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<p>(21) International Application Number: PCT/SE93/00719 (22) International Filing Date: 3 September 1993 (03.09.93) (30) Priority data: 9202551-9 4 September 1992 (04.09.92) SE (71) Applicant (for all designated States except US): ALLGON AB [SE/SE]; Box 500, S-184 25 ÅKERSBERGA (SE). (72) Inventors; and (75) Inventors/Applicants (for US only) : SALDELL, Ulf [SE/SE]; Kvarnåsvägen 2, S-184 51 Österskär (SE). BERGQUIST, Håkan [SE/SE]; Åsätra, S-184 91 Åkersberga (SE). ENGBLOM, Gunnar [SE/SE]; Mönstringsvägen 160, S-184 33 Åkersberga (SE).</p>		<p>(74) Agents: BILLBERG, Hans et al.; Axel Ehrners Patentbyrå AB, Box 10316, S-100 55 Stockholm (SE). (81) Designated States: CA, JP, KR, US, European patent (AT, BE, CH, DE, DK, ES, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE). Published <i>With international search report.</i> <i>With amended claims.</i> <i>In English translation (filed in Swedish).</i></p>
<p>(54) Title: ANTENNA MOUNTING ON WINDOWS</p>		
<p>(57) Abstract</p> <p>A known mounting for attaching an antenna pole to a motor vehicle window comprises an antenna mounting plate which is fitted to the outside of the window glass and an inner plate which is fitted to the inside of the window glass. The inner plate includes antenna connecting means and means for connecting a coaxial cable to a receiver/transmitter. With the intention of simplifying the antenna mounting in a manner which will enable the antenna pole to be readily removed but nevertheless to be securely held when the vehicle is in use, and also with the intention of eliminating the deleterious effect of atmospheric conditions on the mounting and the component parts thereof, so as to prevent corrosion or rusting, the mounting plate (1) is made of an electrically non-conductive material and has formed integrally therewith an attachment (2) which coacts slidably with an antenna-carrying attachment piece (5). The mounting plate has an outer contour which corresponds to the outer contour of the inner plate (12), this plate also being made of an electrically non-conductive material.</p>		

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ANTENNA MOUNTING ON WINDOWS

The present invention relates to an antenna mounting for attaching an antenna or antenna post to a window of a motor vehicle, said mounting including an antenna attachment plate which is intended to be mounted onto the outer surface of the window, an inner plate which is intended to be mounted onto the inner surface of the window, antenna connecting means and means for connecting a coaxial cable to a receiver/transmitter.

Antenna mountings of this kind are known to the art from U.S. 4,932,806, for instance. In the case of this known antenna mounting, the antenna pole is attached to a mounting plate on the outside of the window by means of a screw connection. The screw connection, the mounting plate and the antenna pole attachment piece are all made of metal. These components are thus exposed to the effect of ambient elements and the antenna pole is easily broken unintentionally by catching in some external object. The metal components are also affected by atmospheric conditions, which may render the screw connection difficult to loosen or remove when wishing to remove the antenna pole.

An object of the present invention is to simplify the antenna mounting so that while enabling the antenna pole to be easily removed from its mounting it will nevertheless remain safely secured when the vehicle is in use. Neither shall atmospheric conditions have a corrosive effect on the mounting and its components. Another object of the invention is to provide a simple and reliable coupling system between antenna and coaxial cable to the receiver/transmitter such as to take-up the minimum of space. The antenna mounting shall thus not be bulky or require excessive window space.

These objects are achieved in accordance with the invention with an antenna mounting having the characteristic features

set forth in the following Claims.

The invention will now be described in more detail with reference to a suitable exemplifying embodiment thereof and also
5 with reference to the accompanying drawings.

Figure 1 illustrates the mounting plate from above and Figure 2 illustrates the mounting plate from beneath, i.e. towards
10 the side of the plate that lies against the window.

Figure 3 is a side view of the mounting plate and Figure 4 is a side view taken at an angle of 90° in relation to the side
view of Figure 3.

Figure 5 is a side view of the antenna pole and its attachment
15 piece. Figure 6 illustrates the attachment piece from one side and at an angle of 90° in relation to the view shown in Figure 5.

Figure 7 illustrates the inner plate as seen towards the side
20 which lies distal from the window when mounted.

Figure 8 is a side view of the inner plate.

Figure 9 is a side view of the inner plate as seen from the
25 left in the plane of the drawing.

Figure 10 illustrates a printed circuit board as seen from the
30 side thereof which lies against the window and thus against the mounting plate and the antenna.

The plate 1 is an integral unit made of an electrically non-
conductive material and having a triangular shape in plane.
The underside of the plate 1 is flat and is intended to be
35 affixed directly to the window glass with the aid of a suitable fastening means. The mounting plate has an integrated attachment 2 on the side thereof distal from the window glass,

this attachment 2 being located centrally of the mounting plate. The attachment 2 is shown in side view in Figure 3. As will be seen from Figure 2, the attachment includes two mutually parallel grooves or channels 3 and 4 which extend
5 parallel with the plane of the mounting plate. Figure 4 illustrates the mounting plate and the attachment from the direction indicated by the arrow IV in Figure 3. The attachment 2 is intended to carry a removable and slidable attachment piece
10 5 in which the antenna pole 6 is rigidly fitted, see Figure 5. The attachment piece 5 includes rails 7 and 8 which extend along two mutually opposing sides of the attachment piece and fit into respective grooves 3 and 4 in the attachment 2. The rails 7 and 8 of the illustrated embodiment have a U-shaped cross-section. The bottom part of the antenna pole 6 is moulded
15 in the attachment piece 5 and is curved so as to form a pole-extension 9 which extends parallel to the plane formed by the rails 7 and 8. The pole-extension 9 is preferably secured to a metal plate 10, e.g. soldered thereto, see Figure 6, such as to form a coupling device which forms part of the coupling
20 means between the antenna and the coaxial cable on the other side or inside of the window glass. Figure 6 shows the attachment piece as seen in a direction perpendicular to the side view of Figure 5. The attachment piece is made of an electrically non-conductive material.

25 The attachment 2 and the attachment piece 5 are thus intended for mounting the antenna pole 6 onto the mounting plate 1, which is effected by inserting the rails 7 and 8 into the grooves 3 and 4 in the attachment 2 from one side of the
30 mounting plate 1. The attachment 2 and the attachment piece 5 may be configured to achieve some form of snap engagement therebetween, as indicated in Figure 3 by means of a pin 11. The intention is that the attachment piece 5 can be readily pushed from the attachment 2 by hand when wishing to remove
35 the antenna pole, for instance when washing the vehicle and in order to prevent the antenna pole being stolen. When using an attachment and an attachment piece of the illustrated configu-

ration and when producing said parts from an appropriate material, corrosion of the parts is avoided and the antenna pole can be fitted and removed easily. It must also be ensured that the slip stream engendered by the vehicle in motion will not loosen the antenna pole from the mounting plate.

Figure 7 is a plan view of the inner plate which is fitted onto the inside of the window glass and which carries the end of the coaxial cable to the receiver/transmitter to be connected to the radio antenna. The inner plate 12 has the same outer contours as the mounting plate 1. The inner plate is made of an electrically non-conductive material. Fitted to or moulded in the side of the inner plate 12 that lies against the window glass is a circuit board 13, see Figure 10. The circuit board is shown in broken lines in Figure 7 and Figure 7 shows the inner plate 12 as seen towards that side thereof which faces away from the window glass. A metal plate 14 is mounted in the centre of the circuit board 13.

The metal plate 14 forms a connection plane with the antenna 6 and its optional metal plate 10. The circuit board also carries an earth plane 15 in the form of wire disposed in folds around the metal plate 14. The ends of the wire are enlarged by flattening said ends, as shown at 16.

Figure 9 is a cross-sectional view of the inner plate taken on the line IX-IX in Figure 7. As will be seen from the side view shown in Figure 8, a thickening 17 extends centrally across the inner plate. This thickening 17 is also shown in Figure 9. The thickening is an integral part of the inner plate, for instance a moulded part, in which the free end of the coaxial cable 18 is moulded. The coaxial cable is thus connected electrically with the components on the circuit board 13, these connections being shown in Figures 9 and 10. Thus, the centre conductor 19 of the coaxial cable 18 is connected to the metal plate (the connection plane) 14 by means of a wire 20. The metal sheath (not shown) of the coaxial cable is

connected by means of a wire 21 to the earth plane in the form
of a wire 15. Between the metal plate 14 and the earth plane
15, there is provided an electric coupling 22, the electrical
properties of which are included in the impedance adaptation
5 to the coaxial cable 18.

The electrical length of the earth plane corresponds to a
quarter of a wavelength, although the material length of the
earth plane, i.e. the extension of the wire 15, is much
10 smaller than one-quarter of a wavelength.

As will be seen from Figure 8, the circuit board 13 is fitted
closely to the inner plate 12, so as to form a thin and smooth
platform. The mounting plate is secured with the aid of an
15 appropriate fastener means, for instance double-sided adhesive
tape, with the circuit board facing towards the window glass
and therewith opposite the place where the mounting plate 1 is
fitted. The result is an antenna pole mounting with which the
radio coupling is formed by the lower part of the antenna and
20 a metal plate when used, together with the metal plate 14 of
the circuit board. There is thus formed a so-called capacitor
coupling. The dielectric plate between the metal parts is
formed by the window glass (not shown). The requisite earth
plane is thus found in the circuit board, and the coaxial
25 cable coupling for connection to the receiver/transmitter is
comprised of the inner plate 12.

CLAIMS

1. A mounting for fitting an antenna pole to window glass, comprising an antenna mounting plate which is intended to be fitted to the outer surface of the window glass, an inner plate which is intended to be fitted to the inner surface of the window glass and which includes antenna coupling means and means for connecting a coaxial cable to a receiver/transmitter, characterized in that the mounting plate (1) is made of an electrically non-conductive material and has integral therewith an attachment (2) which coacts slidably with an attachment piece (5) carrying the antenna (6), and in that the outer contours of the mounting plate (1) correspond to the outer contours of the inner plate (12), and in that said plate is made of an electrically non-conductive material.

2. A mounting according to Claim 1, characterized in that the lower part (9) of the antenna pole (6) located in the attachment piece (5) is curved so as to provide a pole-extension which extends parallel with the plane of the mounting plate (1).

3. A mounting according to Claim 1, characterized in that the antenna-pole attachment piece (5) includes two mutually parallel rail means (7, 8), one on each respective opposite side of the attachment piece, said rail means forming guides which coact with grooves (3, 4) provided in the mounting plate (1) or vice versa.

4. A mounting according to Claim 1 and 2, characterized in that the antenna-pole attachment piece (5) has a metal plate (10) which is joined to the antenna pole and which when the attachment is fitted extends parallel with the plane of the mounting plate (1) and forms a coupling with a coupling plane on the inner plate (12).

5. A mounting according to Claim 1, characterized in

z e d in that the side of the inner plate (12) which lies proximal to the mounting plate (1) carries a circuit board (13) which includes a central metal plate (14) which forms a coupling plane with the antenna pole (6), and an earth plane (15), wherein the metal plate (14) is connected to the centre conductor (19) of the coaxial cable by means of a connector (20) and the earth plane (14) is connected to the metal sheath of the coaxial cable (18) by means of a connector (21).

6. A mounting according to Claim 5, c h a r a c t e r i - z e d in that the earth plane (15) is comprised of a wire-form and is disposed in the circuit board (13) outside the central metal plate (14).

7. A mounting according to Claim 6, c h a r a c t e r i - z e d in that the wire-form of the earth plane (15) includes an extension in several folds in one and the same plane.

8. A mounting according to Claim 6 or 7, c h a r a c t e - r i z e d in that the earth plane (15) includes surface-enlarged regions (16) of the wire-form.

9. A mounting according to Claim 5, c h a r a c t e r i - z e d in that the coupling plane (14) is connected electrically (22) to the earth plane (15), wherein the electrical properties of said electrical connection (22) are included in the impedance adaptation to the coaxial cable (18).

10. A mounting according to Claim 5, c h a r a c t e r i - z e d in that the earth plane (15) has an electrical length which corresponds to one-quarter of a wavelength, whereas the material length of the earth plane (15) is smaller than one-quarter of a wavelength.

11. A mounting according to Claim 5, c h a r a c t e r i - z e d in that the inner plate (12) carrying the circuit board (13) is secured to the inner surface of the window glass with

the aid of an adhesive means.

AMENDED CLAIMS

[received by the International Bureau on 2 February 1994 (02.02.94);
original claims 1-3 amended; other claims unchanged (2 pages)]

1. A mounting for fitting an antenna pole to window glass, comprising an antenna mounting plate which is intended to be fitted to the outer surface of the window glass, an inner
5 plate which is intended to be fitted to the inner surface of the window glass and which includes antenna coupling means and means for connecting a coaxial cable to a receiver/transmitter, c h a r a c t e r i z e d in that the mounting plate
10 (1) is made of an electrically non-conductive material and has integral therewith an attachment (2) which coacts slidably with an attachment piece (5) carrying the antenna (6), and in that the outer contours of the mounting plate (1) correspond to the outer contours of the inner plate (12), and in that
15 said plate is made of an electrically non-conductive material, and in that the lower part (9) of the antenna pole (6) located in the attachment piece (5) is curved so as to provide a pole-extension which extends parallel with the plane of the mounting plate (1) and forms a capacitive coupling means with a coupling plane on the inner plate (12).
20
2. A mounting according to Claim 1, c h a r a c t e r i z e d in that the antenna-pole attachment piece (5) includes two mutually parallel rail means (7, 8), one on each respective opposite side of the attachment piece, said rail means
25 forming guides which coact with grooves (3, 4) provided in the mounting plate (1) or vice versa.
3. A mounting according to Claim 1, c h a r a c t e r i z e d in that the antenna-pole attachment piece (5) has a
30 metal plate (10) which is joined to the antenna pole and which when the attachment is fitted extends parallel with the plane of the mounting plate (1) and forms the capacitive coupling with the coupling plane on the inner plate (12).
- 35 4. A mounting according to Claim 1, c h a r a c t e r i z e d in that the side of the inner plate (12) which lies proximal to the mounting plate (1) carries a circuit board

(13) which includes a central metal plate (14) which forms the coupling plane with the antenna pole (6), and an earth plane (15), wherein the metal plate (14) is connected to the centre conductor (19) of the coaxial cable by means of a connector (20) and the earth plane (14) is connected to the metal shield of the coaxial cable (18) by means of a connector (21).

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5. A mounting according to Claim 4, characterized in that the earth plane (15) is comprised of a wire-form and is disposed in the circuit board (13) outside the central metal plate (14).

6. A mounting according to Claim 5, characterized in that the wire-form of the earth plane (15) includes an extension in several folds in one and the same plane.

7. A mounting according to Claim 5 or 6, characterized in that the earth plane (15) includes surface-enlarged regions (16) of the wire-form.

8. A mounting according to Claim 4, characterized in that the coupling plane (14) is connected electrically (22) to the earth plane (15), wherein the electrical properties of said electrical connection (22) are included in the impedance adaptation to the coaxial cable (18).

9. A mounting according to Claim 4, characterized in that the earth plane (15) has an electrical length which corresponds to one-quarter of a wavelength, whereas the material length of the earth plane (15) is smaller than one-quarter of a wavelength.

10. A mounting according to Claim 5, characterized in that the inner plate (12) carrying the circuit board (13) is secured to the inner surface of the window glass with the aid of an adhesive means.

Fig. 1

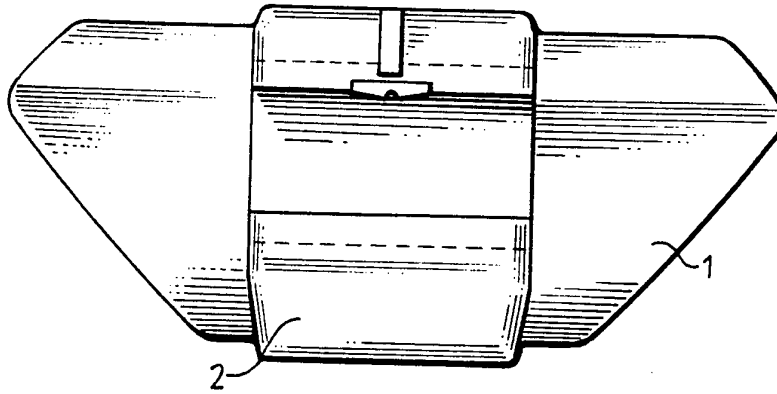


Fig. 2

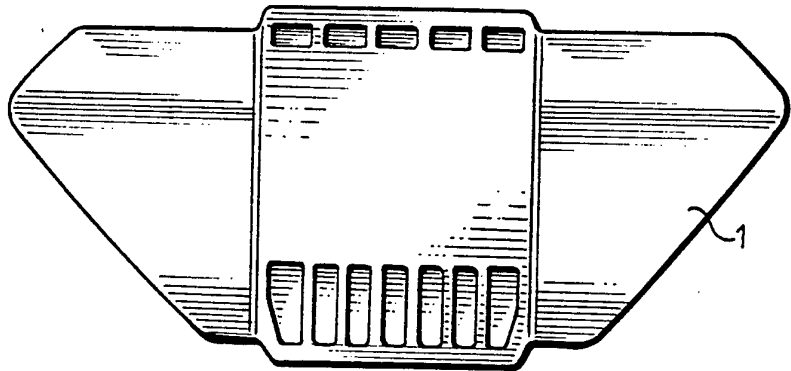


Fig. 3

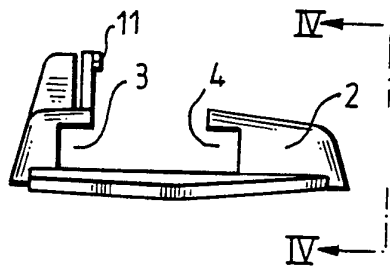
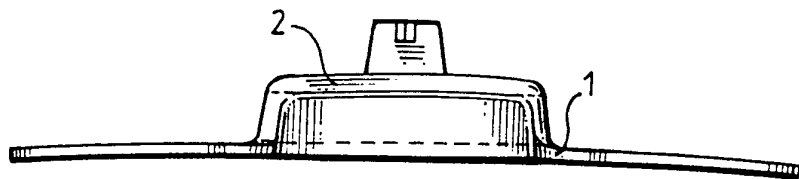


Fig. 4



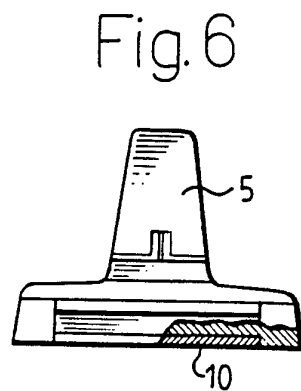
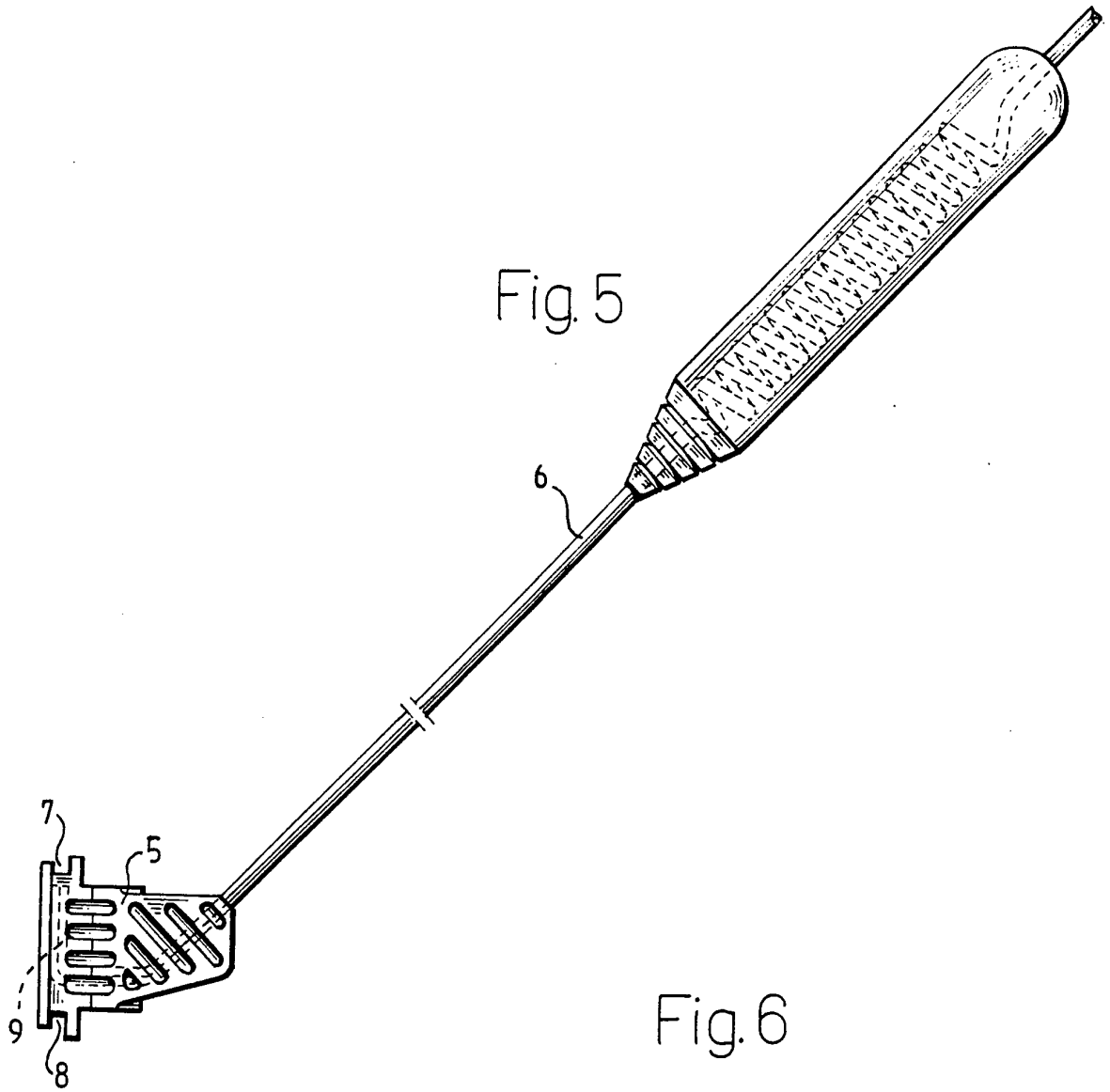


Fig. 7

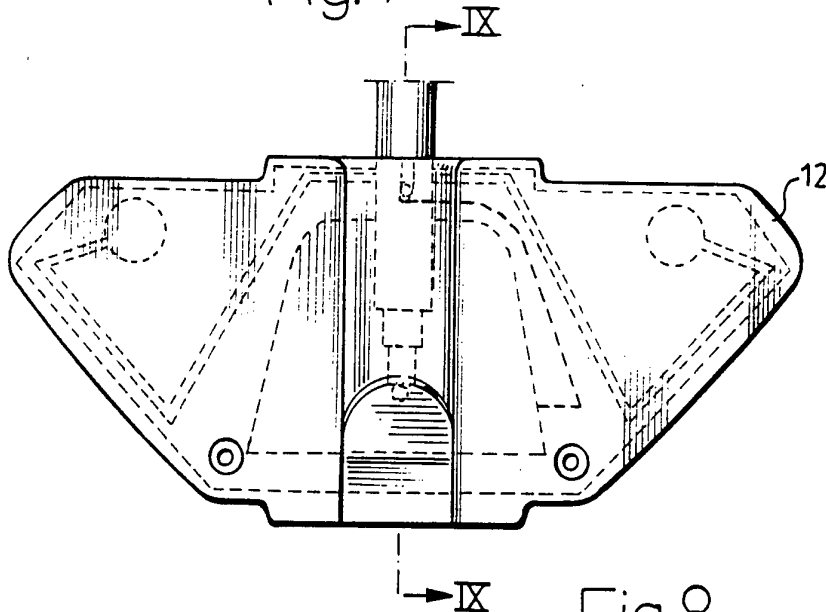


Fig. 8

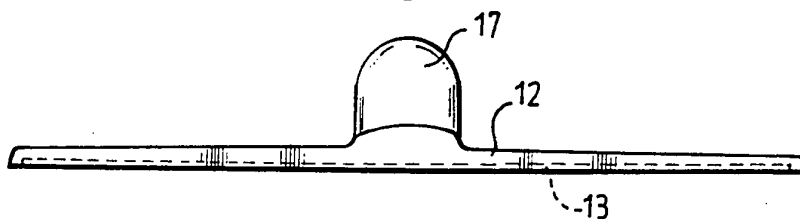


Fig. 9

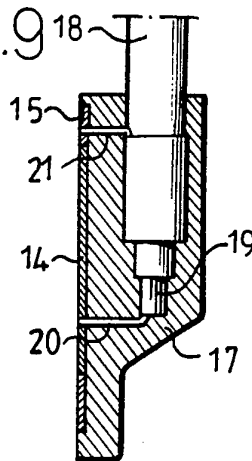
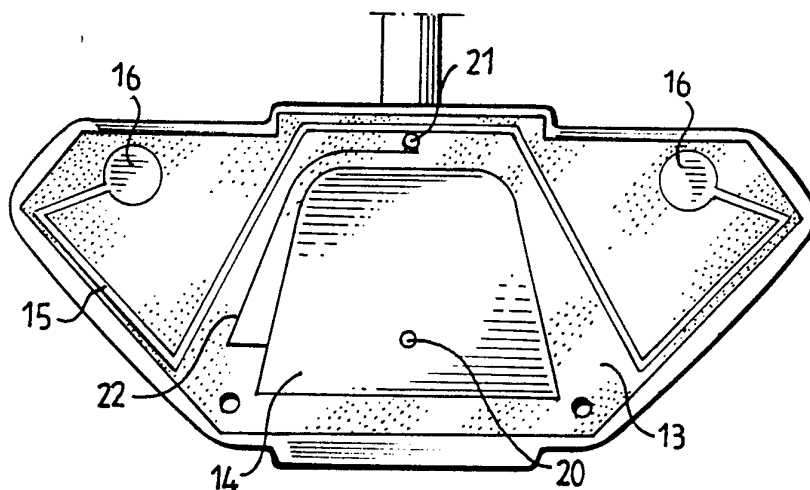


Fig. 10



INTERNATIONAL SEARCH REPORT

International application No.

PCT/SE 93/00719

A. CLASSIFICATION OF SUBJECT MATTER

IPC5: H01Q 1/12, H01Q 1/32

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)

IPC5: 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)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	FR, A1, 2546673 (ICMA S.P.A.), 30 November 1984 (30.11.84), page 1, line 28 - page 2, line 18, figure 1 --	1,3
Y	US, A, 4931806 (BLAKE A. WUNDERLICH), 5 June 1990 (05.06.90), column 2, line 58 - column 3, line 25, figures 1,3 --	1,3
Y	US, A, 5032846 (YU-PIN CHANG), 16 July 1991 (16.07.91), column 2, line 43 - column 3, line 34, figure 2 --	1,3

 Further documents are listed in the continuation of Box C. See patent family annex.

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Date of the actual completion of the international search

1 December 1993

Date of mailing of the international search report

06 -12- 1993

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Facsimile No. +46 8 666 02 86

Authorized officer

Göran Magnusson

Telephone No. +46 8 782 25 00

INTERNATIONAL SEARCH REPORT

International application No.

PCT/SE 93/00719

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US, A, 4658259 (HERBERT R. BLAESE), 14 April 1987 (14.04.87), column 2, line 59 - column 3, line 49, figure 1 --	1,2,5,11
A	US, A, 4862183 (HERBERT R. BLAESE), 29 August 1989 (29.08.89), see the whole document --	1,2,5-11
A	US, A, 4992800 (DALE R. PARFITT), 12 February 1991 (12.02.91), column 2, line 10 - column 3, line 43, figure 1 -----	1,5-11

INTERNATIONAL SEARCH REPORT
Information on patent family members

16/10/93

International application No.
PCT/SE 93/00719

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
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US-A- 4931806	05/06/90	AU-A- 3455489 GB-A- 2218852	16/11/89 22/11/89
US-A- 5032846	16/07/91	NONE	
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US-A- 4862183	29/08/89	AU-B- 591019 AU-A- 1067288 EP-A- 0279117	23/11/89 28/07/88 24/08/88
US-A- 4992800	12/02/91	NONE	