

PATENT SPECIFICATION

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- (21) Application No. 28651/71 (22) Filed 18 June 1971
 (31) Convention Application No. P 20 34 568.0 (32) Filed 11 July 1970 in
 (33) Germany (DT)
 (44) Complete Specification published 5 June 1974
 (51) International Classification F42B 13/24
 B21K 25/00
 (52) Index at acceptance
 F3A 2K 2M
 B3A 129 26



(54) FINNED TAIL-ASSEMBLY FOR FIN-STABILISED PROJECTILES

(71) We, OY TAMPELLA AB, a Finnish Company, of Tampere, Finland, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:

The invention relates to a finned tail-assembly for fin-stabilised projectiles, and to a process for its manufacture.

Fin-stabilised projectiles have at their end a finned tail-assembly, generally consisting of a carrier tube and fins extending radially from the circumference of the tube and longitudinally to its axis. In this case it is usual to make the carrier tube and fins in one piece. Generally, 7 to 10 vanes are distributed on the circumference of the carrier tube. The carrier tube and fins are made from one part by an extrusion process, extruding the material from a correspondingly-shaped tool. The fins sit on the carrier tube with a relatively large degree of rounding, seen in cross-section. Apart from the fact that a light alloy fin assembly is subject to deformation or damage to the fin when the projectile is fired, the arcuate conformation at the foot portions of the fins relative to the circumference of the carrier tube is disadvantageous for reasons of flow technique, because the widening at the leading edge of the fin, resulting from the rounding, is unfavourable to the flow. The ensuing additional air resistance can have an unfavourable influence on the range of the projectile.

The purpose of the invention is to make a finned tail-assembly for fin-stabilised projectiles which allows higher stresses to be exerted, and has a better aerodynamic shape.

According to one aspect of the invention, there is provided a finned tail-assembly for fin-stabilised projectiles, comprising a car-

rier tube and fins, each fin including a planar fin leaf extending radially from and longitudinally to the axis of the tube and a marginal root portion embedded in the tube and formed of parts alternately upset to opposite sides of the fin leaf through acute angles from the fin leaf.

The fins here advantageously consist of steel, and the projectile's tail tube of light alloy.

In such a design of the finned tail-assembly of fin-stabilised projectiles, a combination of several advantages is achieved. By reason of the fact that the marginal root portion of each fin is formed of parts alternately upset to opposite sides of the finleaf through acute angles from the fin leaf, the thickenings or widenings at the leading edge of the fin resulting from the transitional rounding, and which can increase air resistance, are eliminated. By inserting the independent fins directly into the carrier tube it is possible to make the carrier tube thick enough for the fins as independent parts to engage deeply enough in the carrier tube. Pressing the fin into the carrier tube results in a secure hold of the independent fin in the tube, with simplicity of manufacture, particularly when steel vanes are used, the fins can be kept to a minimum cross-section, giving thin fins whose frontal surfaces present the minimum resistance to the air.

The fins, made of harder material than heretofore, are not so prone to deformation on firing, so that the flight-path of the projectile is rendered more arcuate. This particularly applies to projectiles which can attain very high flight speeds.

In this case the marginal root portion of the fin can be defined between a straight line demarcating it from the fin leaf, and the extreme edge of the portion and the upset parts can form an uninterrupted undulation.

[Price 25p]

According to a further aspect of the invention, there is provided a process of manufacturing a finned tail-assembly for fin-stabilised projectiles, comprising providing a carrier tube, providing fins of a material harder than that of the carrier tube, each fin including a planar fin leaf and a marginal root portion formed of parts alternately upset to opposite sides of the fin leaf through acute angles from the fin leaf, and pressing the fins under radial pressure into the peripheral surface of the tube thereby to embed the marginal root portions of the fins in the tube.

Where the carrier tube is made of light metal alloy and the fins are made of steel, the carrier tube may be at a temperature of from 250°C to 350°C, preferably 300°C, during the pressing of the fins into the tube. By means of such a pressing-in measure, a very secure seating of the independent fin in the carrier tube of the projectile is obtained. If grooves are pre-necessary for grooves to be present in the carrier tube, into which the foot portion of the fin is to engage. If grooves are previously provided in the carrier tube, these should have a smaller clear width than that of the fin. The pressing-in of the fin into the carrier tube, with or without a previously-prepared groove, results in an extremely secure seating of the fin in the carrier tube.

An embodiment of the invention will now be described by way of example, with reference to the accompanying drawings in which:—

Fig. 1 is a view of a fin for forming a finned tail-assembly for fin-stabilised projectiles;

Fig. 2 is a frontal view of the fin in Fig. 1, seen in the direction of arrow II;

Fig. 3 is a view from below, according to line III-III of Fig. 2; and

Fig. 4 shows a finned tail-assembly for a fin-stabilised projectile.

The assembly includes a carrier tube 10, e.g. of light metal alloy, shown partially in section, and fins 1. Each fin 1, shown in Fig. 1, has a planar leaf-shaped part 2 of a harder material, particularly steel, e.g. chrome molybdenum steel, extending radially from and longitudinally to the axis of the tube. Fin leaf 2 can be relatively thin, possibly about 2 mm. so that as a result of the narrow leading edge the air-resistance of the fin is also reduced. The leading edge 3 is preferably abruptly-swept back and, seen in cross-section, tapers forwardly, as Figs. 2 and 3 show. The leading edge 3 is followed by a straight edge 4 at the largest radius of the fin in the assembly. The rear part of fin leaf 2 thereafter drops away with a gentle inclination

defined between a straight line demarcating it from the fin leaf 2, and the extreme edge of the portion and is formed of parts 7 and 8 alternately upset to opposite sides of the fin leaf through acute angles from the fin leaf. The upset parts 7 and 8 are joined by transitional parts 9 of substantially the same thickness as the parts 7 and 8 and form an uninterrupted undulation, as Fig. 3 shows.

The fin is fixed to the carrier tube by pressing the fin into the tube. This can be done by pressing the fins as independent parts into the carrier tube, which is of softer material, by exertion of a radial pressure, into the full material of the carrier tube. For this purpose the material of the carrier tube, during the pressing-in process, can be heated to a temperature of 250°C to 350°C, preferably 300°C. When the carrier tube is heated, the fin can be pressed into the carrier tube without providing a groove or the like in the carrier tube. By means of the undulation of the marginal root portion 6 of fin 1, there is provided a considerable reinforcement of such portion of the fin and thus also of the adjacent region of the fin.

The parts 7 and 8 at the same time prevent axial movement of the fin relative to the carrier tube. The fins are press-seated in the carrier tube with absolute security. In order to press the fin into the carrier tube, a prepared groove can be provided in the latter. The groove can in this case be shallower than the height of the foot portion 6 of fin 1. The groove should also have a smaller clear width than the thickness of the fin. When there is a prepared groove in the carrier tube, the fin can also be pressed in when the carrier tube is in a cold state. The straight line demarcating the marginal root portion 6 from the fin leaf 2 lies in the circumferential surface of the carrier tube so that the parts 7, 8 disappear completely into the carrier tube.

WHAT WE CLAIM IS:—

1. A finned tail-assembly for fin-stabilised projectiles, comprising a carrier tube and fins, each fin including a planar fin leaf extending radially from and longitudinally to the axis of the tube and a marginal root portion embedded in the tube and formed of parts alternately upset to opposite sides of the fin leaf through acute angles from the fin leaf.

2. A finned tail-assembly according to claim 1, wherein the marginal root portion is defined between a straight line demarcating it from the fin leaf and the extreme edge of the portion and the upset parts form an uninterrupted undulation.

3. A process of manufacturing a finned

According to a further aspect of the invention, there is provided a process of manufacturing a finned tail-assembly for fin-stabilised projectiles, comprising providing a carrier tube, providing fins of a material harder than that of the carrier tube, each fin including a planar fin leaf and a marginal root portion formed of parts alternately upset to opposite sides of the fin leaf through acute angles from the fin leaf, and pressing the fins under radial pressure into the peripheral surface of the tube thereby to embed the marginal root portions of the fins in the tube.

- 15 Where the carrier tube is made of light metal alloy and the fins are made of steel, the carrier tube may be at a temperature of from 250°C to 350°C, preferably 300°C, during the pressing of the fins into the tube. By means of such a pressing-in measure, a very secure seating of the independent fin in the carrier tube of the projectile is obtained. If grooves are pre-necessary for grooves to be present in the carrier tube, into which the foot portion of the fin is to engage. If grooves are previously provided in the carrier tube, these should have a smaller clear width than that of the fin. The pressing-in of the fin into the carrier tube, with or without a previously-prepared groove, results in an extremely secure seating of the fin in the carrier tube.

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defined between a straight line demarcating it from the fin leaf 2, and the extreme edge of the portion and is formed of parts 7 and 8 alternately upset to opposite sides of the fin leaf through acute angles from the fin leaf. The upset parts 7 and 8 are joined by transitional parts 9 of substantially the same thickness as the parts 7 and 8 and form an uninterrupted undulation, as Fig. 3 shows.

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2. A finned tail-assembly according to claim 1, wherein the marginal root portion is defined between a straight line demarcating it from the fin leaf and the extreme edge of the portion and the upset parts form an uninterrupted undulation.

3. A process of manufacturing a finned



- tail-assembly for fin-stabilised projectiles, comprising providing a carrier tube, providing fins of a material harder than that of the carrier tube, each fin including
- 5 a planar fin leaf and a marginal root portion formed of parts alternately upset to opposite sides of the fin leaf through acute angles from the fin leaf, and pressing the fins under radial pressure into the per-
- 10 ipheral surface of the tube thereby to embed the marginal root portions of the fins in the tube.
4. A process according to claim 3, wherein the carrier tube is made of light
- 15 metal alloy, and the fins are made of steel, and the carrier tube is at a temperature of from 250°C to 350°C during the pressing of the fins into the tube.

5. A finned tail-assembly for fin-stabilised projectiles, substantially as 20 hereinbefore described with reference to the accompanying drawings.

6. A process of manufacturing a finned-tail assembly for fin-stabilised projectiles, substantially as hereinbefore described with 25 reference to the accompanying drawings.

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