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2,997,165

CARTRIDGE FOR EXOTHERMIC REACTION MATERIAL

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Fig. 1

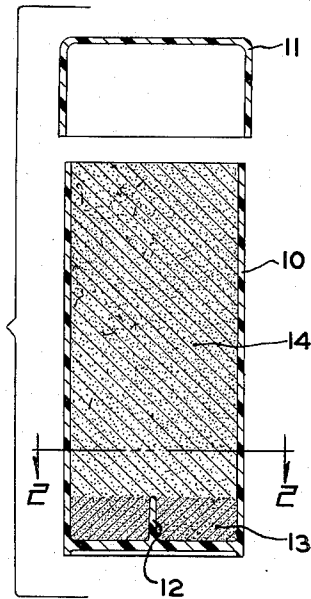


Fig. 2

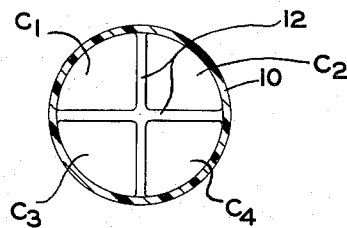


Fig. 3

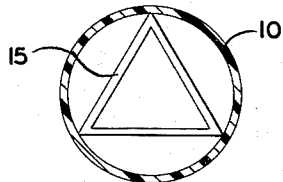


Fig. 4

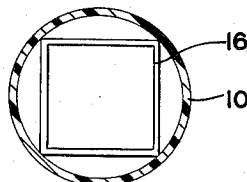
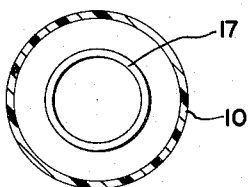


Fig. 5



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CARTRIDGE FOR EXOTHERMIC REACTION MATERIAL

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The present invention relates to a cartridge for containing an exothermic reaction material and, more particularly, to such a cartridge adapted to maintain a segregation between the exothermic reaction material and an ignition powder therefor.

Cartridges containing an exothermic reaction material, such as the conventional Thermit mixture, have been previously used to effect welding operations such as in welding rails together; note, for example, United States Patent No. 2,229,045, to Cadwell. Since the exothermic reaction material does not ignite very readily, it has been the practice to employ with each charge of the exothermic reaction material a small quantity of an igniting powder which may be conveniently and easily ignited with a match or the like and in this manner initiate the exothermic reaction. In cartridges of the type mentioned, it has been the practice to deposit the ignition powder along the bottom of the cartridge to a relatively small height and then to fill the remainder of the cartridge with the charge itself. Subsequently, when the contents of the cartridge are emptied into a suitable receptacle therefor such as a crucible or rail bonding apparatus, the charge enters the crucible first leaving the ignition powder on top and accessible where it may be easily reached by a match and the like.

However, in transporting such cartridges from various points of use or from a manufacturer to a consumer, it has been found that the igniting powder and the exothermic reaction material tend to intermix because of the rattling and shaking attending a shipment. As the contents of the cartridge thus tend to form a homogenized mixture, the igniting powder is so dispersed throughout the exothermic reaction material that the powder loses its identity. In time so little of the igniting powder remains at one end of the cartridge that the powder is not able to initiate the reaction as desired.

A principal object of the present invention is, therefore, to provide an improved cartridge which maintains a separation or segregation between the exothermic reaction material and an igniting powder.

A further object is to provide a cartridge for an exothermic reaction material having a compartmentalized or divided section at one end in which to receive and effectively retain the igniting powder.

A still further object is to provide a cartridge for an exothermic reaction material in which ribs or vanes are formed at one end to define sections or compartments to receive an igniting powder and simultaneously reinforce the cartridge.

Other objects of the invention will become apparent as the description proceeds.

To the accomplishment of the foregoing and related ends, the invention consists of the features hereinafter fully described and particularly pointed out in the claims, the annexed drawing and following disclosure describing in detail the invention, such drawing and disclosure illustrating, however, but one or more of the various ways in which the invention may be practiced.

In said annexed drawing:

FIGURE 1 is a vertical cross-section of a cartridge of the present invention;

FIGURE 2 is a cross-section of FIGURE 1 on the line 2—2; and

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FIGURES 3, 4, and 5 are cross-sections similar to FIGURE 2 but illustrating other modified forms of the present cartridge.

We have found that intermixing of an exothermic reaction mixture and an igniting powder can be effectively prevented by dividing one end of the cartridge into compartments or sections. Although contact between the igniting powder and the exothermic reaction material and the functions of each are not in any way hindered by this structure, the division of one end of the cartridge in the manner indicated appears sufficiently to immobilize the igniting powder that continued segregation is possible and intermixing is inhibited even though the cartridge is rattled and jarred as during shipment.

Referring to the drawings, and particularly FIGURES 1 and 2, the embodiment illustrated includes a cartridge 10 which is shown as cylindrical in cross-section although other cross-sectional configurations may also be employed. The cartridge may be formed from any suitable material, but molded synthetic resins such as polyethylene have been found to be very satisfactory. A cap 11 of the same material fits over the upper end of the cartridge and preferably makes a tight, tensioning fit thereon. At the bottom of the cartridge, ribs or vanes 12 intersect in cruciform shape to form compartments or sections C₁, C₂, C₃, and C₄. These ribs not only form such sections but in addition substantially reinforce the cartridge. The reinforcing effect is especially advantageous when the cartridge is formed of plastics such as polyethylene which is ordinarily quite flexible. The ribs 12 further eliminate the necessity for external rigidifying ridges.

In practice, as indicated in FIGURE 1, the cartridge 10 is filled with an igniting powder 13 to a height approximating the height of the ribs 12. The balance of the cartridge is then filled with an exothermic reaction mixture 14 and the cartridge is then closed by the cap 11.

The compartmentalized end of the present cartridge may take various forms of either polygonal or circular shape. For example, FIGURES 3 and 4 illustrate compartments or sections formed by effectively inscribing an equilateral triangle 15 and square 16, respectively, within the walls of the container 10. FIGURE 5, on the other hand, illustrates a ring 17 having an axial extent approximately equal to the height of the ribs 12, or the triangle 15, or the square 16. The ring 17 is fixed to the bottom of the cartridge 10 and extends substantially concentrically with respect to the cartridge wall.

Although the present invention is obviously not limited to the compositions of the materials employed, for purposes of illustration one exothermic reaction material which may be used comprises the following compositions and proportions:

	Parts by weight
Copper oxide (roasted copper mill scale).....	from about 30 to about 50.
Copper-aluminum alloy.....	from about 14 to about 20.
Tin oxide.....	from about .75 to about 2.
Manganese dioxide.....	from about .4 to about 1.

One igniting powder which may be used comprises the following composition.

	Parts by weight
Copper oxide scale.....	20
Copper-aluminum alloy.....	5
Red phosphorus.....	5
Metallic aluminum powder.....	7.5
Black cooper oxide.....	10

It will now be apparent that we have provided an improved cartridge which maintains a desired separation between the exothermic reaction material and the igniting powder. The ribs or vanes formed preferably integrally

with the bottom of the cartridge inhibit the intermixing of the igniting powder with the exothermic reaction material even though the cartridge be jarred, rattled, and the like. In addition, the ribs and vanes reinforce the cartridge, which is particularly effective when the cartridge is formed from flexible plastics, and eliminate the need for external reinforcing ribs. As indicated, the cartridge can be composed of various materials such as metal and even non-metal compositions such as plastics and resins, cardboard, etc. In addition to polyethylene previously noted, synthetic plastics and resins, whether plasticized or unplasticized, which may also be used include polystyrene, the polyesters, the phenolics such as phenol formaldehyde and resorcinol formaldehyde, the ureas such as urea formaldehyde and melamine formaldehyde, the acrylates such as methacrylate resin, the polyurethanes, the vinyls such as polyvinyl chloride, polyvinylidene chloride, copolymers thereof, and the like.

The ribs which divide the bottom region of the tubular cartridge into compartments communicating with the main body of the cartridge are adapted to contain the starting powder in a manner to prevent substantial dislodgment during loading when the considerably heavier charge of metal-producing exothermic reaction mixture is subsequently deposited therein, as well as inhibiting displacement during further handling.

Other forms embodying the features of the invention may be employed, change being made as regards the features herein disclosed, provided those stated by any of the following claims or the equivalent of such features be employed.

We therefore particularly point out and distinctly claim as our invention:

1. In an exothermic reaction mixture cartridge comprising a tubular container having a closed bottom end and a discharge end closed by a removable cap; a readily ignitable starting composition in the bottom portion of said container, and an exothermic metal-producing reaction mixture heavier than said ignitable composition filling the body of said container and directly overlying and contacting said starting composition, at least one rib projecting within the bottom portion of said container and disposed substantially only in said starting composition effective to inhibit shifting of said starting composition and excessive intermixing thereof with said heavier reaction mixture during handling prior to use, the height of said rib being substantially equal to the depth of said ignitable composition.

2. The cartridge of claim 1, wherein radial ribs divide said bottom portion into a plurality of compartments containing said starting composition in direct communication with the body of said container holding said reaction mixture.

3. A cartridge of exothermic reaction material comprising a container closed at one end to form a bottom, an igniting powder filling a lower portion of said container, an exothermic reaction material heavier than the igniting powder disposed within said container directly over and in contact with said igniting powder, and a rib member within the container disposed substantially entirely within the igniting powder effective to inhibit intermixing of such powder and the exothermic reaction material, the height of said rib member being substantially the depth of the igniting powder.

4. The cartridge of claim 3 wherein said rib member is in the form of a tube disposed substantially concentrically within the cartridge.

5. A cartridge of exothermic reaction material comprising a container closed at one end to form a bottom, a layer of an igniting powder extending across the bottom and filling a lower portion of said container, a layer of an exothermic reaction material heavier than the layer of igniting powder disposed within the container and overlying such powder in direct communication therewith, and a rib member integral with said bottom of the container defining compartments at that end, said rib member extending longitudinally of the container a distance substantially equal to the height of the layer of the lighter igniting powder and yet effective to prevent dislodging of the igniting powder by the heavier exothermic reaction material.

6. A cartridge of exothermic reaction material for a welding operation comprising a container closed at one end to form a bottom, a layer of an igniting powder extending across the bottom and filling a lower portion of said container to a desired height, a layer of an exothermic reaction material heavier than the layer of igniting powder substantially filling the balance of said container and overlying the layer of igniting powder in direct communication to define an uninterrupted interface between such layers, and a rib member integral with said bottom of the container defining compartments at that end, said rib member extending upwardly from said bottom a distance substantially equal to such height of the igniting powder layer and effectively resisting the weight of the heavier exothermic reaction material to dislodge the lighter igniting powder and thereby maintain said material and powder in a segregated relation.

7. A cartridge of exothermic reaction material for a welding operation comprising in combination; a container of flexible plastic closed at one end to form a bottom and open at the other end, a layer of an igniting powder extending across the bottom and filling a lower portion of said container, a layer of an exothermic reaction material heavier than the layer of igniting powder substantially filling the balance of said container and overlying the layer of igniting powder to define an interface therebetween, said layers being in direct contact throughout said interface, and ribs of flexible plastic integral with said container bottom and reaching walls of the container simultaneously to reinforce said container and define a plurality of compartments at said closed end, said ribs extending longitudinally of the container through said layer of igniting powder and terminating substantially at such interface to immobilize the relatively light igniting powder and prevent lateral shifting of the powder due to the heavier overlying exothermic reaction material with resultant intermixing.

8. The cartridge of claim 7 wherein said ribs intersect to form a cruciform configuration.

9. The cartridge of claim 7 wherein said ribs form a polygonal configuration.

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