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(54) **Chaff rocket**

(57) A rocket for distributing metallized chaff has a chamber 3 containing the chaff, means 8 for ejecting the chaff and means 4 for actively spinning the rocket at high speed during flight so as to distribute the chaff effectively on release. The chaff is preferably contained in individual packets 9 which fly apart when ejected.

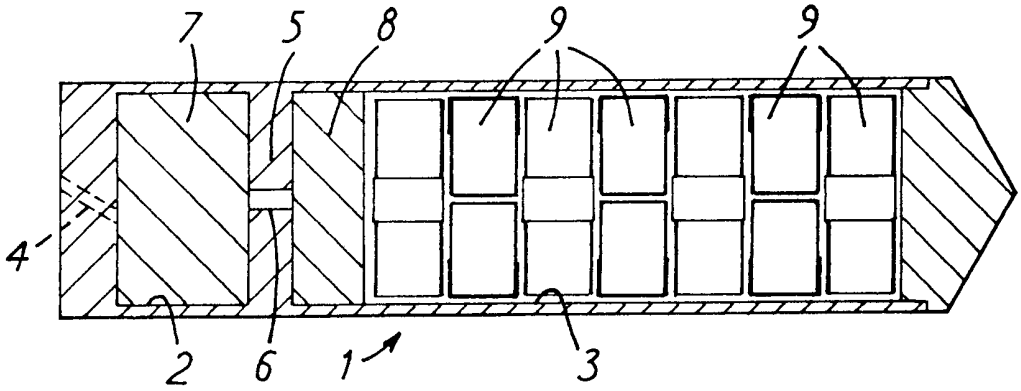

FIG. 1

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The drawing(s) originally filed was/were informal and the print here reproduced is taken from a later filed formal copy.

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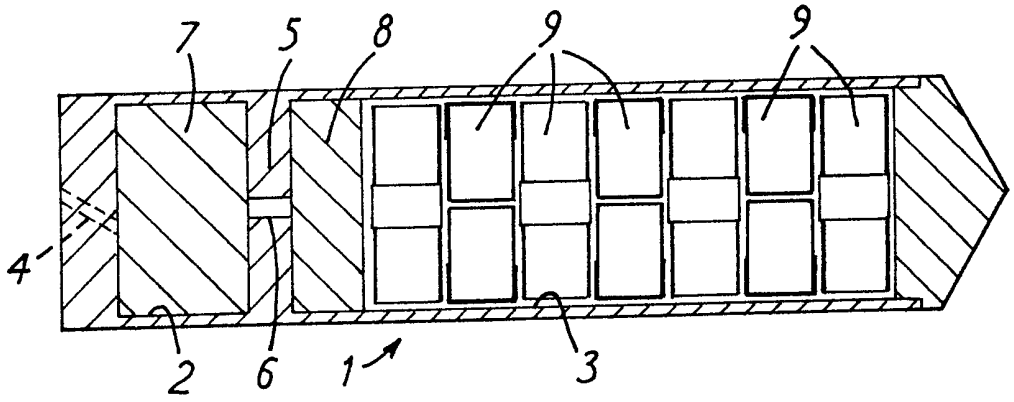


FIG. 1

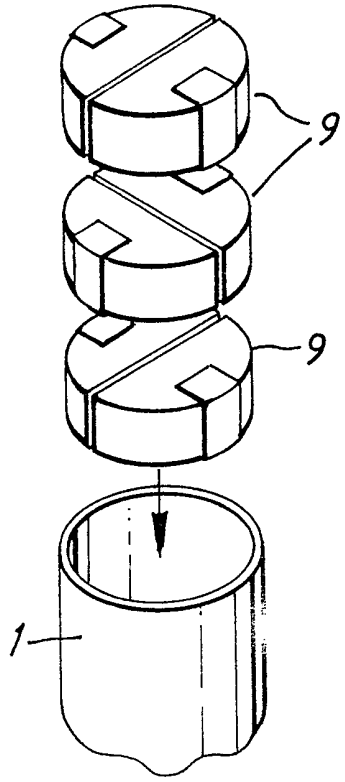
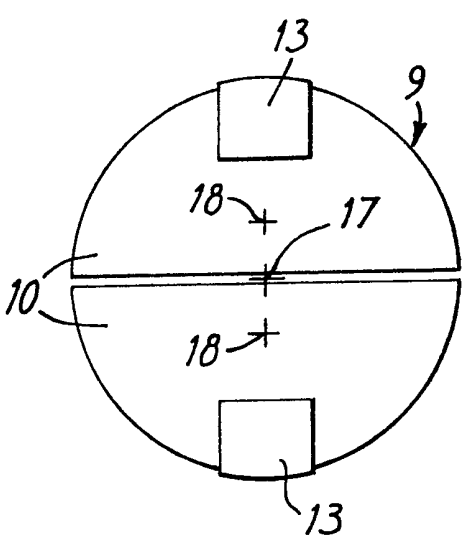


FIG. 2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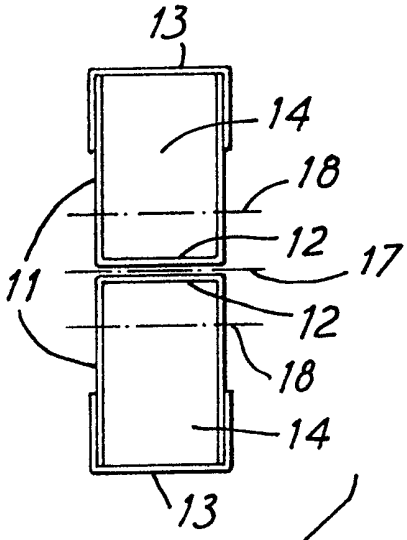
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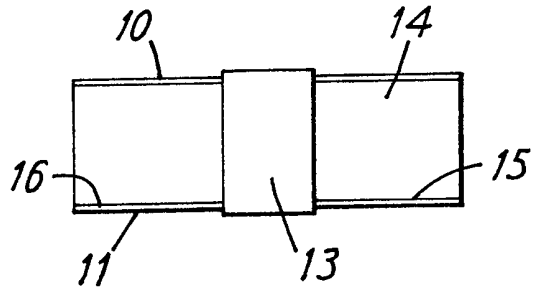
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FIG. 3

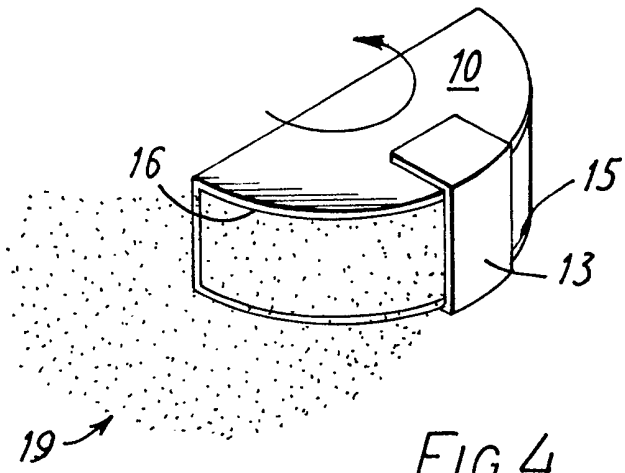
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FIG. 4

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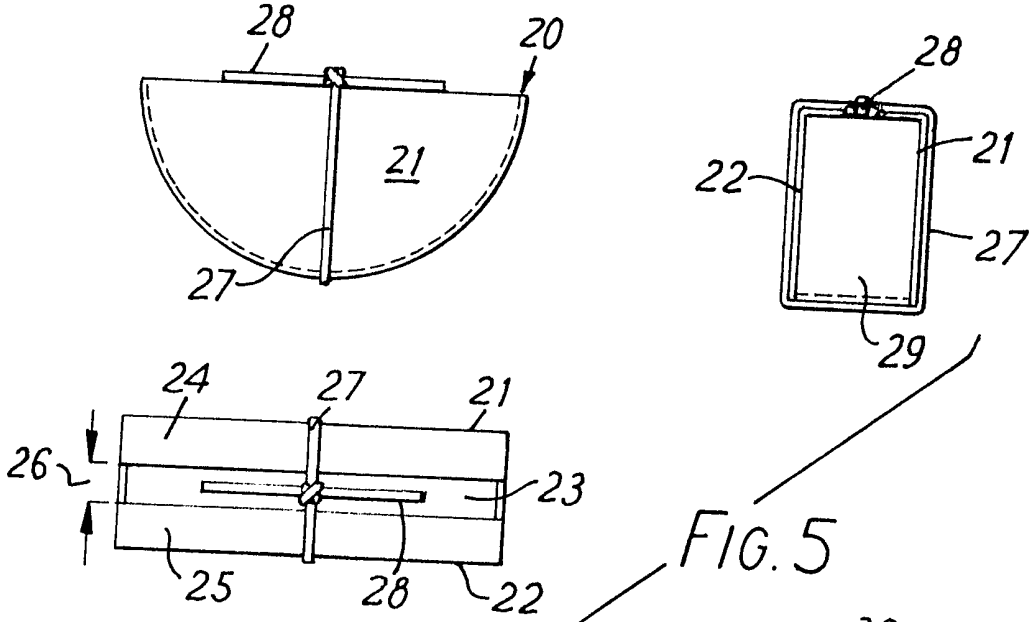

FIG. 5

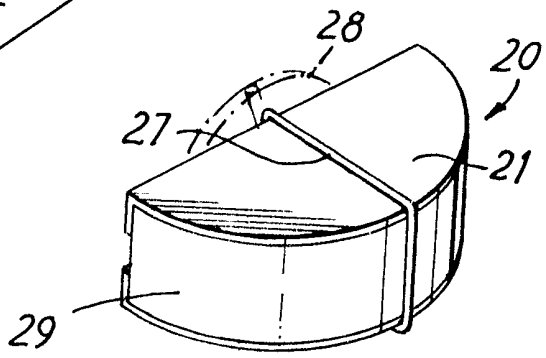

FIG. 6

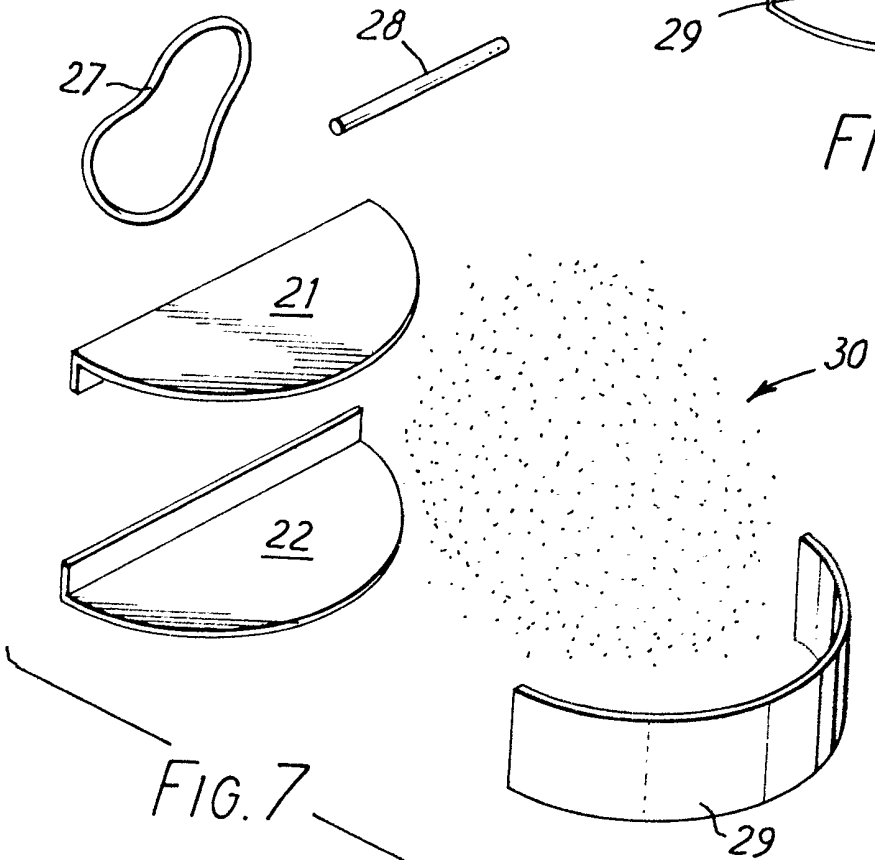

FIG. 7

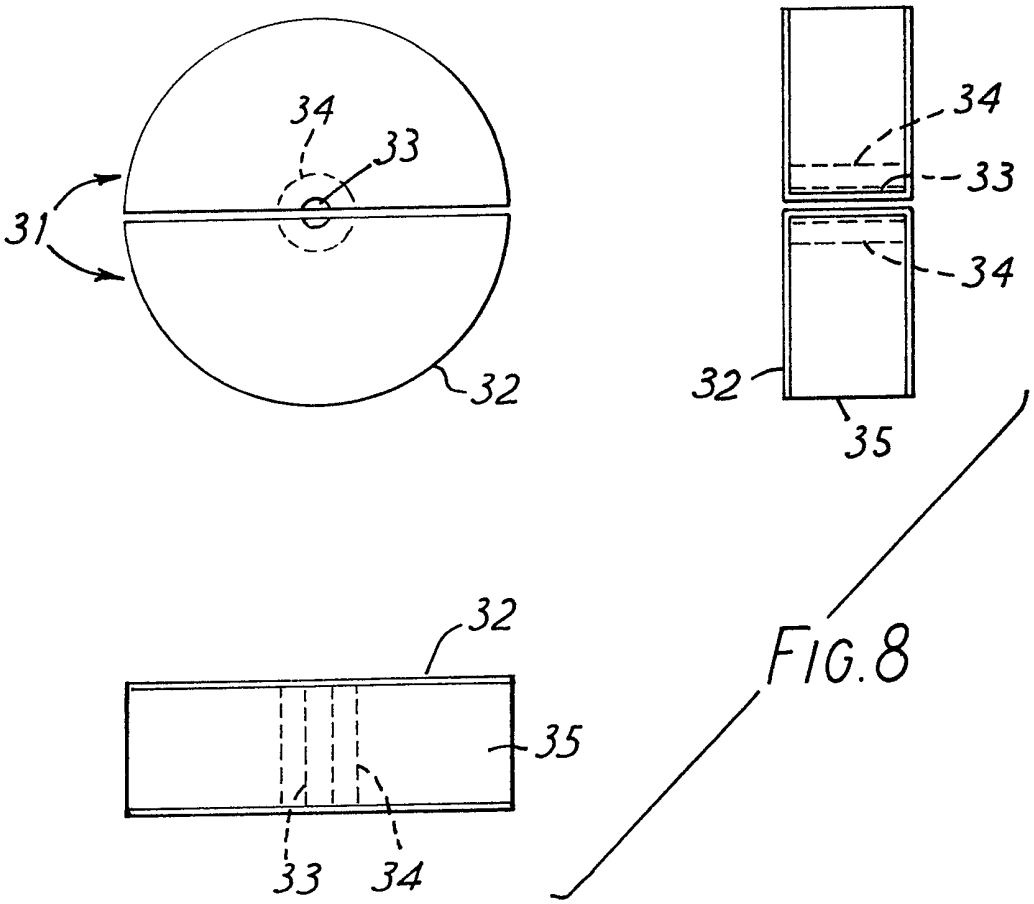

FIG. 8

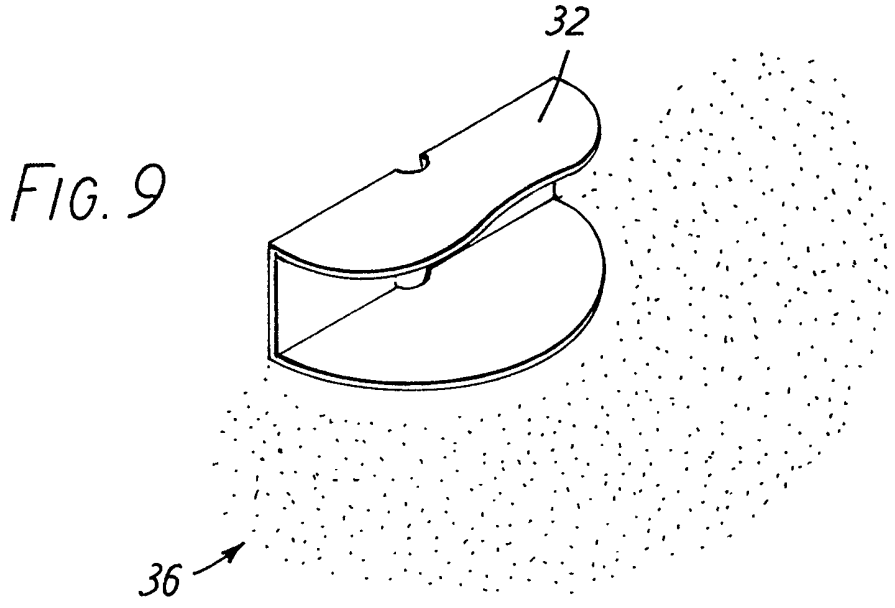

FIG. 9

SPECIFICATION

Chaff rocket

The present invention relates to chaff rockets.

Rockets may be used for distributing chaff, which may consist of very many small metal particles, metallized fibres or other material giving an echo on radar. By its nature chaff is not easy to distribute widely since individual particles have small mass and high air resistance, hence they quickly lose momentum during distribution. This can lead to a long "blooming time", "blooming time" meaning the time taken for a load of chaff to become distributed in a cloud of a certain size.

The objection of the invention is to utilize the spin of a spinning rocket to achieve distribution of chaff.

According to the invention, there is provided a chaff rocket comprising a load of chaff, means for ejecting the chaff from the rocket; means for propelling the rocket by propellant combustion; and means for spinning the rocket rapidly during flight by reaction of combustion efflux gas.

The load of chaff may be ejected as a single batch which is spinning. Usually the ejection will be longitudinally of the rocket and distribution will occur longitudinally. Since the batch is spinning distribution will additionally occur radially giving a faster blooming time than if distribution were occurring only longitudinally.

Preferably, however, the load of chaff is provided in a plurality of individual packs. The packs arranged with their individual centres of gravity eccentric from the central axis of the rocket about which it is spinning so that, on ejection, they fly out radially.

The packs may be open so that distribution of chaff itself starts as soon as the packs are ejected. In this case it is advantageous for each pack to have two openings, air being scooped in at one opening as the pack spins and the chaff being blown out of the other opening by the scooped air. Here the spin of the rocket is of two fold advantage, firstly in flinging the packs from the rocket and secondly in distributing the chaff from the packs.

The packs may alternatively be closed and provided with a time delay device which enables them to fly out an appreciable distance before opening. Then they may open mechanically or they may be blown open pyrotechnically. In either case blooming is effectively speeded since the chaff is distributed from a number of spaced positions. To incrdease the distance flown out before opening part of each pack may be of a heavy metal such as lead to enable the pack to maintain its momentum in flight from the rocket.

The rate of spin of the rocket must be high (typically 8,000 rpm) for effective distribution of chaff in an acceptable blooming time. Accordingly, the preferred means for spinning the rocket is angling of the propulsion jet nozzles. Alternatively, separate spin nozzles may be provided in addition to the main propulsion nozzles. In another arrangement there is provided an annular jet nozzle with spinning slits or fins disposed in the efflux gas stream, such as is disclosed in our British Patent Application No. 7937621. These means for imparting a high rate of spin to the rocket are all active spinning means in that the efflux gas from propulsion combustion is harnessed to spin the rocket. It is envisged that other active spinning means may be used in that efflux gas from combustion separate from the propulsion combustion may be used. Active spinning is to be distinguished from passive spinning such as may be provided by angled rails in a launcher or by angled flight stabilization fins on which the air impinges during flight. Passive spinning means do not, as a rule, give a sufficiently high rate of spin (typically only 500 - 1,000 rpm), for an adequate blooming time.

To help understanding of the invention an embodiment thereof will now be described, by way of example, with reference to the accompanying drawings in which:-

*Figure 1*is a diagrammatic longitudinal section of a rocket according to the invention;

Figure 2 is a diagrammatic perspective view of chaff packs being inserted into the rocket of Figure 1;

Figure 3 combines plan, side and end views of a pair of chaff packs as shown in Figure 2;

Figure 4 is a perspective view of one chaff pack of Figure 3 distributing chaff;

Figure 5 combines plan, side and end views of an alternative chaff pack having a mechanical opening arrangement;

Figure 6 is a perspective view of the chaff pack of Figure 5 in flight;

Figure 7 is a perspective view of the chaff pack of Figure 5 opened and distributing chaff;

Figure 8 combines a plan, side and end view of another alternative chaff pack having a pyrotechnic opening arrangement; and

Figure 9 is a perspective view of the chaff pack of Figure 8 after explosion to distribute the chaff.

The rocket 1 of Figure 1 has a combustion chamber 2 and a pay-load chamber 3. Angled jet nozzles 4 opening from the combustion chamber are provided for propelling and spinning the rocket in flight, typically at 8,000 rpm for a 57 mm diameter rocket. A partition 5 between the combustion chamber 2 and the pay-load chamber 3 carries a fuse 6 which is ignited on ignition of the propellant charge 7. After a suitable inflight delay the fuse 6 ignites an ejection charge 8 which ejects a plurality of chaff packs 9 from the pay-load chamber 3. At the time of ejection, the chaff packs will be spinning with the rocket and consequently fly out radially of the flight path as described in more detail below.

One rocket may carry a large number of chaff packs 9. For example fourteen are shown in Figure 1. They are semi-circular and loaded in pairs with each successive pair set at right angles to the previous pair. Figure 2 shows three pairs of packs being loaded. Figure 3 shows a pair of packs in more detail. Each pack has a shell consisting of a semi-circular top 10 and a semi-circular bottom 11 with a back 12 connecting them, the three parts of the shell being formed of a single piece of bent sheet metal. A further U shaped piece 13 is connected between the top and the bottom at the front of the pack. The chaff is contained within a foil wrapping 14 in the pack.

The foil is exposed at openings 15, 16 on either side of the U piece 13. As the packs are inserted, the foil is slit for release of the chaff once the pack is ejected. The individual packs are paired back-to-back, so that their combined centre of gravity 17 will be on the central axis of the rocket. However the individual centres of gravity 18 are eccentrically positioned with the result that the packs fly out with a radial component of velocity from the rocket when ejected. They continue to spin in flight with the result that air enters the opening 15 and distributes the chaff from the opening 16, and with anti-clockwise spin shown in Figure 4, to form a chaff cloud 9.

The chaff pack 20 shown in Figure 5 embodies a mechanical delay which prevents chaff being distributed therefrom until the pack has flown out radially some distance from the rocket. Individual packs 20 are inserted into the rocket in the same manner as the packs 9 of Figure 3. The packs 20 include upper and lower semi-circular plates 21, 22 between which foil wrapped chaff 23 is sandwiched. The plates 21, 22 have lips 24, 25 between which is left a gap 26. The pack is held together by an elastomeric band 27 tight by a tourniquet 28, which is accommodated in the gap 26. A strip 29 of lead bent to the semi-circular contour of the plates extends around the front of the pack outside the chaff but within the front edges of the plates. Figure 6 shows a pack 20 flying radially from the rocket. Since the tourniquet 28 is no longer constrained in the gap 26 by the pack, being placed in back-to-back relationship with another such pack, it unwinds and releases the band 27. Figure 7 shows the position where the band has become loose and the pack has spun out of it. The plates 21, 22 and the lead strip 29 separate leaving the chaff to form a cloud 30.

Another alternative pair of packs 31 is shown in Figure 8. They each have a shell 32 similar to that of pack 9 shown in Figure 3, except that the shell is fully open at the front. At the centre of the back a fuse 33 is provided, which extends centrally along the entire load of chaff packs and is ignited immediately prior to ejection of the chaff packs from the rocket. Surrounding the fuse 33, within the shell 33 is a small charge 34 at the centre of foil wrapped chaff 35. On ejection the fuse 33 burns through with a slight delay to allow the pack to fly radially from the rocket for a certain distance, whereupon the charge 34 explodes distributing the chaff into a cloud 36.

The invention is not intended to be restricted to the details of the above described embodiments. Other configurations of chaff packs may be used e.g. third or quarter circular as opposed to semi-circular. Other delays may be used. The chaff packs may be ejected mechanically as opposed to pyrotechnically.

CLAIMS

1. A chaff rocket comprising a load of chaff, means for ejecting the chaff from the rocket; means for propelling the rocket by propellant combustion; and means for spinning the rocket rapidly during flight by reaction of combustion efflux gas.

2. A chaff rocket as claimed in claim 1 wherein the propellant efflux gas is directed through ducts to give a tangential component of motion.

3. A chaff rocket as claimed in claim 1 or claim 2 wherein the chaff is contained in a plurality of individual packs, which packs fly apart from each other, on ejection from the rocket, by virtue of the spinning action.

4. A chaff rocket as claimed in claim 3 wherein the packs having openings from which the chaff is distributed during flight.

5. A chaff rocket as claimed in claim 3 wherein the packs have delayed-action devices to release the chaff after some delay following ejection from the rocket.

6. A chaff rocket as claimed in claim 5 wherein the delayed-action devices are mechanical devices comprising tourniquet-held resilient bands.

7. A chaff rocket as claimed in any of claims 3 to 6 wherein the individual packs are semi-circular and are mounted back-to-back in pairs in the rocket.

8. A chaff rocket substantially as hereinbefore described with reference to the accompanying drawings.

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