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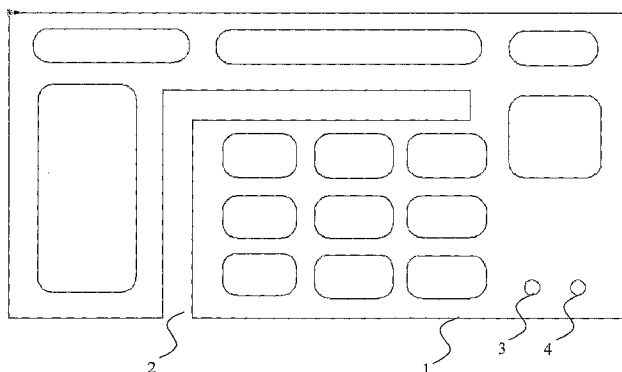
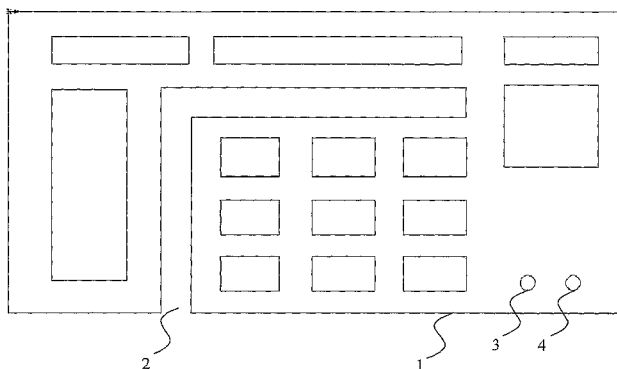
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(54) Title: A METHOD OF PRODUCTION OF AN ANTENNA PATTERN



(57) Abstract: The present invention relates to a
method of production of an antenna pattern having a
predetermined general outline, with an ink jet printer,
laser activation device or similar device. The device
creates the antenna pattern with a plurality of empty
inner portions within the general outline.



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A METHOD OF PRODUCTION OF AN ANTENNA PATTERN**FIELD OF INVENTION**

The present invention relates generally to antennas, and particularly to a method of production of an antenna
5 pattern.

BACKGROUND

The market for portable radio communication devices, such as mobile phones, PDA, portable computers and similar devices, is today very competitive, which puts tough economical
10 demands on the manufacturers. Furthermore, antennas of such devices many times only have access to limited space of different shapes.

On way of making inexpensive antennas is to electrolytic build up antenna patterns, which however is limited in
15 choice of 3D shape details for the antenna pattern. One way of making advanced 3D shape details of antenna patterns is to use ink jet printers, laser activation devices, or similar devices, which however tends to make the antennas expensive to manufacture.

20 SUMMARY OF THE INVENTION

An object of the present invention is to provide a method of production of antenna patterns that makes antennas less expensive to manufacture.

This object, among others, is according to the present
25 invention attained by a method, an antenna pattern and a portable radio communication device, respectively, as defined by the appended claims.

At insight of that the cost for production of an antenna pattern created by use of an ink jet printer, laser activation device, or similar device is very much dependent on the purchase cost for the manufacturing device, such as a laser activation device. In this way a significant reduction of manufacturing costs for making an antenna pattern is achieved by reducing the cycle time of e.g. the laser activation device, which is obtained by not activating inner portions of the antenna pattern.

Further features and advantages of the present invention will be evident from the following description.

BRIEF DESCRIPTION OF THE DRAWINGS

The present invention will become more fully understood from the detailed description of embodiments given below and the accompanying figures, which are given by way of illustration only, and thus, are not limitative of the present invention, wherein:

Figs. 1a-c schematically shows antenna patterns produced according to the present invention;

Fig. 2 schematically shows a grid pattern of an antenna having a generally rectangular outline;

Fig. 3 is a return loss chart for different grid sizes of the antenna in Fig. 2; and

Fig. 4 is a total efficiency chart for different grid sizes of the antenna in Fig. 2.

DETAILED DESCRIPTION OF EMBODIMENTS

In the following description, for purpose of explanation and not limitation, specific details are set forth, such as

particular techniques and applications in order to provide a thorough understanding of the present invention. However, it will be apparent for a person skilled in the art that the present invention may be practiced in other embodiments that
5 depart from these specific details. In other instances, detailed description of well-known methods and apparatuses are omitted so as not to obscure the description of the present invention with unnecessary details.

A preferred embodiment of the present invention will now be
10 described with reference to Figs. 1a-c.

An antenna pattern for a portable radio communication device, such as a mobile phone, personal digital assistant, portable computer or similar device, is created by a laser activation device and a following metallization process.
15 Alternatively, the antenna pattern is created by an ink jet printer or similar device. The creating device is preferably capable of manufacturing 3D shaped antennas also having via holes.

The antenna pattern is in this embodiment exemplified having
20 a predetermined general outline 1, preferably a generally rectangular outline 1 with a preferred L-shaped slot 2. Further, the antenna pattern is preferably provided with one or more feed points 3 and/or one or more ground points 4. The inner part of the predetermined general outline of the
25 antenna pattern is for a plurality of inner portions empty by not being created by the laser activation device, which reduces the cycle time of the laser activation device considerably, at the same time largely maintaining antenna performance.

30 The more of the antenna pattern that is empty, i.e. not activated by the laser activation device, the shorter cycle

time is for the laser activation device. Further, the antenna performance is more affected by empty portions close to the feed point and ground point, whereby the antenna pattern preferably is more densely activate close to the feed point and ground point, respectively. Portions close to sharp corners and the edges are preferably also somewhat more solid than the rest of the antenna pattern (not illustrated) to improve the antenna performance.

The plurality of empty inner portions of the antenna pattern not activated by the laser activation device is preferably rectangular-shaped having rounded corners, such as illustrated in Fig. 1b, which is advantageous for manufacturing and for antenna performance. Alternatively the plurality of empty inner portions are rectangular having sharp corners as illustrated in Fig. 1a, are circular as illustrated in Fig. 1c or having other shapes such as irregular shapes.

Advantageously, the empty spaces of the antenna pattern can be used to position discrete components therein, to save space in a portable radio communication device. Although the present invention is to its most advantage for antennas having large connected areas, wherein great reduction of cycle time can be achieved by the present invention, also other antennas having small tongues and other complex structures benefit from having empty spaces.

In short a laser activation device modifies an organic-metallic complex such that only the modified portions are metallized during a later metallization process.

Next an experiment illustrating the antenna performance for different antennas patterns having different grid sized is shown in connection with Figs. 2-4.

The return loss and total efficiency was measured for an antenna having a general outline of a rectangle. The measurement was performed for a solid antenna pattern, an antenna pattern having a grid size of 1 mm, a grid size of 2 mm and a grid size of 4 mm, respectively. The bandwidth at -6 dB was largely unaffected of the grid size, even if the centre frequency was somewhat shifted. Such a frequency shift is however easily compensated for by matching of the antenna. Also for the total efficiency of the antenna the bandwidth is largely unaffected.

It will be obvious that the present invention may be varied in a plurality of ways. Such variations are not to be regarded as departure from the scope of the present invention as defined by the appended claims. All such variations as would be obvious for a person skilled in the art are intended to be included within the scope of the present invention as defined by the appended claims.

CLAIMS

1. A method of production of an antenna pattern having a predetermined general outline, created with an ink jet printer, laser activation device or similar device,
5 **characterized by** creating said antenna pattern with a plurality of empty inner portions within said general outline.
2. The method according to claim 1, wherein said plurality of empty inner portions has rounded corners.
- 10 3. The method according to claim 1 or 2, wherein said antenna pattern comprises one or more feed points and wherein inner portions close thereto being more densely printed or activated than other inner portions of the antenna pattern.
- 15 4. The method according to any of claims 1-3, wherein said antenna pattern comprises one or more ground points and wherein inner portions close thereto being more densely printed or activated than other inner portions of the antenna pattern.
- 20 5. The method according to any of claims 1-4, wherein said predetermined general outline is more densely printed or activated than inner portions of the antenna pattern.
6. The method according to any of claims 1-5, wherein said predetermined general outline is generally rectangular and
25 is provided with a slot.
7. An antenna pattern having a predetermined general outline and a plurality of empty inner portions, wherein said antenna pattern is created by an ink jet printer, laser activation device or similar device.

8. A portable radio communication device comprising an antenna pattern having a predetermined general outline and a plurality of empty inner portions, wherein said antenna pattern is created by an ink jet printer, laser activation
5 device or similar device.

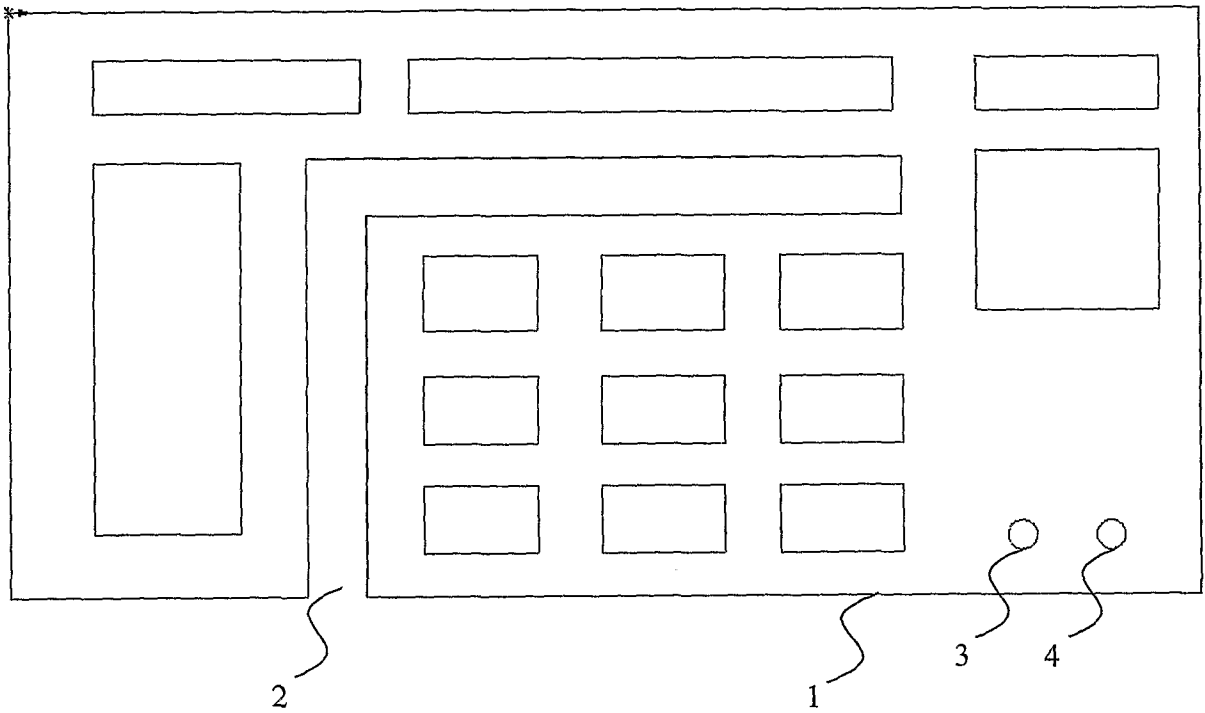


Fig. 1a

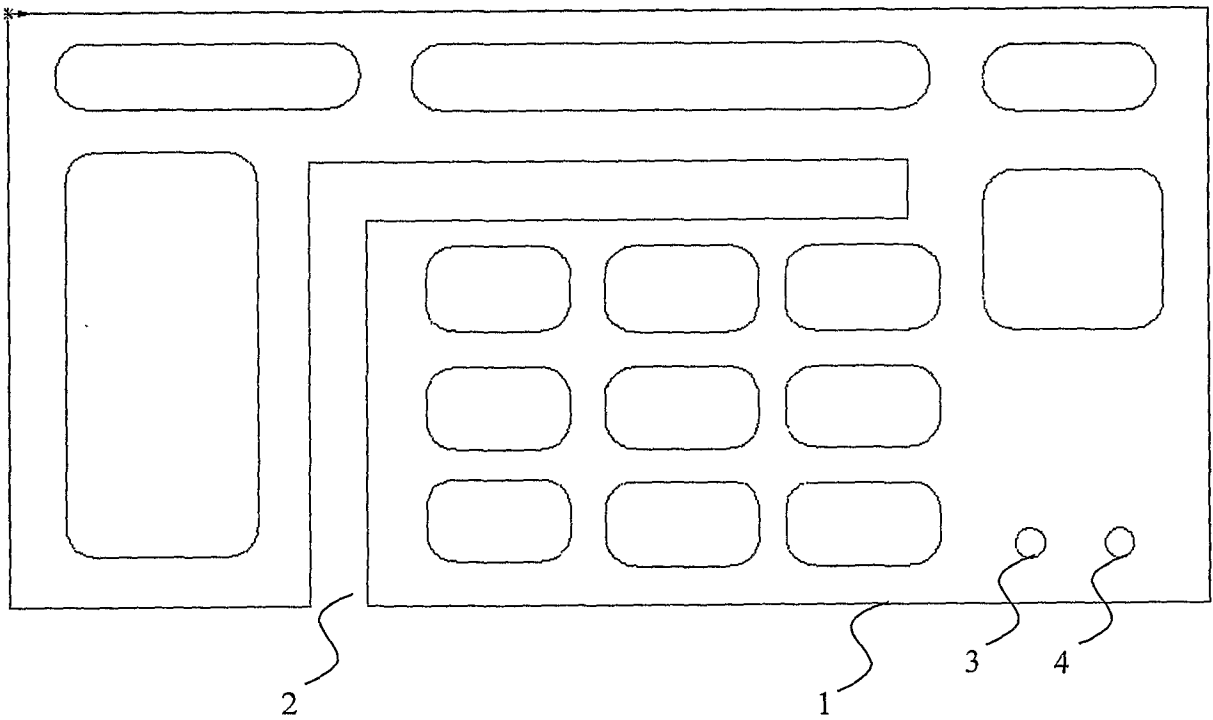


Fig. 1b

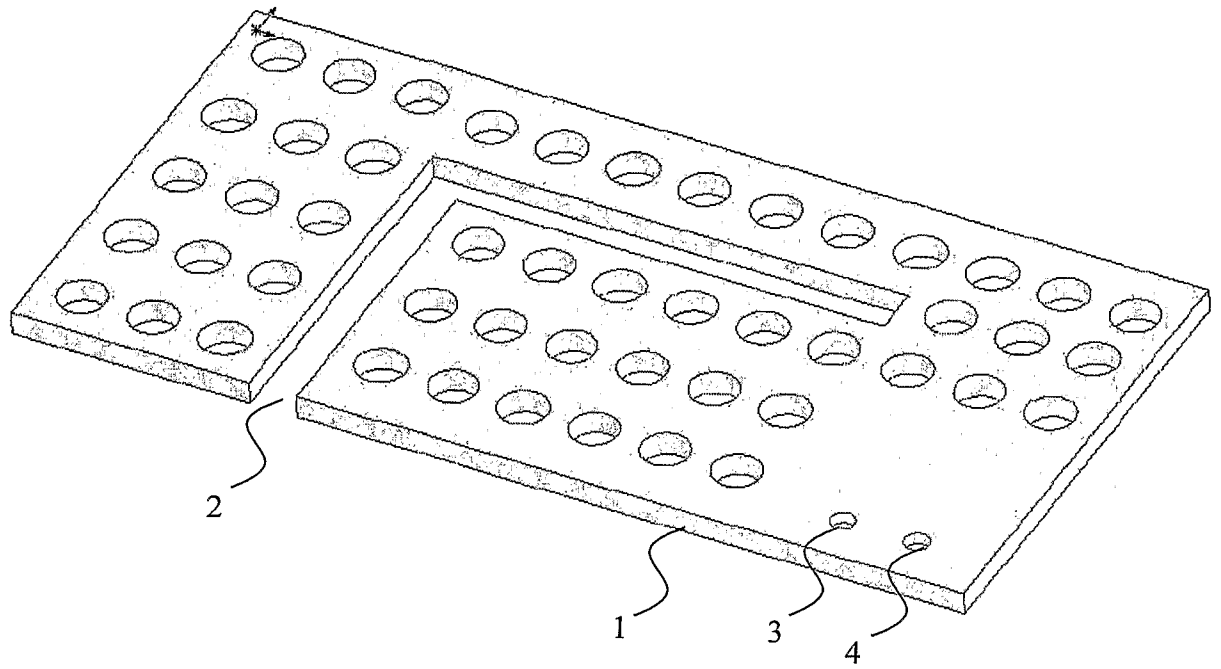


Fig. 1c

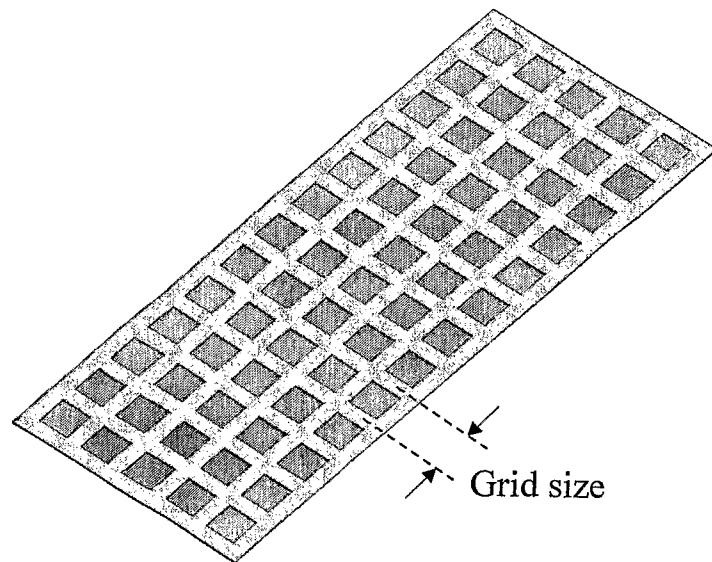
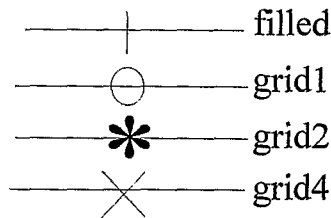
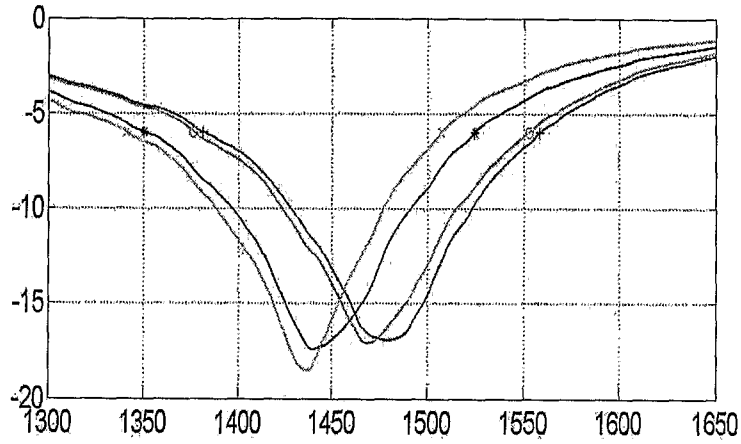


Fig. 2

Return loss



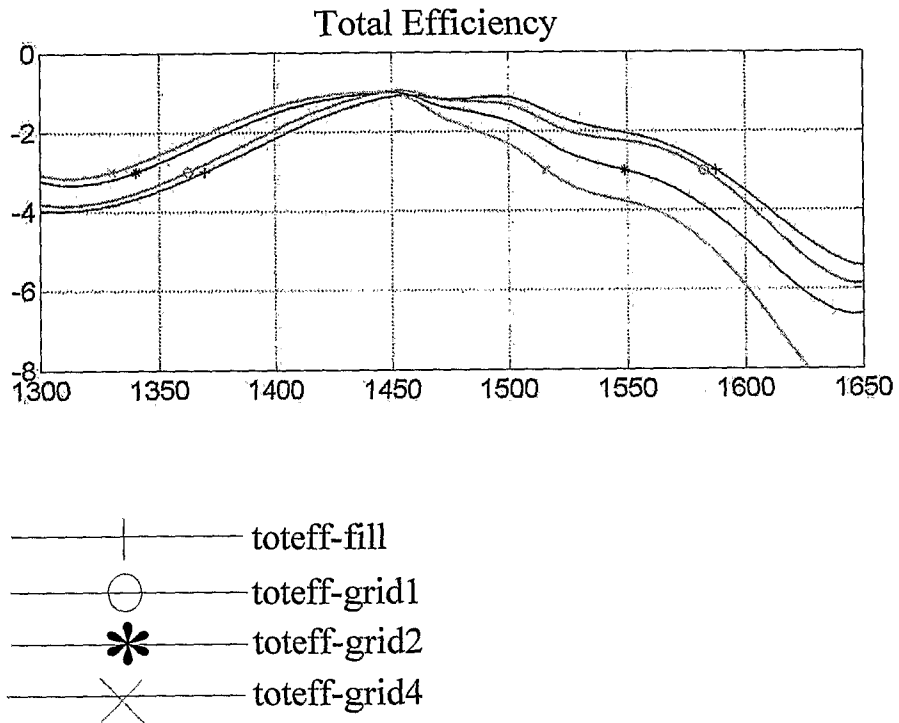
filled	
1381.3	-6.0 dB
1558.4	-6.0 dB
Bandwidth @ -6.0 dB	
No. 1	177.1 MHz

grid1	
1376.6	-6.0 dB
1552.8	-6.0 dB
Bandwidth @ -6.0 dB	
No. 1	176.2 MHz

grid2	
1350.4	-6.0 dB
1524.6	-6.0 dB
Bandwidth @ -6.0 dB	
No. 1	174.2 MHz

grid4	
1340.8	-6.0 dB
1506.9	-6.0 dB
Bandwidth @ -6.0 dB	
No. 1	166.1 MHz

Fig. 3



totreff-fill	
1369.4	-3.0 dB
1587.3	-3.0 dB
Bandwidth @-3.0 dB	
No.1	217.9 MHz

totreff-grid1	
1362.2	-3.0 dB
1582.2	-3.0 dB
Bandwidth @-3.0 dB	
No. 1	220.0 MHz

totreff-grid2	
1340.4	-3.0 dB
1549.0	-3.0 dB
Bandwidth @-3.0 dB	
No. 1	208.6 MHz

totreff-grid4	
1330.1	-3.0 dB
1516.1	-3.0 dB
Bandwidth @-3.0 dB	
No. 1	186.0 MHz

Fig.4

INTERNATIONAL SEARCH REPORT

International application No.

PCT/SE2007/000898

A. CLASSIFICATION OF SUBJECT MATTER

IPC: see extra sheet

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC: H01Q

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

SE,DK,FI,NO classes as above

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

EPO-INTERNAL, WPI DATA, PAJ

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 20050237243 A1 (ANNAMAA, P ET AL), 27 October 2005 (27.10.2005), abstract --	1-8
A	US 20030108664 A1 (KODAS, T T ET AL), 12 June 2003 (12.06.2003), Paragraph [0353] -- -----	1-8

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Cited literature, if any, will be enclosed in paper form.

INTERNATIONAL SEARCH REPORT

Information on patent family members

29/12/2007

International application No.

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US	20050237243	A1	27/10/2005	CN	1691408	A	02/11/2005
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				FI	20040584	A	27/10/2005
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				US	20070122932	A	31/05/2007
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