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(54) Projectile stabilising fin unit.

(57) This invention provides a stabilising fin unit (10) for a projectile in which a number of radially directed fins (14) are secured to a tubular body (12). The fins (14) extend longitudinally of the body (12) and are equiangularly spaced about the body. The fins (14) are secured by welding on the surface of or in grooves (20) in the body (12), and each fin (14) being simultaneously welded along each side by a single pass of two or more welding heads. This form of construction requires minimal machining, provides economy of material and allows thinner fins to be used, reducing drag in flight.

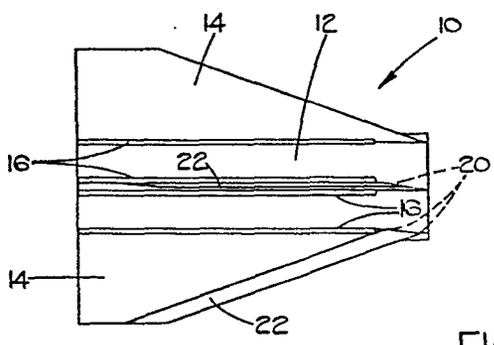

FIG.1.

EP 0 174 082 A1

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Projectile Stabilising Fin Unit

This invention relates to stabilising fin units as fitted to the rear of projectiles or missiles (herinafter referred to as projectiles) for maintaining an accurate trajectory or flight of the latter. The fin units consist usually of a tubular body or core member having radial fins, the body being screwed or otherwise rigidly secured to a rear part of a projectile in an axial arrangement.

The projectiles to which such fin units are fitted are designed for different levels of performance according to the function they are required to perform.

A high performance projectile attains a high speed in flight and this requires a correspondingly high energy charge to propel it from its launcher. In turn this means that the fin unit has to withstand a correspondingly high heat input arising from the burning of the propellant charge. A lower performance projectile which travels slower will be subjected to a correspondingly lower heat input. The fin unit also has to withstand the loads encountered during the flight of the projectile. The mechanical properties of the material from which the fin

unit is constructed will be adversely affected dependant upon the temperature attained in firing and when in flight due to frictional drag at supersonic speed.

Hitherto such fin units have been machined from the solid or extruded from a solid metal blank, for example of aluminium or aluminium alloy, and machined. The present invention seeks to provide an improved stabilising fin unit.

According to this invention a stabilising fin unit comprises a tubular body and a plurality of radial or similarly directed fins extending longitudinally of the body and secured thereto by welding or the like, said fins being uniformly distributed about the periphery of the body.

Further in accordance with the invention the method of manufacture of the fin unit comprises arranging a plurality of radial or similarly directed fins about a tubular body and extending longitudinally thereof said fins being spaced uniformly around the periphery of the body, and securing each fin to the body by welding or the like.

Preferably a welding head or the like is used on each

side of a fin and, in a single pass, simultaneous welds or the like are made along the length or major part of the length of each side of a fin,

More than one fin may be secured to the body simultaneously in a single pass by using welding or the like equipment having a plurality of pairs of welding heads or the like, each pair serving to weld one fin.

Preferably the body and fins are of metal having a performance at elevated temperature superior to that of aluminium and its alloys.

The present invention is further described hereinafter, by way of example, with reference to the accompanying drawings in which:

Figure 1	is a side elevation of a preferred embodiment of stabilising fin unit according to the present invention; and
Figure 2	is a rear elevation of the unit of Figure 1.

Figures 1 and 2 show a stabilising fin unit 10 having round section tubular body or core 12 with radial fins 14 arranged around the body 12, extending lengthwise thereof, and secured to it by welding along the whole or a portion of the length of each side of a fin. The welds are

indicated at 16 i.e. between each side of the fin 14 immediately adjacent its base 18 and the adjacent exterior periphery of the body 12. The fins may be welded to the surface of the body 1 or alternatively the base 18 of each fin may be secured in a respective longitudinal groove 20 by welding. The grooves 20 are equiangularly spaced about the exterior of the body and are shown in dotted lines. Preferably pulsed TIG (tungsten inert gas) welding is employed. A welding head or the like may be used on each side of a fin to make simultaneous welds along the length of each side of a fin. Welding equipment having a number of pairs of welding heads may be used, each pair serving to weld one fin, to secure more than one fin simultaneously in a single pass.

Each fin 14 is of increasing radial extent from the leading end towards the rear end of the body 12. Also the outer edge portion of each fin 14 is chamfered on one side at 22 whereby required rotation is imparted, by relative air flow, to the fin unit about its axis and likewise to the projectile or missile to which it is fitted, for maintaining required accuracy of the trajectory or flight of the projectile under operational conditions.

The body 12 and fins 14 are of stainless steel or other suitable material and in the example shown six equispaced

radial fins 14 are provided about the body 12 but the number may be varied according to requirements.

The fins 14 are shown parallel to the axis of the body 12 but if desired they may have some inclination to the axis in providing a helix or similar formation to the fins 14. The fins may extend with some variation from the true radial direction.

The body 12 has a coaxial bore 24 which is screw threaded as necessary (not shown) for screw on mounting of the fin unit on a co-operating rear part of a projectile which screw threaded engagement tends to be tightened by the rotation imparted to the fin unit during flight. The bore 24 is shown to indicate its size at the time the fins are welded on and to accept any distortion during welding. It is then machined and screw threaded to provide a body of thinner section and hence less weight.

As will be appreciated from the foregoing the fabricated construction of the fin unit and resulting method of manufacture provides considerable practical advantages as regards minimal machining and economy of material whilst it is also suitable for automated production.

The use of material such as stainless steel which has

a performance at elevated temperature superior to that of aluminium and its alloys enables thinner fins to be used. By way of example, fins of 16 S.W.G. (1.6 mm) have proved very successful in practical tests. A further advantage arising out of the use of the thinner fins allowed by the construction of this invention is a reduction of drag in flight. A consequence of this reduced drag is that the projectile suffers a lower velocity drop during flight and consequently it has greater kinetic energy on impact with resultant greater potential for damaging the target.

Pulsed T.I.G. welding is a preferred process for securing the fins to the body because heating is very localised with this process thus minimising risk of distortion.

Extremely neat welds can be obtained which help in minimising drag forces in flight.

CLAIMS:

1. A stabilising fin unit for a projectile, comprising a substantially tubular body and a plurality of radial or similarly directed fins extending longitudinally of the body and secured thereto by welding or the like.

2. A fin unit as claimed in claim 1 wherein said fins are uniformly distributed about the periphery of said body

3. A fin unit as claimed in claim 1 or 2 wherein said body and fins are of metal having a performance at elevated temperature superior to that of aluminium and its alloys.

4. A fin unit as claimed in claim 3 wherein said metal is stainless steel.

5. A fin unit as claimed in any of claims 1 to 4 wherein each said fin is secured in a respective longitudinal groove in said body

6. A method of manufacturing a stabilising fin unit for a projectile comprises arranging a plurality of radial or similarly directed fins about a tubular body and extending longitudinally thereof and securing each

fin (14) to the body (12) by welding or the like.

7. A method as claimed in claim 6 wherein said fins (14) are spaced uniformly around the periphery of said body (12).

8. A method as claimed in claim 6 or 7 wherein a respective welding head or the like is used on each side of a fin (14) and, in a single pass, simultaneously welds or the like are made along at least a major portion of the length of each side of a fin (14).

9. A method as claimed in claim 8 wherein a plurality of fins (14) are secured to the body (12) simultaneously in a single pass using welding or the like equipment having a plurality of pairs of welding heads or the like, each pair serving to weld one fin (14).

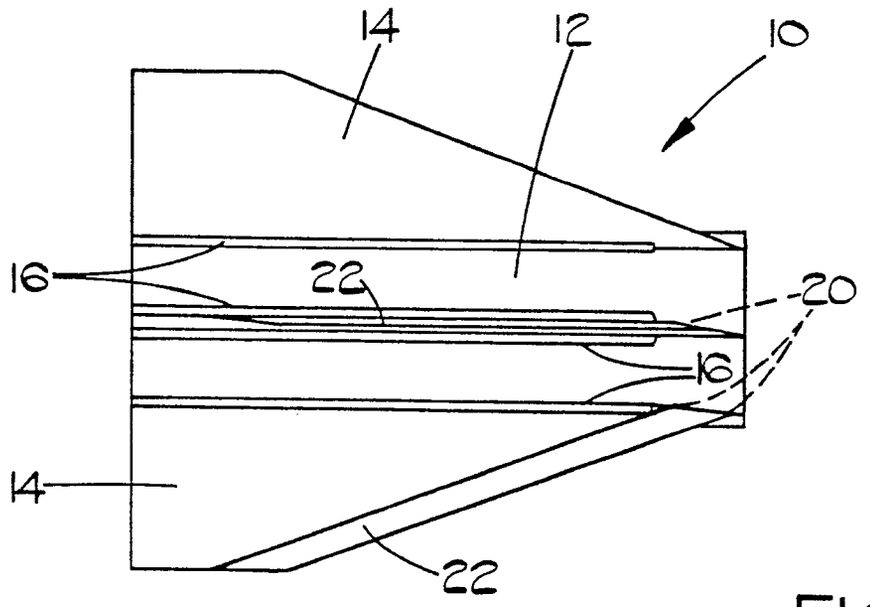

FIG.1.

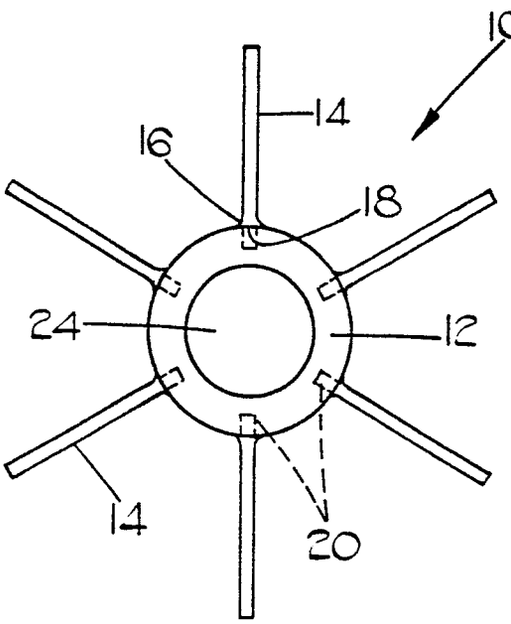

FIG.2.

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EUROPEAN SEARCH REPORT

Application number
0174082

EP 85 30 5205

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int Cl 4)
X	US-A-3 378 216 (OSS) * Column 2, lines 64-72; column 3, line 1; figures 1,2 *	1,2,6, 7	F 42 B 13/24
Y		3,4,5, 8,9	

Y	FR-A-2 099 880 (OY TAMPELLA) * Page 3, lines 12-38; page 4, lines 1-24; figures 1-4 *	3-5	

Y	US-A-3 596 051 (NOMURA) * Column 3, lines 27-48; figures 1-4 *	8,9	
	---		TECHNICAL FIELDS SEARCHED (Int Cl 4)
Y	US-A-3 233 074 (SMITH) * Column 1, lines 27-35,62,63; column 3, lines 28-71; column 4, lines 1-6; figures 1-5 *	8,9	F 42 B B 23 K

X	GB-A- 12 985 (BINGHAM)(A.D.1915) * Whole document *	1,2	

X	FR-A- 592 328 (BRANDT) * Page 4, lines 1-28; figures 1,2,9 *	1,2,6, 7	
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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	16-09-1985	VAN DER PLAS J.M.

CATEGORY OF CITED DOCUMENTS

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L : document cited for other reasons

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EUROPEAN SEARCH REPORT

0174082
Application number

EP 85 30 5205

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int Cl.4)
X	US-A-2 494 026 (ANDERSON) * Column 3, lines 16-31; figure 5 * ---	1,2,6, 7	
A	US-A-2 831 957 (YOUNG) ---		
A	FR-A-1 032 036 (DELES) -----		

TECHNICAL FIELDS SEARCHED (Int. Cl.4)

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	16-09-1985	VAN DER PLAS J.M.

CATEGORY OF CITED DOCUMENTS

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