

(19)



Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) Publication number:

0 114 797
A2

(12)

EUROPEAN PATENT APPLICATION

(21) Application number: 84850019.5

(51) Int. Cl.³: **H 01 Q 15/14**

(22) Date of filing: 18.01.84

(30) Priority: 20.01.83 SE 8300280
20.01.83 SE 8300281
18.11.83 SE 8306372

(43) Date of publication of application:
01.08.84 Bulletin 84/31

(84) Designated Contracting States:
AT BE CH DE FR GB IT LI LU NL SE

(71) Applicant: **Andersson, Stig Olof**
Kvarngatan 61
S-335 00 Gnosjö(SE)

(71) Applicant: **Gustafsson, Regis**
Köpmannagatan 10
S-335 00 Gnosjö(SE)

(72) Inventor: **Andersson, Stig Olof**
Kvarngatan 61
S-335 00 Gnosjö(SE)

(72) Inventor: **Gustafsson, Regis**
Köpmannagatan 10
S-335 00 Gnosjö(SE)

(74) Representative: **Onn, Thorsten et al,**
AB STOCKHOLMS PATENTBYRA Box 3129
S-103 62 Stockholm(SE)

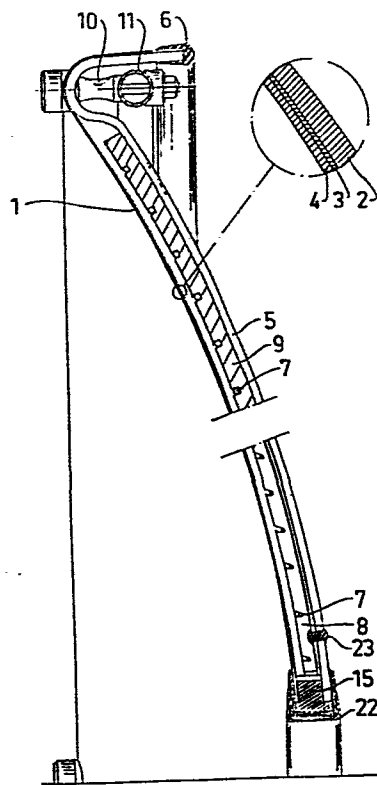
(54) **Micro wave antenna.**

(57) Parabolic antenna made from several layers of vacuum-formed plastic. A first front vacuumshaped shell (1) consists in its turn of a rear supporting layer (2), a metal layer (3) for reflection of radiation and a front protective layer (4), behind this front shell an air space, behind this an insulation (9) and finally a rear enclosing shell (5). The shells are at the outer edge interconnected, sealed and provided with elastic fastening means (10).

EP 0 114 797 A2

./...

FIG. 1



This invention relates to antennas of the kind including a reflecting surface collecting or focusing the radiation. Antennas of this kind are for instance radar antennas, so-called parabolic antennas for transmitting and receiving for instance satellite television as well as antennas for telephone communication. Antennas of this kind have been known for several years and these antennas have been made in different ways. Up to now these antennas have had a tendency to be comparatively expensive to make or of a bad quality due to the fact that the reflecting surface must be very carefully shaped in order to allow an optimum output. Already very small deviations from the ideal surface result in essential power losses. One fabrication method used for the fabrication of antennas of this kind is the enclosing of a metal net in a glassfiber reinforced plastic, which for instance has been shown in the US patent 2 948 896.

Yet another method of fabrication is to coat the reflectory surface of the antenna with a metal, which for instance has been shown in the French patent 2 502 852, which like the device according to the US patent mentioned above is a sandwich-construction, i.e. a construction with several different layers in order to achieve a sufficient strength. These two constructions mentioned are however comparatively expensive to fabricate due to the great number of fabrication steps as well as the amount of used parts. Nor is the desired exactness for the reflectory surface obtained. This exactness in its turn is very important in order to ensure maximum gain for the antenna.

The object of the invention is therefore to define an embodiment and a method for fabrication of parabolic antennas, which is essentially simpler than known technique and at the same time, results in an improved exactness in the reflecting surface.

In accordance with the invention this object is obtained

by vacuum forming the antenna or shaping this in a heated state from for instance plastic, which before the shaping can be coated with a metal layer. In this way a very exact reflecting surface for the micro wave in question is obtained with a comparatively cheap method. The reflector can either be made with a reflecting layer, "preferably of metal" on its front side or on the back side of a plastic layer.

In case the metal layer is arranged on the outside it can not be left in this condition, but must suitably be coated or in some other way covered with a protective layer, not only to protect the metal layer, but also to prevent the parabolic antenna from functioning as a sun reflector which might burn the receiving means in the focus point.

It is important that the layer in front of the reflecting surface is very thin or has a thickness related to the wavelength of the radiation that is to be reflected in order to prevent power loss.

In an embodiment of the invention the shaping does not only include the metal layer and a supporting plastic layer, but also a third layer, so that the metal layer is enclosed between two plastic layers, a thin one and a thicker one, in front of and behind the metal layer respectively. This shaping can take place in one common concurrent operation or in separate operations.

Several different types of material can be used for the fabrication of an antenna in accordance with the invention. For example acrylic can be used and for instance a mixture consisting of 25% impact resistant acrylic and 75% of a not impact resistant acrylic.

In an antenna particularly adapted to northern latitudes it is possible to arrange heating of the antenna in a known manner behind the shell comprising the above mentioned layers and to arrange a further shell behind the heating device partly in

order to enclose the heat and partly in order to protect the heating device. These shells enclose a closed intermediate space for the heating device, which space also serves to distribute the heated air. In one embodiment of the invention the heating layer, that can consist of resistance wires, heating cloth or the like, and the rear enclosing shell can be shaped in the same operation. Alternatively the method of foaming can be used. By appropriately enclosing the heating device in this way or another which will be exemplified below it will be possible to feed the heating device directly with a net voltage without an intermediate transformer and without safety risks.

The shaping of the antenna preferably can be made against a positive mould, i.e. that the surface brought in contact with the mould is the front side of the antenna. In this way one also obtains the advantage that the same tool can be used independently of how many layers or how thick the antenna is to be made. In case the heating device is also enclosed in the shaping it is possible, if this consists of radial spokes holding the resistance wires, to obtain radially extending projections in the rear shell or layer, which further increases the stiffness of the antenna. Of course similar reinforcements can be obtained in other ways, for instance by the shaping of a rear shell in a separate operation, a suitable amount of space being provided for the heating device between the front and rear shell of the antenna.

It is of course also possible, in order to place a heating device between the front and rear shell, to include distance elements of a suitable material, e.g. polyurethane. Within the scope of the invention it is of course also possible to carry out the shaping in two steps, so that the front layer or shell is first shaped according to the mould, then the rear shell or layer(s) is heated and shaped

by suction or pressure over the first front shell.

The invention is below to be described by way of example with reference to the drawings. Fig 1 shows a section through a part of an antenna in accordance with the invention while figs 2 and 3 show the suspending of the antenna.

The antenna shown in fig 1 includes a front shell, which has been given the reference numeral 1. This shell, in its turn has a rear supporting plastic layer 2, a metallic layer 3 applied on the front side of this, and about 12 μm (Micrometer) thick and a protecting layer in front of the metal layer, the protective layer being 130-150 μm and given the reference number 4. Instead of being built up in this way the front layer can be relatively thin, preferably 1,5 mm at the most, and coated with metal, which on the rear side will be protected in this way in the interior of the antenna. The antenna further includes a rear shell having the reference numeral 5. The front shell 1 and the rear shell 5 are then at the circumference thereof arranged close to each other and sealed with a seal 6 (or by glueing), that runs around the circumference of the antenna. The antenna can either be an unbroken surface or provided with a hole in the middle as is shown. The hole in the middle can be closed in the same way as at the outer edge or in the way shown with a ring 15 between the antenna shells and a rubber mold 22 gripping this distance ring 15 as well as the two antenna shells.

As can be seen the shells 1 and 5 are so shaped that they define between themselves a space, in which a resistance wire 7 is placed. This is in the left part of the figure shown as secured in a holder 8 extending like spokes and provided with oblique cuts, so that the resistance wire cannot lose its grip. The parts 8 arranged like spokes are fastened to the rear antenna shell, e.g. by rivets 23 of plastic. In the right part of fig 1 the resistance

wire 7 is placed on or in an insulating disc 9, which further improves the heating of the front side of the antenna, since the heat from the resistance wire 7 is prevented by the insulation from being led backwards. Since
5 in the right as well as in the left embodiment an air space is present for air circulation behind the front shell of the antenna an even heating of the antenna front shell is ensured.

The antenna is at its outer edge elastically suspended in
10 a circular frame. This elastic fastening is achieved by the aid of rubber elements 10, at which bolts are fastened that in turn are fastened at the antenna and the supporting construction, respectively, which in fig 1 in particular constitutes a frame 11. At the fastening point of
15 the elastic element 10 at the antenna special washers are adapted to the circular shape of the antenna, partly to achieve a good seal and partly to allow as much freedom of movement as possible between the antenna and the supporting frame. Since several elastic fastening elements
20 10 are arranged around the antenna, the antenna always retains the same amount of directional stability as the supporting frame, so that in spite of the elastic arrangement of the antenna, permitting movement due to temperature differences, the antenna always maintains its direction, which is very important in order to achieve a good
25 reception.

Fig 2 shows the supporting frame of the antenna shown in fig 1 which is shown here only schematically and given the reference numeral 12. The circular frame 11 is connected with further details of framework construction
30 that is journalled in an upper journalling point 13 and can be adjusted with a screw 14 to its elevation. The journal 13, as can be seen in particular from fig 3, consists of two ears 17 and 18, a strut 16 arranged between these ears and journal not shown therebetween. Since
35

the ears 17 and 18 are relatively far apart a good stability is obtained even if a play should occur in the journal 13. The strut 16 is in its turn fastened to a vertical strut 19, which in turn constitutes a journal
5 for movement in the horizontal plane in a fixed frame, that has been given the reference numeral 20 and which is intended to be fastened to a wall or mast.

At one of the ears 18 is further fastened a latent strut 21 extending to a frame part 20, with which a fine adjustment or change of the direction of the antenna in the
10 horizontal plane can be achieved. By mounting the strut 19 in a way known per se in parallel with the axis of the earth it is possible to use the antenna for receiving or emitting signals from several different satellites.

15 The antenna is changed from one satellite to another only by a small change of the adjustment means 21. The adjustment means 21 can even be replaced by a device driven by an electrical motor.

Finally it should be mentioned that the better precision
20 and the improved design of the antenna in accordance with the invention results in a far stronger signal than what is the case with the known antennas, which in turn means that the antenna in accordance with the invention can be made with approximately 30% smaller diameter than what else
25 should have been possible.

Within the scope of the invention it is also possible to apply the reflective coating after the shaping or forming, e.g. by metal spray.

CLAIMS

1. Method of fabricating bowl shaped antennas intended for reception or transmission of radiation with micro wave length, c h a r a c t e r i z e d i n that the antenna is fabricated by vacuum forming or heat forming of a suitable thermoplastic material to the desired shape.
2. Method according to claim 1, c h a r a c t e r i z e d i n that the material includes a supporting shed of a thermoplastic material coated by a reflecting electrically conductive layer.
3. Method according to claim 2, c h a r a c t e r i z e d i n that the reflective layer is enclosed between two plastic layers, which are all shaped in one operation.
4. Method according to claim 1, c h a r a c t e r i z e d i n that the reflective layer is enclosed between two separately shaped plastic layers.
5. Method according to claim 3 or 4, c h a r a c t e r i z e d i n that the reflective layer is applied on the back of the front layer by using metal foil or flame technique.
6. Method according to claim 1 or 2, c h a r a c t e r i z e d i n that after the shaping of layers to a shell at the back of this electric heating means are arranged, which are then enclosed by a rear shell with a space therebetween so great that air circulation in the closed space can ensure an even heating.
7. Method according to any of claims 1-6, c h a r a c t e r i z e d i n that distance elements are placed between two layers.
8. Method according to any of the preceding claims, c h a r a c t e r i z e d i n that the outer edge of the antenna is sealed after fabrication.
9. Method according to claim 8, c h a r a c t e r i z e d i n that the sealing is obtained by the aid of a rubber or plastic mould.

10. Method according to claim 1, c h a r a c t e r i - z e d i n that after the fabrication of the antenna a metal layer is applied on the front side with a protective layer applied thereon.

11. Antenna fabricated in accordance with any of the preceding claims 1-10, c h a r a c t e r i z e d i n that it includes a bowl shaped antenna element, that at its circumference is fastened in a frame by means of elastic elements preferably arranged evenly spaced over the circumference.

12. Method according to any of the claim 1-10, c h a r a c - t e r i z e d i n that the antenna is given a parabolic shape.

FIG. 1

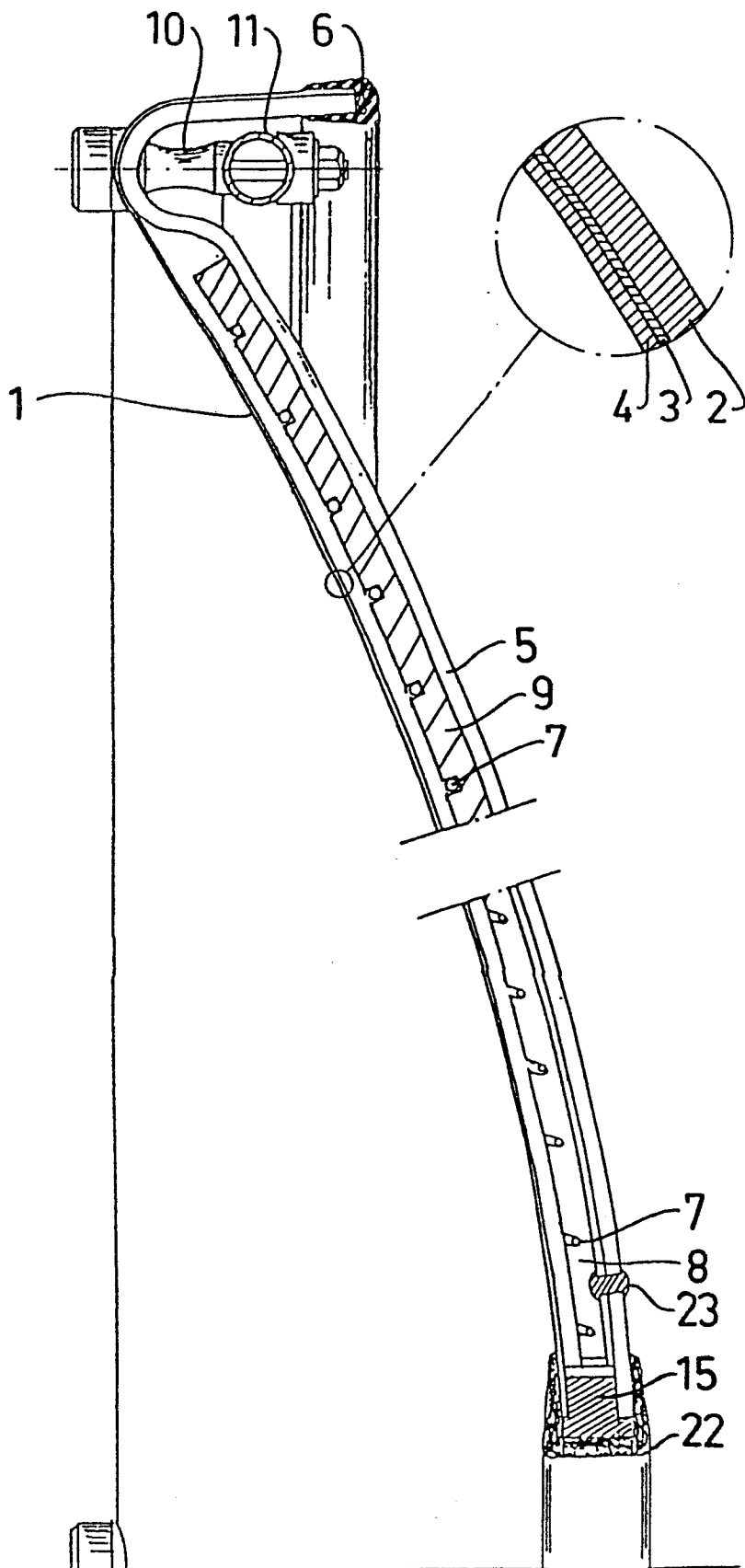


FIG.2

