Firearm cartridge reloading dies, such as a die having a metallic body with a cavity extending through the body and a sleeve inserted in the cavity. The sleeve is configured to receive a firearm cartridge and reconfigure the cartridge for loading or reloading. The sleeve can be metal, non-metallic ceramic, and/or.
Fig. 5

Fig. 6

Fig. 7

FORMING A BORE IN A DIE BODY

POSITIONING A SLEEVE MEMBER IN THE BORE
FIREARM CARTRIDGE RELOADING DEVICES AND METHODS

CROSS REFERENCE TO RELATED APPLICATIONS

This application claims the benefit of U.S. Provisional Patent Application No. 60,776,577, filed Feb. 24, 2006, which is incorporated herein by reference.

TECHNICAL FIELD

The present disclosure is directed to devices and methods for loading and/or reloading firearm cartridges.

BACKGROUND

Many shooting enthusiasts prefer to load or reload their own firearm cartridges with a reloading press. Although shooters often reload cartridges simply as a hobby, shooters are also able to save money and fine tune the accuracy and specific loads of their cartridges by reloading themselves. For example, shooters can adjust the weight of the load and bullet in the cartridge for specific applications, such as using a lighter load for practice or target shooting. Conventional reloading presses accept a reloading die for reconfiguring or reshaping the cartridge case before or after firing. Common reloading dies include full-length, neck, and seating dies. Typical cartridge cases, such as straight wall or bottleneck cartridges, are formed of malleable brass and are forcibly inserted into a bore in a resizing die. Forcibly inserting the cartridge in the die causes the brass to deform and assume the dimensions of the die’s central bore. The process resizes the fired cartridge case to desired dimensions in preparation for inserting a new primer, new propellant, and a new bullet.

FIG. 1 is a schematic side view of a conventional reloading die assembly 100. The assembly 100 includes a die 110 and a cap assembly 150. The die 110 includes a body 112 having an internal bore (not shown). The body 112 includes a plurality of external threads 114 and a lock nut 112 disposed on the threads 114. The die 112 can be secured to a press (not shown) by mating the external threads 114 to internal threads of the press and tightening the lock nut 112 to secure the die 112 to the press. The die 110 also includes an opening 118 at the external threaded portion of the die that is configured to receive the cartridge for shaping and reloading. The cap 150 includes a cylindrical top portion 152 having a plurality of external threads 154 and a second lock nut 156 disposed on the threads 154. The cap assembly 150 is threaded into the bore of the die 110 by mating the threads 154 with internal threads (not shown) of the bore, and the lock nut 156 secures the top portion 152 in place.

For durability and correct shaping of the cartridges, conventional dies such as the die 100 illustrated in FIG. 1, are typically constructed of steel and have steel or other metallic inner bore surfaces to contact and resize the cartridges. These metallic inner surfaces are manufactured on lathes, which can be time consuming for manufacturers using manual lathes and cost prohibitive for manufacturers to use an automated lathe. Moreover, the machining process creates a large amount of scrap relative to the finished product. Disposing of or recycling the scrap is also time consuming and expensive. In addition, when reconfiguring the cartridges in the die, the metal-to-metal contact of the die to the cartridge requires lubrication to prevent the cartridge from sticking in the die following the resizing. Lubricating the cartridges creates additional time and expense in the reloading process. For example, a shooter must lubricate the cartridges before resizing and remove the lubricant after resizing before the cartridge is reloaded with powder. In addition, if the lubricant is not adequately removed before firing the cartridge, the lubricant can foul the chamber of a firearm thereby creating a hazardous firing condition. Accordingly, a need exists to improve reloading devices and methods.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a schematic side view of a reloading firearm die in accordance with the prior art.

FIGS. 2-6 are schematic cross-sectional side views of reloading dies in accordance with embodiments of the invention.

FIG. 7 is a flow diagram illustrating a method of manufacturing a reloading die in accordance with an embodiment of the invention.

DETAILED DESCRIPTION

A. Overview

The following disclosure describes several embodiments of firearm cartridge loading and reloading dies. For the purposes of this disclosure, reloading dies include, but are not limited to, full-length, neck, and seating dies, capable of configuring straight wall, bottleneck, belted, beltedless or other cartridges. In addition, reloading dies may reconfigure used firearm cartridges as well as new firearm cartridges. One embodiment of a cartridge reloading die is directed to a die including a housing having a cavity and a sleeve coupled to the housing in the cavity. The housing is composed of a first material; and the sleeve is composed of a second material. The sleeve includes a first internal portion having a first diameter and a second internal portion having a second diameter smaller than the first diameter.

In another embodiment, a die for reloading a firearm cartridge includes a body composed of a first material and having a cavity extending through the body. The die also includes an insert fixedly connected to the cavity of the body. The insert is composed of a second material different from the first material and the insert includes a bore that is configured to at least partially receive a cartridge for shaping at least a portion of the cartridge. The bore has a first diameter and a second diameter smaller than the first diameter.

In yet another embodiment, a die for reloading a firearm cartridge includes a body having an interior bore. The bore includes a first portion having a first diameter and a second portion having a second diameter greater than the first diameter, wherein the second portion is coated with a ceramic material and configured to at least partially receive a cartridge.

In another embodiment, a cartridge reloading die includes a body composed of a first exterior metallic portion, a second interior non-metallic portion, and a third interior portion. The die also includes a cavity in the body. The second portion of the body defines a bore portion of the
cavity configured for at least partially shaping a cartridge, and the third interior portion defines an engaging portion of the cavity configured for engaging a cap member.

[0013] Another embodiment is directed to a method of manufacturing a firearm cartridge reloading die. The method includes forming a bore in a die body and positioning a sleeve member in the bore. The sleeve member has a first diameter and a second diameter less than the first diameter. The cavity is configured to releasably contact a cartridge at least partially inserted into the cavity for shaping at least a portion of the cartridge.

[0014] Specific details of several embodiments of the invention are described below with reference to firearm cartridge reloading dies; however several details describing well-known structures or processes often associated with reloading dies are not set forth in the following description for purposes of brevity and clarity. Also, several other embodiments of the invention can have different configurations, components, or procedures than those described in this section. A person of ordinary skill in the art, therefore, will understand that the invention may have other embodiments with additional elements, or the invention may have other embodiments without several of the elements shown and described below with reference to FIGS. 1-6.

[0015] Where the context permits, singular or plural terms may also include the plural or singular term, respectively. Moreover, unless the word “or” is expressly limited to mean only a single item exclusive from other items in reference to a list of at least two items, then the use of “or” in such a list is to be interpreted as including (a) any single item in the list, (b) all of the items in the list, or (c) any combination of the items in the list. Additionally, the term “comprising” is used throughout to mean including at least the recited feature(s) such that any greater number of the same features and/or other types of features and components are not precluded.

B. Embodiments of Firearm Cartridge Reloading Dies

[0016] FIG. 2 is a schematic cross sectional view of a cartridge reloading die 200 in accordance with one embodiment of the invention. One skilled in the art will appreciate that the die 200 may be a full length die, neck die, seating die or other type of die capable of reshaping different types of firearm cartridges. The die includes a housing or body 214 having a plurality of external threads 226 and a bore or cavity 216. The body 214 is made of an alloy steel or similar metal suitable for precision machining. The external threads 226 mate with internal threads of a press (not shown), and a lock nut (not shown) disposed on the external threads 226 secures the die 200 to the press. The cavity 216 extends through the body 214 of the die 200 and through a bushing or sleeve portion 218, and is configured to receive a firearm cartridge inserted into a lower portion 210 of the die 200. One skilled in the art will appreciate that the cavity 216 can be configured to receive different types of cartridges, such as straight wall, bottlenecked, belted, or other types of diameters for example. The die 200 also includes an upper portion 260 having a first diameter less than a second diameter of the lower portion 210. In some embodiments, the body 214 has a single diameter that extends through the length of the die. The sleeve 218 extends through the body 214 and also includes a plurality of internal threads 234 on an upper section 224 of the sleeve 218. The inner threads 234 are configured to receive a cap assembly (not shown) as is conventional in the art for reloading cartridges. The sleeve 218 can also include a transition surface 222 between the upper portion 260 and the lower portion 210 of the die 200.

[0017] The sleeve 218 is coupled to the body 214 and forms a contact surface 220 for contacting and reshaping cartridges inserted into the die 200. In the embodiment illustrated in FIG. 2, the sleeve 218 is composed of a non-metallic material. For example, the sleeve 218 may be composed of a synthetic or ceramic material in specific embodiments. Forming the sleeve 218 of a non-metallic material provides many advantages over conventional cartridge reloading dies. By inserting a non-metallic sleeve 218 or bushing into the body 214 of the die 200, significant portions of the die body 214 can be molded or formed with out machining. For example, the sleeve 218 can be formed by a molding manufacturing process. As a result, decreasing the machining process of the die 200 on a lathe can significantly reduce the cost and waste associated with manufacturing the die 200. Additionally, the non-metallic sleeve 218 and non-metallic contact surface 220 are configured to reshape or resize the cartridge and release the cartridge from the cavity 216 such that the cartridge does not stick in the cavity 216. More specifically, lubricant is not required to prevent the cartridge from sticking to the non-metallic sleeve 218 following resizing of the cartridge. For example, a ceramic or synthetic sleeve 218 and contact surface 220 resizing a metal cartridge will not cause the cartridge to stick in the sleeve 218. Eliminating the need to lubricate the cartridge reduces the time and expense of the reloading process by eliminating the steps of applying the lubricant before resizing the cartridge and removing the lubricant after resizing the cartridge. Moreover, eliminating the lubricant also eliminates the danger of leaving residual lubricant on the cartridge after resizing, which can corrupt the load and also foul the firearm chamber creating a hazardous firing condition.

[0018] In certain embodiments the sleeve 218 is removably attached to the body 214 of the die 200. A removable sleeve 218 provides the additional flexibility of replacing the contact surface 220 of the die 200 as the contact surface 220 becomes worn over time or is damaged, without having to replace the entire die 200. Replacing only the sleeve portion 218 of the die 200 saves the time and expense of replacing the whole die unit 200. In addition, reinserting the sleeve 218 can be cheaper than remanufacturing the entire die 200. For example, in one embodiment the sleeve 218 is formed by molding, which can be significantly cheaper than manufacturing the bore or cavity 216 of the die 200 on a lathe. In addition, in some embodiments, removing the sleeve 218 can facilitate removing a cartridge from the die 218 after the cartridge has been reconfigured.

[0019] FIGS. 3-6 are schematic cross-sectional views of a cartridge reloading die 200 in accordance with other embodiments of the invention. Like reference characters refer to like components in FIGS. 3-6 and FIG. 2, and the description of such components will not be repeated with reference to FIG. 3-6. Referring specifically to FIG. 3, the die 300 is generally similar to the die 200 described above with reference to FIG. 2. The illustrated die 300, however, includes a body 314 that is formed from a non-metallic material. For example, the body 314 of the die 300 can be a synthetic or ceramic material, rather than a conventional steel body. The non-metallic die 300 can provide similar
performance characteristics as the die 200 shown in FIG. 2, while also reducing the time and cost of manufacturing the die 300. Specifically, the die 300 can be formed using manufacturing processes other than those required for machining the steel die 200. For example, in certain embodiments the entire body 314 of the die 300 can be formed by a molding process. A molding process at least partially reduces the scrap material produced in manufacturing dies described above and accordingly reduces the time and cost of disposing of or recycling the scrap material. In addition, the contact surface 220 of the non-metallic body 314 does not require a lubricant to release a cartridge from the cavity 216 following reconfiguration of the cartridge.

FIG. 4 is a schematic cross-sectional view of a cartridge reloading die 400 in accordance with another embodiment of the invention. The difference between the die 200 shown in FIG. 2 and the die 400 shown in FIG. 4 is that the sleeve 418 does not extend all the way through the body 414. It will be appreciated that the sleeve and body configuration of FIG. 4 can be incorporated with the other embodiments described in this disclosure. Another difference illustrated in FIG. 4 is that the die 400 has a non-metallic body 414 and metallic sleeve 418. For example, the body 414 is formed of a ceramic or synthetic material and the sleeve 418 is formed of a steel alloy. The configuration of the non-metallic body 414 and metallic sleeve 418 provides the benefit of maintaining high tolerances of the contact surface 220 in the cavity 216 formed of the metallic sleeve 418, while still allowing a significant portion of the die 400 to be formed from less expensive and time consuming manufacturing processes, such as molding for example. In addition, if the body 414 of the die 400 becomes worn or damaged, the sleeve 418 can be removed from the body 414 and a new body 414 can be attached to the sleeve 418.

FIG. 5 is a schematic cross-sectional view of a cartridge reloading die 500 in accordance with another embodiment of the invention. The difference between the die 200 shown in FIG. 2 and the die 500 shown in FIG. 5 is that the die 500 is formed of a metallic body 214 having a non-metallic plating or coating 540 on the contact surface 220 of the cavity 216 in the body 214. In certain embodiments the non-metallic coating 540 is a ceramic or synthetic coating having similar performance characteristics to the sleeve 218 described above. For example, the coating 540 eliminates the need for applying a lubricant to a cartridge inserted into the die 500, which in turn reduces the number of steps in resizing or reconfiguring the cartridge. Moreover, the coating 540 can be replaced or reapplied if the coating becomes worn or damaged or otherwise incapable of holding the required tolerances for reconfiguring cartridges, thus reducing the expense of replacing the entire die 500.

FIG. 6 is a schematic cross-sectional view of a cartridge reloading die 600 in accordance with another embodiment of the invention. The difference between the die 200 shown in FIG. 2 and the die 600 shown in FIG. 6 is that the body 614 of the die 600 is formed of a plurality of layers. In the embodiment shown in FIG. 6, the body 614 comprises a first layer 670, a second layer 674 and a third layer 678. In certain embodiments, the first layer 670 is metallic, the second layer 674 is non-metallic, and the third layer 678 is metallic. For example, the first and third layers 670 and 678 can be steel, and the second layer 674 can be a synthetic or ceramic material. The layers of the body 614 are configured such that the surface of the non-metallic second layer 674 is the contact surface 220 for receiving and reshaping cartridges. Accordingly, the non-metallic contact surface 220 can have similar performance characteristics and benefits of the non-metallic portions or contact surfaces of the die as described above. In another embodiment illustrated in FIG. 6, the body 614 comprises two layers rather than three layers. For example, the body 614 includes a metallic outer layer 688 and a non-metallic inner layer 684 extending the full-length of the die 600. The inner layer 684 also forms the contact surface 628 for receiving and resizing cartridges inserted into the cavity 216, and have similar performance characteristics and benefits of the non-metallic portions or contact surfaces described above.

FIG. 7 is a flow diagram illustrating a process 700 that can be used for manufacturing the cartridge reloading die 200 described above. The process 700 can include forming a bore in a die body at a block 710. In certain embodiments the bore can be metallic and can be formed in a molding or casing process. At a block 720 a sleeve member is positioned in the bore. The sleeve member can have a first and a second diameter, the second diameter being less than the first diameter. The sleeve member can be configured to releasably contact a cartridge that is at least partially inserted into the cavity for shaping or reconfiguring at least a portion of the cartridge. In certain embodiments, the sleeve member can be non-metallic, such as a ceramic or synthetic material, and can be formed in a molding or casting process.

From the foregoing, it will be appreciated that specific embodiments of the invention have been described herein for purposes of illustration, but that various modifications may be made without deviating from the invention. Furthermore, aspects of the invention described in the context of particular embodiments may be combined or eliminated in other embodiments. Further, while advantages associated with certain embodiments of the invention have been described in the context of those embodiments, other embodiments may also exhibit such advantages, and not all embodiments need necessarily exhibit such advantages to fall within the scope of the invention. Accordingly, the invention is not limited, except as by the appended claims.

We claim:

1. A cartridge reloading die, the die comprising:
   a housing having a cavity, wherein the housing is composed of a first material; and
   a sleeve coupled to the housing in the cavity, wherein the sleeve is composed of a second material and includes a first internal portion having a first diameter and a second internal portion having a second diameter smaller than the first diameter.

2. The die of claim 1 wherein the sleeve further comprises a transition portion between the first and second internal portions having a generally tapering diameter between the first and second diameters.

3. The die of claim 1 wherein the second material is non-metallic.

4. The die of claim 3 wherein the first material comprises a synthetic material.

5. The die of claim 3 wherein the non-metallic material comprises a ceramic material.

6. The die of claim 1 wherein the first material is metallic.
7. The die of claim 1 wherein the housing and the sleeve are integral components of the die.
8. The die of claim 7 wherein the first and second materials are non-metallic.
9. The die of claim 1 wherein the sleeve is removable from the housing.
10. The die of claim 1 wherein the sleeve comprises a single piece.
11. The die of claim 1 wherein at least a portion of the cavity is threaded and at least an exterior portion of the housing is threaded.
12. A die for reloading a firearm cartridge, the die comprising:
   a body composed of a first material, the body having a cavity extending through the body; and
   an insert fixedly connected to the cavity of the body, wherein the insert is composed of a second material different from the first material and includes a bore that is configured to at least partially receive a cartridge for shaping at least a portion of the cartridge, wherein the bore has a first diameter and a second diameter smaller than the first diameter.
13. The die of claim 12 wherein the first material is metallic and the second material is non-metallic.
14. The die of claim 13 wherein the second material comprises ceramic.
15. The die of claim 13 wherein the second material comprises a synthetic material.
16. The die of claim 12 wherein the bore is coated with a ceramic material.
17. The die of claim 12 wherein the bore is configured for removing the cartridge after shaping at least a portion of the cartridge.
18. The die of claim 17 wherein the bore is configured for removing the cartridge without a lubricant.
19. A die for reloading a firearm cartridge, the die comprising a body having an interior bore, wherein the bore includes a first portion having a first diameter and a second portion having a second diameter greater than the first diameter, wherein the second portion is coated with a ceramic material and configured to at least partially receive a cartridge.
20. A cartridge reloading die, the die comprising:
   a body composed of a first exterior metallic portion, a second interior non-metallic portion, and a third interior portion; and
   a cavity in the body, wherein the second portion defines a bore portion of the cavity configured for at least partially shaping a cartridge, and the third interior portion defines an engaging portion of the cavity configured for engaging a cap member.
21. The die of claim 19 wherein the third interior portion is metallic.
22. A method of manufacturing a firearm cartridge reloading die, the method comprising:
   forming a bore in a die body; and
   positioning a sleeve member in the bore, wherein the sleeve member has a first diameter and a second diameter less than the first diameter, and wherein the cavity is configured to releasably contact a cartridge at least partially inserted into the cavity for shaping at least a portion of the cartridge.
23. The method of claim 22 wherein the bore is metallic and the sleeve member is non-metallic.
24. The method of claim 22 wherein the sleeve member is composed of a ceramic or synthetic material.
25. The method of claim 22 wherein forming the bore comprises molding or casting the bore, the method further comprising molding or casting the sleeve member.

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