **Hsu, Lo-Ping**
Changzhi Hsiang
Pingtung Hsien (TW)

(72) Inventor: **Hsu, Lo-Ping**
Changzhi Hsiang
Pingtung Hsien (TW)

(74) Representative: **Schildberg, Peter**
Hauck Patent- und Rechtsanwälte
Neuer Wall 50
20354 Hamburg (DE)

(54) Magnetic levitation cushion and magnetic levitation device thereof

(57) A magnetic levitation cushion has multiple magnetic levitation devices (1) being assembled with at least one bracket (2). Each magnetic levitation device (1) has a housing (10), a fixed magnet (14), a movable magnet (15), a shaft (16) and a primary pad (17). The fixed magnet (14) is mounted securely in the housing (10). The movable magnet (15) is mounted slidably in the housing (10) and faces the fixed magnet (14) with a same magnetic pole. The shaft (16) is mounted slidably through the housing (10) and has a bottom end attached to the movable magnet (15). The primary pad (17) is mounted on a top end of the shaft (16). The magnetic levitation cushion is used for upholstered furniture such as chairs, beds and sofas and does not suffer metal fatigue or material hardening problems and may be cleaned, rearranged and recycled effectively.

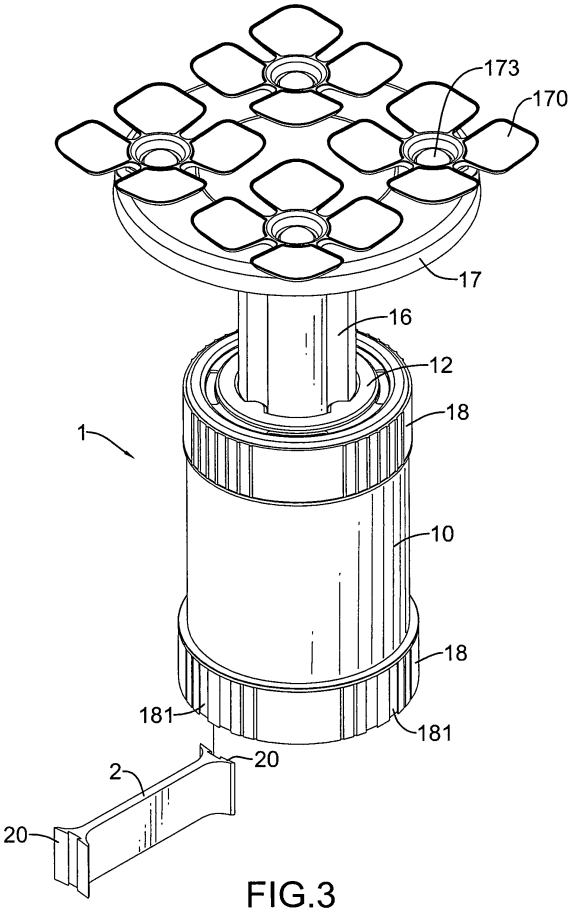

FIG.3

EP 2 036 461 A1

Description

1. Field of the Invention

[0001] The present invention relates to a cushion, especially to a magnetic levitation cushion being used as a supporting assembly for beds, chairs, sofas and the like.

2. Description of the Prior Arts

[0002] Upholstered furniture like beds, chairs or sofas generally comprise supporting elements, such as springs or latex.

[0003] A spring-bed offers a level of comfort determined by a number of coils of metal springs and wire diameter of the metal springs installed inside the spring-bed. The springs also affect flexibility and hardness of the spring-bed. Therefore, lying on a very hard or soft spring-bed may chronically injure a person's back and spine and may also cause loss of sleep due to discomfort and even negatively-affect growth of a child's spine. The spring-bed has a lifespan due to metal fatigue and will become too soft for a person's spine.

[0004] Furthermore, the internal structure of the spring-bed is so complicated that dirt easily accumulates inside and the spring-bed is hard to be dismantled for cleaning the dirt.

[0005] A latex bed is suitable for lying on. However, the material of the latex bed has a high density. With bad ventilation, the latex bed will not provide good heat-dissipation and cause discomfort, even heat-rash by excessive perspiration. Besides, latex material of the latex bed will become harder year by year and crumble causing terminal failure.

[0006] To overcome the shortcomings, the present invention provides a magnetic levitation cushion to mitigate or obviate the aforementioned problems.

[0007] The main objective of the present invention is to provide a magnetic levitation cushion that uses permanent magnets to exert repulsive magnetic forces as supporting forces.

[0008] The magnetic levitation cushion has multiple magnetic levitation devices being assembled with at least one bracket. Each magnetic levitation device has a housing, a fixed magnet, a movable magnet, a shaft and a primary pad. The fixed magnet is mounted securely in the housing. The movable magnet is mounted slidably in the housing and faces the fixed magnet with a same magnetic pole. The shaft is mounted slidably through the housing and has a bottom end attached to the movable magnet. The primary pad is mounted on a top end of the shaft. The cushion is used for upholstered furniture such as chairs, beds and sofas. Since the magnets provide magnetic forces, the cushion does not suffer from metal fatigue or material hardening problems and may be cleaned, rearranged and recycled effectively.

[0009] Other objectives, advantages and novel features of the invention will become more apparent from the following detailed description when taken in conjunction with the accompanying drawings.

[0010] In the drawings:

Fig. 1 is a perspective view of a magnetic levitation cushion in accordance with the present invention;
Fig. 2 is a partial enlarged perspective view of the magnetic levitation cushion in Fig. 1;
Fig. 3 is a perspective view of a first embodiment of a magnetic levitation device in accordance with the present invention;
Fig. 4 is an exploded perspective view of the magnetic levitation device in Fig. 3;
Fig. 5 is a cross sectional view of the magnetic levitation device in Fig. 3;
Fig. 6 an exploded perspective view of a second embodiment of a magnetic levitation device in accordance with the present invention; and
Fig. 7 is a cross sectional view of a third embodiment of the magnetic levitation device in accordance with the present invention.

[0011] With reference to Fig. 1, a magnetic levitation cushion in accordance with the present invention comprises multiple magnetic levitation devices (1) and at least one bracket (2).

[0012] With further reference to Figs. 2 to 5 and 7, the magnetic levitation devices (1) are attached to each other using the at least one bracket (2). Each magnetic levitation device (1) comprises a housing (10), an optional base (11), an optional lid (12), an optional piston (13), a fixed magnet (14), a movable magnet (15), a shaft (16), a primary pad (17), two optional rings (18) and at least one optional suspended magnet (30).

[0013] The housing (10) has an open top, an open bottom, a top rim and a bottom rim, may be cylindrical or cuboidal and may have multiple protrusions (100), multiple tab holes and at least one bracket mount. The protrusions (100) and the tab holes are formed in the top rim and bottom rim of the housing (10) and may be adjacent to each other. The at least one bracket mount is formed on the housing (10) and may be a protrusion.

[0014] The base (11) is mounted on the open bottom of the housing (10) and has a top surface, a recess (110) and multiple optional tabs. The recess (110) is formed on the top surface of the base (11). The optional tabs are resilient and protrude radially around the base (11) and respectively extend into a corresponding tab hole of the housing (10).

[0015] The lid (12) is mounted on the open top of the housing (10) and has a through hole (120) and multiple optional tabs. The through hole (120) is formed through the lid (12) and may be keyed and may be a cross, a polygon or the like. The optional tabs are resilient and protrude radially around the lid (12) and respectively extend into a corresponding tab hole of the housing (10).

[0016] The piston (13) is mounted slidably inside the

housing (10) and has an upper surface, a lower surface, a recess (130) and a shaft mount (131). The recess (130) is formed on the lower surface and opposite to the recess (110) of the base (11). The shaft mount (131) is formed on the upper surface of the piston (13) and may protrude from the upper surface of the piston (13), correspond to and extend into the through hole (120) of the lid (12).

[0017] The fixed magnet (14) is mounted securely inside the housing (10) and may be mounted in the recess (110) of the base (11).

[0018] The movable magnet (15) is mounted slidably in the housing (10), faces the fixed magnet (14) with a same magnetic pole to exert repulsion forces to the fixed magnet (14) and may be mounted securely in the recess (130) of the piston (13). The movable magnet (15) then stays apart from the fixed magnet (14) due to the magnetic repulsion forces and is prevented from flipping by the piston (13).

[0019] The shaft (16) is mounted slidably through the housing and has a bottom end and a top end. The bottom end is attached to the movable magnet (15), extends through the through hole (120) of the lid (12) into the housing (10), and may have a piston mount (160). The piston mount (160) corresponds to and is connected securely to the shaft mount (131) of the piston (13).

[0020] The primary pad (17) is mounted on the top end of the shaft (16) and may have an upper surface, at least one pad mount (171) and at least one secondary pad (170). The at least one pad mount (171) is formed on upper surface of the primary pad (170). The at least one secondary pad (170) is mounted on the at least one pad mount (171) and may be resilient and comprise multiple wings protruding away from a plane of the at least one secondary pad (170) and has a center, a mounting hole (172) and a fastener (173). The mounting hole (172) is formed through the center of the at least one secondary pad (170). The fastener (173) mounts the at least one secondary pad (170) on the pad mount (171) of the primary pad (17) through the mounting hole (172).

[0021] With further reference to Fig. 6, the rings (18) are respectively mounted on the top rim and bottom rim of the housing (10). Each ring (18) may have an inner sidewall, an outer sidewall, at least one slot (180) and at least one bracket mount (181). The slot (180) is formed on the inner sidewall and engages a corresponding protrusion (100) of the housing (10) to fix the ring (18) on the housing (10) and reinforce the housing (10). The at least one bracket mount (181) is formed on the outer sidewall of the ring (18) to allow simple attachment of multiple magnetic levitation devices (1).

[0022] The at least one optional suspended magnet (30) is mounted slidably between the fixed magnet (14) and the movable magnet (15) inside the housing (10) and may comprise a suspension frame mounted between the housing (10) and the suspended magnet (30) to prevent rotation or flipping thereof.

[0023] The at least one bracket (2) holding the magnetic levitation devices (1) together and may have at least two ends and each end having a ring mount (20) formed on the end. Each ring mount (20) corresponds to and engages the bracket mount (181) of the housing (10), maybe on the ring (18) mounted on the bottom rim or the top rim, or the top and bottom rims of the housing (10). Therefore the magnetic levitation devices (1) are assembled with the bracket (2).

[0024] When a force is applied against the primary pad (17), the magnetic repulsion between the magnets (14, 15, 30) resists the force by reducing a separation distance. When the force is removed, the magnets increase the separation distance. Therefore, the present invention can be used as a supporting structure for upholstered furniture. Furthermore, the magnets (14, 15, 30) are all permanent magnets and will maintain the magnetic repulsion inside the housing (10) for a long time. The upholstered furniture thus has a long lifespan.

[0025] The present invention also has following advantages:

1. Easy to clean, a user can dismantle the magnetic levitation cushion by themselves for internal cleaning.
2. Easy to repair, damaged magnetic levitation devices (1) in the magnetic levitation cushion can be individually replaced. Therefore, the furniture need not be disposed of if one device fails.
3. Superior air ventilation, every magnetic levitation device (1) is a single structure and space between the magnetic levitation devices (1) is sufficient for ventilation.
4. Easy to change size, a size of the magnetic levitation cushion can be changed as desired by decreasing or increasing the number of the magnetic levitation devices (1).
5. Recyclable, furniture employing the magnetic levitation devices (1) may be reshaped and reupholstered by changing an exterior only more cheaply than replacing an entire furniture for improved adaptability and to maintain changing trends and fashions.

[0026] Even though numerous characteristics and advantages of the present invention have been set forth in the foregoing description, together with details of the structure and features of the invention, the disclosure is illustrative only. Changes may be made in the details, especially in matters of shape, size, and arrangement of parts within the principles of the invention to the full extent indicated by the broad general meaning of the terms in which the appended claims are expressed.

Claims

1. A magnetic levitation device (1) comprising:

a housing (10) having an open top, and a top rim;
a fixed magnet (14) being mounted securely in-

side the housing (10);
a movable magnet (15) being mounted slidably in the housing (10) and facing the fixed magnet (14) with a same magnetic pole;
a shaft (16) being mounted slidably through the housing (10) and having a bottom end being attached to movable magnet (15); and a top end; and
a primary pad (17) being mounted on the top end of the shaft (16).

2. The magnetic levitation device (1) as claimed in claim 1, wherein:

the housing (10) further has an open bottom and a bottom rim;
the magnetic levitation device (1) further comprises

a base (11) being mounted on the open bottom of the housing (10) and has

a top surface; and
a recess (110) being formed on the top surface of the base (11);

a lid (12) being mounted on the open top of the housing (10) and having a through hole (120) being formed through the lid (12); and
a piston (13) being mounted slidably inside the housing (10) and having
an upper surface;
a lower surface;
a recess (130) being formed on the lower surface and opposite to the recess (110) of the base (11); and
a shaft mount (131) being formed on the upper surface of the piston (13);

the fixed magnet (14) is mounted in the recess (110) of the base (11);
the movable magnet (15) is mounted securely in the recess (130) of the piston (13); and
the bottom end of the shaft (16) extends through the through hole (120) of the lid (12) into the housing (10) and has a piston mount (160) corresponding to and being connected securely to the shaft mount (131) of the piston (13).

3. The magnetic levitation device (1) as claimed in claim 2, wherein

the magnetic levitation device (1) further comprises two rings (18) being respectively mounted on the top rim and bottom rim of the housing (10); wherein
at least one of the rings (18) has
an outer sidewall; and
at least one bracket mount (181) being formed on the outer sidewall of the ring (18) to allow attachment of multiple magnetic levitation devices (1).

4. The magnetic levitation device as claimed in claim 3, wherein
the housing (10) further has multiple protrusions (100) being formed in the top rim and bottom rim of the housing (10); and
each of the rings (18) mounted on the top rim and bottom rim of the housing (10) further has
an inner sidewall; and
at least one slot (180) being formed on the inner sidewall and engaging a corresponding protrusion (100) of the housing (10).

5. The magnetic levitation device (1) as claimed in claim 4, wherein the primary pad (17) has
an upper surface;
at least one pad mount (171) being formed on the upper surface; and
at least one secondary pad (170) being mounted on the at least one pad mount (171).

6. The magnetic levitation device as claimed in claim 5, wherein the at least one secondary pad (170) has a center;
a mounting hole (172) being formed through the center of the at least one secondary pad (170); and
a fastener (173) mounting the at least one secondary pad (170) on the pad mount (171) of the primary pad (17) through the mounting hole (172).

7. The magnetic levitation device (1) as claimed in claim 6, wherein the at least one secondary pad (170) is resilient and has multiple wings protruding away from a plane of the at least one secondary pad (170).

8. The magnetic levitation device as claimed in claim 2, wherein the shaft mount (131) of the piston (13) protrudes from the upper surface of the piston (13), corresponds to and extends into the through hole (120) of the lid (12).

9. The magnetic levitation device as claimed in claim 2, wherein
the housing (10) further has multiple tab holes being formed in the top rim and bottom rim of the housing (10) and being adjacent to each other;
the base (11) further has multiple tabs being resilient and protruding radially around the base (11) and respectively extending into a corresponding tab hole of the housing (10); and
the lid (13) further has multiple tabs being resilient and protruding radially around the lid (12) and respectively extending into a corresponding tab hole

of the housing (10).

10. The magnetic levitation device as claimed in claim 2, wherein the through hole of the lid is a cross or a polygon.

11. The magnetic levitation device as claimed in anyone of claims 1 to 10, wherein the magnetic levitation device further comprises at least one suspended magnet being mounted slidably between the fixed magnet and the movable magnet inside the housing.

12. The magnetic levitation device as claimed in claim 11, wherein the at least one suspended magnet (30) further comprises a suspension frame mounted between the housing (10) and the suspended magnet (30).

13. The magnetic levitation device (1) as claimed in claim 1 or 2, wherein the multiple magnetic levitation devices (1) are implemented as a magnetic levitation cushion and attached to each other using at least one bracket (2).

14. The magnetic levitation device (1) as claimed in anyone of claims 3 to 7, wherein the multiple magnetic levitation devices (1) are implemented as a magnetic levitation cushion and attached to each other using at least one bracket (2).

15. The magnetic levitation cushion as claimed in claim 14, wherein
the at least one bracket has at least two ends and each end has a ring mount (20) formed on the end; and
each ring mount (20) corresponds to and engages the bracket mount (181) of the ring (18) mounted on the bottom rim or the top rim, or the top and bottom rims of the housing (10).

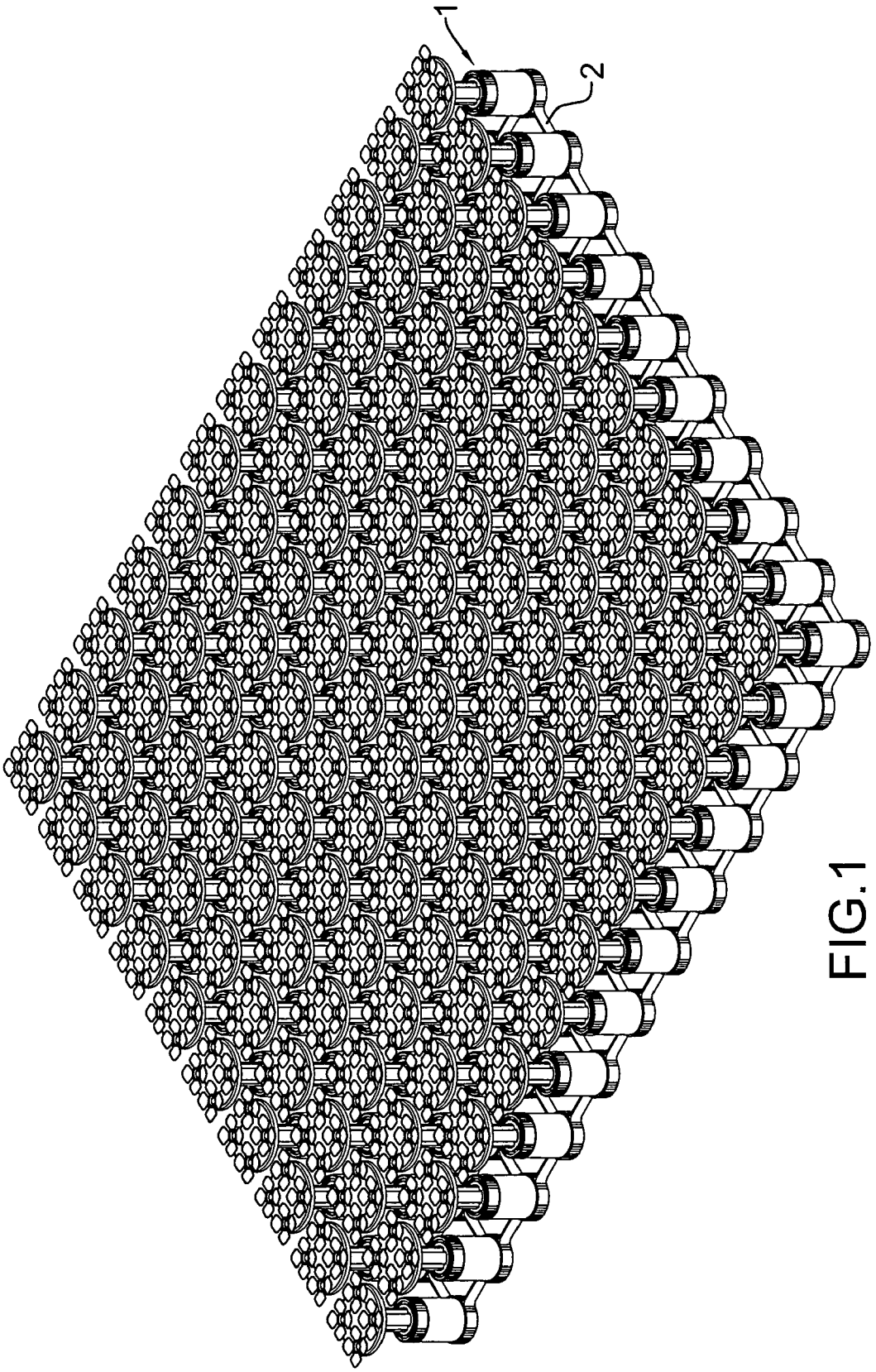

FIG.1

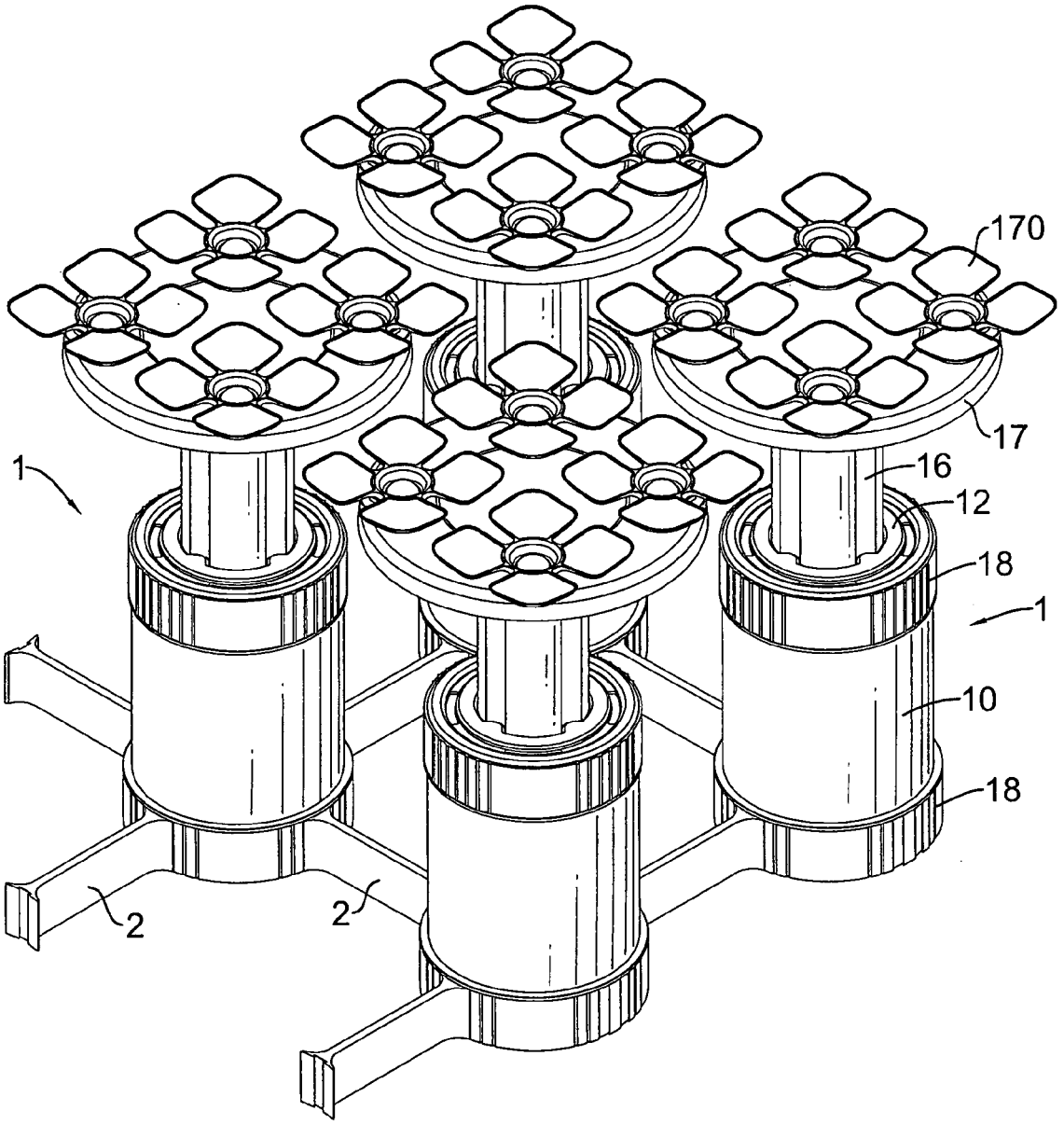

FIG.2

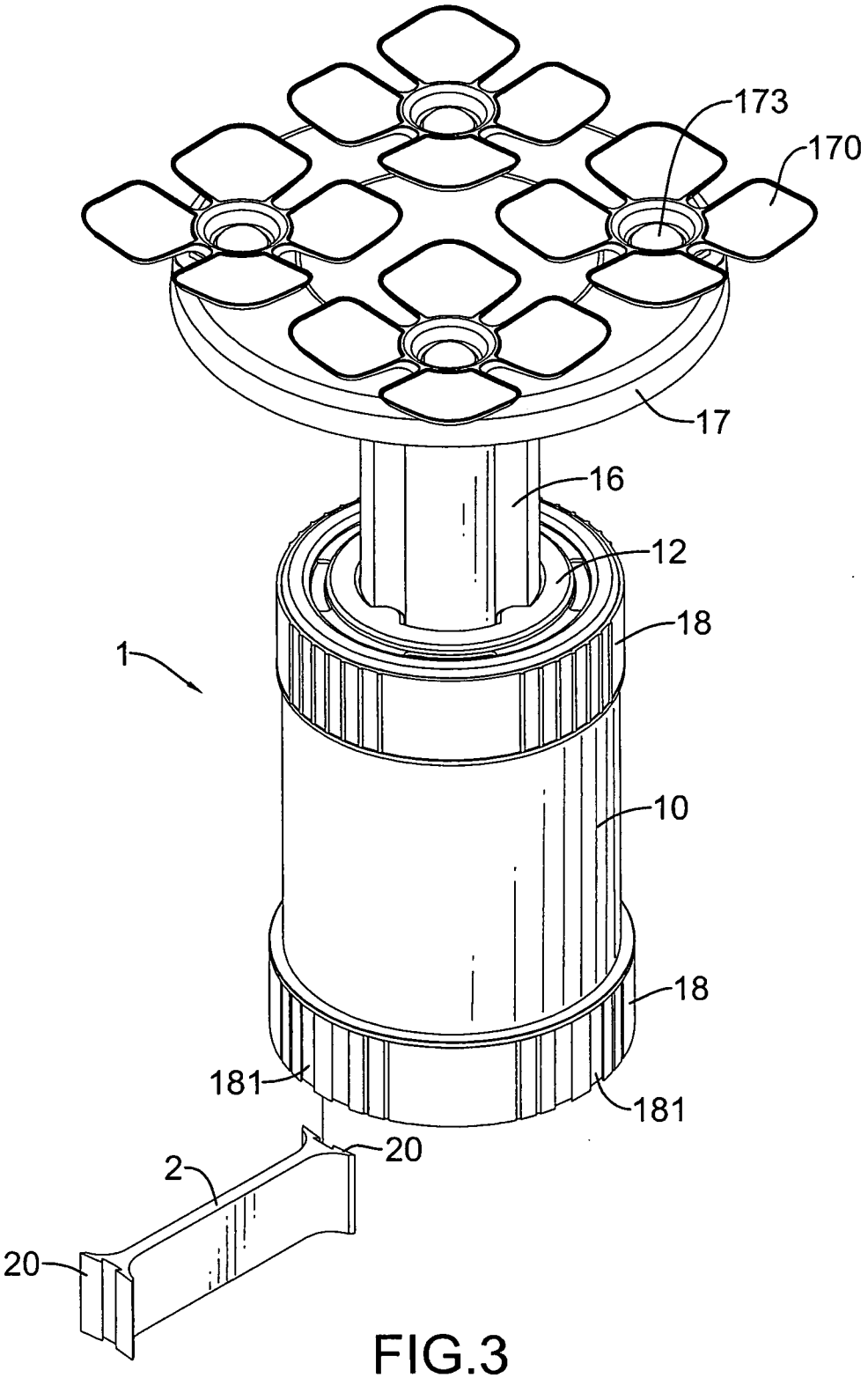

FIG.3

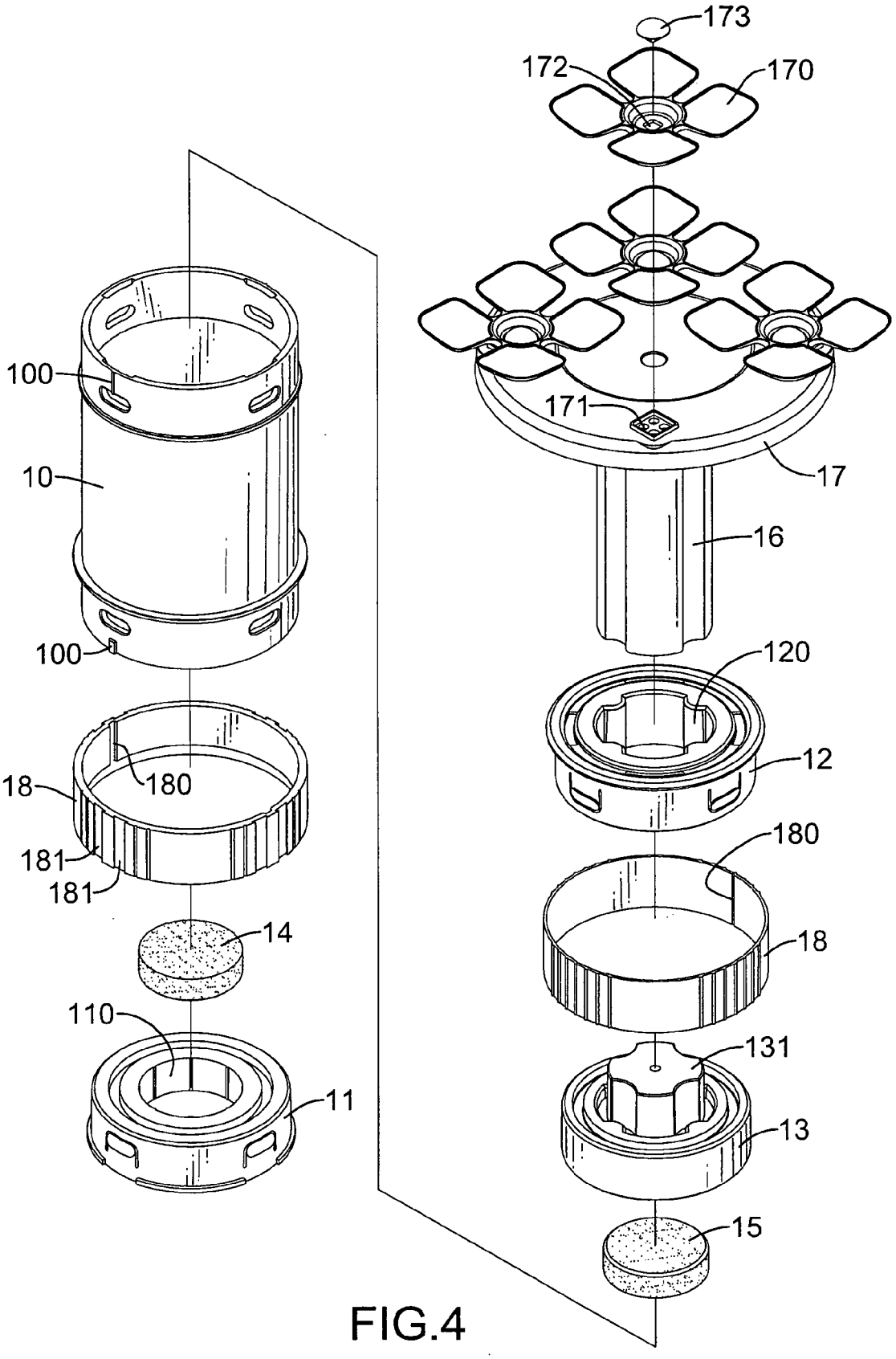
173
172
170
171
17
16
120
12
180
18
131
13
15
100
10
100
18
180
181
181
14
110
11

FIG.4

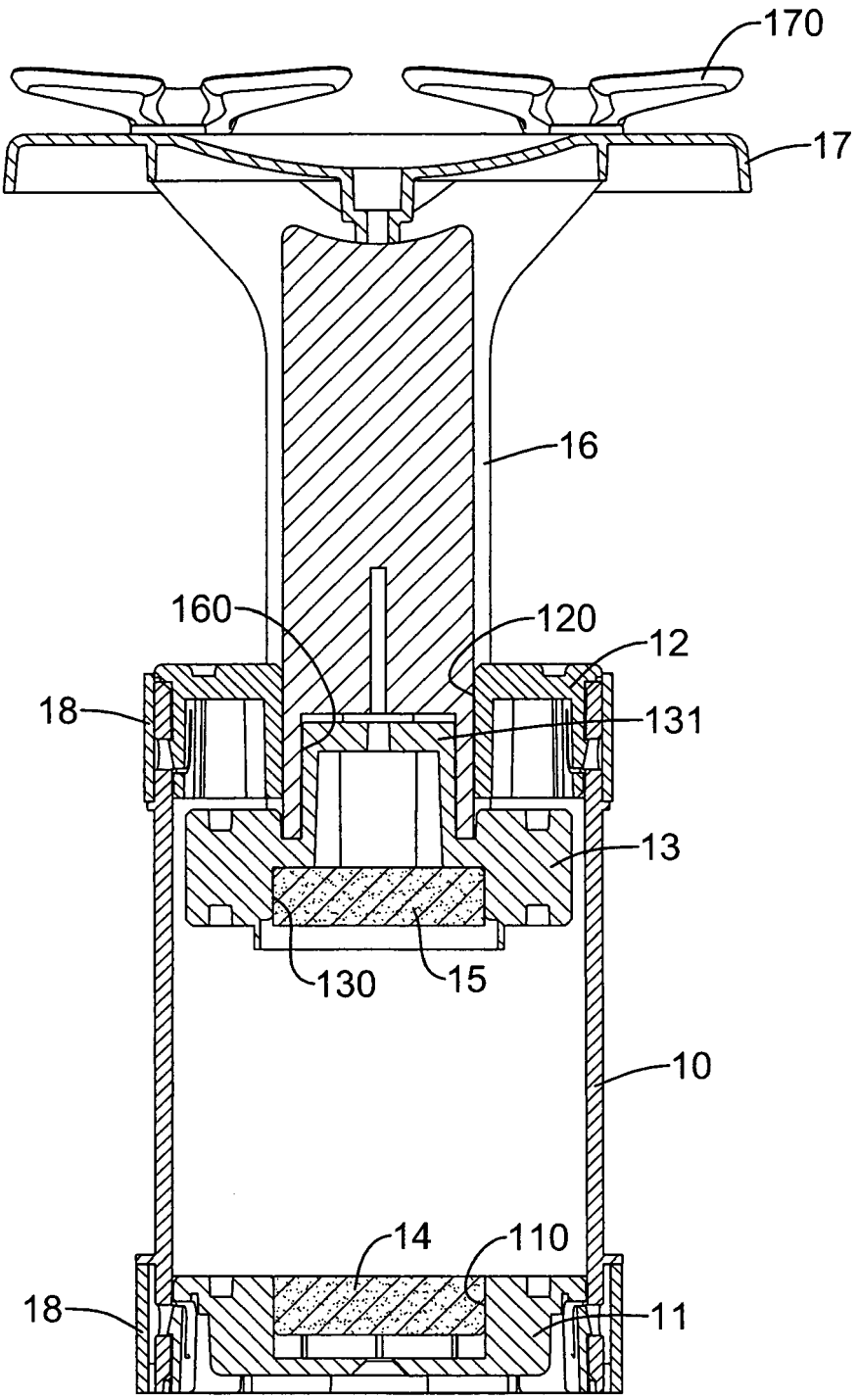

FIG.5

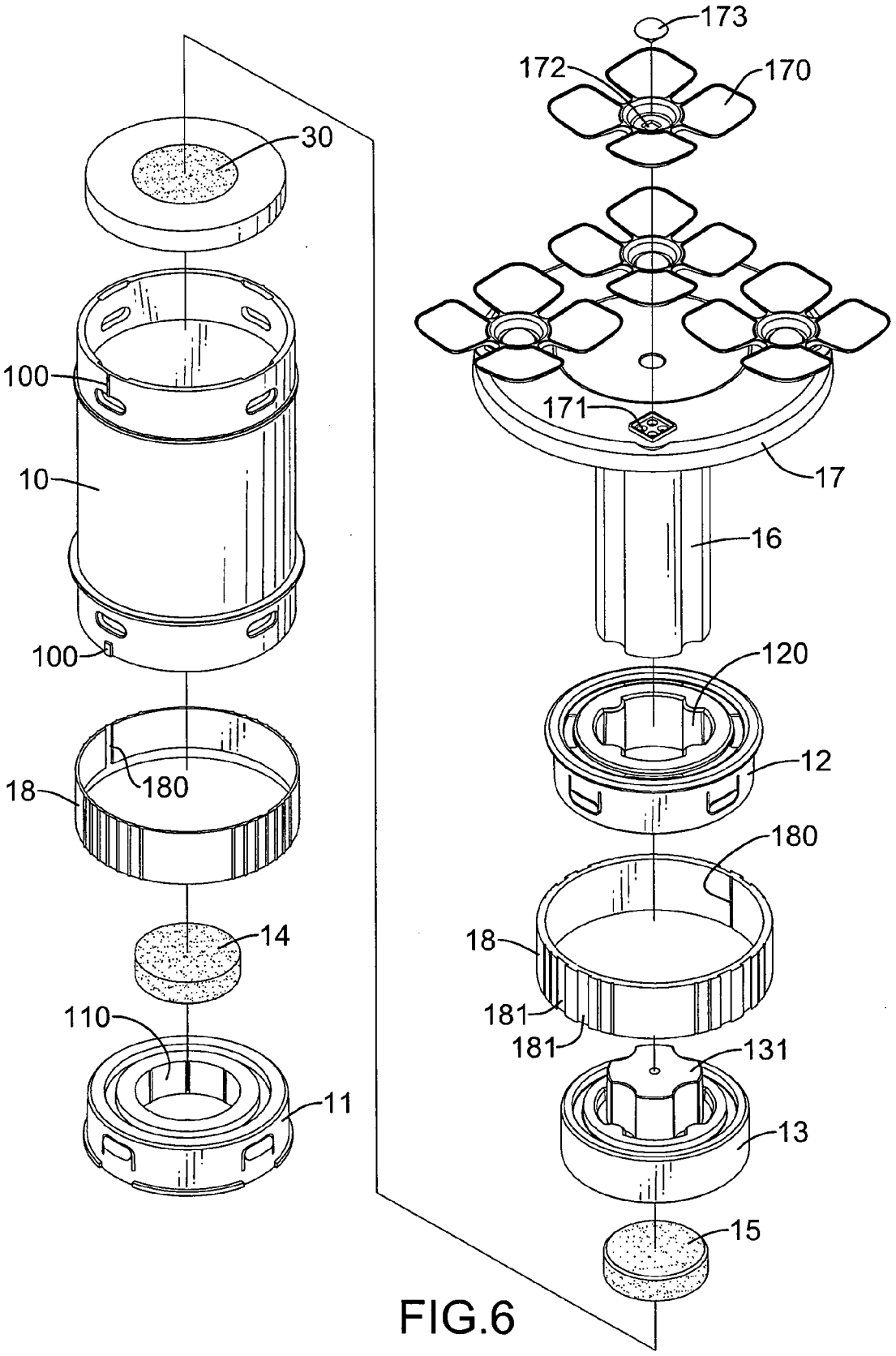
30
100
10
100
18
180
14
110
11
173
172
170
171
17
16
120
12
180
18
181
181
131
13
15

FIG.6

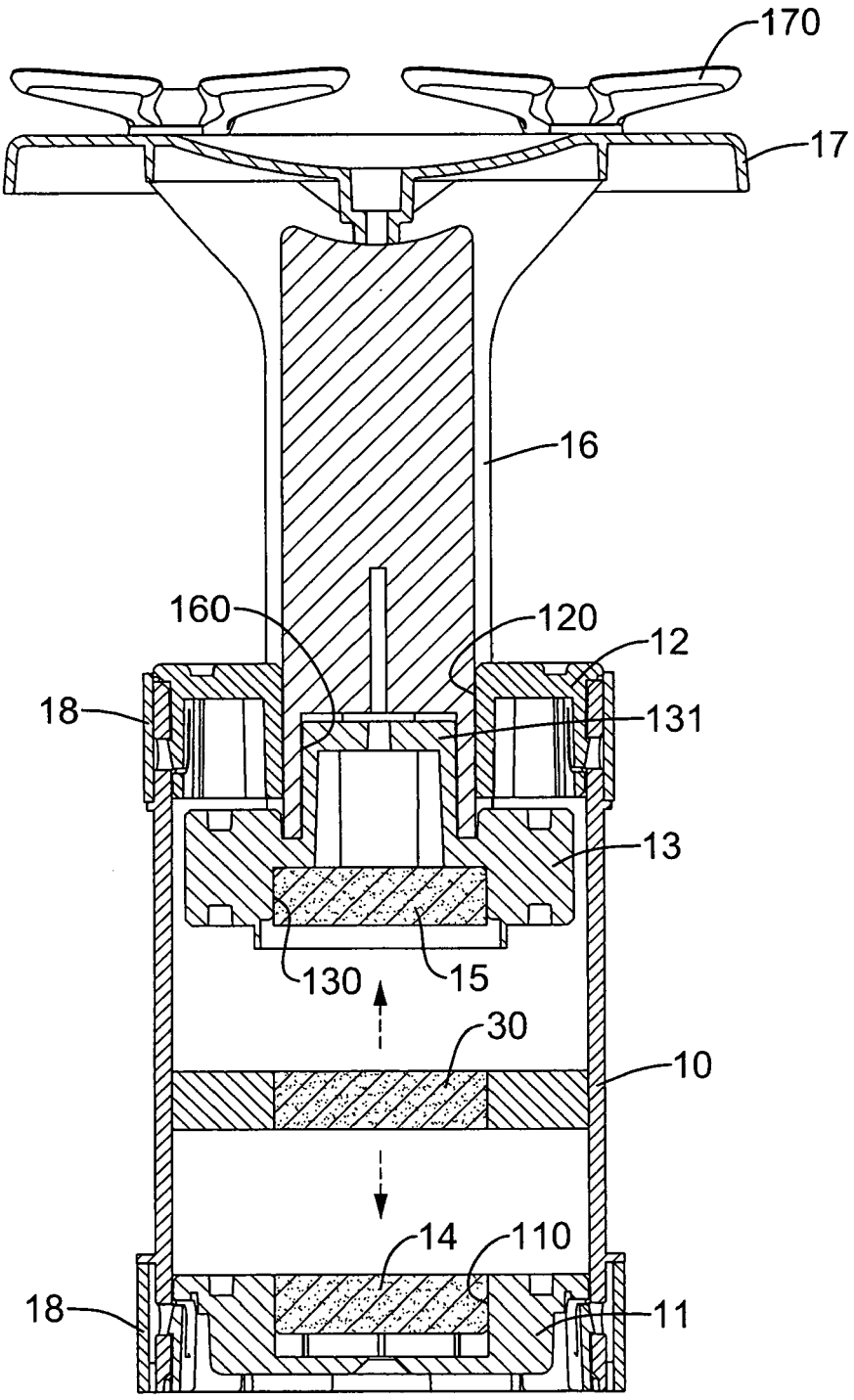

FIG.7

Europäisches Patentamt
European Patent Office
Office européen des brevets

EUROPEAN SEARCH REPORT

Application Number
EP 08 01 4831

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
A	DE 43 05 066 A1 (VOELKENING RALF [DE]) 22 July 1993 (1993-07-22) * the whole document *	1-15	INV. A47C23/00
A	DE 27 38 529 A1 (THIMM HARRY) 1 March 1979 (1979-03-01) * the whole document *	1-15	
A	US 3 604 027 A (KONNO SHUNICHI) 14 September 1971 (1971-09-14) * the whole document *	1-15	
A	US 3 467 973 A (MINNICK CHRIS A) 23 September 1969 (1969-09-23) * the whole document *	1-15	
A	US 2004/231057 A1 (SABIN JEFFREY M [US]) 25 November 2004 (2004-11-25) * the whole document *	1-15	
A	DE 103 30 644 B3 (FEN GMBH SCHLAFSYSTEME [DE]) 30 December 2004 (2004-12-30) * the whole document *	1-15	TECHNICAL FIELDS SEARCHED (IPC) A47C
A	US 2002/163114 A1 (LOBRY JACQUES [FR] ET AL) 7 November 2002 (2002-11-07) * the whole document *	1-15	

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	4 December 2008	Cardan, Cosmin

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 08 01 4831

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.

04-12-2008

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
DE 4305066 A1	22-07-1993	NONE	
DE 2738529 A1	01-03-1979	NONE	
US 3604027 A	14-09-1971	NONE	
US 3467973 A	23-09-1969	NONE	
US 2004231057 A1	25-11-2004	NONE	
DE 10330644 B3	30-12-2004	EP 1641369 A1 WO 2005002399 A1	05-04-2006 13-01-2005
US 2002163114 A1	07-11-2002	AT 347294 T DE 60216540 T2 EP 1269894 A1 ES 2277990 T3 FR 2824246 A1 US 2006033250 A1	15-12-2006 27-09-2007 02-01-2003 01-08-2007 08-11-2002 16-02-2006

EPO FORM P0459

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