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Remarks:
Amended claims in accordance with Rule 137(2) EPC.

(54) Antenna plug

(57) An antenna plug, which consists of a signal pin (1), which is mounted axially and slideably, and a shielding sleeve (5) mounted slideably around the said signal pin, both the signal pin (1) and the shielding sleeve (5) are subject to a force exerted by the compression springs (2, 6), which make them protrude above the surface of the casing (7) of the antenna plug, the said antenna plug is provided with an insulating sleeve (3) that separates the signal pin (1) and a guiding sleeve (4), along which the shielding sleeve is mounted slideably, wherein the butting surface of its shielding sleeve (5) is provided with at least two contact pins (17), which are adapted to engage with a plurality of flat-end shielding contacts of the socket.

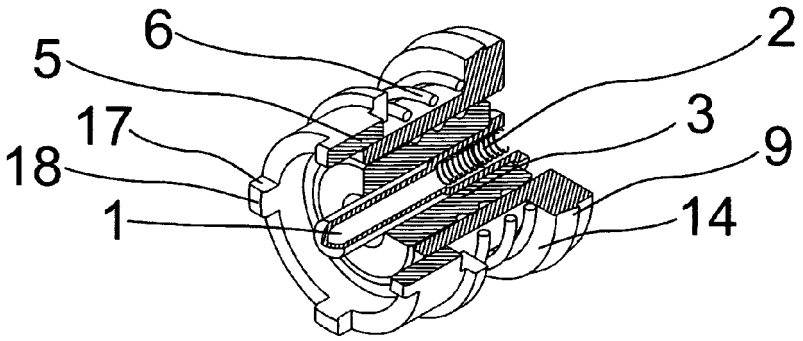

Fig. 4

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Description

[0001] This invention relates to an antenna plug for electronic devices, which consists of a signal pin, mounted axially and slideably, and a slideable shielding sleeve surrounding the said signal pin.

[0002] In electronic devices the external antenna receiving radio signals, e.g. GPS, GSM, is connected with the electronic device by means of a plug and an antenna socket.

[0003] The European patent EP 0343848 B1 discloses an antenna connector for a mobile phone, which consists of a round pin and a plurality of contact blades located on both sides of the pin along the same line.

[0004] The European patent EP 1193810 B1 discloses an electric connector for a mobile phone, which has a form of an adapter and is provided, on both sides, with an axial main pin and a surrounding slideable resilient sleeve with a flat contact surface.

[0005] The German patent DE 101 64799 B4 discloses an antenna connector for a mobile phone, which is provided with a plurality of multi-axially located pins. A major inconvenience of this solution is that the signal pin is not perfectly shielded by the axial and parallel shielding pins.

[0006] The research works that have resulted in this invention included the measurement of the loss of antenna signal transmitted by the antenna connector as a function of the signal frequency for various configurations and shapes of the antenna plug.

[0007] This is an objective of this invention to provide an antenna plug, which will ensure the most favourable shielding of the signal pin and will enable an application of this pin to various types of known antenna sockets with various contact surfaces.

[0008] According to the invention there is provided an antenna plug, characterised in that the butting surface of its shielding sleeve is provided with at least two contact pins, which are adapted to engage with a plurality of flat-end shielding contacts of the socket.

[0009] The contact surface of the contact pins of the shielding sleeve and the contact surface of the signal pin are positioned in one plane when the plug is in the "as-connected" state.

[0010] The shielding sleeve of the antenna plug is favourably provided, on its butting surface, with four contact pins located symmetrically on the circumference of the shielding sleeve.

[0011] The contact surface of the contact pins, located on butting surface of the shielding sleeve, is favourably flat.

[0012] The contact surface of the contact pins, located on butting surface of the shielding sleeve, is convex.

[0013] The guiding sleeve of the plug is connected with the plug casing by means of a snap joint.

[0014] The guiding sleeve is provided, on the circumference of its flange, with a with a resilient protruding ring, which is adapted to enter into the corresponding groove in the casing of the plug.

[0015] The performance tests of the antenna plug, according to the invention, proved that it ensures the most favourable shielding for the signal transmitted through the pin and, in the same time, it can be applied to various sockets provided with various configurations of the shielding contacts.

[0016] The antenna plug, according to the invention, is depicted on the drawings where Fig. 1 - is a longitudinal section of the antenna plug, according to the invention; Fig. 2 - is a top view of the same plug; Fig. 3 - is a side view of the same plug; Fig. 4 - is a perspective view of the same plug along the B-A cross-section; Fig. 5 - is a perspective top view of the plug, according to the invention, additionally provided with a plurality of contact pins; Fig. 6 - is a perspective bottom view of this plug; Fig. 7 - is a side view of this plug; Fig. 8 - is the plug, according to the invention, sitting in a socket according to the DE 101 64 799 B4; fig. 9 - is a comparative chart of noise suppression.

[0017] The antenna plug, according to the invention, as depicted in the Figs. 1-4, consists of a known signal pin (1), which is mounted axially and slideably, an insulating sleeve (3), in which there is a housing (12) fixed immovably and adapted to guide the signal pin (1) axially, and a shielding sleeve (5) mounted slideably around the outer surface of the guiding sleeve (4). The signal pin (1) is exposed to a force exerted by the first compression spring (2), which is mounted in a cavity (15) and the other end of which rests on the bottom (16) of the housing (12). In the hole within the guiding sleeve (4) the insulating sleeve (3) is clamped thanks to deformable grooves (10) formed on its outer surface. The shielding sleeve (5) is subject to a force exerted by the second compression spring (6) mounted around the outer surface of the guiding sleeve (4). The bearing surfaces for the second compression spring (6) are the upper surface of the flange (14) of the guiding sleeve (4) and the lower surface of the flange (13) of the shielding sleeve (5). On its portion, which protrudes from the casing (7), the shielding sleeve (5) is provided with contact protrusions (17), which butting surface (18) is flat or convex.

[0018] The antenna plug, as depicted in the Figs. 5-7, according to the invention, consists of the ring-type plug (19) and a plurality of additional contacts (20), enclosed in the casing (7) and adapted to transfer other electric signals.

[0019] The antenna plug, according to the invention, may be adapted to various known connectors. The Fig. 8 depicts the plug, according to the invention, as-connected with an antenna socket according to the German patent DE 101 64 799 B4.

[0020] The Fig. 9 is a chart comparing the noise suppression for A: the plug according to the invention and B: a known plug comprising a plurality of axial and parallel tubular pins.

[0021] The chart shows that the noise suppression is higher in case of the plug according to the invention and the higher is the frequency of the signal transmitted

through the antenna plug, the bigger is the difference in noise suppression.

[0022] The invention is not limited to the embodiments presented above but includes also any modifications thereof provided that these modifications are consistent with the idea of this invention.

Claims

1. An antenna plug, which consists of a known signal pin (1), which is mounted axially and slideably, and a shielding sleeve (5) mounted slideably around the said signal pin, both the signal pin (1) and the shielding sleeve (5) are subject to a force exerted by the compression springs (2, 6), which make them protrude above the surface of the casing (7) of the antenna plug, the said antenna plug is provided with an insulating sleeve (3) that separates the signal pin (1) and a guiding sleeve (4), along which the shielding sleeve is mounted slideably, **characterized in that** the butting surface of the shielding sleeve (5) is provided with at least two contact pins (17), which are adapted to engage with a plurality of flat-end shielding contacts of the socket.

2. The plug according to the Claim 1, **characterized in that** the contact surface (18) of the contact pins (17) of the shielding sleeve (5) and the contact surface of the signal pin (1) are positioned in one plane when the plug is in the "as-connected" state.

3. The plug according to the Claim 1, **characterized in that** the shielding sleeve (5) of the antenna plug is provided, on its butting surface, with four contact pins (17) located symmetrically on the circumference of the shielding sleeve.

4. The plug according to the Claim 1, **characterized in that** the contact surface of the contact pins (17), located on butting surface of the shielding sleeve, is flat.

5. The plug according to the Claim 1, **characterized in that** the contact surface of the contact pins (17), located on butting surface of the shielding sleeve, is convex.

6. The plug according to the Claim 1, **characterized in that** the guiding sleeve (4) of the plug is connected with the casing (7) of the plug by means of a snap joint.

7. The plug according to the Claim 6, **characterized in that** the guiding sleeve (4) is provided, on the circumference of its flange (14), with a resilient protruding ring (9), which is adapted to enter into the corresponding groove (8) in the casing (7) of the plug.

Amended claims in accordance with Rule 137(2) EPC.

1. An antenna plug, which consists of a known signal pin (**1**), which is mounted axially and slideably, and a shielding sleeve (**5**) mounted slideably around the signal pin, both the signal pin (**1**) and the shielding sleeve (**5**) are subject to a force exerted by the compression springs (**2, 6**), which make them protrude above a surface of a casing (**7**) of the antenna plug, the antenna plug is further provided with an insulating sleeve (**3**) that separates the signal pin (**1**) and a guiding sleeve (**4**), along which the shielding sleeve (**5**) is mounted slideably, **characterized in that** a butting surface of the shielding sleeve (**5**) is provided with at least two contact pins (**17**), which are adapted to engage with a plurality of flat-end shielding contacts of a socket, and a contact surface (**18**) of the contact pins (**17**) and a contact surface of the signal pin (**1**) are positioned in one plane, when the plug is in the "as-connected" state, wherein the insulating sleeve (**3**) has on its outer surface deformable grooves (**10**), which are adapted to clamp the insulating sleeve (**3**) in a hole within the guiding sleeve (**4**).

2. The plug according to Claim 1, **characterized in that** the shielding sleeve (**5**) of the antenna plug is provided, on its butting surface, with four contact pins (**17**) located symmetrically on the circumference of the shielding sleeve (**5**).

3. The plug according to Claim 1, **characterized in that** the contact surface of the contact pins (**17**), located on butting surface of the shielding sleeve (**5**), is flat.

4. The plug according to Claim 1, **characterized in that** the contact surface of the contact pins (**17**), located on butting surface of the shielding sleeve (**5**), is convex.

5. The plug according to Claim 1, **characterized in that** the guiding sleeve (**4**) of the plug is connected with the casing (**7**) of the plug by means of a snap joint.

6. The plug according to Claim 5, **characterized in that** the guiding sleeve (**4**) is provided, on the circumference of its flange (**14**), with a resilient protruding ring (**9**), which is adapted to enter into the corresponding groove (**8**) in the casing (**7**) of the plug.

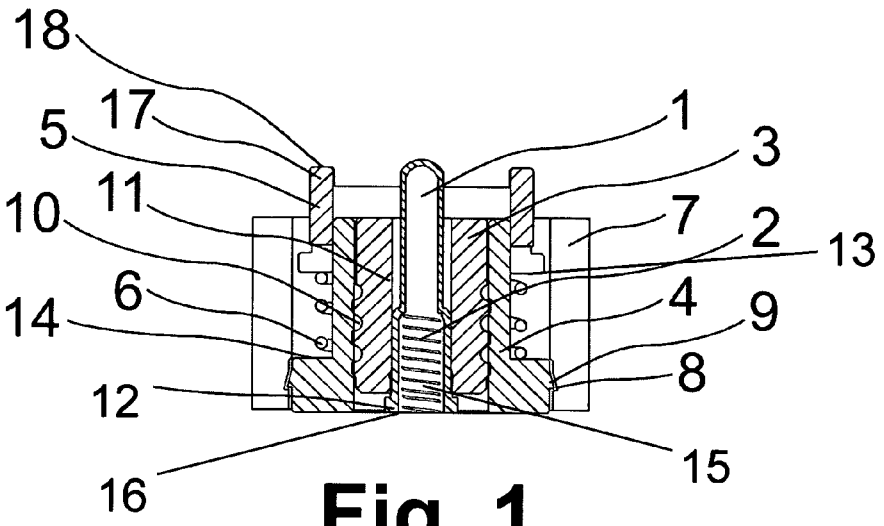

Fig. 1

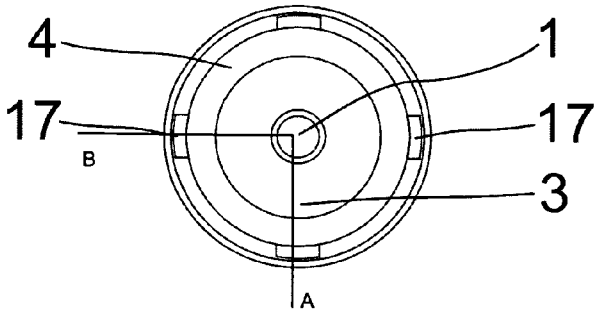

Fig. 2

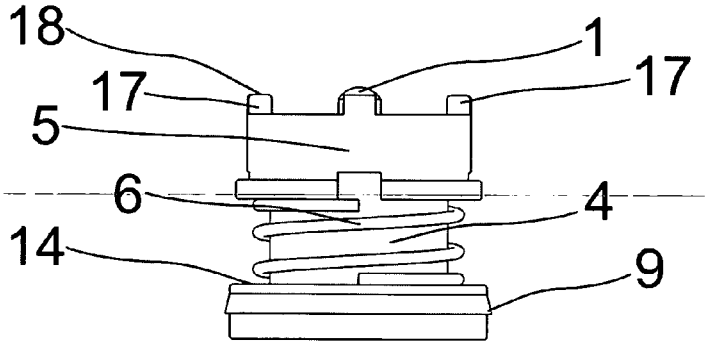

Fig. 3

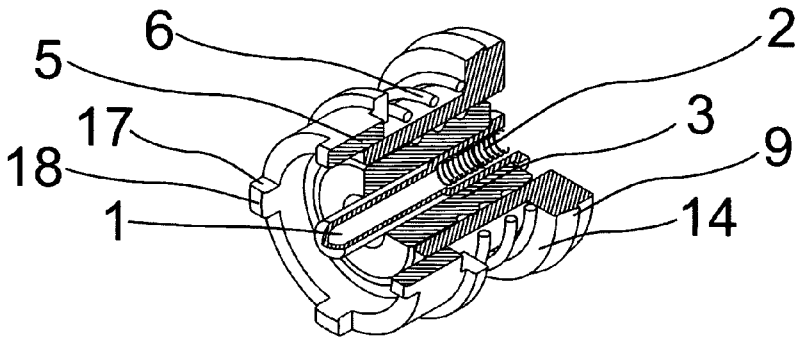

Fig. 4

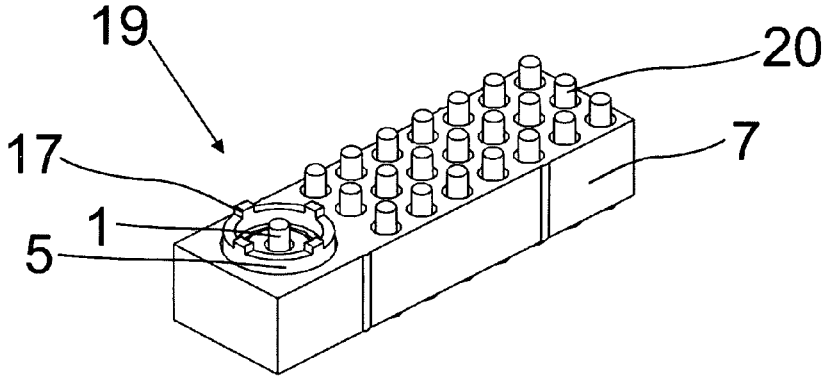

Fig. 5

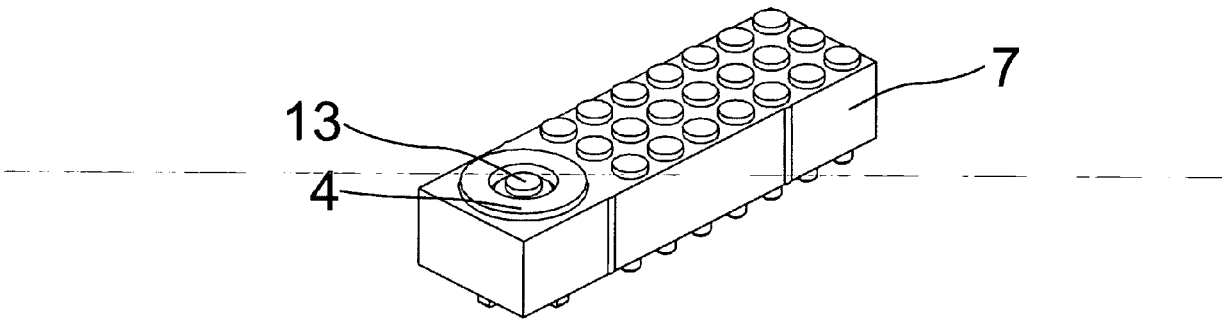

Fig. 6

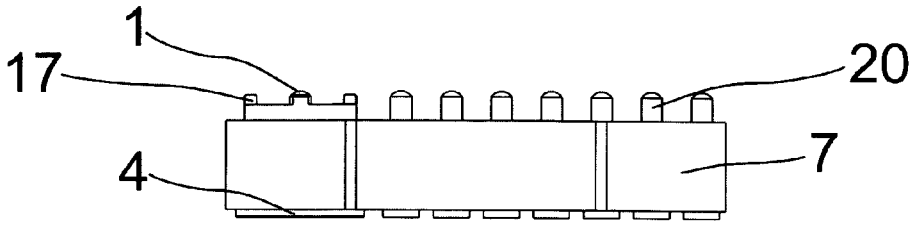

Fig. 7

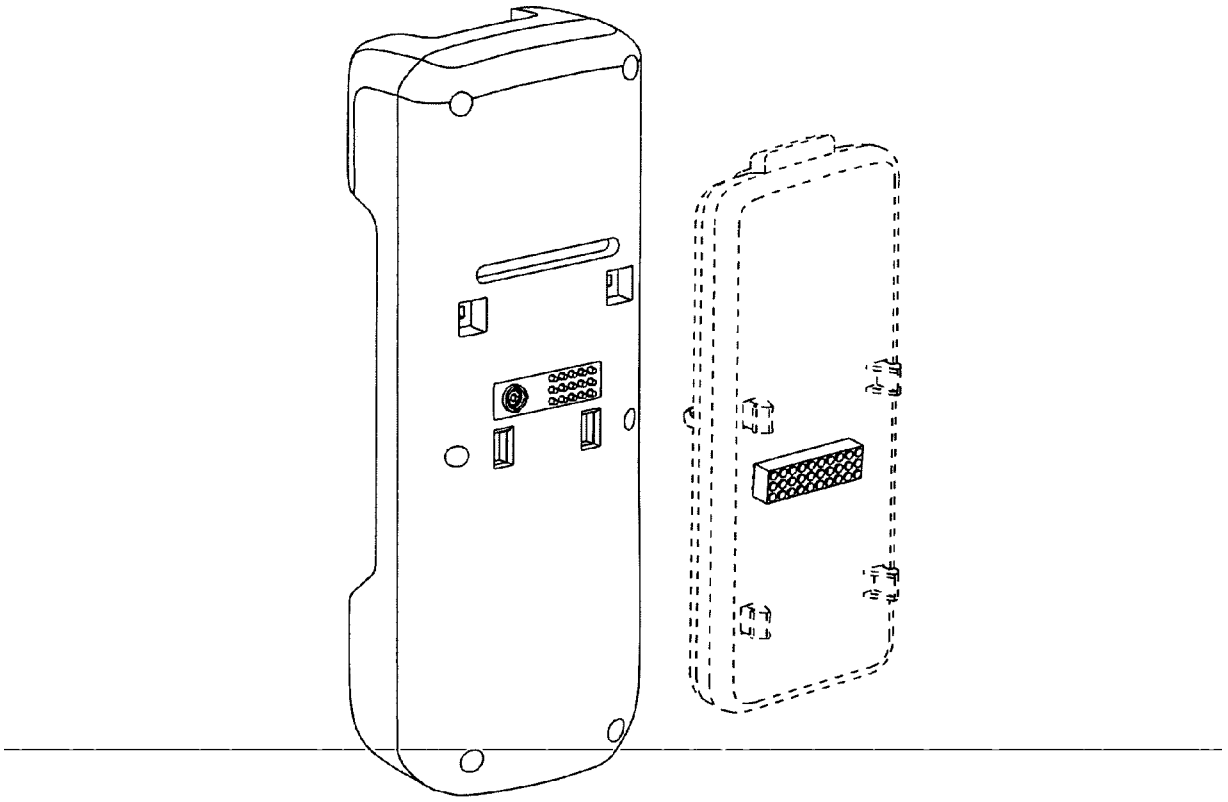

Fig. 8

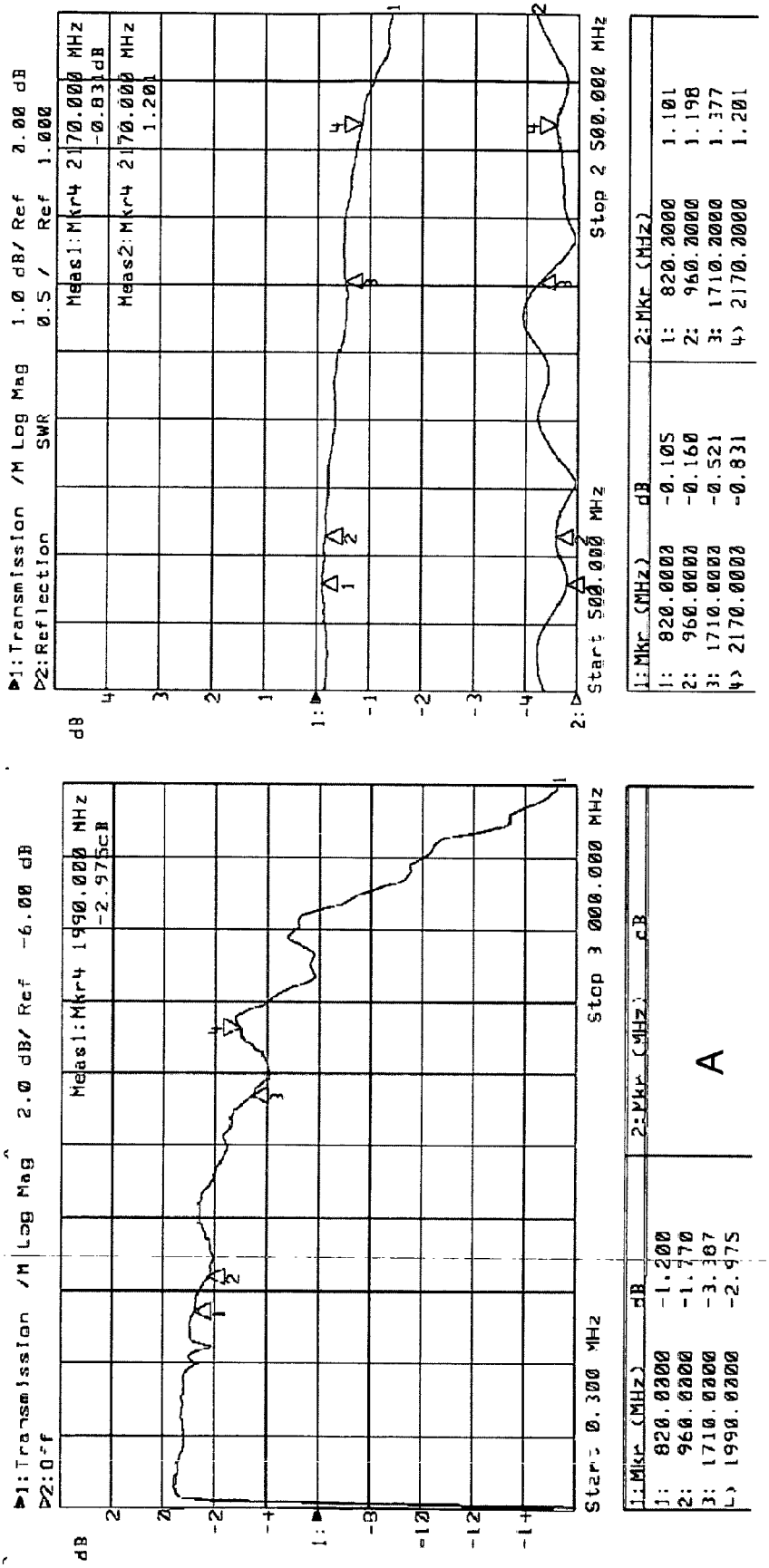
A
B
Start 0.300 MHz
Stop 3 000.000 MHz
Start 500.000 MHz
Stop 2 500.000 MHz

Fig. 9

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EUROPEAN SEARCH REPORT

Application Number
EP 10 46 0024

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The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
The Hague	18 October 2010	Salojärvi, Kristiina

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