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(54) **Fan device**

(57) A fan device includes: a fan housing (1) configured with a receiving space (10) defined among opposite top and bottom walls (12, 11), and a surrounding side wall (13); a fan impeller (2) mounted in the receiving space (1), disposed adjacent to an air outlet (121) in the top wall (11) and operable to rotate about a central axis (X) transverse to the top and bottom walls (12, 11) of the fan housing (1); and an air-guiding unit (3) mounted fixedly in the receiving space (1) and disposed adjacent to an air inlet (111) in the bottom wall (11). The air-guiding unit (3) includes a central connecting member (31) disposed axially with the central axis (X), and a plurality of angularly spaced apart air-guiding blades (32) interconnecting the central connecting member (31) and the surrounding side wall (13). An angular distance (θ) between each adjacent pair of the air-guiding blades (32) is different from that of any other adjacent pair of the air-guiding blades (32).

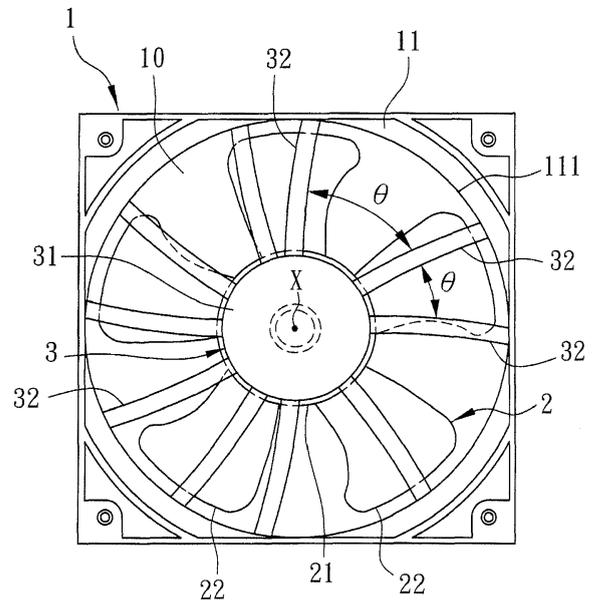


FIG. 1

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Description

[0001] The invention relates to a fan device, and more particularly to a fan device capable of producing enhanced air pressure.

[0002] In order to enhance air pressure, a stator impeller is applied to a fan. The stator impeller is mounted to a fan housing of the fan, and includes a plurality of angularly equidistant stator blades. An air-guiding channel is formed between an adjacent pair of the stator blades. When a fan impeller of the fan is driven to rotate, air flowing from the air inlet is guided by the stator impeller to flow toward the fan impeller through the air-guiding channels, thereby enhancing air pressure produced by the fan. As a result, increased airflow amount can be attained. However, in such a configuration, greater acoustic noise occurs during rotation of the fan impeller at a speed within a certain speed range.

[0003] Therefore, an object of the present invention is to provide a fan device that can produce enhanced air pressure and increased airflow amount with reduced acoustic noise.

[0004] According to the present invention, a fan device comprises:

a fan housing configured with a receiving space and having a bottom wall formed with an air inlet in spatial communication with the receiving space, a top wall formed with an air outlet in spatial communication with the receiving space, and a surrounding side wall transverse to and interconnecting the top and bottom walls, and cooperating with the top and bottom walls to define the receiving space thereamong;

a fan impeller mounted in the receiving space in the fan housing, disposed adjacent to the air outlet in the top wall of the fan housing, and operable to rotate about a central axis that is transverse to the top and bottom walls of the fan housing; and

an air-guiding unit mounted fixedly in the receiving space in the fan housing and disposed adjacent to the air inlet in the bottom wall of the fan housing, the air-guiding unit including a center connecting member disposed coaxially with the central axis, and a plurality of air-guiding blades angularly spaced apart from each other and interconnecting the central connecting member and the surrounding side wall of the fan housing, an angular distance between each adjacent pair of the air-guiding blades being different from that of any other adjacent pair of the air-guiding blades.

[0005] Other features and advantages of the present invention will become apparent in the following detailed description of the preferred embodiments with reference to the accompanying drawings, of which:

Figure 1 is a schematic bottom view showing the first preferred embodiment of a fan device according to

the present invention;

Figure 2 is a perspective view showing the first preferred embodiment without a fan impeller;

Figure 3 is a partly schematic sectional view showing the first preferred embodiment;

Figure 4 is a plot illustrating experimental measurement results of acoustic noise generated by the prior art and the first preferred embodiment;

Figure 5 is a schematic top view showing the second preferred embodiment of a fan device according to the present invention without a fan impeller;

Figure 6 is a schematic top view showing a variation of the second preferred embodiment; and

Figure 7 is a schematic top view showing the third preferred embodiment of a fan device according to the present invention.

[0006] Before the present invention is described in greater detail, it should be noted that like elements are denoted by the same reference numerals throughout the disclosure.

[0007] Referring to Figures 1 to 3, the first preferred embodiment of a fan device according to the present invention is shown to include a fan housing 1, a fan impeller 2, and an air-guiding unit 3.

[0008] The fan housing 1 is configured with a receiving space 10, and has a bottom wall 11, a top wall 12 and a surrounding side wall 13. The bottom wall 11 is formed with an air inlet 111 in spatial communication with the receiving space 10. The top wall 12 is formed with an air outlet 121 in spatial communication with the receiving space 10. The surrounding side wall 13 is transverse to and interconnects the top and bottom walls 12, 11, and cooperates with the top and bottom walls 12, 11 to define the receiving space 10 thereamong.

[0009] The fan impeller 2 is mounted in the receiving space 10 in the fan housing 1, is disposed adjacent to the air outlet 121 in the top wall 12 of the fan housing 1, and is operable to rotate about a central axis (X) that is transverse to the top and bottom walls 12, 11 of the fan housing 1. In this embodiment, the fan impeller 2 includes a hub body 21, and a plurality of fan blades 22 extending outwardly and radially from the hub body 21. In this embodiment, the fan blades 22 are angularly equidistant.

[0010] The air-guiding unit 3 is mounted fixedly in the receiving space 10 in the fan housing 1, and is disposed adjacent to the air inlet 111 in the bottom wall 11 of the fan housing 1. The air-guiding unit 3 includes a center connecting member 31 disposed coaxially with the central axis (X), and a plurality of air-guiding blades 32 angularly spaced apart from each other and interconnecting the center connecting member 31 and the surrounding side wall 13 of the fan housing 1. An angular distance (θ) between each adjacent pair of the air-guiding blades 32 is different from that of any other adjacent pair of the air-guiding blades 32. In this embodiment, the center connecting member 31 includes a circular cap body 312, and a tube body 311 extending integrally from the cap body

312 toward the hub body 21 and disposed coaxially with the central axis (X).

[0011] In operation, when the fan impeller 2 is driven to rotate, air flowing from the air inlet 111 is guided by the air-guiding blades 32, and then flows toward the air outlet 121, as indicated by solid-line arrows in Figure 3.

[0012] In sum, due to the presence of the air-guiding unit 3, the fan device of the present invention can produce enhanced air pressure, thereby resulting in increased air-flow amount. It is noted that, since the angular distances (θ) are different from each other, the fan device of the present invention generates reduced acoustic noise during operation as compared to the prior art, as shown in Figure 4.

[0013] Figure 5 illustrates the second preferred embodiment of a fan device according to this invention, which is a modification of the first preferred embodiment. Unlike the first preferred embodiment, the air-guiding unit 3' further includes a plurality of auxiliary air-guiding blades 33 extending inwardly and radially from the surrounding side wall 13 of the fan housing 1 toward the central connecting member 31. Each auxiliary air-guiding blade 33 is disposed between a corresponding adjacent pair of the air-guiding blades 32, and is spaced apart from the corresponding adjacent pair of the air-guiding blades 32 and the central connecting member 31. In this embodiment, the auxiliary air-guiding blades 33 have the same length.

[0014] Figure 6 illustrates a variation of the second preferred embodiment, wherein each of the auxiliary air-guiding blades 33 of the air-guiding unit 3' has a length different from that of any other one of the auxiliary air-guiding blades 33.

[0015] Figure 7 illustrates the third preferred embodiment of a fan device according to this invention, which is a modification of the first preferred embodiment. Unlike the first preferred embodiment, an angular distance (ϕ) between each adjacent pair of the fan blades 22 is different from that of any other adjacent pair of the fan blades 22.

Claims

1. A fan device characterized by:

a fan housing (1) configured with a receiving space (10) and having a bottom wall (11) formed with an air inlet (111) in spatial communication with said receiving space (10), a top wall (12) formed with an air outlet (121) in spatial communication with said receiving space (10), and a surrounding side wall (13) transverse to and interconnecting said top and bottom walls (12, 11), and cooperating with said top and bottom walls (12, 11) to define said receiving space (10) thereamong;

a fan impeller (2) mounted in said receiving

space (10) in said fan housing (1), disposed adjacent to said air outlet (121) in said top wall (12) of said fan housing (1), and operable to rotate about a central axis (X) that is transverse to said top and bottom walls (12, 11) of said fan housing (1); and

an air-guiding unit (3) mounted fixedly in said receiving space (10) in said fan housing (1) and disposed adjacent to said air inlet (111) in said bottom wall (11) of said fan housing (1), said air-guiding unit (3) including a center connecting member (31) disposed coaxially with the central axis (X), and a plurality of air-guiding blades (32) angularly spaced apart from each other and interconnecting said central connecting member (31) and said surrounding side wall (13) of said fan housing (1), an angular distance (θ) between each adjacent pair of said air-guiding blades (32) being different from that of any other adjacent pair of said air-guiding blades (32).

2. The fan device as claimed in Claim 1, **characterized in that** said air-guiding unit (3') further includes a plurality of auxiliary air-guiding blades (33) extending inwardly and radially from said surrounding side wall (13) of said fan housing (1) toward said central connecting member (31), each of said auxiliary air-guiding blades (33) being disposed between a corresponding adjacent pair of said air-guiding blades (32) and being spaced apart from the corresponding adjacent pair of said air-guiding blades (32) and said central connecting member (31).

3. The fan device as claimed in Claim 2, further **characterized in that** said auxiliary air-guiding blades (33) of said air-guiding unit (3') have the same length.

4. The fan device as claimed in Claim 2, further **characterized in that** each of said auxiliary air-guiding blades (33) of said air-guiding unit (3') has a length different from that of any other one of said auxiliary air-guiding blades (33).

5. The fan device as claimed in Claim 1, **characterized in that** said fan impeller (2) includes:

a hub body (21) disposed coaxially with the central axis (X); and

a plurality of fan blades (22) extending outwardly and radially from said hub body (21) and angularly spaced apart from each other, an angular distance (ϕ) between each adjacent pair of said fan blades (22) being different from that of any other adjacent pair of said fan blades (22).

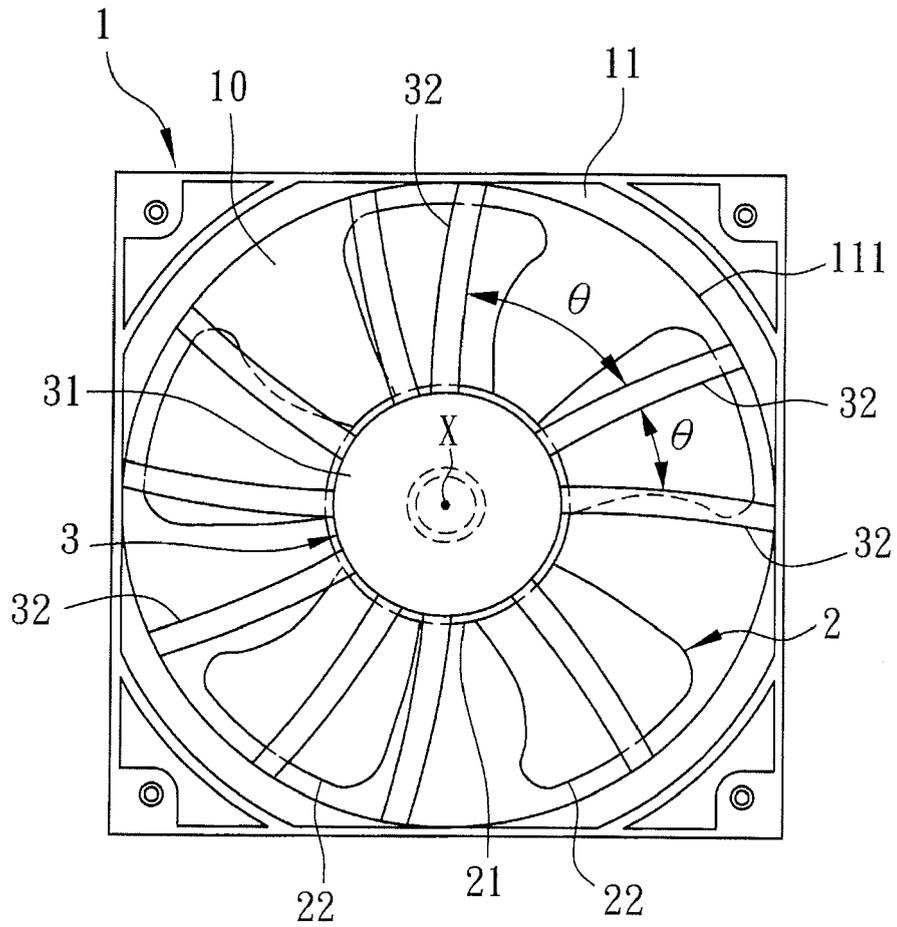


FIG. 1

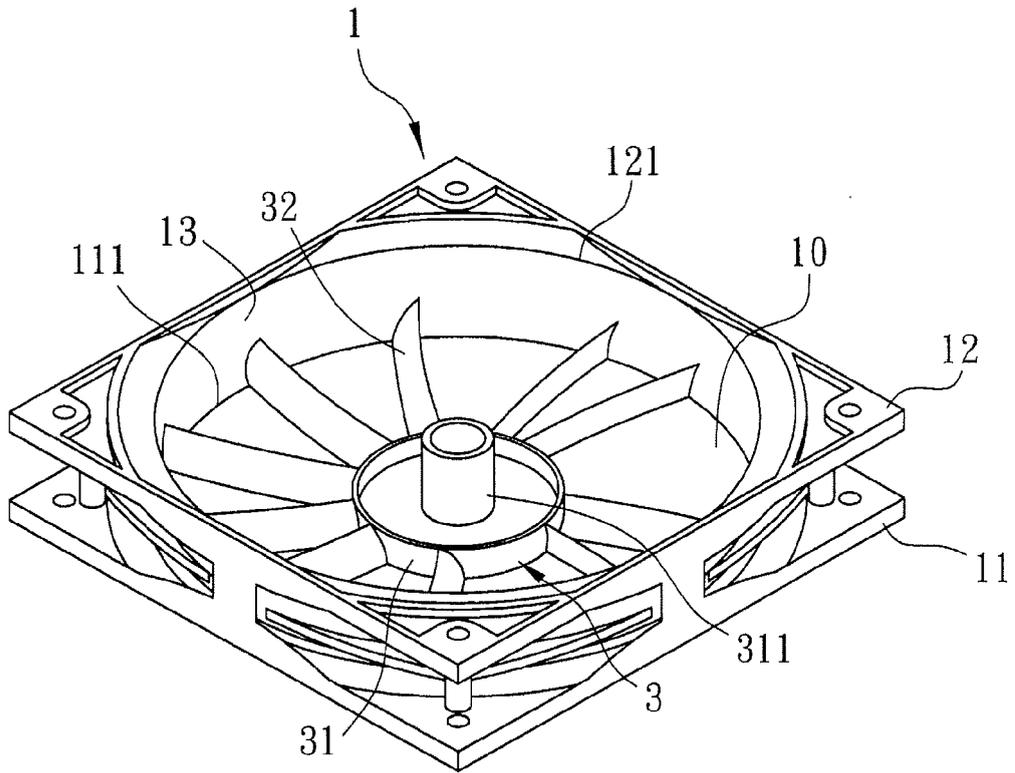


FIG. 2

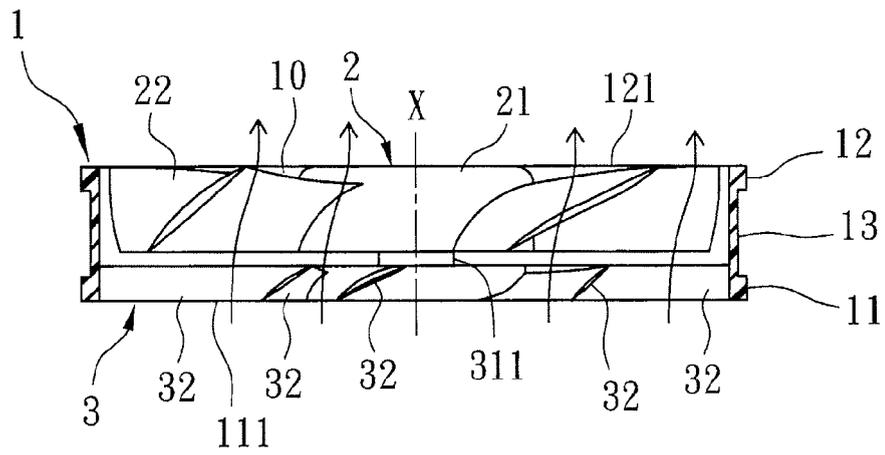


FIG. 3

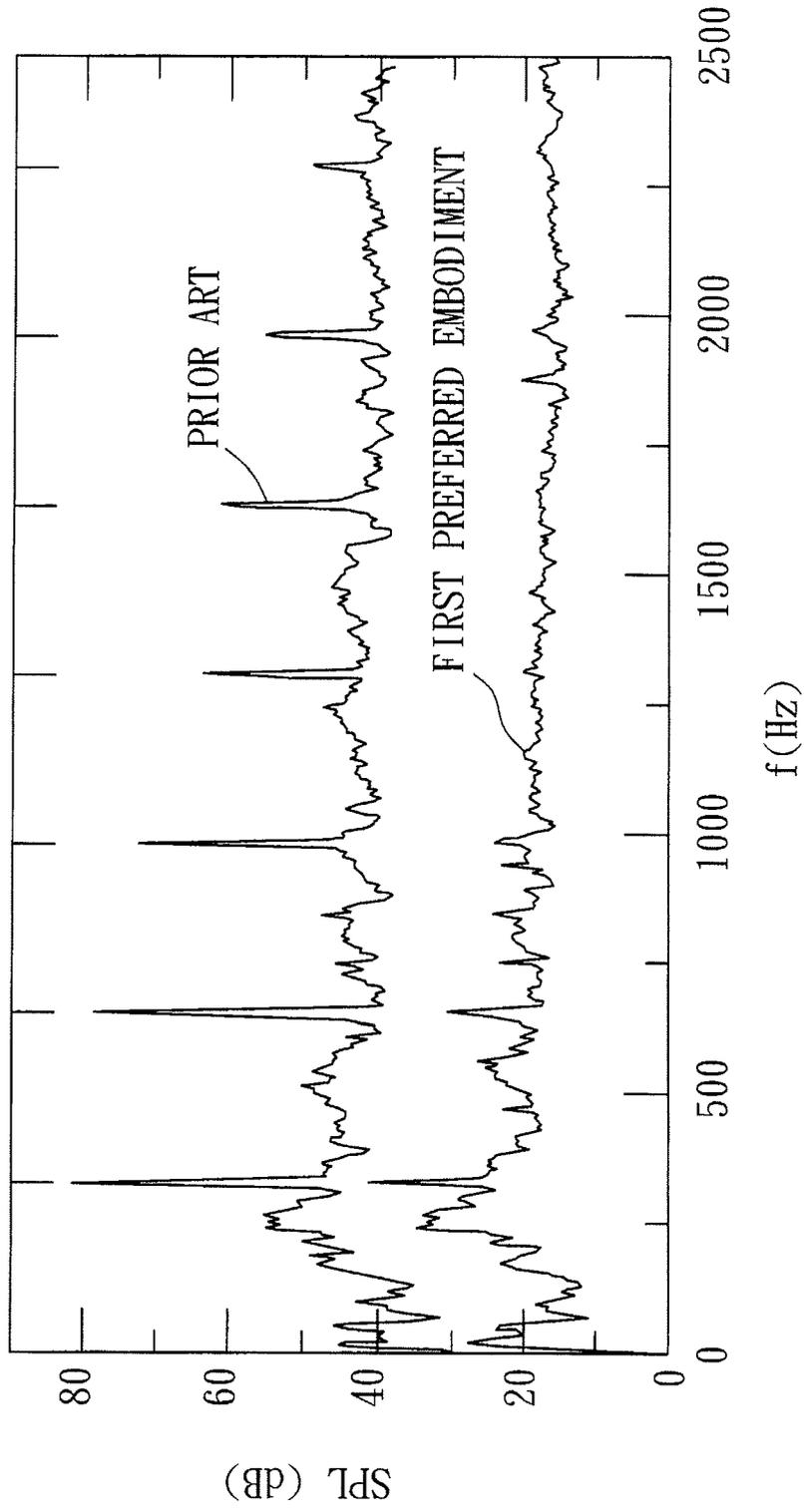


FIG. 4

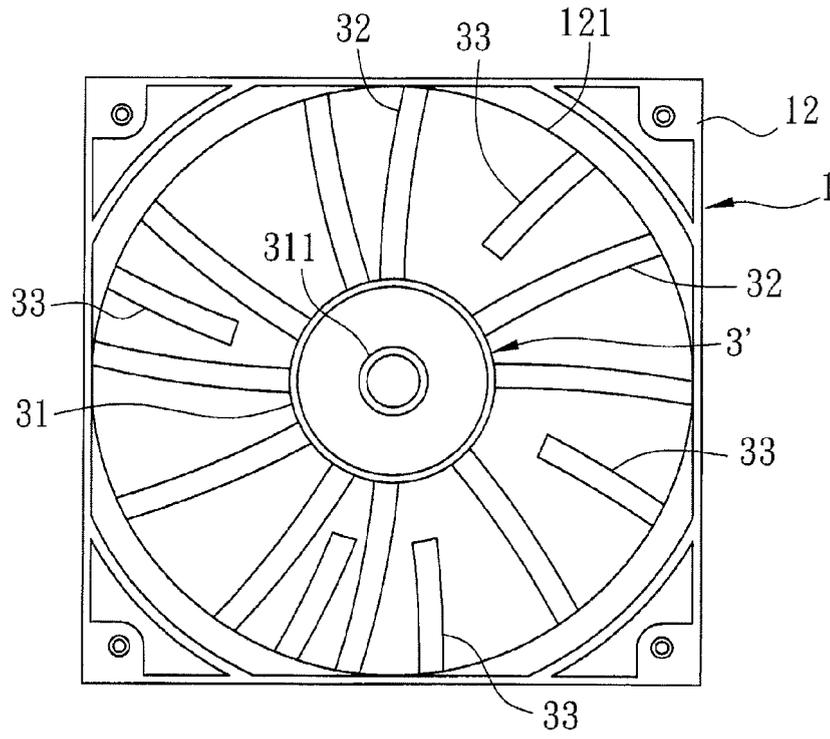


FIG. 5

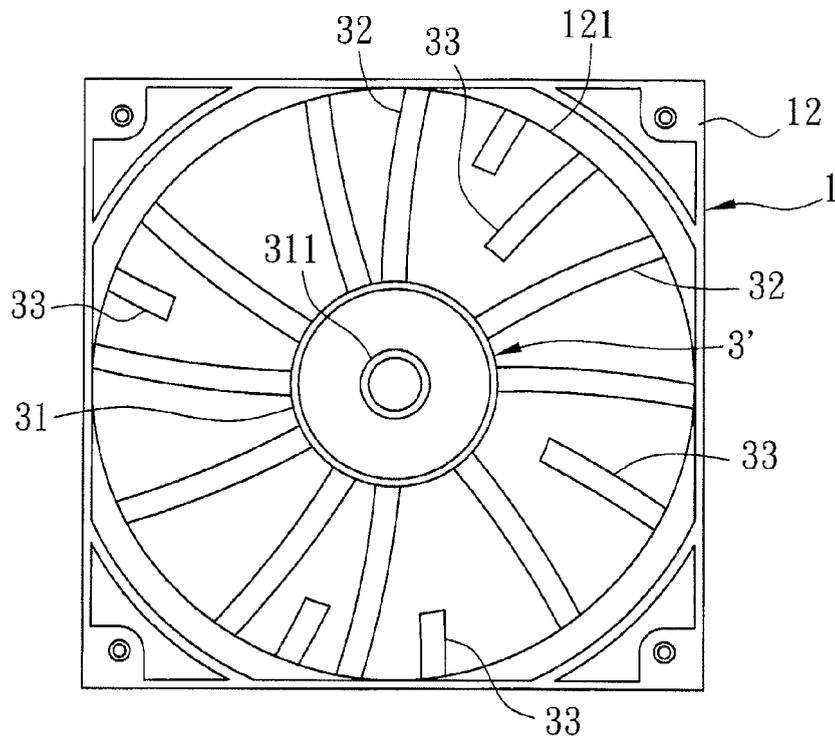


FIG. 6

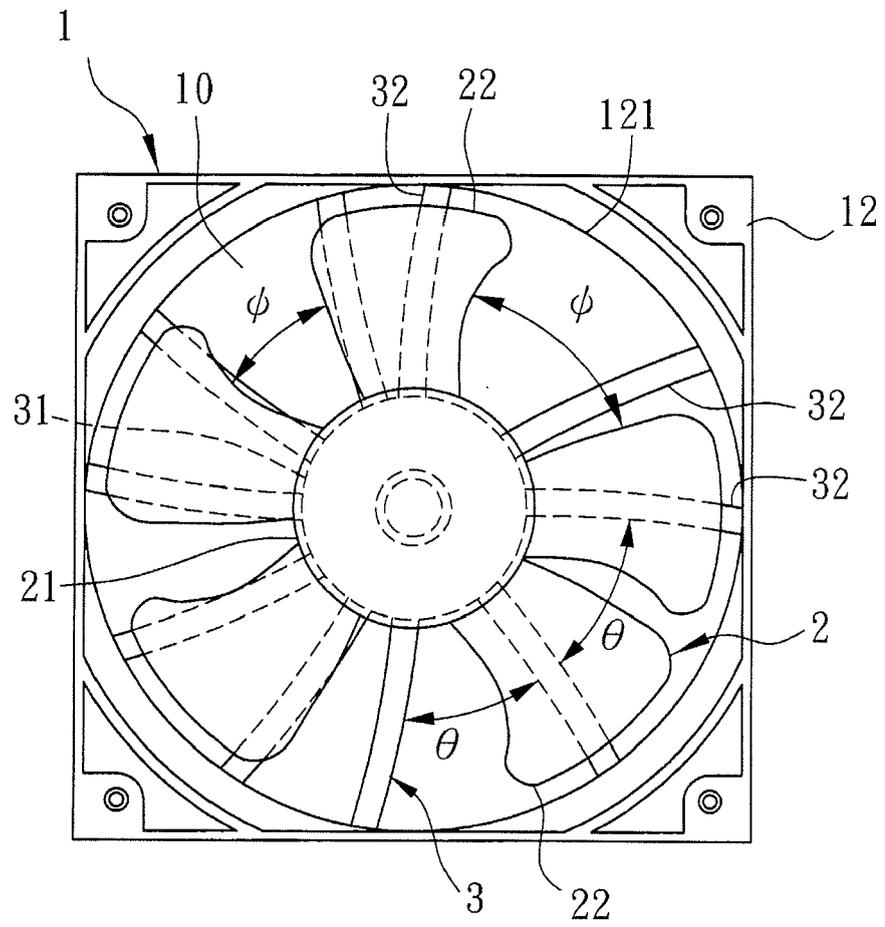


FIG. 7



EUROPEAN SEARCH REPORT

Application Number
EP 10 16 4124

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	JP 2008 303778 A (NIHON DENSAN KK) 18 December 2008 (2008-12-18)	1	INV. F04D25/06 F04D29/54 F04D29/66 F04D25/08 F04D29/32
Y	* abstract; figures 11,13 * -----	2-5	
X	DE 10 2005 023868 B3 (MINEBEA CO LTD [JP]) 20 July 2006 (2006-07-20) * paragraphs [0002] - [0008], [0038]; figures 7,9 *	1	
X	ANONYMOUS: "Stille Brise - Richtige Auslegung geraeuscharmer Geraetelueftungen" F & M MECHATRONIK, CARL HANSER VERLAG, MUNCHEN, DE, vol. 112, 1 October 2004 (2004-10-01), pages 20-22, XP009137935 ISSN: 1619-0424 * page 21, right-hand column *	1	
X	JP 49 024005 B (UNKNOWN) 20 June 1974 (1974-06-20) * figures 1,2 *	1	
Y	US 2007/048129 A1 (CHANG PEI-YU [TW] ET AL) 1 March 2007 (2007-03-01) * paragraphs [0015], [0016], [0018]; figures 3,5 *	2-4	
Y	US 2002/182053 A1 (MIYAZAWA ATSUSHI [JP]) 5 December 2002 (2002-12-05) * paragraphs [0002], [0100] - [0102]; figures 4,5,10; table 1 *	5	
Y	US 2008/101936 A1 (LEE JEONG-HAN [KR] ET AL) 1 May 2008 (2008-05-01) * paragraphs [0009], [0024] - [0031]; figures 1,10; table 1 *	5	
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The present search report has been drawn up for all claims			
Place of search Munich		Date of completion of the search 6 September 2010	Examiner Homan, Peter
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	

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Application Number
EP 10 16 4124

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
Y	GB 2 038 426 A (FORD MOTOR CO) 23 July 1980 (1980-07-23) * page 1, lines 68-85; figure 1 *	5	
Y	JP 56 085594 A (MATSUSHITA SEIKO KK) 11 July 1981 (1981-07-11) * abstract; figure 2 *	5	
A	US 2006/257254 A1 (HO SHIH-HUA [TW] ET AL) 16 November 2006 (2006-11-16) * figures 1A,1B,2A *	1-5	
			TECHNICAL FIELDS SEARCHED (IPC)
The present search report has been drawn up for all claims			
Place of search Munich		Date of completion of the search 6 September 2010	Examiner Homan, Peter
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	

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

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06-09-2010

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
JP 2008303778 A	18-12-2008	NONE	
DE 102005023868 B3	20-07-2006	NONE	
JP 49024005 B	20-06-1974	NONE	
US 2007048129 A1	01-03-2007	TW 276743 B	21-03-2007
US 2002182053 A1	05-12-2002	JP 4075264 B2 JP 2001214894 A	16-04-2008 10-08-2001
US 2008101936 A1	01-05-2008	CN 101173674 A DE 102006061122 A1 JP 2008115845 A KR 20080039599 A	07-05-2008 08-05-2008 22-05-2008 07-05-2008
GB 2038426 A	23-07-1980	DE 2945223 A1 DE 7931621 U1 JP 55078197 A	12-06-1980 19-06-1980 12-06-1980
JP 56085594 A	11-07-1981	NONE	
US 2006257254 A1	16-11-2006	DE 102005047861 A1 JP 4244388 B2 JP 2006316787 A	23-11-2006 25-03-2009 24-11-2006