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(71) Applicant: **International United Technology Co., Ltd.**
Taipei City (KR)

(72) Inventors:
- **Hou, I-Chung, International Utd. Tech. Co., Ltd.**
Hsin-Chu Hsien, Taiwan, R.O.C. (TW)
- **Hsu, Cheng-Wei,**
Hsin-Chu Hsien, Taiwan, R.O.C. (TW)
- **Lan, Yuan-Liang,**
International Utd. Tech. Co., Ltd
Hsin-Chu Hsien, Taiwan, R.O.C. (TW)

(74) Representative: **Bauer, Robert, Dipl.-Ing. et al**
Patentanwälte Boeters & Bauer
Bereiteranger 15
81541 München (DE)

(54) Ink container for feeding a printer

(57) An ink container (10) for feeding a printer comprises a casing (12), an air vent (14) in a top portion of said casing, an ink reservoir (18) within said casing, an air bag (16) within said casing, said air bag being surrounded by said ink reservoir and connected to said air vent for enabling air to enter or leave the air bag, an ink outlet (20) in a bottom portion of said casing (12) and connected to said ink reservoir, and a spring (28) within said casing, said spring pressing on said air bag, tending to contract the air bag as this expands in response to back pressure reduction in said ink reservoir. According to the invention, this ink container (10) is characterized in that said spring (28) is a helical spring arranged between a restraining plate (34) abutting said air bag (16) and a lateral wall of said casing (12) in a manner to apply pressure on said air bag, the air bag, at the same time, abutting an opposite lateral wall of said casing. By this construction fabrication of the components of the pressure modulating system is simplified same as installation thereof.

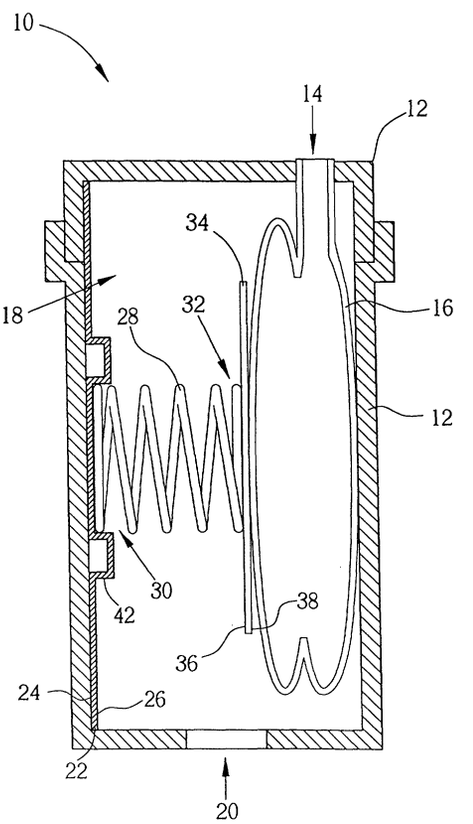

Fig. 3

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Description

[0001] The present invention relates to an ink container according to the pre-characterizing clause of claim 1.

[0002] A prior art ink container of this kind, as disclosed in US Patent 5,409,134, comprises a pressure modulating system employing a flat spring that abuts one side of a bifurcated air bag. Such a pressure modulating system is to prevent ink to abundantly flow from the ink container when the ink container feeds a printer. However, in this prior art ink container the flat spring must be fittingly installed within the casing, having previously been fitted to the air bag. This results in the wasting of cost and time when fabricating the ink container.

[0003] This in mind, the present invention aims at providing a corresponding ink container having a pressure modulating mechanism wherein the ink container is easy to fabricate and at low cost.

[0004] This is achieved, according to the invention, by an ink container according to claim 1. The dependent claims pertain to corresponding further developments and improvements.

[0005] As will be seen more clearly from the detailed description following below, the claimed ink container has a helical spring and a restraining plate. Accordingly, the ink container can be easily fabricated and nevertheless retain precision of operation of the pressure modulating system.

[0006] In the following, the invention is further illustrated by way of example, taking reference to the accompanying drawings. Thereof

Fig. 1 is a perspective outside view of an ink container according to the present invention,

Fig. 2 is an exploded diagram of the ink container of Fig. 1,

Fig. 3 is a sectional view of the ink container of Fig. 2,

Fig. 4 is a perspective view of a helical spring fixed to a restraining plate inside the ink container and

Fig. 5 is a perspective view of a supporting plate inside the ink container in a somewhat different embodiment with respect to Fig. 2.

[0007] The ink container 10 of the Figs. 1 - 3 comprises a bipartite casing 12 including an ink reservoir 18. The ink reservoir 18 is used to store printing ink. The casing 12 has an air vent 14 in a top portion of the casing and an ink outlet 20 in a bottom portion of the casing.

[0008] The pressure modulating system of the ink container 10 comprises a supporting plate 22, a helical pressure spring 28, a restraining plate 34 and an air bag 16. A first surface 24 of the supporting plate 22 abuts one lateral wall within the casing 12. The second surface 26 of the supporting plate 22 comprises an integral protrusion 42 the shape of which corresponds to the cross section of a first end 30 of the helical spring 28. The protrusion 42 ensures that the end 30 of the helical spring 28 connects to the supporting plate 22 in a fixed manner.

[0009] The second end 32 of the helical spring 28 is fixed to a first surface 36 of the restraining plate 34 by a hook-like structure 40 (Fig. 2). The opposite surface 38 of the restraining plate 34 presses on the air bag 16 to clamp the air bag 16 between the restraining plate 34 and the opposite wall of the casing 12. The interior of the air bag 16 is isolated from ink within the ink reservoir 18. Air may enter and leave the air bag 16 through the air vent 14.

[0010] As can be seen in the Figs. 2 and 3, the shape of the supporting plate 22 corresponds to the inner cross section of the casing 12, surface 24 of the supporting plate abutting the respective lateral wall of the casing 12. The opposite surface 26 of the supporting plate 22 is monolithically formed with a protrusion 42. The shape of a sunken central portion of the protrusion 42 corresponds to the cross section of the first end 30 of the helical spring 28 so that this end is fixedly held in respect to the supporting plate 22. The second end 32 of the spring 28 is securely fixed to the restraining plate 34 by connection to a hook-like structure 40 on one side thereof. The helical spring 28 produces ideal pressure to clamp the air bag 16 between surface 38 of the restraining plate 34 and the adjoining wall of the casing 12. That is, because of the elastic force of the helical spring 28, the restraining plate 34 provides appropriate pressure to the air bag 16 to keep the pressure within the ink reservoir 18 lower than external air pressure. By being shaped to correspond to the adjoining wall of the casing 12, the supporting plate 22 connects to the casing 12 without sliding. Further, the end 30 of the helical spring 28 will not slide with respect to the supporting plate 22 due to its being fixed to the protrusion 42 thereof. Since, likewise, the opposite end 32 of the helical spring 28 is fixed to the restraining plate 34, the spring 28 can provide proper force to the restraining plate 34 in an exact direction and at an exact position. Dispersed over an area of the restraining plate 34, the correct force can apply uniform pressure on the air bag 16, the air bag at the same time abutting the adjoining wall of the casing 12, and this controls the volume of the air bag 16 to keep the pressure within the ink reservoir 18 lower than external air pressure.

[0011] For more precise understanding of the operational principle of the pressure modulating system, please refer again to Fig. 3. Ink within the ink reservoir 18 flows out of the ink outlet 20, feeding a printer. This outflow of ink causes pressure within the ink reservoir 18 to drop. In response, the air bag 16 expands by accepting external air through the air vent 14. If the air bag 16 could expand at will, the pressure within the ink reservoir 18 would equalize with that of the external air.

Therefore, ink within the ink reservoir 18 would flow out of the ink outlet 20 uncontrolled. To keep the pressure within the ink reservoir 18 lower than external air pressure, expansion of the volume of the air bag 16 needs to be restrained appropriately. On this behalf, the ink container 10 of the invention uses the helical spring 28 to press upon the air bag 16. The spring 28 pressing the air bag 16 by way of the restraining plate 34 restrains expansion of the air bag 16 and, thus, the pressure within the ink reservoir 18 is continuously kept lower than external air pressure.

[0012] Fig. 4 is a perspective view of end 32 of the helical spring 28 attached to the restraining plate 34. The restraining plate 34, in this embodiment, is a thin plate and the hook-like structure 40 comprises strips dug out from the restraining plate 34, leaving recesses 43 therein and bent inside to securely hold the end 32 of spring 28.

[0013] Fig. 5 is a perspective view of a supporting plate 52 somewhat different from the supporting plate 22 of Figs. 2 and 3. The supporting plate 52 comprises a protrusion 54 for fixing the end 30 of the helical spring 28. The protrusion 54 comprises three protruding blocks, these blocks being shaped to fit into an annular zone 56 of the supporting plate 52. End 30 of the helical spring 28 exactly fits into - or upon - the protrusion 54. As with the supporting plate 22 of Figs. 2 and 3, the shape of the supporting plate 52 corresponds to the cross section of the ink reservoir 18.

[0014] So the supporting plate 52 same as the supporting plate 22 is fixed to the casing 12 by means of the elastic force of the helical spring 28 without any other process being needed therefor.

[0015] As a result, the invention provides an ink container with a pressure modulating system that is easy to fabricate. The shape of the components of the pressure modulating system correspond to the shape of the ink reservoir. Because of the elastic force produced by a helical spring at both ends thereof, the present invention does not require any complicated fixing manipulations. At the same time fabrication of the components is simple in spite of the pressure modulating system operating reliably.

Claims

1. An ink container (10) for feeding a printer, said ink container including a pressure modulating system and comprising:

a casing (12) ;
an air vent (14) in a top portion of said casing (12);
an ink reservoir (18) within said casing (12);
an air bag (16) within said casing (12), said air bag being surrounded by said ink reservoir (18) and connected to said air vent (14) for enabling air to enter or leave the air bag;
an ink outlet (20) in a bottom portion of said casing (12) and connected to said ink reservoir (18); and
a spring (28) within said casing (12), said spring pressing on said air bag (16) tending to constrict the air bag as the air bag expands in response to back pressure reduction in said ink reservoir (18);

characterized in that said spring (28) is a helical spring arranged between a restraining plate (34) abutting said air bag (16) and a lateral wall of said casing (12) in a manner to apply pressure on said air bag, the air bag, at the same time, abutting an opposite lateral wall of said casing.

2. The ink container (10) of claim 1 wherein the end of said spring (28) remote from said restraining plate (34) is connected to a supporting plate (22; 52) itself fixedly arranged inside said casing (12).

3. The ink container (10) of claim 2, wherein said supporting plate (22; 52) has a shape corresponding to the cross section of said casing (12) in a plane perpendicular to the axis of said spring (28).

4. The ink container (10) of claim 2 or 3 wherein said supporting plate (22; 52), on its side facing said spring (28), comprises a protrusion (42; 54) the shape of which corresponds to the cross section of the abutting end (30) of the spring to hold this end in a fixed position in respect to the supporting plate.

5. The ink container (10) of any one of the preceding claims wherein said restraining plate (34), on its side facing said spring (28), comprises a hook-like structure (40) enabling the abutting end (32) of the spring to be fixed to the restraining plate.

6. The ink container of claim 4 or 5 wherein said protrusion (42; 54) and/or said hook-like structure (40) is formed in one piece with said supporting plate (22; 52) or, respectively, said restraining plate (34).

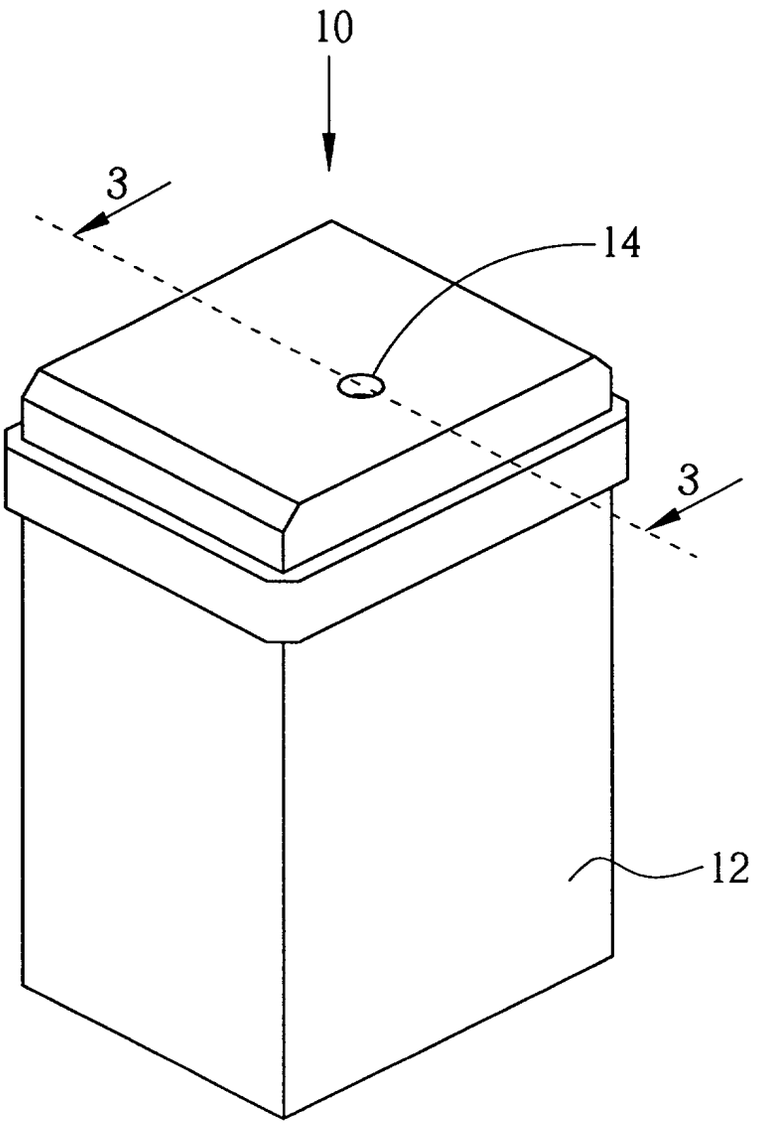

Fig. 1

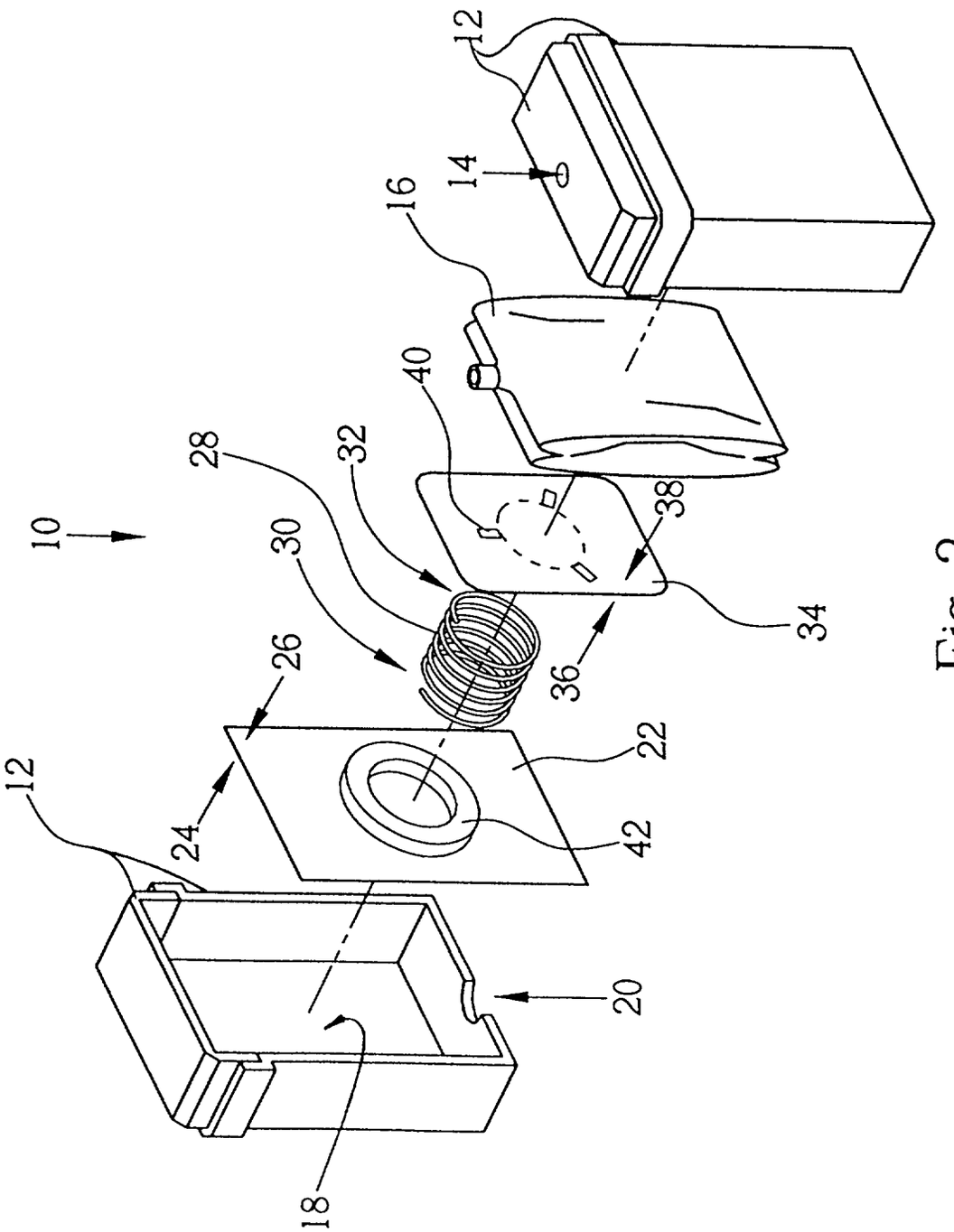

Fig. 2

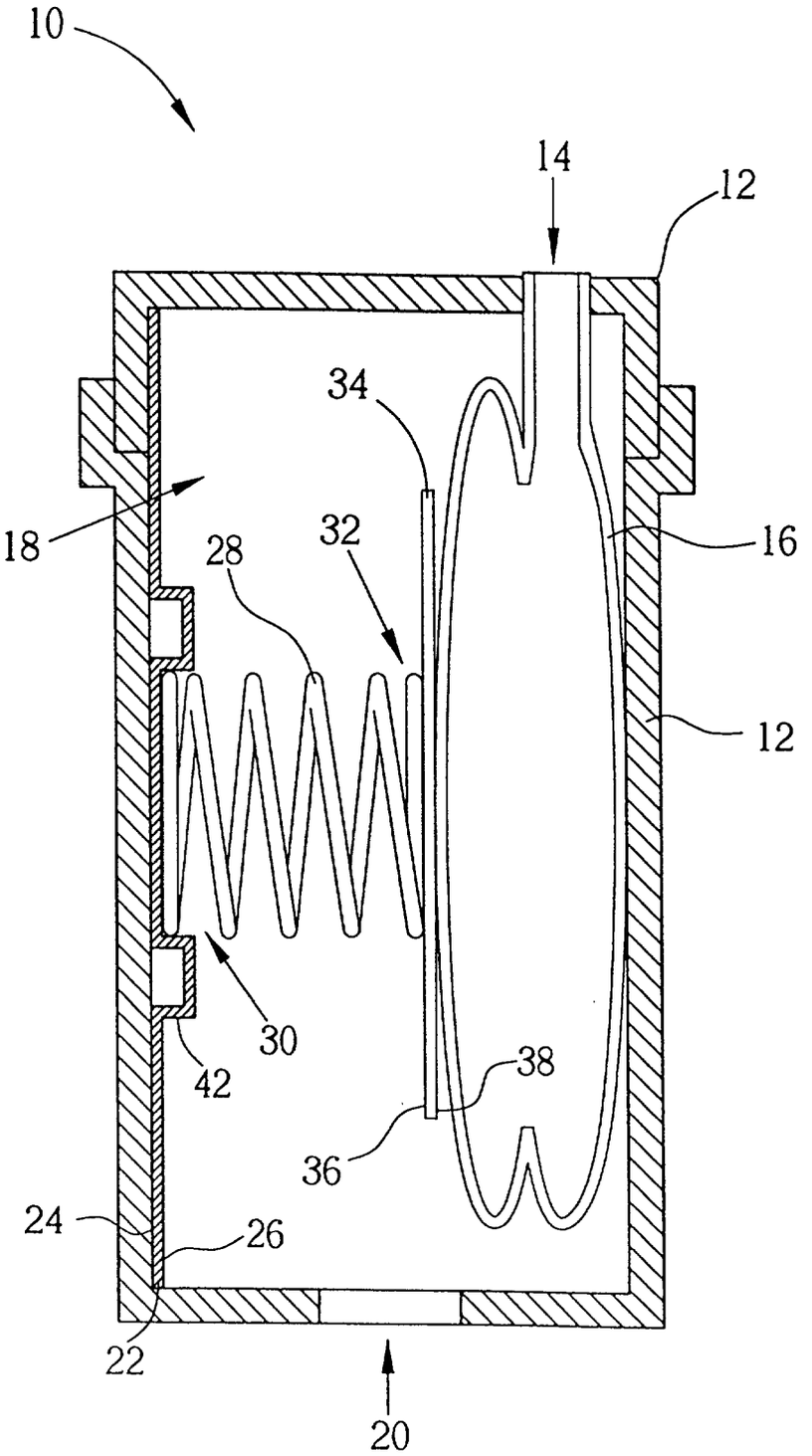

Fig. 3

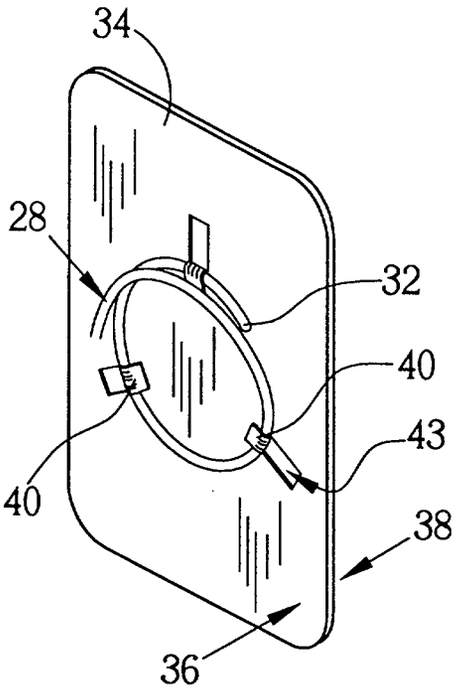

Fig. 4

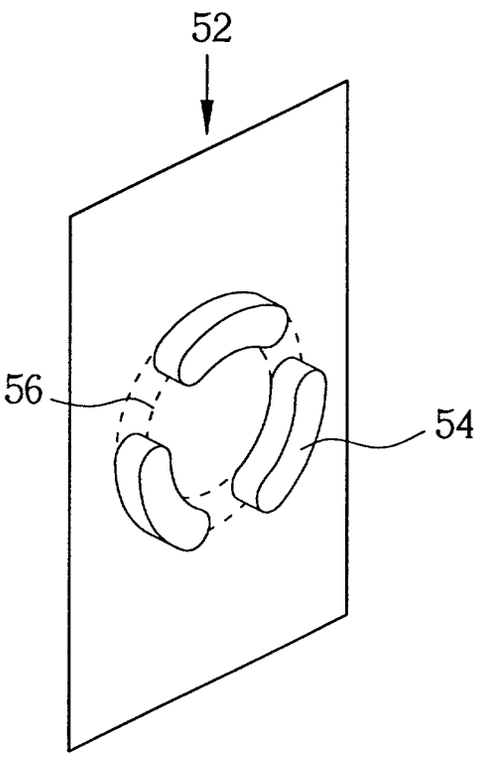

Fig. 5

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EUROPEAN SEARCH REPORT

Application Number
EP 01 11 0169

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.7)
X	US 6 213 598 B1 (HOU I C ET AL) 10 April 2001 (2001-04-10) * column 3, line 34 - column 4, line 17 * * column 5, line 25 - column 8, line 23; figures 3,4,6 *	1-6	B41J2/175
A	EP 0 375 383 A (HEWLETT PACKARD CO) 27 June 1990 (1990-06-27) * column 8, line 49 - column 9, line 39; figures 4-6 *	1-6	

TECHNICAL FIELDS SEARCHED (Int.Cl.7)

B41J

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
MUNICH	12 October 2001	Vorwerg, N

CATEGORY OF CITED DOCUMENTS

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