United States Patent

Jacobitz

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[54] **SHELL RELOADING APPARATUS**

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[52] **U.S. Cl.**.....**86/28,** 86/32

[51] **Int. Cl.**.....**F32b 33/02**

[58] **Field of Search**.....86/23, 32, 33, 28

[56] **References Cited**

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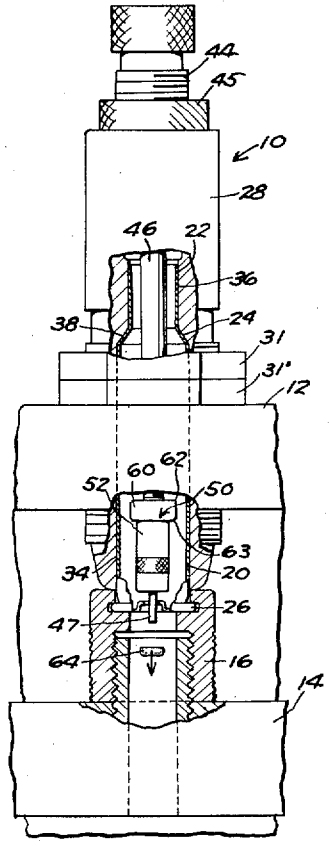
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[57] **ABSTRACT**

A shell reloading apparatus having an improved expander button which is positioned to expand the bullet-gripping shell neck. A used shell is first inserted into a cavity of the apparatus to reduce the diameter of the shell neck. The shell is then withdrawn from the cavity and over the expander button. A hard metal carbide ring on the expander button engages the inside of the shell neck as the shell is withdrawn from the cavity to thereby expand the shell neck to an accurately controlled diameter. Lubrication of the neck is not required and the ring can last indefinitely since it is highly immune to wear.

13 Claims, 3 Drawing Figures



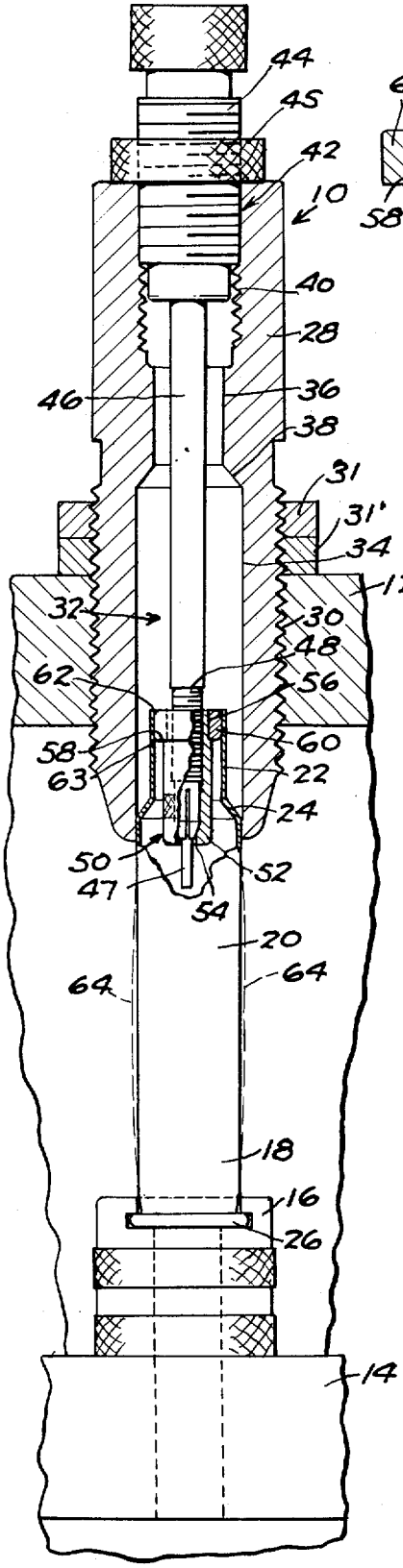


FIG. 2

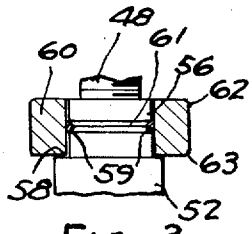


FIG. 3

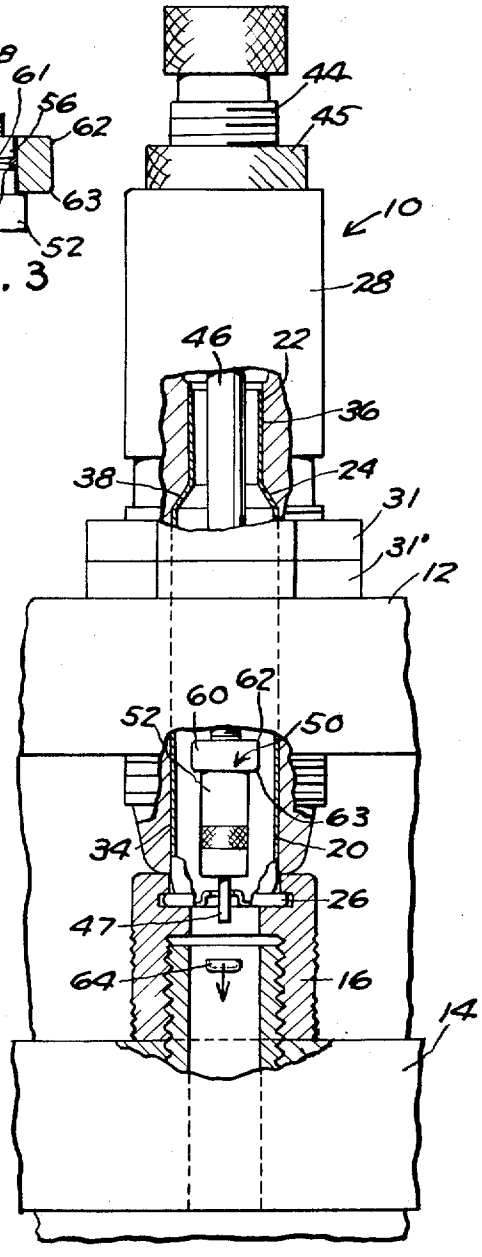


FIG. 1

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SHELL RELOADING APPARATUS

This invention relates to the art of reloading cartridge shells and particularly to an improvement in shell reloading apparatus.

The firing of a cartridge within the firing chamber of a firearm causes the cartridge shell, or casing, to slightly expand and elongate. As long as the shell is neither torn nor split, this deformation is usually sufficiently small to enable the shell to be reloaded. Before the shell is reloaded, however, it must first be resized to its original dimensions. One way in which resizing can be performed is by inserting the expanded shell into a press which is then operated to force the shell into a resizing die. In reshaping the shell, the diameter of the shell neck is particularly critical because it must grip the bullet in the completed cartridge.

One type of die construction for controlling this dimension comprises an expander button which is supported within the cavity of the resizing die. The expander button is coaxially aligned with the cavity and preferably positioned close to the cavity opening. As an expanded shell is forced neck first into the cavity, the expanded neck freely passes over the expander button. The dimensions of the cavity are such that when the shell is fully inserted therein the shell neck is contracted to a diameter less than its original diameter before firing. At the same time, the shell body, whose diameter is less critical, is resized to approximately its original diameter. As the shell is then withdrawn from the die, the now-reduced shell neck is drawn over the expander button to be increased to its original diameter.

In the past, such expander buttons have been typically formed of hardened steel with which it has been necessary to use a special lubricant within the shell neck to produce an acceptable resized shell. Improper lubrication can cause galling in the neck while excessive lubrication can create wrinkles thereby rendering the shells unacceptable. In addition, the shell must be thoroughly cleaned before sizing and the expander button must also be thoroughly cleaned after each sizing operation. Moreover, as the expander button gradually wears out the critical shell neck diameter is not maintained.

Therefore it is an object of this invention to provide an improved expander for a cartridge shell resizing die which eliminates the need to lubricate the shell.

Another object of the invention is to provide an improved expander for a cartridge shell resizing die which can last indefinitely to consistently maintain the critical neck dimension of the shells.

It is another object of the invention to provide an improved expander for a cartridge shell resizing die comprising a carbide expander ring which when drawn through the shell neck smoothly and uniformly expands the shell neck to the desired accurately-sized diameter.

In the drawings:

FIG. 1 is a front elevational view of a typical shell reloading apparatus having portions broken away and shown with a shell fully inserted into a resizing die which includes the improved expander of the present invention.

FIG. 2 is a front elevational view partly in section of the structure of FIG. 1 shown as the shell is being withdrawn from the die.

FIG. 3 is an enlarged fragmentary view of a portion of FIG. 1 having a portion broken away.

Referring now to the drawings, a shell reloading die **10** is attached to a fixed die mounting plate **12** of a shell reloading press (not shown). The press includes a movable ram plate **14** to which is attached a shell holder **16** which supports a shell **18** in an upright position perpendicular to plates **12** and **14**.

Shell **18** comprises a thin-walled tubular body **20**, a diametrically reduced neck **22** forward of body **20** and a frustum **24** connecting neck **22** with body **20**. The neck end of shell **18** is open to receive a lead bullet (not shown), and its opposite end is enclosed by a peripherally crimped shell base **26**, by means of which shell **18** is supported on shell holder **16**.

Die **10** comprises a generally cylindrical body **28** which is threaded as at **30** for attachment to plate **12**. This attachment is secured by a pair of nuts **31**, **31'**, which permit vertical adjustment of die **10**. A female die cavity **32** conforming to the shape of shell **18** extends upwardly through body **28**. Cavity **32** comprises a large cylindrical bore **34** for resizing shell body **20**, a small cylindrical bore **36** for reducing the diameter of neck **22** and a conical portion **38** connecting bores **36** and **34** for sizing frustum **24**. A threaded hole **40** extends downwardly from the upper end of body **28** to communicate with cavity **32**.

Hole **40** receives a spindle **42** which extends concentrically downward through the entire length of cavity **32**. Spindle **42** includes a head **44** which is threaded into hole **40** and a stem **46** which projects downwardly from the bottom of head **44** terminating in a decapping pin **47**. After the spindle is adjusted to its desired position it is locked in place by a jam nut **45**. The lower portion of stem **46** is threaded as at **48** to receive the improved expander **50** of the present invention.

Expander **50** comprises a thimble **52** which is threaded onto the lower end of stem **46**. A small opening **54** in the head of thimble **52** provides clearance for pin **47**. The opposite or upper end of thimble **52** is diametrically reduced as at **56** to define a shoulder **58**. An expander ring **60** is seated on shoulder **58** about the reduced portion **56** of thimble **50**. The inside diameter of ring **60** is dimensioned to closely fit onto reduced portion **56** and is preferably secured thereto by a small amount of epoxy resin **59** applied between the mating surfaces (FIG. 3). Bonding of ring **60** onto reduced portion **56** of thimble **52** is facilitated by a V-shaped groove **61** around portion **56**. The outside diameter of ring **60** is equal to the dimension to which the inside diameter of neck **22** is to be resized. Ring **60** is formed of one of the group of materials which are known as hard metal carbides. These carbides comprise finely divided, hard particles of carbide of refractory metal such as tungsten, titanium or tantalum, in combination with one or more metals to provide extreme hardness and high compressive strength. The upper and lower circular edges **62** and **63** respectively of ring **60** are preferably slightly rounded or chamfered.

Describing now the operation of the disclosed shell resizing apparatus, with ram plate **14** at the bottom of its stroke, a previously fired shell, indicated by the broken lines **64** in FIG. **2**, is first inserted into shell holder **16**. As ram **14** is now moved upwardly toward die **10**, the expanded neck **22** of shell **18** freely passes

over expander **50**. Simultaneously, shell body **20** is being resized by bore **34** to approximately its original diameter. As ram **14** moves toward the top of its stroke, the entrance of the upper end of neck **22** into the lower end of bore **36** begins reducing neck **22** to a diameter less than its original diameter before firing. Concurrently, pin **47** ejects the used primer cap **64**. When the ram arrives at the top of its stroke, the lower end of body **28** abuts the top of shell holder **16** to complete the resizing of body **20**, and neck **22** is now fully inserted within bore **36**.

Ram **14** is next moved downwardly to start withdrawing shell **18** from die **10**. As ram **14** approaches the bottom of its stroke, the lower portion of neck **22** contacts the top circular edge **62** of ring **60**. Continued movement of ram **14** causes neck **22** to be drawn over ring **60** (FIG. **2**) to thereby expand the diameter of neck **22** to the required dimension. When ram **14** reaches the bottom of its stroke the resizing operation is complete and shell **18** may be removed from shell holder **16**.

The resizing operation just described requires no lubrication within neck **22**. The expanding operation is particularly smooth and sizes neck **22** uniformly and consistently to a precisely controlled tolerance. Because the carbide material of ring **60** is extremely hard it can last indefinitely, and hence does not have to be replaced. By way of example, ring **60** has been constructed to a tolerance of 0.0005 in. for use with 8mm. or 30 caliber shells and may be constructed to other dimensions to resize similar types of shells.

I claim:

1. In a cartridge shell resizing apparatus of the type comprising means for reducing the inside diameter of a bullet-engaging neck portion of the shell to a dimension less than the original dimension thereof before firing and means for expanding the reduced inner diameter of said neck portion to an accurately predetermined size, said expanding means being located within the body of the shell when the neck is reduced to said lesser dimension, that improvement which comprises a round fitting on said expander means formed of a hard metal carbide, said round fitting having an accurately sized outer diameter and being positioned to engage the reduced inner diameter of the neck portion of said shell portion for expanding said portion to said accurately predetermined size when the shell and expander are axially separated.

2. The apparatus called for in claim **1** wherein said carbide fitting is shaped to form a circular surface over which said reduced neck portion is drawn for expanding said neck portion to said accurately predetermined size.

3. The apparatus called for in claim **1** wherein said carbide fitting comprises a ring over which said reduced portion is drawn for expanding said portion to said original dimension.

4. In a cartridge shell resizing apparatus of the type comprising a die having a cavity into which an expanded shell of a previously fired cartridge is insertable, said cavity being dimensioned to reduce the inside diameter of a portion of the shell to a dimension less than the original dimension thereof before firing when the shell is inserted into the cavity and means for expanding the reduced diameter of said shell portion, that improvement which comprises a member on said expander means formed of a hard metal carbide and positioned to engage the reduced diameter of said shell portion for expanding said portion to said original dimension.

5. The apparatus called for in claim **4** wherein said carbide member defines a surface which is concentric with the die cavity and over which said reduced portion is drawn to expand said portion to said original dimension.

6. The apparatus called for in claim **5** wherein said surface is circular.

7. The apparatus called for in claim **5** wherein said surface is spaced axially of said cavity from the portion of the cavity which reduces the inside diameter of said shell portion.

8. The apparatus called for in claim **7** wherein said surface is positioned within said cavity.

9. The apparatus called for in claim **4** wherein said carbide member comprises a ring concentric with said cavity.

10. The apparatus called for in claim **9** wherein said ring is spaced axially of the cavity from the portion of the cavity which reduces said shell portion.

11. The apparatus called for in claim **9** wherein said expander member includes a diametrically reduced portion terminating in a shoulder on which said ring is seated.

12. The apparatus called for in claim **11** wherein the inner diameter of said ring corresponds closely to the outer diameter of said reduced portion of the expander member.

13. The apparatus called for in claim **12** wherein there is provided a small area clearance between the inner cylindrical surface of the ring and the outer cylindrical surface of said reduced portion to receive bonding material for securing the expander ring to the expander assembly.

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