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MISSILE CASING

Original Filed Nov. 13, 1959

Fig. 2

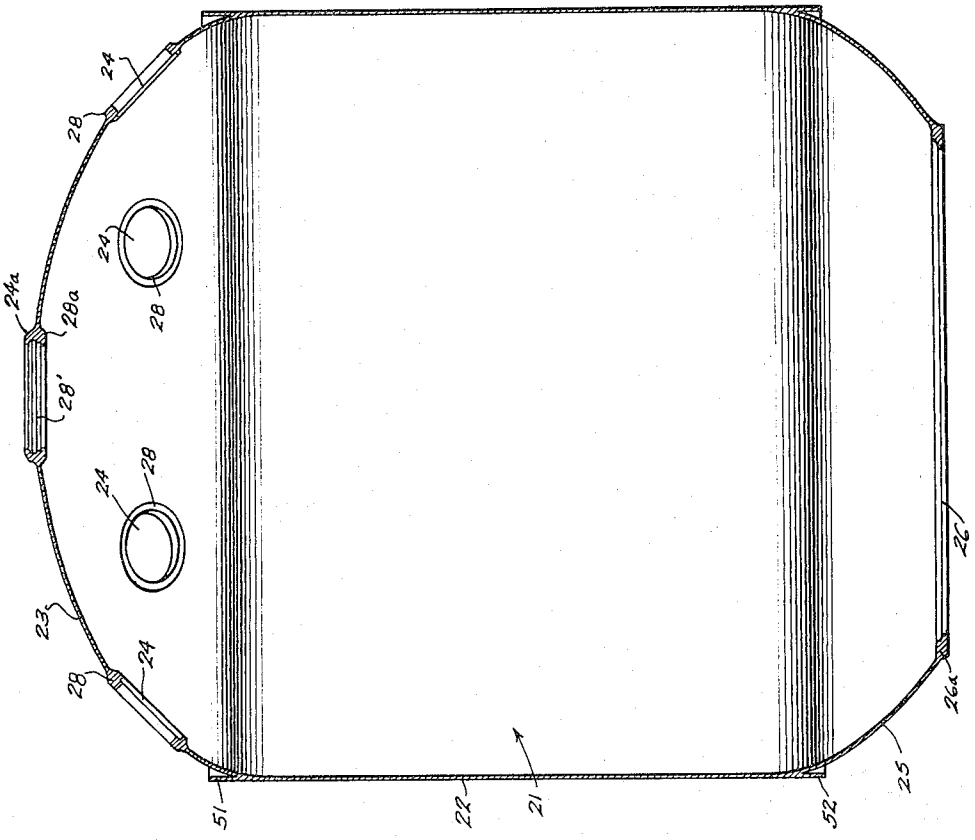
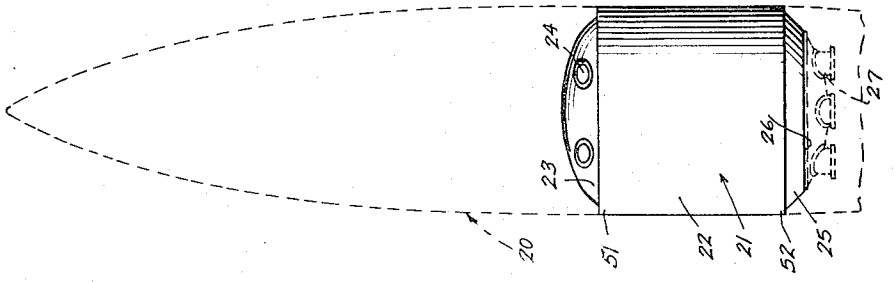


Fig. 1



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MISSILE CASING

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Original application Nov. 13, 1959, Ser. No. 852,755, now Patent No. 3,137,057, dated June 16, 1964. Divided and this application Dec. 26, 1961, Ser. No. 161,860

11 Claims. (Cl. 102—49)

This is a division of application Serial No. 852,755, filed Nov. 13, 1959, now Patent No. 3,137,057.

The present invention relates broadly to the manufacture of missile and related casings, and is more particularly concerned with weapon component housings having among its features minimum utilization of machining and the production of a one-piece body without resort to welding techniques.

Rocket engine chambers and related missile casings necessarily must have a high strength to weight ratio and customarily are relatively thin wall structures formed of a relatively expensive high alloy steel. It is the current practice in the art to flow-turn at least the chamber center section, machine the end sections, and weld said sections one to the other. Not only is this structure costly to manufacture from a time and material standpoint, but the resulting structure falls far short of the desired strength properties.

As is further known each motor chamber is provided with a plurality of thrust ports which function to reduce the missile speed at a predetermined point during flight. One technique employed is to weld the thrust port collar to the supporting chamber structure, and here again, much time is required and a weakening of the chamber walls can well result.

It is accordingly an important aim of the present invention to provide a missile casing or motor housing which avoids each of the named objections to and disadvantages of the prior art structures.

According to the general features of this invention there is provided a one-piece motor chamber housing, comprising a generally cylindrical central body portion and substantially arcuately curved end portions connected to said body portion and integral therewith, one of said end portions having a plurality of openings therethrough and an integral collar of the same metal as the body and end portions surrounding each of said openings and effectively strengthening said one end portion.

Still another object of this invention is to provide a one-piece motor chamber housing, comprising a generally cylindrical central body portion and substantially arcuately curved end portions connected to said body portion and integral therewith, and a pair of axially spaced skirt portions at the junctures of said body and end portions, said skirt portions extending in axially opposite directions radially spaced from said end portions whereby weld joints made to said skirt portions are spaced from the end portions to prevent weakening of said end portions.

Other objects and advantages of the invention will become more apparent during the course of the following description, particularly when taken in connection with the accompanying drawings.

In the drawings, wherein like numerals are employed to designate like parts throughout the same;

FIGURE 1 is a side elevation showing in full line a motor chamber of this invention and showing in phantom lines an illustrative missile shape and thrust structure for the motor chamber; and

FIGURE 2 is a vertical sectional view of the chamber shown in FIGURE 1.

Referring now first to FIGURE 1 of the drawings,

there is shown a missile or other space vehicle generally designated by the numeral **20**, the propulsive force of which is provided by a plurality of power plants (not shown) housed in a plurality of motor chambers **21**, only one of which is shown. As is known, thrust for a vehicle **20** is provided by sequential or simultaneous ignition of the power plants, and for this purpose the motor chambers are attached in a series one to the other. However, for the reasons earlier noted, the conventional motor chambers are far from satisfactory from the standpoints of strength properties and fabrication costs.

A motor chamber **21** as produced in accordance with this invention is provided with a generally cylindrical body portion **22** integral at one end with a dome portion **23** apertured at a plurality of locations **24** which provide speed control devices communicating with the missile exterior, and through which exhaust gases are ported under action of timing devices to reduce the missile speed at a predetermined time. At the opposite end of the motor chamber body portion 22 there is provided a curved aft or tail portion **25** apertured centrally at **26** to receive a thrust assembly **27**. It may now be seen that, generally speaking, the motor chamber **21** is an essentially spheroidal-ended cylinder, although it is of course appreciated that other shapes may be produced. In addition, the structure comprising the motor chamber can be used for other purposes. The chamber **21** can be manufactured from high alloy steels or other metals.

Each of the thrust ports **24** and **24***a* are provided with thickened collars **28** and **28***a*. These collars extend away from opposite surfaces of the dome portion **23** and are formed integral with the material of the dome portion **23** and radially inwardly of the cylindrical body portion **22**. In the form of motor chamber **21** illustrated in FIGURE 1, the ports **24** are six in number.

The arcuately curved end portion **25** is provided with the relatively large aperture **26** which is defined by a thickened collar **26***a* that is formed from the same material as the curved end portion **25**. It will be noted that the collars **26***a* and **28** all have a stepped internal surface area and that the collar **24***a* is provided with a stepped grooved area or surface **28'**.

The junctures between the end portions **23** and **25** with the cylindrical body portion **22** are provided with axially spaced and circumferentially extending annular skirt portions or skirts **51** and **52**. The skirts may be seen to extend in generally a straight line parallel to the central longitudinal axis of the motor chamber body portion **22**, and they may also be seen to be spaced sufficiently from the end portions **23** and **25** to permit attachment of tubular shields or shrouds to other motor chambers of generally corresponding shape. In this manner the aerodynamic smoothness of the missile is improved, but more importantly, there are no welds made directly to the walls of the pressure vessel. It will further be noted that the skirts **51** and **52** are concentric with respect to one another and with respect to the body portion **22** and that they all have a common diameter.

The collar **26***a* is provided with its stepped inner diameter to accommodate the thrust nozzle assembly **27** of FIGURE 1.

It is now apparent that the casing **21** is of a unique construction which enables it to be produced with a minimum number of rejects as contrasted with prior types of motor casings. Further. the investment in the missile or other airborne vehicle is also substantial, and weaknesses in the motor chambers resulting in misfirings represent substantial losses in labor and materials. In fact, a failure of the motor chamber can produce a loss of the entire missile, which is often represented by an investment of millions of dollars. Additionally, it may be noted that

the motor chamber 21 as herein produced is an integral one-piece construction, and is thereby characterized by its ability to withstand higher thrust loads, which in turn permit increased missile speed and range. As produced herein of high alloy steels, the motor chamber 21 is capable of withstanding pressures of the order of 275,000 p.s.i. yield and 330,000 p.s.i. tensile. Further, it will also be observed that the casing 21 can be produced in such a way that extensive machining is not required. Labor and material savings again result, and since the shroud weld attachments are made at locations spaced from the motor chamber walls, inspection techniques are greatly facilitated, and as compared with motor chambers welded of several sections, the number of inspection procedures required are greatly reduced.

It will be understood that modifications and variations may be effected without departing from the scope of the novel concepts of the present invention.

I claim as my invention:

1. A metallic motor chamber housing formed from a single piece of material as a one-piece unit, comprising a generally cylindrical central body portion and substantially arcuately curved end portions connected to said body portion and integral therewith with said body and end portions being totally free of welds, and a pair of axially spaced skirt portions at the junctures of said body and end portions, said skirt portions extending in axially opposite direction radially spaced from said end portions whereby weld joints made to said skirt portions are spaced from the end portions to prevent weakening of said end portions.

2. A metallic motor chamber housing formed from a single piece of material as a one-piece unit, comprising a generally cylindrical central body portion and substantially arcuately curved end portions connected to said body portion and integral therewith with said body and end portions being totally free of welds, one of said end portions having a plurality of openings therethrough and an integral collar of the same metal as the body and end portions surrounding each of said openings and effectively strengthening said one end portion.

3. A metallic motor chamber housing formed from a single piece of material as a one-piece unit, comprising a generally cylindrical central body portion and substantially arcuately curved end portions connected to said body portion and integral therewith with said body and end portions being totally free of welds, and a pair of axially spaced skirt portions at the junctures of said body and end portions, said skirt portions extending in axially opposite directions radially spaced from said end portions whereby weld joints made to said skirt portions are spaced from the end portions to prevent weakening of said end portions, one of said end portions having a plurality of openings therethrough and an integral collar of the same metal as the body and end portions surrounding each of said openings and effectively strengthening said one end portion.

4. In combination, a missile and a metallic motor chamber housing formed from a single piece of material as a one-piece unit, the housing comprising a generally cylindrical central body portion and substanially arcuately curved end portions connected to said body portion and integral therewith with said body and end portions being totally free of welds, and a pair of axially spaced skirt portions at the junctures of said body and end portions, and skirt portions extending in axially opposite directions radially spaced from said end portions and being welded to said missile whereby weld joints made to said skirt portions are spaced from the end portions of the housing to prevent weakening of said end portions.

5. A metallic motor chamber housing formed from a single piece of material as a one-piece unit and having a thrust assembly, comprising a generally cylindrical central body portion and substantially arcuately curved end portions connected to said body portion and integral

therewith and with said body and end portions being totally free of welds, and a pair of axially spaced annular skirt portions at the junctures of said body and end portions, said annular skirt portions extending in axially opposite directions radially spaced from said end portions whereby weld joints made to said annular skirt portions are spaced from the end portions to prevent weakening of said end portions, the thrust assembly being spaced radially inward and axially of said annular skirt portions.

6. A metallic motor chamber housing formed from a single piece of material as a one-piece unit, comprising a generally cylindrical central body portion and substantially arcately curved end portions connected to said body portion and integral therewith and with said body and end portions being totally free of welds, and a pair of axially spaced skirt portions at the junctures of said body and end portions, said skirt portions extending in axially opposite directions radially spaced from said end portions whereby weld joints made to said skirt portions are spaced from the end portions to prevent weakening of said end portions, one said end portions having a plurality of openings therethrough and an integral collar of the same metal as the body and end portions surrounding each of said openings and effectively strengthening said one end portion, said skirt portions being annular and with said collars being spaced radially inwardly of said skirt portions.

7. A metallic motor chamber housing formed from a single piece of material as a one-piece unit, comprising a generally cylindrical central body portion and substantially arcuately curved end portions connected to said body portion and integral therewith and with said body and end portions being totally free of welds, and a pair of axially spaced skirt portions at the junctures of said body and end portions, said skirt portions extending in axially opposite directions radially spaced from said end portions whereby weld joints made to said skirt portions are spaced from the end portions to prevent weakening of said end portions, said axially spaced skirt portions and said cylindrical central body portion being concentric and having the same diameters.

8. A metallic motor chamber housing formed from a single piece of material as a one-piece unit, comprising a generally cylindrical central body portion and substantially arcuately curved end portions connected to said body portion and integral therewith and with said body and end portions being totally free of welds, one of said end portions having a plurality of thrust ports and an integral collar of the same metal as the body and end portions surrounding each of said thrust ports and effectively strengthening said one end portion, said collar being thicker than the thickness of said curved end portion and said collars extending away from said curved end portion on its opposite curved surfaces.

9. A metallic motor chamber housing formed from a single piece of material as a one-piece unit, comprising a generally cylindrical body portion and substantially arcuately curved end portions connected to said body portion with said body and end portions being totally free of welds, and a pair of axially spaced annular skirt portions extending axially from the juncture of said body and end portions, said skirt portions and said body portion being concentric and having a common diameter with said skirt portions extending in axially opposite directions with respect to one another and radially spaced from said portions whereby weld joints made to said skirt portions are spaced from the end portions to prevent weakening of said end portions.

10. A metallic motor chamber housing formed from a single piece of material as a one-piece unit, comprising a generally cylindrical central body portion and substantially arcuately curved ring shaped end portions connected to said body portion and integral therewith and with said body and end portions being totally free of welds, and a pair of axially spaced annular skirt portions

at the junctures of said body and ring shaped end portions, said annular skirt portions extending in axially opposite directions radially spaced from said ring shaped end portions whereby weld joints made to said annular skirt portions are spaced from the ring shaped end portions to prevent weakening of said ring shaped end portions.

11. In combination, a cylindrical missile and a metallic motor chamber housing formed from a single piece of material as a one-piece unit and being disposed internally within the missile and having a generally cylindrical central body portion and ring shaped end portions connected to said body portion and integral therewith and with said body and end portions being totally free of welds, and a pair of axially spaced annular skirt portions at the junctures of said body and end portions, said skirt portions radially overlying and opposing said ring-shaped end portions and extending in axially opposite directions

radially spaced from said end portions whereby weld joints made for joining said missile to said skirt portions are spaced from the ring shaped end portions to prevent weakening of said end portions.

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