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SHAPED CHARGE

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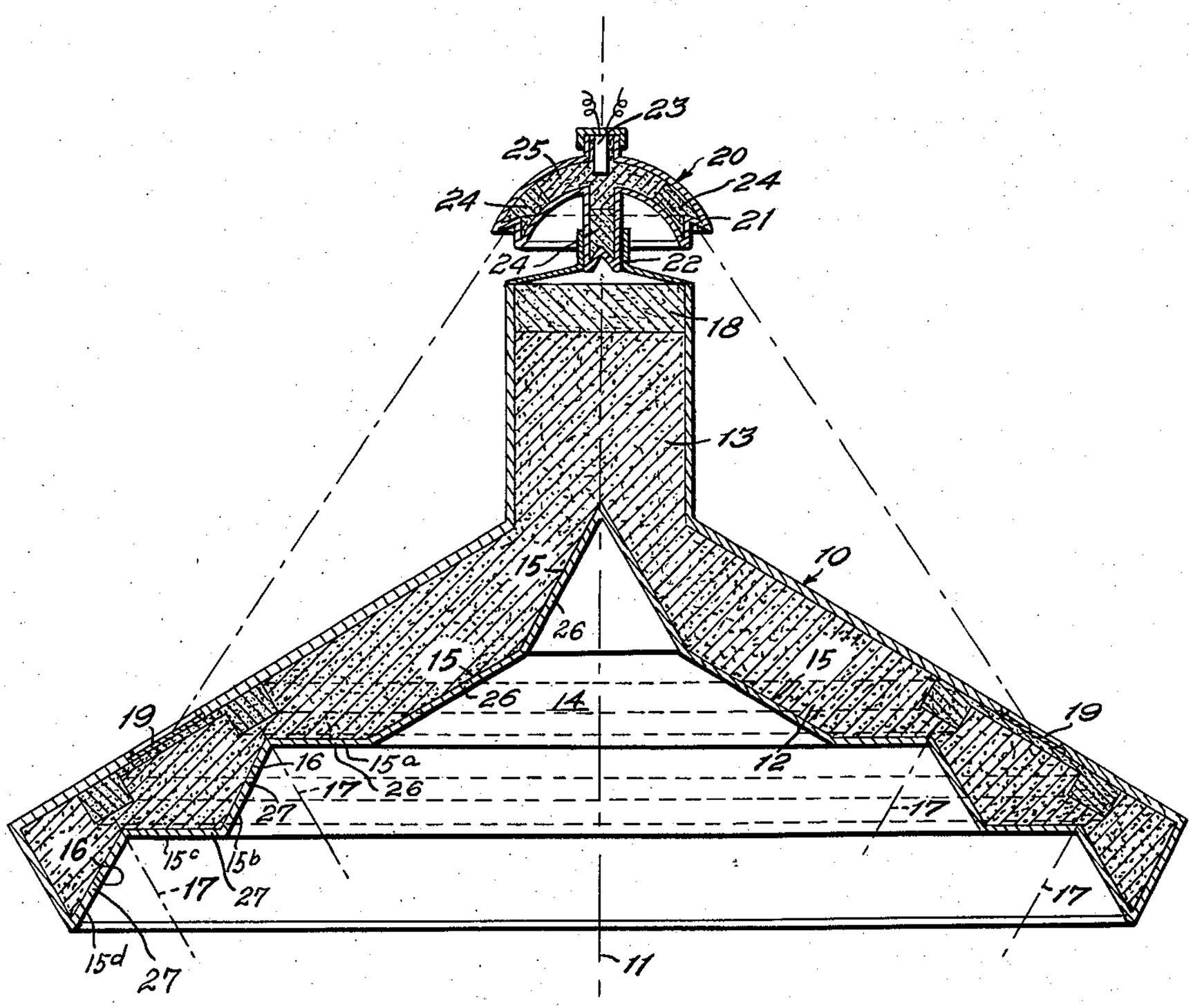

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SHAPED CHARGE

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5 Claims. (Cl. 102—24)

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The invention described in the specification and claims may be manufactured and used by or for the Government for governmental purposes without the payment to us of any royalty thereon.

This invention relating to shaped charges, is a continuation-in-part of our application Serial No. 158,047 filed April 25, 1950, now abandoned.

The principal object of our invention is to provide a shaped charge with a cavity form which will enhance the directive effect of the cavity upon the forces of detonation which are focused therethrough than heretofore known in the art.

Other and important objects will be apparent to those skilled in this art from the following description when considered with the appended drawing in which:

The single view discloses a vertical sectional view through a shaped charge provided with one form of cavity in accordance with our invention.

We have for convenience chosen to illustrate our present invention in connection with a shaped charge generally indicated at **10** which is confined within and fits a casing externally configured about a central longitudinal axis of symmetry **11** so as to provide a lower truncated conical section **12** and integral upwardly projecting cylindrical section **13.**

As shown, the charge **10** is shaped to define a conical surface **15** symmetrical of axis **11** and having its base circumference or circle coincident with the smaller circumference of a frusto-conical section **12** also symmetrical of axis **11.** This frusto-conical surface may be considered to have formed in its surface adjacent its larger circumference, first and second annular channels each shown as **V**-shaped in cross section. Thus the cross section of the first channel is defined by a first pair of sides **15***a* and **15***b* and the cross section of the second channel is defined by sides **15***c* and **15***d* both having an apex angle substantially equal to the apex angle of frusto-conical surface **15.** The bisectors **17** of the angles formed between the respective pairs of sides, intersects axis **11** at points forwardly of the open face of the shaped charge. As shown the surfaces generated by sides **15***a* and **15***c* are parallel as are those generated by sides **15***b* and **15***d.* It is thus seen that the entire shaped cavity is a generally rearwardly convergent surface of revolution coaxial and symmetrical about axis **11,** with the surfaces **15***d,* **15***c* and **15***a,* **15***b* paired to form secondary shaped cavities **16** symmetrical about minor axes **17** and with the force of explosion directed inwardly in a manner to cause the effect of the secondary cavities **16** to augment the blast effect produced by the primary cavity **14.**

The charge **10** as shown may be detonated through boosters **18, 19** by detonator **20** in differentially timed relation so as to cause the detonation waves from sections **12** and **13** of the charge **10** to reach the cavities **14, 16** substantially simultaneously or in preselected order. As shown in the drawings the annular booster **19** is substantially **U**-shaped in cross section and is embedded in the charge **10** adjacent the forward end thereof so that its legs are directed inwardly of the charge and in axial alignment with the axes **17—17** for the purpose of producing detonation waves in alinement with each of the apices of secondary cavities **16.**

As indicated the detonator **20** is provided with a component detonator **21** adapted to detonate the annular booster **19** throughout its length simultaneously and with a depending booster component **22** adapted to detonate the booster **18.** Action of detonator **20** is initiated by the initiator **23** and the time sequence of detonating the detonable explosives **24** in detonator components **21, 22** by the ratio of fuse powder **25** to detonable explosive in each of the detonator components.

As we have merely shown charge **10** as having the external figuration disclosed for purposes of illustration we do not intend thereby to be limited to such external configuration but contemplate configurations of any appropriate geometric form.

Likewise we have shown primary cavity **14** of generally rearwardly converging conical form merely for purposes of illustration and contemplate secondary cavities **16** as being of any appropriate symmetric cross sectional form arranged in any appropriate symmetrical disposition about axis **11** to accomplish our stated principal object. As the symmetric forms appropriate for use in shaping cavities **14, 16** are so numerous and well known in the art of shaped charges we do not consider it necessary to specifically enumerate and/or disclose them in the drawings to make it clear to those skilled in the art that all such shapes may be utilized in cavities **14, 16.**

The cavities **14, 16** may be lined with complemental liners **26, 27** made of any metallic or non-metallic material appropriate for such use. The liners **26, 27** may be made integrally or as components either secured or unattached to each other and will be made of such thickness as is called for by the purpose to be served. In interpreting the claims, the forward direction is from top to bottom, along axis **11,** as the parts are viewed upon the figure of the drawing.

We claim:

1. In a demolition unit, a frusto-conical portion of sheet material united at its end of smaller diameter with a tubular neck portion of equal diameter, to form a casing, said portions having a common axis of symmetry, a solid charge of explosive fitting said casing, the face of said charge opening through the larger end of said frusto-conical portion and having a cavity therein symmetrical about said axis and defined by a forwardly-opening conical surface of first apex angle merging at its base into a frusto-conical surface of second apex angle greater than said first angle, both said surfaces being symmetrical about said common axis, a first booster in detonating relation with the explosive in the rearward end of said neck portion, a second annular booster extending about said frusto-conical portion in detonating relation with the explosive charge therein and coaxial of said axis, a single detonator operatively associated with both said boosters and symmetrical of said axis rearwardly of said first booster, said detonator including shaped charges adapted for simultaneously directing flame onto both said boosters to initiate the same.

2. The demolition unit of claim 1, said detonator including concentric first and second radially spaced hemispherical elements of lesser and greater radii respectively, and symmetrical about said axis to define a hemispherical shell between them and a tubular element fixed with said first hemispherical surface and extending radially thereof forwardly along said common axis to a point adjacent said first booster, a unitary explosive priming charge filling said shell and tubular element and

shaped to direct an initiating flame onto said first and second boosters, respectively.

3. In a demolition unit, a frusto-conical portion of sheet material united at its end of smaller diameter with a tubular neck portion of equal diameter, said portions having a common axis of symmetry and jointly forming a casing, a solid charge of explosive fitting within said casing, the face of said charge opening through the larger end of said frusto-conical portion and having a cavity therein symmetrical about said axis and defined by a forwardly-opening conical surface of first apex angle having its base circumference coincident with the smaller circumference of a frusto-conical surface having a larger apex angle than said conical surface, said frusto-conical surface having first and second channels of uniform cross section in planes radial of said axis, a first booster fixed in detonating relation with said explosive charge at the rearward end of said tubular portion, a second annular booster fixed in detonating relation with said charge adjacent the bottoms of said channels, a single detonator operatively associated with both said boosters positioned symmetrically of said common axis and initiable to simultaneously project flame into both said boosters to initiate the same.

4. The demolition unit of claim 3, said detonator including concentric first and second radially spaced hemispherical elements of lesser and greater radii, respectively, concentric about a point on said axis forwardly of said detonator and defining a hemispherical shell between them, and a tubular element fixed with said first hemispherical surface and extending radially thereof forwardly along said common axis to a point adjacent said first booster, a unitary explosive priming charge filling said shell and tubular element and having its exposed surfaces shaped to direct flame onto said

first and second boosters, respectively, and means carried by said second element on said axis, to initiate said priming charge.

5. In a shaped charge demolition unit, a main charge having a frusto-conical portion integral at the end of smallest diameter with a cylindrical neck portion, a cavity in said frusto-conical portion at the end of largest diameter, said cavity and cylidrical portion being symmetrical about the longitudinal axis of said frusto-conical portion, a first booster charge overlying the rearward end of said neck portion, a second annular booster overlying a portion of said frusto-conical charge adjacent said cavity, a single detonator operatively associated with both said boosters and symmetrical about said axis rearwardly of said first booster, said detonator including shaped charges adapted and arranged to direct a jet of flame onto said first booster and an annular jet of flame onto said second booster.

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