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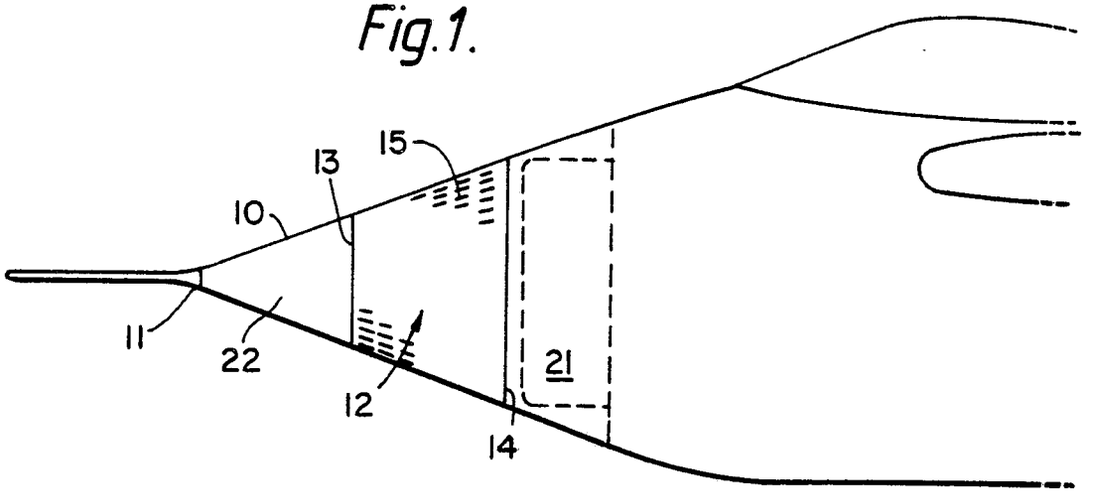
(54) Vehicleincluding a radar antenna.

(57) A vehicle (1) includes a radar antenna (12) mounted in a nose portion (10) of it. The antenna (12) is shaped substantially to conform to the exterior contour of the nose portion (10) and has a surface angled with reference to the forward direction and hence to the expected direction of incident emission from a threat radar so that the emission is deflected away from and not returned to its source. This reduces the forward hemisphere radar signature of the vehicle which is the dominant signature as far as an enemy radar is concerned to a considerable degree.

Fig.1.



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Vehicle Including A Radar Antenna

This invention relates to a radar antenna arranged to reduce or at least change the radar signature of a vehicle on which it is mounted. By radar signature is meant that characteristic radar signal which, when the vehicle is illuminated by a radar emission, is returned from the vehicle and received back at the radar source. The term vehicle is to be used in a broad sense to include aircraft and other aerial vehicles, such as guided weapons, in addition to ground or sea based vehicles.

Conventionally most vehicles which carry radar have a forward facing radar transparent panel or dome behind which their radar receiving and transmitting equipment is located. The radar equipment may be mounted in the nose of the vehicle such as an aircraft or guided weapon or may be mounted in the nose of a pod attached to the vehicle. Such equipment makes a significant contribution to the radar signature of a vehicle particularly over its forward hemisphere which is the dominant radar cross-section illuminated by an enemy search radar. This is particularly so where an enemy search radar is operating at the same frequency or at certain multiples of the vehicle's radar frequency.

It is thus an aim of the present invention to reduce the radar signature of such a radar installation and hence reduce the radar signature of a vehicle on which it is mounted. Naturally, this aim must be achieved without degrading the performance of the radar installation beyond acceptable limits.

According to this invention a vehicle includes a radar antenna mounted in a nose portion of it, the antenna being shaped substantially to conform the exterior contour of the nose portion and having a surface angled with reference to the forward direction and hence to the expected direction of incident emission from a threat radar, so that the emission is deflected away from and not returned to its source.

Preferably the antenna is of hollow, generally tubular form so that equipment, either associated with the radar antenna or separate from it, can be housed within the antenna.

Preferably, where the nose portion diverges rearwardly from a forward apex, the antenna has the form substantially of a truncated cone with spaced, not necessarily regular, leading and trailing edges lying aft of the apex. By this arrangement the antenna can extend fully around the nose portion. Its included angle can be selected not only such that the incident radiation from a threat radar source positioned generally forward of the aircraft is deflected by the exterior shape of the antenna in directions other than back to source, but that the desired exterior shape of the nose of the vehicle is closely followed.

The outside of the antenna may include radiating slots through which the radar radiation is emitted and, in this case these slots are preferably covered by a microwave transparent skin.

Preferably, the radar radiation emitted from the antenna is caused to scan by known electronic scanning techniques. The antenna thus remains fixed during the scanning.

A particular example of a vehicle in accordance with this invention will now be described with reference to the accompanying drawings, in which:-

Figure 1 is a side elevation of an aircraft nose, with an antenna fitted;

Figure 2 is a perspective view of the antenna located within a hollow nose cone;

Figure 3 is a perspective view of the antenna; and,

Figure 4 is a scrap partially sectioned perspective view drawn to a larger scale of the antenna.

Hitherto, aircraft have had a nose mounted forward looking radar system which usually includes a tiltable, that is to say scanning, antenna housed within a radar transparent radome, the radome being of a shape chosen to provide both a reasonable aerodynamic and a reasonable radar performance. In achieving this these known systems not only include much unusable space within the radome in front of the antenna but also are found to present an unacceptable high radar signature to enemy surveillance systems as a result of incident radar emissions being reflected from the radar installation and its mountings.

Thus to ameliorate particularly the latter problem, but also reduce any unusable space, the arrangement of Figure 1 is proposed. In this arrangement an aircraft has a nose region 10 which diverges rearwardly from an apex 11 towards the remainder of the fuselage. The nose region 10 may or may not be circular in cross section.

Conforming in general to the contour of the nose is a radar antenna 12. This is formed as a truncated cone with a forward edge 13 and a rearward edge 14, the region in between being formed of metal with radiating slots 15 of known design.

In Figure 2, the nose region 10 is formed of a hollow metal cone-like member, the antenna 12 is frusto-conical and provided with radiating slots 15. The antenna 12 is housed within a radar transparent radome 16 made, for example, of Kevlar (Registered Trade Mark).

In Figure 3, the antenna is formed as a rigid tube structure having an outer skin portion 17 with the slots 15 and a cavity forming wall structure 18. Transmission line feeds 19 feed the microwave radiation to the cavities 18.

The radar emission is caused to adopt a beam type configuration and to be scanned by electronic means feeding the transmission line feeds 19.

Although illustrated as a regular solid of revolution in all the drawings, this is not necessarily the case. For example the front and rear edges 13 and 14 may not be parallel with one another, the antenna may form only part of a solid of revolution, and moreover it may or may not be circular in cross-section.

In the Figures, radar or other equipment can be mounted not only at 21 in Figure 1 but also in the hollow interior of the antenna 12. It can also be mounted ahead of the antenna at 22 (Figures 1 and 2).

Claims

1. A vehicle (1) including a radar antenna (12) mounted in a nose portion (10) of it, the antenna (12) being shaped substantially to conform the exterior contour of the nose portion (10) and having a surface angled with reference to the forward direction and hence to the expected direction of incident emission from a threat radar, so that the emission is deflected away from and not returned to its source.

2. A vehicle according to claim 1, in which the antenna (12) is of hollow, generally tubular form.

3. A vehicle according to claim 1 or 2, in which the nose portion (10) diverges rearwardly from a forward apex and the antenna has the form substantially of a truncated cone with spaced leading and trailing edges lying aft of the apex.

4. A vehicle according to claim 3, in which the antenna extends fully around the nose portion.

5. A vehicle according to any one of the preceding claims, in which the antenna includes radiating slots (15) in its outside surface through which the radar radiation is emitted, and which is covered by a microwave transparent skin (16).

Fig.1.

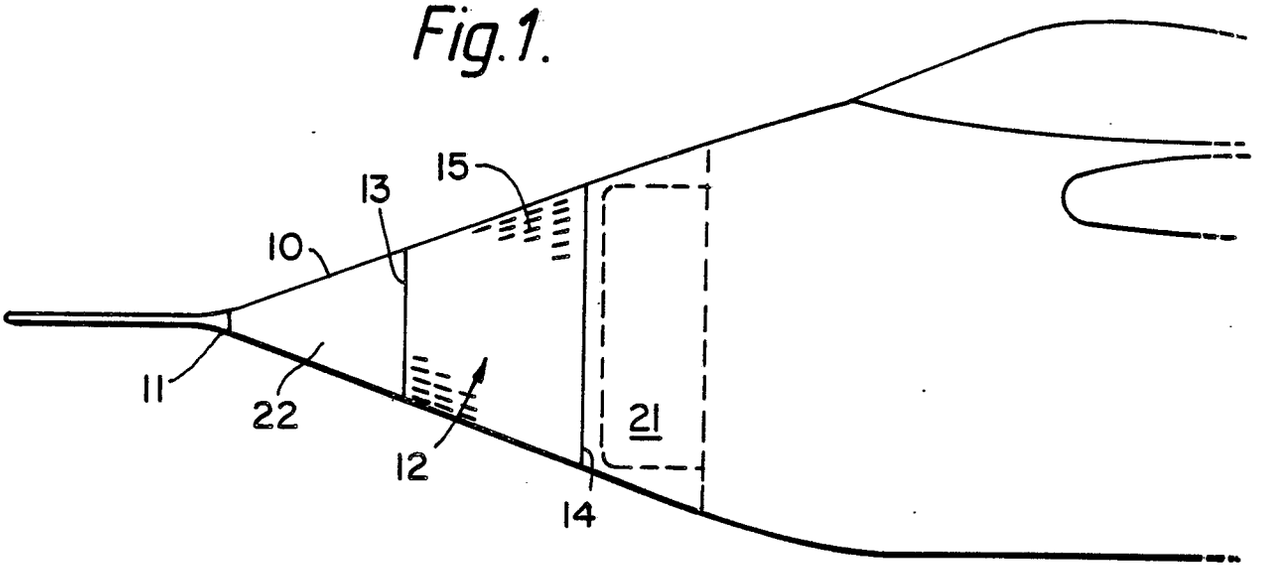

Fig.2.

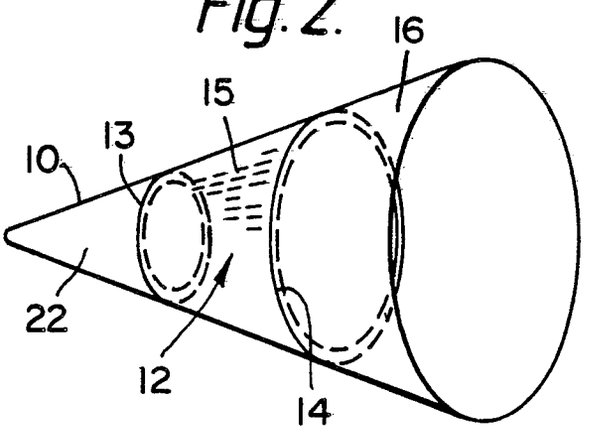

Fig.3.

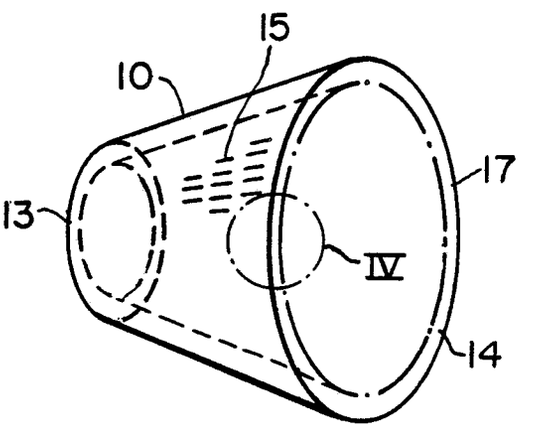

Fig.4.