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GUIDE VANE ARRANGEMENT FOR ROCKET MISSILES

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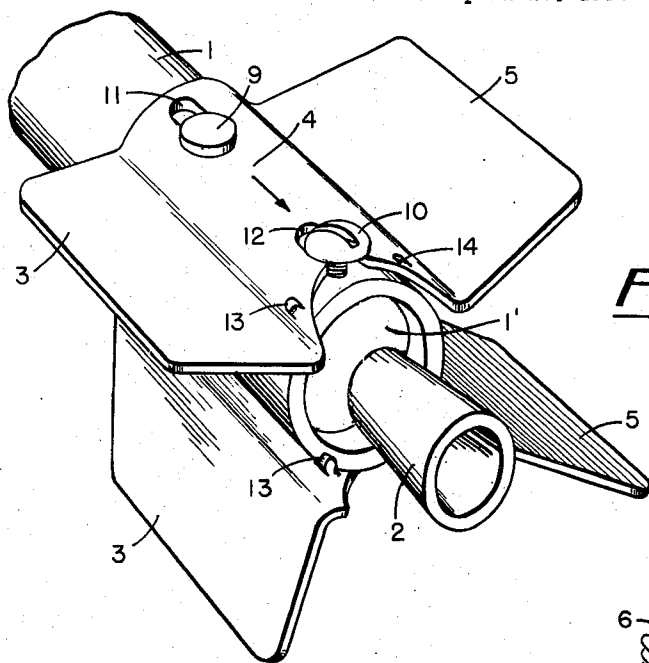


FIG. 1

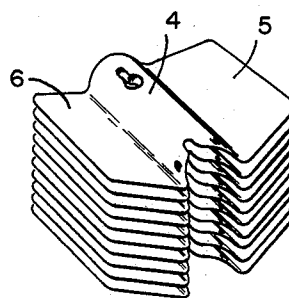


FIG. 3

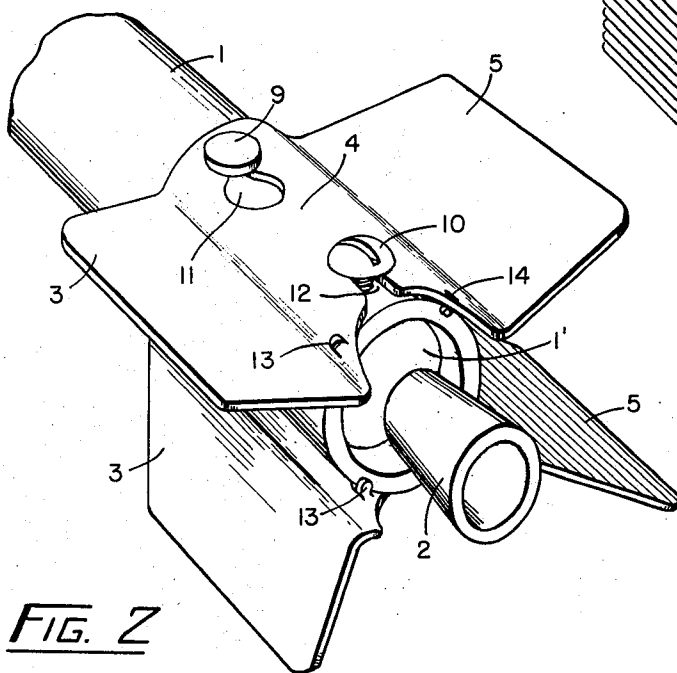


FIG. 2

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GUIDE VANE ARRANGEMENT FOR ROCKET MISSILES

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6 Claims. (Cl. 102—50)

The present invention relates to guide vanes of rocket missiles and mounting means for mounting the vanes on the rocket, more specifically on a tubular portion of the rocket, generally the rocket motor.

To serve their purpose of guiding and stabilizing the trajectory of a rocket missile, the guide vanes must be mounted in a very definite centered position on the rocket motor. While an accurate mounting of the vanes may not present particular difficulties when it is made in the factory or in a fully equipped machine shop, it is desirable to transport and store the rockets without the vanes and to attach the same in situ. As the vanes protrude from the otherwise generally smooth rocket body, they increase considerably the bulk of the shipment and the required storage space. Also, the vanes being comparatively fragile, are easily bent or otherwise damaged.

An accurate centric mounting in situ of the vanes with mounting means as hitherto known causes considerable difficulties, the more so as fully mechanically trained and equipped personnel is not always available and it is often desirable or imperative to complete the mounting of the vanes within the shortest possible period of time.

Accordingly, one of the objects of the present invention is to provide a novel and improved vane and mounting arrangement which permits a rapid and accurate mounting in situ of pairs of vanes in a definite position relative to the rocket motor and other pairs of vanes without requiring the use of tools other than the most simple ones such as a screwdriver.

Another object of the invention is to provide a novel mounting arrangement by means of which the pairs of vanes can be fixed and secured against displacement, both in axial and circumferential direction relative to the rocket body.

Still another object of the invention is to provide a vane and mounting arrangement which permits transportation and storage of the vanes separately from the rockets and stacking of the vanes until used thereby reducing the space requirements to a minimum.

A further object of the invention is to provide a novel and improved mounting arrangement all the components of which on the rocket body protrude very little from the same so that they do not appreciably increase the bulk of the rocket and are not likely to be damaged.

Other and further objects, features and advantages of the invention will be pointed out hereinafter and set forth in the appended claims forming part of the application.

In the accompanying drawing a now preferred embodiment of the invention is shown by way of illustration and not by way of limitation.

In the drawing:

Fig. 1 is an isometric view of a vane and mounting arrangement according to the invention showing an intermediate stage of the application of the arrangement to the body of a rocket.

Fig. 2 is an isometric view similar to Fig. 1 showing

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the vane and mounting arrangement completely attached to the rocket body; and

Fig. 3 is an isometric view of a plurality of stacked vane units.

Referring now to the figures in detail, Figs. 1 and 2 show part of the rear portion of a tubular rocket motor 1 and a nozzle 2 which is mounted on an inner wall 1' of the rocket motor. Two identical guide vane units are provided for the rocket. Each of these units is formed of a single piece of sheet metal and comprises two vanes 3 and 5 joined by an intermediate portion 4. The vanes proper are plane and the intermediate portion 4 of each unit is curved approximately equal to the circumferential curvature of the tube of the rocket motor. The radius of the curvature of the intermediate portions 4 may also be slightly smaller than the outer radius of tube 1 in which case the sheet metal of which the vane units are formed is preferably springy.

For the purpose of releasably attaching the vane units to rocket tube 1 in a definite position relative to the rocket and to each other, two locking members are provided for each vane unit near the rear end of tube 1. These locking members are shown as a pin 9 having a smooth stem and an enlarged substantially disk-shaped head and a screw 10 having an enlarged head. Pin 9 is fixedly secured to the rocket tube 1 by any suitable means and screw 10 is threaded into a threaded hole provided in tube 1 for this purpose. The length of the stem of pin 9 is preferably just sufficient to provide space for the thickness of the intermediate portion 4 when fitted between the tube wall and the head of the pin. Similarly, the length of the threaded portion of screw 10 must be such as to permit a safe grip of the screw in the tube threads when portion 4 is fitted between the screw head and the wall of tube 1. While a pin and a screw are shown, it is of course also possible to provide either two pins or two screws.

The intermediate portion 4 of each vane unit is provided with two female locking elements or slots 11 and 12 coacting with the male locking members 9 and 10. Each of the slots is formed with a portion sufficiently wide to pass therethrough the heads of the pin and the screw respectively and a narrow portion just sufficiently wide to receive the stem and the threaded portion respectively of the locking members. Slot 11 is situated near the forward edge of the vane unit spaced therefrom and slot 12 extends from the rear edge of the vane unit. As can be clearly seen on Figs. 1 and 2, the axial spacing of the retaining members relative to the axial spacing of the slots is such that when a vane unit is placed in a position in which the head of pin 9 is received by the wide portion of slot 11 the threaded portion of screw 10 has already entered the narrow portion of slot 12.

Each of the vane units is further provided with two retaining lugs 13 and 14 protruding from the inner wall of the intermediate portion 4. The two lugs are spaced symmetrically relative to slot 12 and so situated that they will reach over the rear edge of rocket tube 1 when the vane units are mounted on the rocket tube. The two lugs are preferably slightly springy and may be formed by pressing out portions of the intermediate portion 4.

The vane units are attached to the rocket tube by placing each unit with its intermediate portion 4 upon the tube in a position in which the respective screw 10 faces the narrow portion of slot 12 and the forward portion of the unit rests upon the head of pin 9. The vane unit is then slid rearwardly whereby the threaded portion of the screw enters the narrow portion of slot 12, and until the head of pin 9 is in registry with the wide portion of slot 11. The forward portion of the vane unit can now be pressed against the wall of tube 1 and the unit

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can be slid further rearwardly into a position in which the stem of pin 9 has entered the narrow portion of slot 11 and lugs 13 and 14 overlies the rear edge of tube 1. Tightening of screw 10 completes the mounting of a vane unit.

When it is desired to detach a vane unit from the rocket the aforementioned operations are repeated in reversed order.

In case two pins are employed as locking members, a vane unit is detached from the rocket body by slightly pressing the two vanes 3 and 5 toward each other in circumferential direction thereby flattening somewhat the intermediate member 4. As a result, lugs 13 and 14 are forced out of their engagement with the rear edge of rocket tube 1.

The mounting means formed by locking members 9 and 10 and slots 11 and 12 assure that the vane units are always fastened to the rocket body in the same position relative to the rocket body and to each other. It is also apparent that the attachment or detachment of the vane units is extremely simple.

The provision of lugs 13 and 14 increases further the accuracy of the centering of the vane units on the rocket body, and the lugs also prevent any tendency of the vane units to move in axial direction.

The mounting means as hereinbefore described, involve as components protruding from the generally smooth body of the rocket merely the locking members 9 and 10 which are insignificantly small in comparison with the overall size of the rocket so that they do not appreciably increase the space required for shipping and storing the rocket bodies. The vane units have no protruding parts at all so that they can be conveniently stacked as is shown in Fig. 3. A stack according to Fig. 3 can obviously be shipped and stored separately from the rockets proper. The stacking of the vane units is not only convenient for shipping and storing purposes but also protects the rather fragile vane units against damage for instance by bending.

While the invention has been described in detail with respect to a certain now preferred example and embodiment of the invention it will be understood by those skilled in the art after understanding the invention, that various changes and modifications may be made without departing from the spirit and scope of the invention, and it is intended, therefore, to cover all such changes and modifications in the appended claims.

What is claimed as new and desired to be secured by Letters Patent, is:

1. A guide vane arrangement for attachment to a tubular rocket missile comprising a pair of diverging vanes and an intermediate member formed as a unit of sheet metal, said intermediate member being curved and having a concave surface facing away from said vanes, the inner radius of the curvature of said concave surface of said

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intermediate member being slightly smaller than the outer radius of the circumferential curvature of the rocket missile, said rocket having protruding therefrom male locking members and said intermediate member having enlarged female locking slots for receiving said locking members in one axial position of said intermediate member relative to the rocket and slot portions of reduced size to retain said locking members in releasably locking engagement in another axial position of said intermediate member relative to the rocket.

2. A guide vane arrangement according to claim 1, in combination with retaining members extending from said intermediate member on the inwardly curved side thereof symmetrically disposed at each side of the central longitudinal axis of said slots, the said retaining members being engageable with the rear edge of the rocket for centering and further retaining the vane unit on the rocket.

3. A guide vane arrangement according to claim 2, wherein the said retaining members are in form of two lugs protruding from the sheet metal portion forming said intermediate member, the said lugs being adapted to overlie the respective rear edge of the rocket.

4. A guide vane arrangement according to claim 1, wherein the axial spacing of said slots is such that one of said locking members enters the said slot portion of reduced size prior to the locking member coacting with the other slot.

5. A guide vane arrangement according to claim 4, wherein said intermediate portion further comprises a slot opening toward the rear edge and is first engaged upon application of the vane unit to the rocket.

6. A guide vane arrangement according to claim 5, wherein one of said male locking members is in form of a headed screw threaded in the rocket and another male locking member is in form of a headed locking member having a smooth stem, the said screw being engageable with the slot extending from said rear edge.

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