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US 5751549 A US 4917572 A US 3829250 A

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(71) Applicant(s)
Lucent Technologies Inc
(Incorporated in USA - Delaware)
600 Mountain Avenue, Murray Hill,
New Jersey 07974-0636, United States of America

(72) Inventor(s)
Simon John Kerslake
Graham Spencer Bestwick
Philip Leslie Eden
William George Gates

(74) Agent and/or Address for Service
D J Williams
Lucent Technologies UK Limited, 5 Mornington Road,
WOODFORD GREEN, Essex, IG8 0TU,
United Kingdom

(54) Abstract Title
Cabinet for units which dissipate heat

(57) A cabinet 2 is disclosed for a plurality of units 6 which dissipate heat. The cabinet 2 has a plenum chamber 12, a rack 4 for mounting the units allowing passages for cooling air past the units, and a fan unit 14 for propelling air to flow from outside the cabinet through the passages into the plenum chamber and through an exhaust from the plenum chamber. The fan unit has a backwardly curved impeller 16 mounted for driven rotation about an axis and an outlet passage 20 arranged to direct out-flowing air generally parallel to the axis.

The fan unit 14 may be mounted in the top of the cabinet so as to direct out-flowing air upwardly. The cabinet 2 may have a passage containing a filter through which the air is drawn into the cabinet 2.

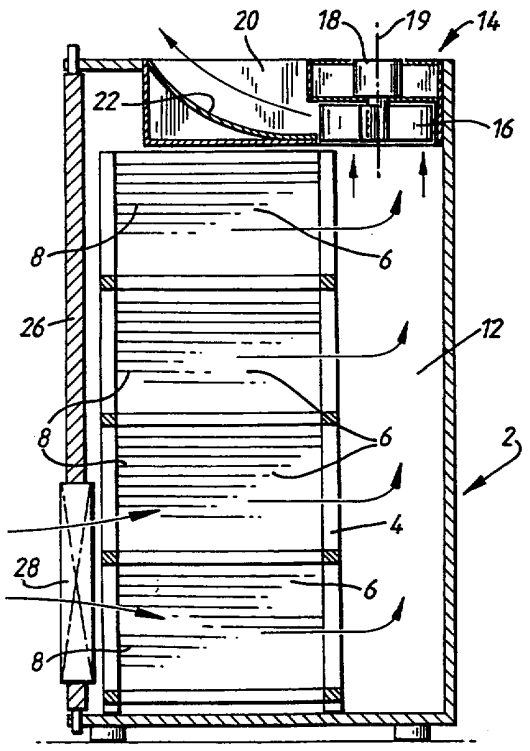

Fig.1

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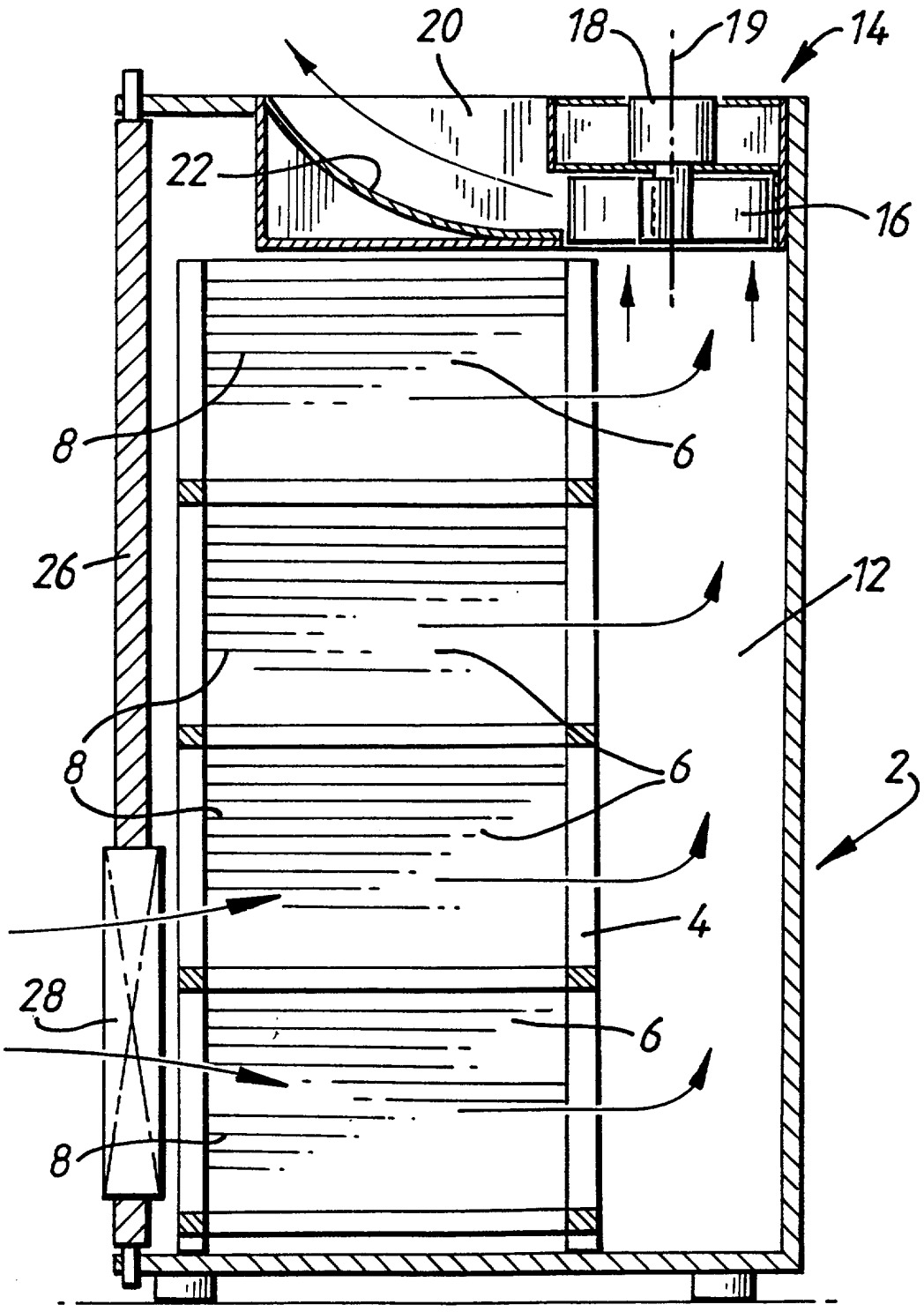

Fig. 1

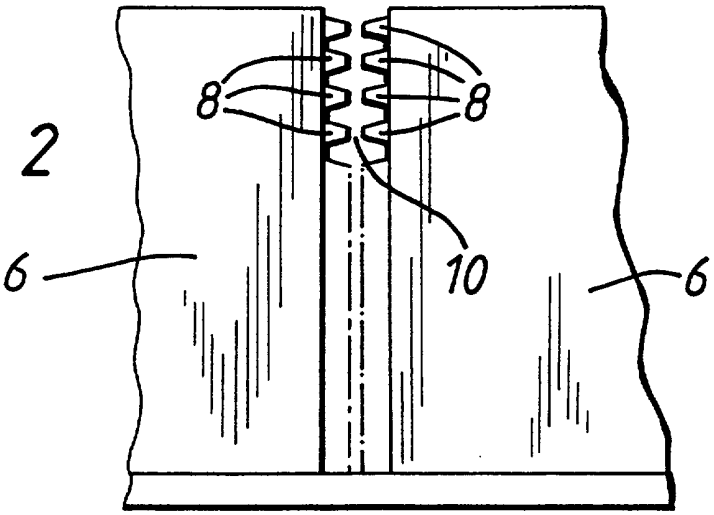

Fig. 2

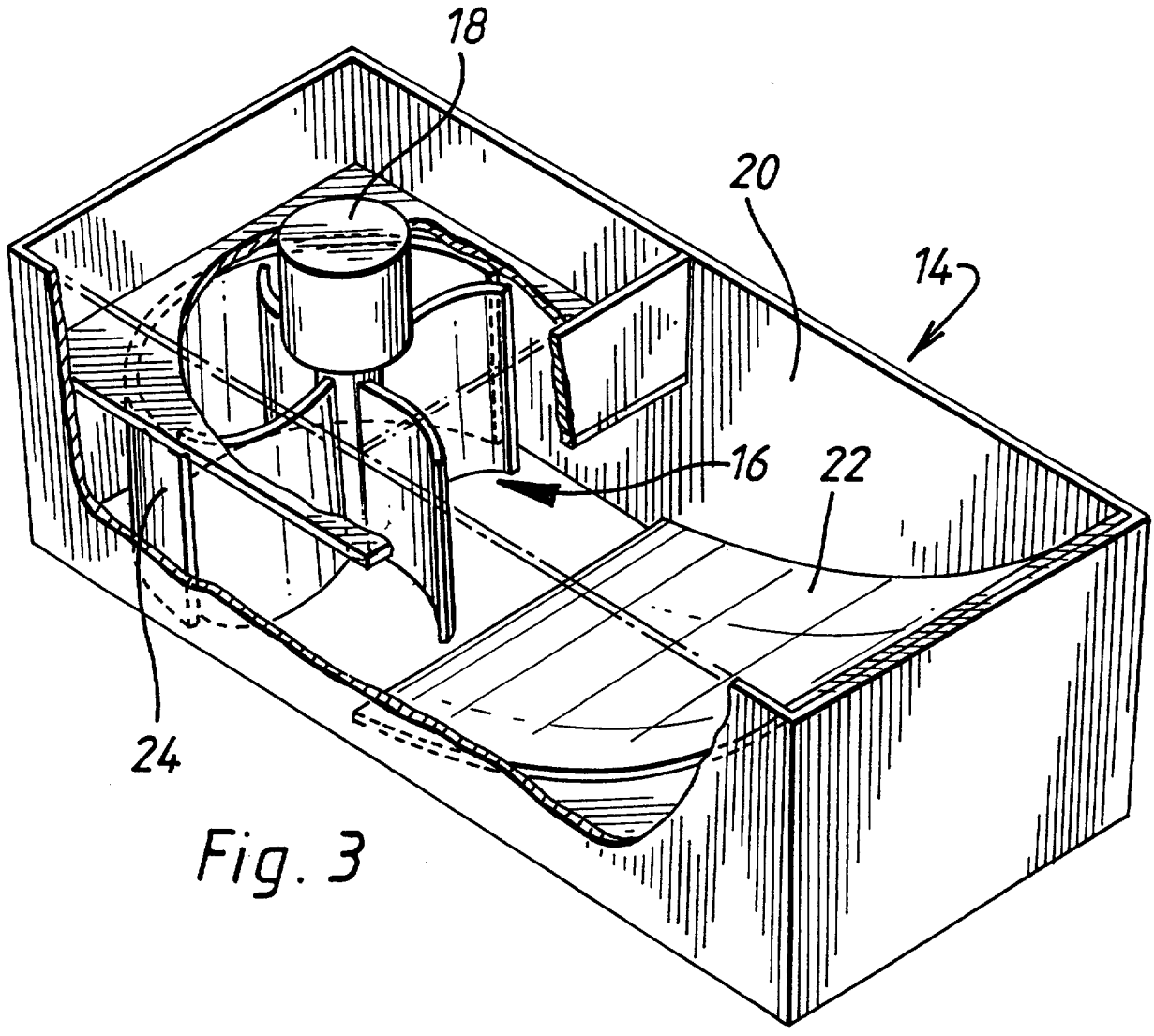

Fig. 3

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CABINET FOR UNITS WHICH DISSIPATE HEAT

This invention relates to cabinets for units which dissipate heat.

The background to the invention will be described with reference to a particular application. The invention is not limited to this application and others will occur readily to the reader.

Electronic equipment is often manufactured in units intended to be mounted in racks. Each unit dissipates heat and may require cooling. One method of cooling is to provide each unit with its own cooling fan. The invention is based on a proposal to construct the rack as a cabinet and to draw air into the cabinet over all the units so cooling them all together. Designing a cabinet uncovers a conflict. The cabinet has to be dimensioned to fit existing equipment rooms, i.e. its dimensions are desired to be conventional. In the cabinet it is desired to place as many units as possible, so they will be as close together as possible commensurate with leaving passages for cooling air to circulate between them. Narrower passages also lead to higher air speed which improves cooling. However, narrower passages also lead to greater resistance to air flow and thus to larger fans which reduces the amount of interior space available for the units.

Against this background, there is provided a cabinet for a plurality of units which dissipate heat, the cabinet having a plenum chamber, means for mounting the units allowing passages for cooling air past the units, and a fan unit for propelling air to flow from outside the cabinet through the passages into the plenum chamber and through an exhaust from the plenum chamber, said fan unit having a backwardly curved impeller mounted for driven rotation about an axis and an outlet passage arranged to direct out-flowing air generally parallel to the axis. The provision of a fan unit having backwardly a curved impeller, dramatically increases the potential working pressure difference across a fan unit of given dimensions, compared with an axial fan, which allows maximum internal space to be allocated to the heat dissipating units.

Preferably, the fan unit is mounted in the top of the cabinet so as to direct out-flowing air upwardly.

The invention has even greater advantage when, as in a preferred embodiment, air is drawn into the cabinet through a filter, since this increases the resistance to flow and thus the load on the fan unit.

In a preferred arrangement, the cabinet has a door in which the passage is located and the plenum chamber is located behind the units remote from the door.

One embodiment of the invention will now be described, by way of example, with reference to the accompanying drawings, in which:

Figure 1 is a schematic cross section of a cabinet embodying the invention;

Figure 2 is a scrap front view of two units contained by the cabinets, showing an air passage between them; and

Figure 3 is a pictorial view of the fan unit with its cover removed.

Referring to the drawings, the cabinet 2 has an internal rack 4 for electronic units 6, e.g. radio units, antenna coupling equipment, power distribution equipment, central processing electronics etc. The units are mounted side by side in the rack as illustrated in Figure 2. The units 6 dissipate heat and some or all have extended external surfaces, or fins, 8 to assist cooling as air circulates through narrow passages 10 between them.

Behind the rack 4 is a plenum chamber 12 at the upper end of which a fan unit 14 is located. In order to remain desirably small whilst being able to draw sufficient air through the narrow passages 10, the fan unit has a backwardly curved impeller 16 which is driven by an electric motor 18 to rotate about an axis 19. From the nature of a backwardly curved impellor, air is drawn axially into the impeller from the plenum chamber 12 and is driven radially outwardly by the rotating impeller. It is desired that the exhaust air should flow generally upwardly parallel to the axis 19 and to this end the fan unit has an outlet passage 20 defined by a baffle 22 which deflects air generally

vertically. A further baffle 24 deflects outwardly flowing air forwardly towards the outlet passage 20.

The cabinet is closed and sealed by a door 26 so that the only inlet for air into it is through a filter, shown schematically at 28, mounted in the door. This further restricts the airflow increasing the load on the fan unit and making the need for the backwardly curved impeller greater.

CLAIMS

1. A cabinet for a plurality of units which dissipate heat, the cabinet having a plenum chamber, means for mounting the units allowing passages for cooling air past the units, and a fan unit for propelling air to flow from outside the cabinet through the passages into the plenum chamber and through an exhaust from the plenum chamber, said fan unit having a backwardly curved impeller mounted for driven rotation about an axis and an outlet passage arranged to direct out-flowing air generally parallel to the axis.

2. A cabinet as claimed in claim 1, wherein the fan unit is mounted in the top of the cabinet so as to direct out-flowing air upwardly.

3. A cabinet as claimed in claim 1 or 2, including a passage containing a filter through which the air is drawn into the cabinet.

4. A cabinet as claimed in claim 3, wherein the cabinet has a door in which the passage is located and the plenum chamber is located behind the units remote from the door.

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Claims searched: 1-4

Examiner: Kalim Yasseen
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Patents Act 1977
Search Report under Section 17

Databases searched:

UK Patent Office collections, including GB, EP, WO & US patent specifications, in:

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Int Cl (Ed.6): F04D (29/30); H05K (5/00, 5/02, 5/04, 7/20)

Other: Online: EPODOC, JAPIO, WPI

Documents considered to be relevant:

Category	Identity of document and relevant passage		Relevant to claims
Y	GB 2 293 279 A	(QUESTECH) an example of a cabinet for electrical equipment cooled by fans	1-4
Y	WO88/01127 A1	(NCR) an example of an electronic equipment enclosure cooled by fans	1-4
Y	EP 0 741 246 A1	(ALCATEL) an example of a radial fan having backwardly curved blades	1-4
Y	US 5 751 549 A	(SUN) an example of an electronic equipment enclosure cooled by fans	1-4
Y	US 4 917 572 A	(AIRFLOW) an example of a fan having rearwardly curved blades	1-4
Y	US 3 829 250 A	(SAMSON) a fan assembly having a backwardly curved blades	1-4

X	Document indicating lack of novelty or inventive step	A	Document indicating technological background and/or state of the art.
Y	Document indicating lack of inventive step if combined with one or more other documents of same category.	P	Document published on or after the declared priority date but before the filing date of this invention.
&	Member of the same patent family	E	Patent document published on or after, but with priority date earlier than, the filing date of this application.