March 16, 1965 W. F. BROSKE 3,173,369

EXPLOSIVE SHELL FOR POWDER ACTUATED TOOL

Filed Nov. 23, 1962 2 Sheets-Sheet 1

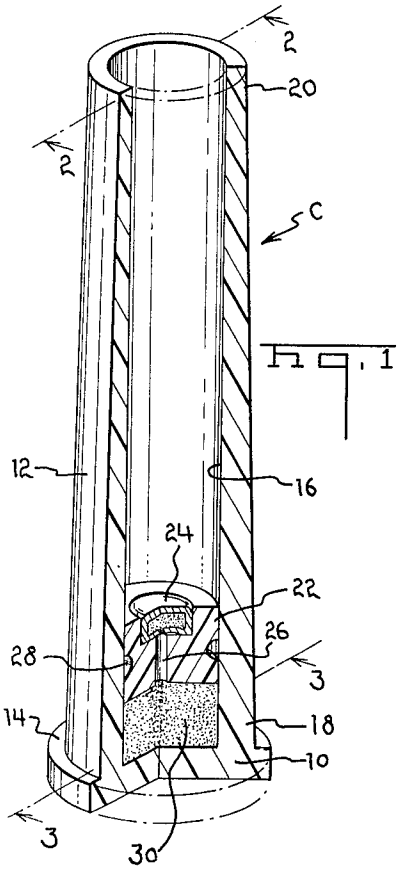


Fig. 1

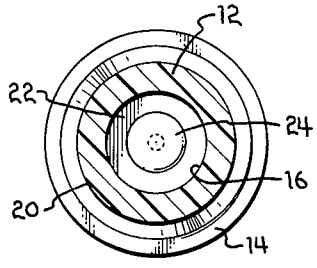


Fig. 2

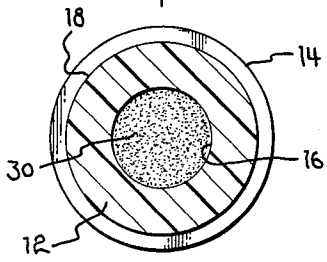


Fig. 3

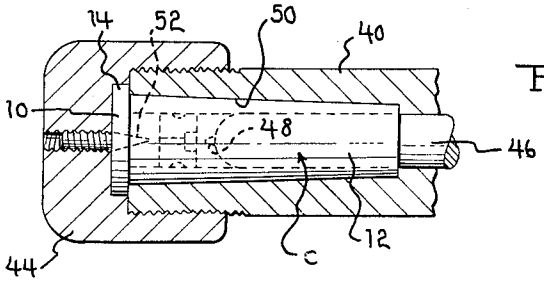


Fig. 4

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March 16, 1965 W. F. BROSKE 3,173,369

EXPLOSIVE SHELL FOR POWDER ACTUATED TOOL

Filed Nov. 23, 1962 2 Sheets-Sheet 2

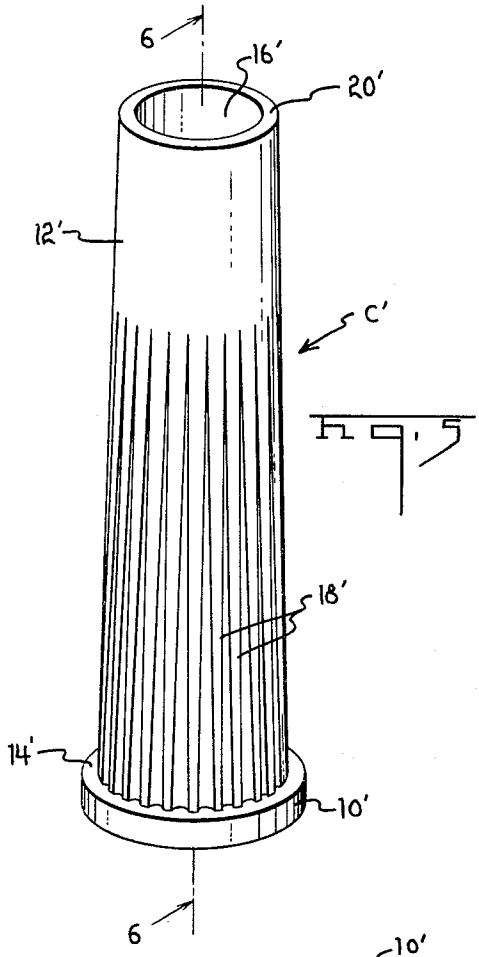


Fig. 5

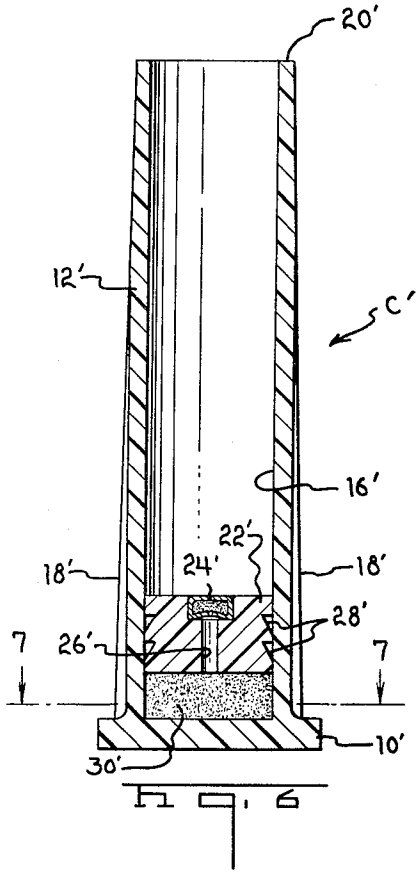


Fig. 6

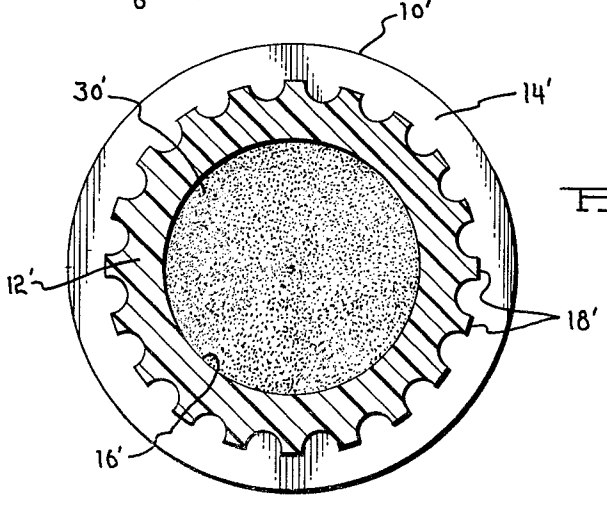


Fig. 7

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3,173,369
EXPLOSIVE SHELL FOR POWDER ACTUATED TOOL

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2 Claims. (Cl. 102—38)

This application constitutes a continuation-in-part of my prior application, Serial No. 206,768, filed July 2, 1962, now abandoned.

In the use of powder-actuated tools for industrial purposes, it has been discovered that a plastic shell having a plastic plug and an explosive charge may be utilized to retain the high combustion gases within the shell during the firing cycle, as described in my prior application, Serial No. 793,814, filed February 17, 1959, now Patent No. 3,007,409.

This type of shell has been found particularly useful in devices for pressure-forming electrical connectors onto conductors, as described in a prior application, Serial No. 172,183, filed February 9, 1962. However, in industrial tools of the type described, it has been found that the presence of a grease or a lubricant on the outer surface of the plastic shell may tend to cause the shell to rupture during the firing cycle. It has not been completely established why this result occurs under these conditions, but it may be that the ungreased shell is frictionally constrained from outward flow by the chamber of the barrel. The presence of grease or lubricant may reduce this frictional constraint, thus permitting sufficient extrusion of the plastic to cause rupture.

Whatever the reasons, I have discovered that if the outer surface of the shell is tapered so that the cross-section is thicker at the base and thinner at the open end, and the firing chamber is similarly tapered, rupture of the shell is prevented even when the shell is coated with grease.

One embodiment of a shell made according to the teaching of the invention includes a tapered shell having fluted ribs on the outer surface to effect the taper. This reduces the amount of material required to make the shell, as well as dissipating the shock wave of the explosion.

Thus, it is an object of this invention to provide a plastic shell of the type described, which will not rupture during firing even though coated with grease. It is also an object of this invention to prevent the shell from rupturing during the firing cycle by tapering the thickness of the shell in cross-section. I have also discovered that providing a tapered shell to fit into a tapered firing chamber increases the facility with which the shell may be removed. This is particularly true in industrial tools where the plastic shell may be expanded during the operation of the tool.

Other objects and attainments of the present invention will become apparent to those skilled in the art upon a reading of the following detailed description when taken in conjunction with the drawings in which there are shown and described illustrative embodiments of the invention; it is to be understood, however, that these embodiments are not intended to be exhaustive nor limiting of the invention but are given for purposes of illustration in order that others skilled in the art may fully understand the invention and the principles thereof and the manner of applying it in practical use so that they may modify it in various forms, each as may be best suited to the conditions of a particular use.

In the drawings:

FIGURE 1 is a perspective view, partially cut away, illustrating one embodiment of the invention;

FIGURE 2 is a cross-sectional view taken along plane 2—2 of FIGURE 1;

FIGURE 3 is a sectional view taken along plane 3—3 of FIGURE 1;

FIGURE 4 is a fragmentary view showing the device of FIGURE 1 fitted in a firing chamber of an industrial tool;

FIGURE 5 is a perspective view of another embodiment of the device incorporating the principles of the invention;

FIGURE 6 is a view taken along plane 6—6 of FIGURE 5; and

FIGURE 7 is a sectional view taken through plane 7—7 of FIGURE 6.

One embodiment of the invention (FIGURE 1), the shell casing, generally designated "C," includes a base member **10** which is in the form of a disk closing off one end of a cylindrical member **12**. The disk **10** and cylinder **12** may be integral. The preferred embodiment is achieved by molding the casing from polyethylene. The disk **10** has a flange **14** projecting outside the surface of the cylinder to permit the shell to be retained in a tool.

Also, as shown in FIGURE 1, the inner surface **16** of the casing "C" has a constant internal diameter. The outer surface has a larger external diameter at the base portion **18** than at the nose portion **20**. Thus the outer surface provides a tapered, frusto-conical configuration. As shown in FIGURES 2 and 3, the thickness of the casing in the base portion **18** is greater than the thickness of the casing at the nose portion **20**.

In addition to the casing, the shell comprises a plug **22** (preferably of polyethylene) which has an outside diameter forming a friction-fit with the inside surface of the casing **16**. The plug **22** has a primer **24** on its exterior surface, a central axial opening **26**, and a circular aperture **28**. When the shell is assembled (as shown in FIGURE 1), an explosive charge **30** is located within the casing adjacent the inner surface of the disk **10** and retained in place by plug **22**.

As shown in FIGURE 4, the shell is adapted to fit into a firing chamber **40** of an industrial tool (e.g., as shown in the prior application, Serial No. 172,183, filed February 9, 1962), having a cap **44** secured to the end thereof, and a ram **46** adapted to fit into the cylindrical shell. A firing pin **48** on one end of the ram is adapted to strike the primer **24** to actuate the powder charge.

As shown in FIGURE 4, the firing chamber **40** has an inner tapered surface **50** which corresponds to the taper on the outer surface of the casing "C." When the ram **46** is driven against the primer **24**, the primer explodes to ignite the powder charge **30**. The powder charge **30** drives the plug **22** toward the nose portion **20** of the casing "C," and thus drives the ram **46** ahead of it to operate the device.

A pin **52** may be located in the cap **44** to release combustion gases, as described in my prior application, Serial No. 164,756, filed January 8, 1962.

Another embodiment of the invention, as shown in FIGURES 5–7, includes a casing C' with a base member **10'** closing one end of the cylinder **12'**. The disk **10'** also has a plane **14'** having an inner surface **16'** of a constant internal diameter. As shown in FIGURES 6 and 7, the tapered outer surface comprises a plurality of ribs **18'** which provide a fluted or scalloped cross-sectional configuration. The ribs **18'** taper from the base **10'** toward the nose portion **20'** of the casing C', at which point they blend into the outer surface of the cylinder **12'**. As shown in FIGURE 6, the thickness of the cylindrical member **12'** is constant when measured at the low point between the ribs **18'**. However, when the thickness is measured across the ribs **18'**, the exterior surfaces of the

ribs converge from a maximum thickness at the base 10' to a minimum thickness at the nose portion 20'.

The shell, shown in FIGURES 5–7, also comprises a plug 22', with a primer 24', and axial opening 26', circular apertures 28' and an explosive charge 30' all assembled in the same fashion as disclosed in the embodiment of FIGURES 1–3. The casing C' may be inserted into a tool and fired in the same manner as illustrated in FIGURE 4.

Changes in construction will occur to those skilled in the art and various apparently different modifications and embodiments may be made without departing from the scope of the invention. The matter set forth in the foregoing description and accompanying drawings is offered by way of illustration only. The actual scope of the invention is intended to be defined in the following claims when viewed in their proper perspective against the prior art.

I claim:

1. A shell casing for an explosively-operated tool comprising: a hollow, generally cylindrical member having an internal surface and an external surface, said internal surface having a constant diameter, said external surface defining a frusto-conical configuration and including a series of circumferential ribs, a wall member closing one

end of said cylindrical member, the other end of said cylindrical member being open, said cylindrical member being integrally formed of plastic material, each of said ribs tapering from a major thickness proximate to the one end of the cylindrical member to a minor thickness remote from the one end, an explosive charge in said cylindrical member adjacent the one end, a plug in said cylindrical member retaining said explosive charge in place, a surface of said plug facing the open end of the cylindrical member, and means in said plug for igniting said explosive charge.

2. A casing according to claim 1 wherein the thickness of the cylindrical member between the ribs is constant.

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