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TITLE OF INVENTION

54 **MINIATURISED PRIMING CHAIN**

EARLIEST PRIORITY CLAIMED	COUNTRY	NUMBER	DATE
NB - Use International abbreviation for country (See Schedule 4)	33 DE	31 10 2008 008 937.0	32 13 Feb 2008

57	Abstract (not more than 150 words) and figure of the drawings to which the abstract refers, are attached.

Number of sheets	18

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Abstract

Described is a modular miniaturised priming chain including a detonator and a priming booster means, wherein the priming booster means has a first priming booster (54) and a second priming booster (66) which can be modularly combined together depending on the respective power requirement at the output of the priming chain, or only the first priming booster (54) is combined with the detonator which is formed by a miniature detonator (10).

Figure for publication: Figure 1

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FIGURE FOR PUBLICATION

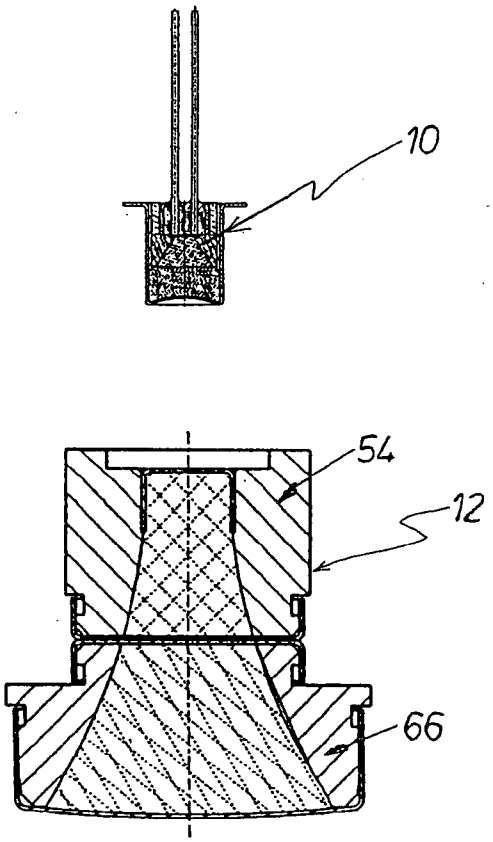


FIG.1

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Miniaturised priming chain

Field of the Invention

This invention relates to a miniaturised priming chain.

Background to the Invention

The invention aims at providing a miniaturised priming chain which can be varied according to the respective required power at the output of the priming chain and/or the permissible fuse screw-in length in the respective projectile (in accordance with STANAG).

Summary of the Invention

According to the invention, there is provided a miniaturised priming chain including a detonator and a priming booster means, wherein the priming booster means has a first priming booster and a second priming booster which can be modularly combined together depending on the respective power requirement at the output of the priming chain.

Accordingly, when a low level of power requirements is involved only the first priming booster of the priming booster means is combined with the detonator, formed by a miniature detonator, of the priming chain.

The miniature detonator may have a charge of a small mass and may be provided for the directed generation of its power emanating from a central initiation location towards a detonator base which is of a concavely indented configuration for transformation into a flat disc (flyer) of high speed.

The charge may include a primary charge and a secondary charge adjoining same, wherein the primary charge may be provided in a centering element of the miniature detonator and the secondary charge may adjoin the concavely indented detonator base.

There may be provided an electrical bridge element for initiating the primary charge.

The electrical bridge element may be provided on an electrically insulating bottom closure element of the miniature detonator, wherein connecting elements contacted with the bridge element extend out of the bottom closure element.

The electrically insulating bottom closure element may have a peripheral sleeve.

The centering element may be mounted to an extension sleeve.

There may be provided a compensating sleeve between the peripheral sleeve of the electrically insulating bottom closure element and the extension sleeve of the centering element.

The concavely indented detonator base may be formed integrally in respect of the material involved with a detonator peripheral casing.

The detonator peripheral casing, the extension sleeve of the centering element, the compensating sleeve and the peripheral sleeve of the electrically insulating bottom closure element may be sealingly welded together at the connecting side remote from the concavely indented detonator base .

The miniature detonator may form a first stage of a miniature priming chain, the second stage of which may be formed by an insensitive first booster

The insensitive first booster may be of an entry diameter adapted to the exit diameter of the miniature detonator.

The first booster may have an insensitive explosive charge which is provided in a receiving space, which enlarges in a funnel shape, of a first booster housing.

The insensitive first booster may be combined with a second booster stage which also enlarges in a funnel shape.

The second booster stage may be provided in an associated second booster housing adjoining the first booster housing.

The first booster housing may be formed with a concavely indented base to produce a flyer and the second booster housing may be formed with a concavely indented base to produce a flyer.

The modular miniaturised priming chain according to the invention has the advantage that it is possible for example to reduce the explosive-force priming booster output for HE-munition to a priming booster output for firing transfer primer charges of a cargo munition, by removal of the second booster stage, that is to say the second priming booster. At the same time that provides for adaptation of the fuse screw-in length into the respective projectile. It is thus advantageously possible for example for a proximity fuse/multi-function fuse to be adapted to use as a time fuse by unscrewing or removing the second booster stage.

The modularity is implemented in such a way that the booster stages involved are accommodated in receiving means which can be modularly connected in positively locking relationship, force-locking relationship or by a connection involving intimate joining of the materials concerned. The receiving means can also be identical or unitary with the respective booster housing. In that respect it can be provided that a priming booster is screwed or glued into a screw-in

ring. That screw-in ring can then be screwed on to a screwthread of a receiving means or a housing of the preceding booster stage.

Detailed Description of the Invention

Further details, features and advantages will be apparent from the description hereinafter of a non-limiting embodiment illustrated in the drawings by way of example of the modular miniaturised priming chain according to the invention and essential details thereof.

In the drawings:-

Figure 1 shows a view in longitudinal section on a larger scale of a configuration of the modular miniaturised priming chain;

Figure 2 shows a view in longitudinal section on an enlarged scale of a configuration of the miniature detonator of the priming chain of Figure 1;

Figure 3 shows a view in longitudinal section of a configuration of an insensitive first booster, that is to say a first priming booster, which forms a second stage of the modular miniaturised priming chain, the first stage of which is formed by the miniature detonator as shown in Figure 2;

Figure 4 shows a view in longitudinal section of a second booster stage, that is to say a second priming booster, shown spaced from the first booster of Figure 3; and

Figure 5 shows a view in longitudinal section of the boosters, that is to say the first and second priming booster, of Figures 3 and 4 which are combined together as in Figure 1.

Figure 1 shows a configuration of the modular miniaturised priming chain with a miniature detonator 10 and an associated priming chain 12, wherein with respect to further details of the miniature detonator 10 and the priming chain 12 attention is directed to the description hereinafter of Figures 2 to 5.

Figure 2 shows a view on an enlarged scale of a miniature detonator 10 provided for detonation transfer on to a priming chain 12. As can be seen from Figure 2 the miniature detonator 10 has a charge 14 of small mass of for example 10 to 20 mg. The charge 14 is provided for directed generation of its power emanating from a central initiation location 16, towards a detonator base 18. The detonator base 18 is of a concavely indented configuration for transformation into a flat disc (flyer) 20 moving at high speed. The flyer 20 is indicated in thin broken lines at a small axial spacing from the miniature detonator 10 in Figure 2.

The charge 14 of the miniature detonator 10 has a primary charge 22 and a secondary charge 24 adjoining same. The primary charge 22 is disposed in a centering element 26. The secondary charge 24 adjoins the concavely indented detonator base 18.

The miniature detonator 10 has an electrical bridge element 28 for initiation of the primary charge 22. The electrical bridge element 28 is provided on an electrically insulating bottom closure element 30 of the miniature detonator 10. Connecting elements 32 which are contacted with the electrical bridge element 28 extend at a spacing from each other out of the electrically insulating bottom closure element 30.

The electrically insulating bottom closure element 30 has a peripheral sleeve 34 which surrounds the bottom closure element 30.

The centering element 26 is mounted to an extension sleeve 36. In the embodiment of the miniature detonator 10 shown in Figure 2, there is provided

a compensating sleeve 38 between the extension sleeve 36 of the centering element 26 and the peripheral sleeve 34 of the electrically insulating bottom closure element 30.

The concavely indented detonator bottom 18 is formed integrally in respect of the material involved with a peripheral detonator casing 40. The detonator casing 40, the extension sleeve 36 of the centering element 26, the compensating sleeve 38 between the extension sleeve 36 and the peripheral sleeve 34 of the bottom closure element 30 and the peripheral sleeve 34 are sealingly welded together at the connecting side that is remote from the concavely indented detonator base 18. That sealed weld is identified by reference 42.

The miniature detonator 10 shown in Figure 2 forms a first stage of the miniaturised modular priming chain, the second stage of which is formed by an insensitive first booster 54 or a first priming booster (see Figures 3 and 5). The insensitive first booster 54 has an entry diameter adapted to the exit diameter of the miniature detonator 10. The first booster 54 has an insensitive explosive booster charge 56 provided in a receiving space 58, which enlarges in a funnel shape, of a first booster housing 60. The receiving space 58 which is enlarged in a funnel shape in the first booster housing 60 is closed on the side towards the miniature detonator by a closure element 62 and on the other side remote therefrom by a closure element 64 (see Figures 3 and 5).

The insensitive first booster 54 is or can be combined with a second booster stage 66 which in Figure 4 is axially spaced from the first booster 54 as shown in Figure 3 and is shown in Figure 5 combined with the first booster 54.
The two booster stages can be arranged in spaced relationship in the fuse in dependence on the structural factors involved.

The second booster stage 66 has an associated second booster housing 68 which has a receiving space 70 which is also enlarged in a funnel-like shape.

An explosive booster charge 72 is provided in the receiving space 70. The receiving space 70 of the second booster housing 68 of the second booster stage 66 is closed at the side towards the first booster 54 (see Figure 3) by means of a closure element 74 and on the second side remote therefrom by a closure element 76.

The closure element 64 of the first booster 54 can be of a concavely indented configuration to form a flyer. That is indicated in Figure 3 by an arcuate broken line 78. Likewise it is possible for the closure element 76 of the second booster stage 66 to be of a concavely indented configuration to form a flyer. That is indicated in Figure 4 by the broken line 80.

As already mentioned the Figures illustrate a miniaturised modular priming chain in which the first booster 54, that is to say the first priming booster, and the second booster stage 66, that is to say the second priming booster, respectively form independent components which are or can be arranged in mutually adjoining relationship. For that purpose it is possible for them to be connected together in positively locking relationship, force-locking relationship or by a connection involving intimate joining of the materials concerned. In that respect easily releasable connections are to be preferred as simpler faster adaptation to the purpose of use is thereby often possible. Specifically screw connections are considered as they afford sufficient stability or guidance, such as for example by way of a suitable screwthread or bore in conjunction with a fixing ring, but in that respect they can also be easily released again. It is however also possible to have recourse to clamping connections, rivet connections, claw coupling configurations, adhesive layers and the like.

The miniature detonator 10 can be for example of a diameter of 2.5 mm and an axial lengthwise dimension of 3.5 mm. It will be appreciated that other dimensions are also possible.

The explosive booster charge of the miniature detonator is for example 10 to 20 mg without being restricted thereto.

It is to be appreciated, that the invention is not limited to any particular embodiment or configuration as hereinbefore generally described or illustrated.

The claims which follow are to be considered an integral part of the present disclosure. Reference numbers (directed at the drawings) shown in the claims serve to facilitate the correlation of the integers of the claims with illustrated features of the preferred embodiment(s), but are not intended to restrict in any way the language of the claims to what is shown in the drawings, unless the contrary is clearly apparent from the context.

List of references

10 miniature detonator (for 12)
12 priming chain
14 charge (of 10)
16 central initiation location (of 14)
18 detonator base (of 10)
20 flat disc (flyer) (from 18)
22 primary charge (of 14)
24 secondary charge (of 14)
26 centering element (of 10 for 22)
28 electrical bridge element (for 22 on 30)
30 electrically insulating bottom closure element (of 10 for 28)
32 connecting elements (for 28)
34 peripheral sleeve (of 30)
36 extension sleeve (of 26)
38 compensating sleeve (between 34 and 36)
40 detonator peripheral casing (of 10 for 18)
54 first booster/first priming booster (of 12)
56 insensitive explosive charge (of 54)
58 receiving space enlarged in a funnel shape (in 60 for 56)
60 first booster housing (of 54)
62 first closure element (of 54)
64 second closure element (of 54)
66 second booster stage/second priming booster (of 12)
68 second booster housing (of 66)
70 receiving space (in 68 for 72)
72 explosive charge (in 70)
74 first closure element (of 70)
76 second closure element (of 70)
78 arcuate broken line (at 64)
80 arcuate broken line (at 76)



CLAIMS

1. A miniaturised priming chain including a detonator and a priming booster means, wherein the priming booster means has a first priming booster (54) and a second priming booster (66) which can be modularly combined together depending on the respective power requirement at the output of the priming chain.

2. A priming chain as claimed in claim 1, wherein the miniature detonator (10) has a charge (14) of a small mass and is provided for the directed generation of its power emanating from a central initiation location (16) towards a detonator base (18) which is of a concavely indented configuration for transformation into a flat disc (flyer) (20) of high speed.

3. A priming chain as claimed in claim 2, wherein the charge (14) includes a primary charge (22) and a secondary charge (24) adjoining same, wherein the primary charge (22) is provided in a centering element (26) of the miniature detonator (10) and the secondary charge (24) adjoins the concavely indented detonator base (18).

4. A priming chain as claimed in claim 3, wherein there is provided an electrical bridge element (28) for initiating the primary charge (22).

5. A priming chain as claimed in claim 4, wherein the electrical bridge element (28) is provided on an electrically insulating bottom closure element (30) of the miniature detonator (10), and wherein connecting elements (32) contacted with the bridge element (28) extend out of the bottom closure element (30).

6. A priming chain as claimed in claim 5, wherein the electrically insulating bottom closure element (30) has a peripheral sleeve (34).

7. A priming chain as claimed in any one of claims 3 to 5, wherein the centering element (26) is mounted to an extension sleeve (36).

8. A priming chain as claimed in claim 6 and claim 7, wherein there is provided a compensating sleeve (38) between the peripheral sleeve (34) of the electrically insulating bottom closure element (30) and the extension sleeve (36) of the centering element (26).

9. A priming chain as claimed in any one of claims 2 to 8, wherein the concavely indented detonator base (18) is formed integrally in respect of the material involved with a detonator peripheral casing (40).

10. A priming chain as claimed in claim 9, wherein the detonator peripheral casing (40), the extension sleeve (36) of the centering element (26), the compensating sleeve (38), and the peripheral sleeve (34) of the electrically insulating bottom closure element (30) are sealingly welded together at the connecting side remote from the concavely indented detonator base (18).

11. A priming chain as claimed in any one of claims 2 to 10, wherein the miniature detonator (10) forms a first stage of a miniature priming chain, the second stage of which is formed by an insensitive first booster (54).

12. A priming chain as claimed in claim 11, wherein the insensitive first booster (54) is of an entry diameter adapted to the exit diameter of the miniature detonator (10).

13. A priming chain as claimed in claim 11 or claim 12, wherein the first booster (54) has an insensitive explosive charge (56) which is provided in a receiving space (58), which enlarges in a funnel shape, of a first booster housing (60).

14. A priming chain as claimed in any one of claim 11 to 13, wherein the insensitive first booster (54) is combined with a second booster stage (66) which also enlarges in a funnel shape.

15. A priming chain as claimed in any one of claim 11 to 13, wherein the insensitive first booster (54) can be combined with a second booster stage (66) which also enlarges in a funnel shape.

16. A priming chain as claimed in claim 14 or 15, wherein the second booster stage (66) is provided in an associated second booster housing (68) adjoining the first booster housing (60).

17. A priming chain as claimed in claim 13, wherein the first booster housing (60) is formed with a concavely indented base to produce a flyer.

18. A priming chain as claimed in claim 16, wherein the second booster housing (66) is formed with a concavely indented base to produce a flyer.

19. A miniaturised priming chain according to the invention, as hereinbefore generally described.

20. A miniaturised priming chain as specifically described with reference to or as illustrated in the accompanying drawings.

21. A miniaturised priming chain including any new and inventive integer or combination of integers, substantially as herein described.

DATED AT PRETORIA THIS 11TH DAY OF FEBRUARY 2009.

HAHN & HAHN INC.
APPLICANTS' ATTORNEYS

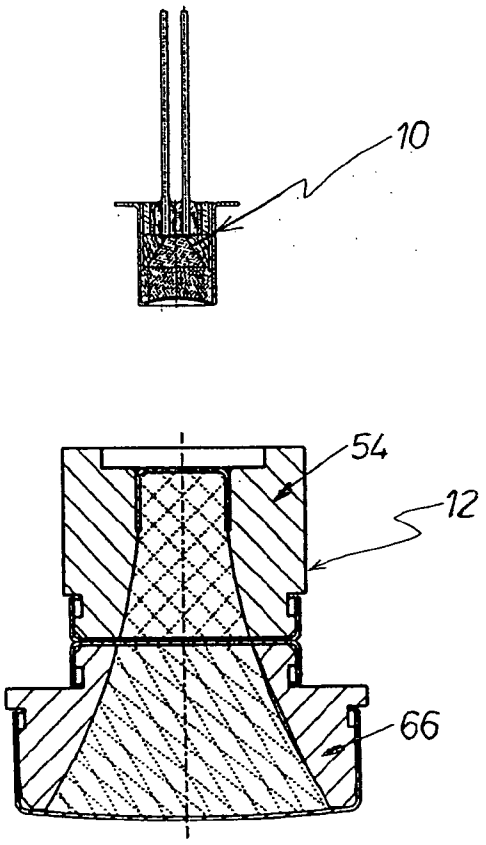


FIG.1

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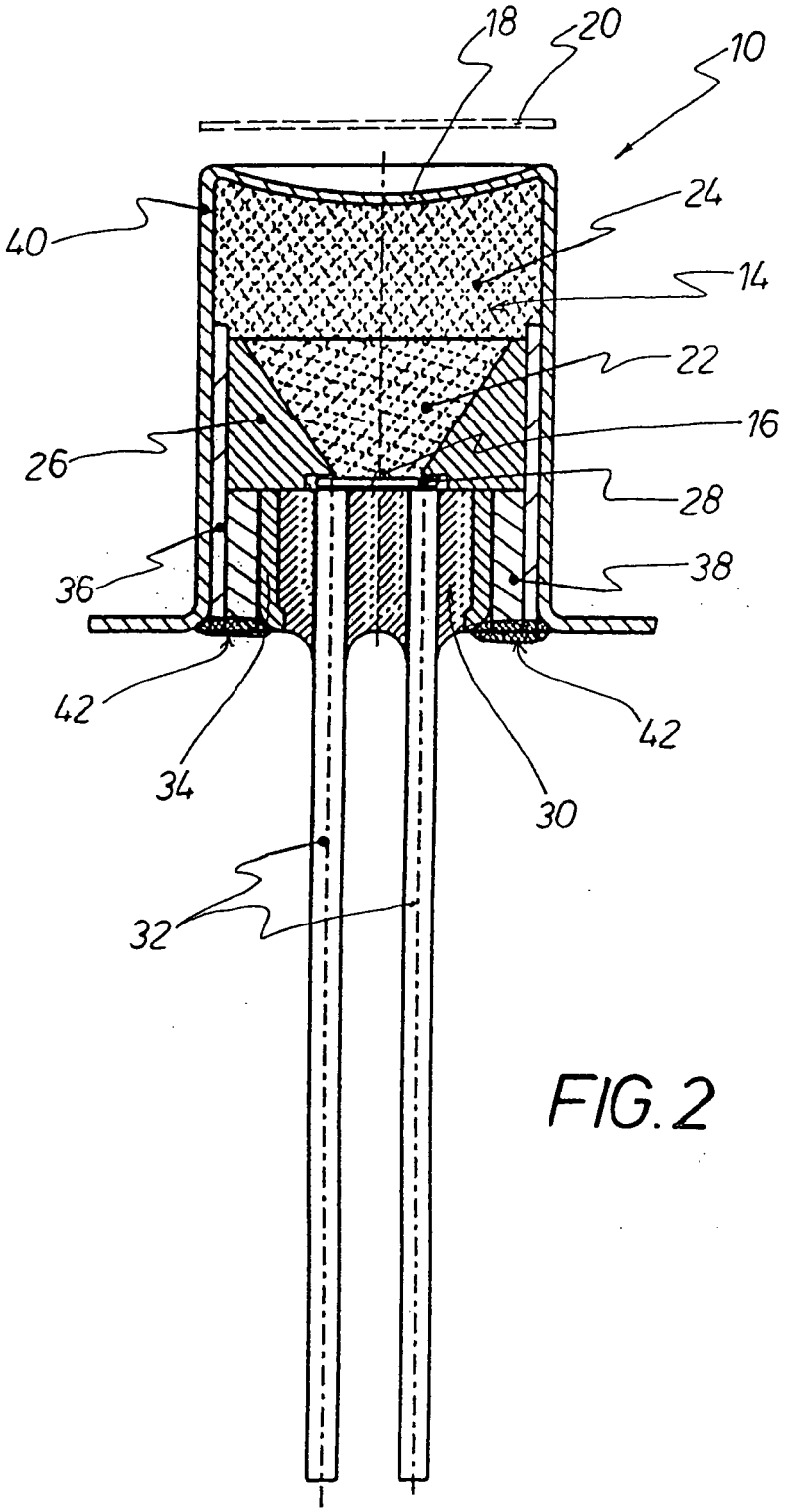


FIG. 2

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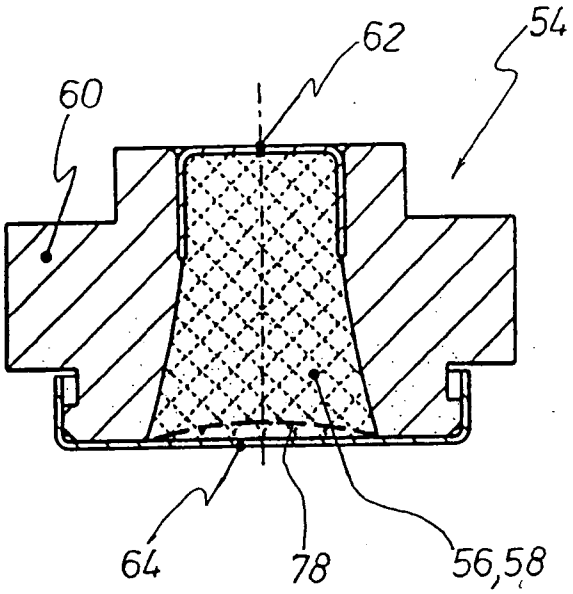


FIG. 3

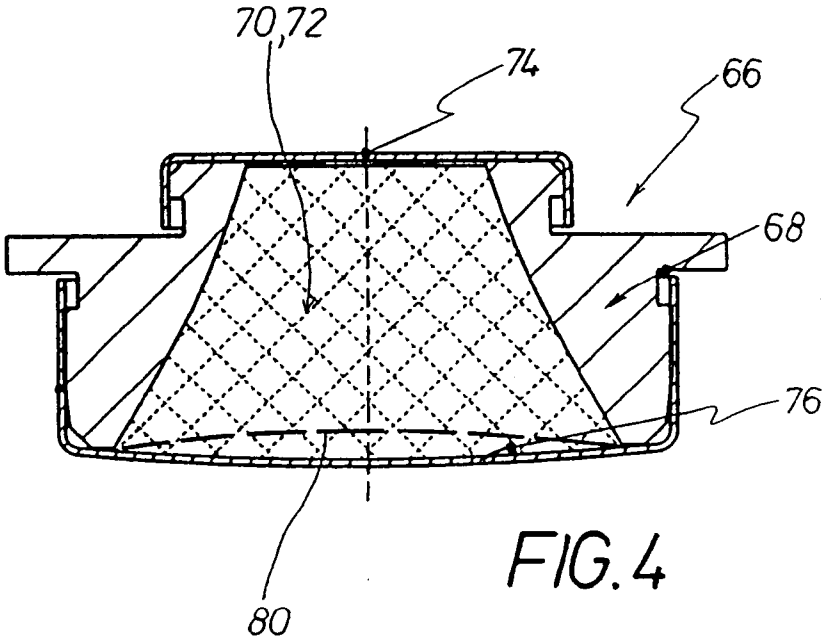


FIG. 4

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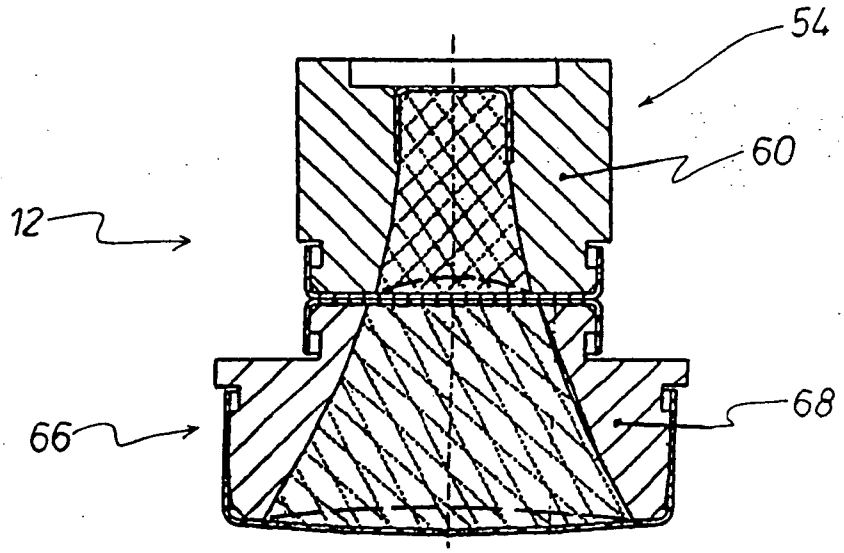


FIG. 5

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