July 20, 1943. R. A. A. HENTSCHEL 2,324,775

FIREARM

Filed Jan. 31, 1941

Fig. 1

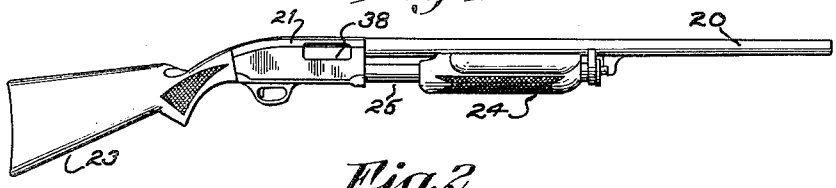


Fig. 2

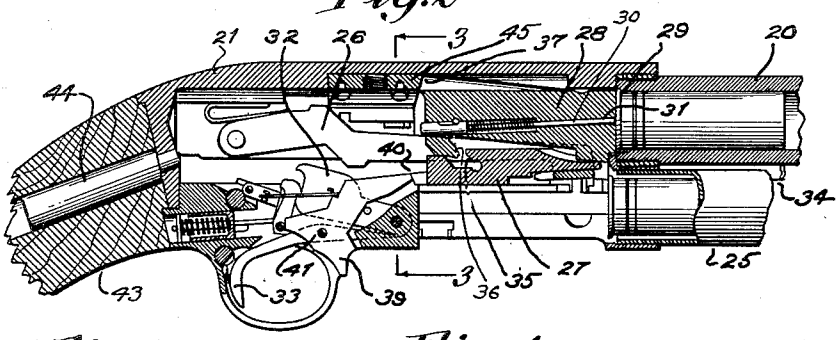


Fig. 3

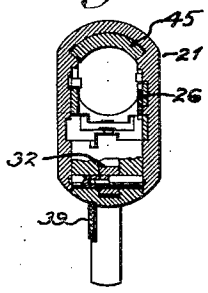


Fig. 4

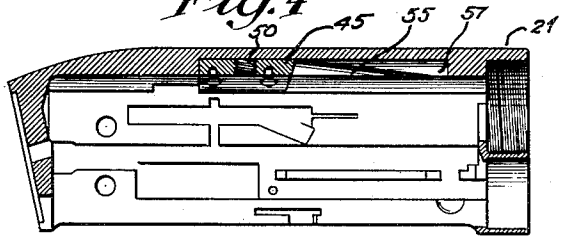


Fig. 5

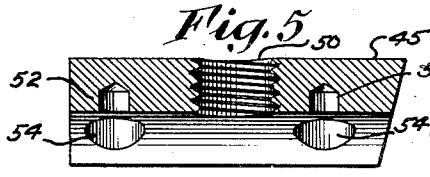


Fig. 6

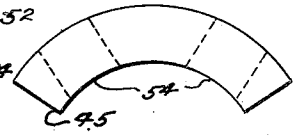


Fig. 8

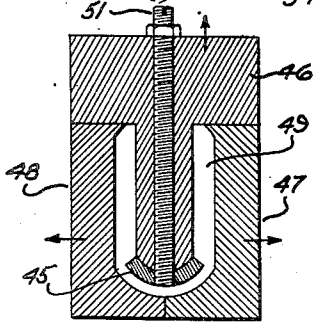


Fig. 7

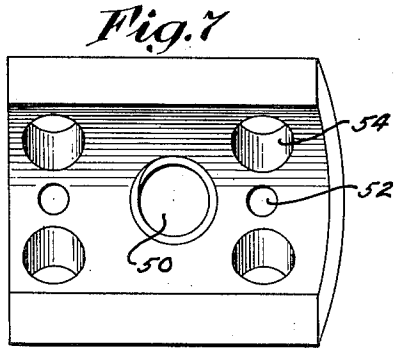
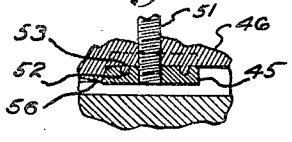


Fig. 9



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FIREARM

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Application January 31, 1941, Serial No. 376,715

6 Claims. (Cl. 42—2)

This invention relates to firearms and particularly to a die cast receiver which houses the operating parts of the gun. The conventional firearm includes a stock, a barrel having a breech, breech closing means usually carrying a firing pin or striker, a trigger, and connecting means to cause the firing pin to strike the cartridge when the trigger is operated. In automatic or self-loading guns, a suitable magazine is included. There is also provided means to carry the cartridges from the magazine to a position in front of the breech closing means so that the cartridge may be placed within the chamber located in the breech of the barrel. By the use of the term "self-loading guns," it is intended to include the conventional pump gun or repeating firearm which is manually reloaded by operation of the fore-end. The receiver has a stock secured thereto and the receiver also serves as a support for the barrel. If the barrel is of the fixed type, the end of the barrel may be screwed into the receiver or fastened in any other suitable manner. If the gun is of the reciprocating barrel type, the receiver may serve as a guide for the reciprocation of the barrel.

It is to be distinctly understood that the illustrations used herewith are merely for purposes of description and are not to be construed as a limitation upon the invention nor is the invention to be limited to automatic or repeating firearms.

In the drawing:

Fig. 1 shows a firearm of the repeating or pump gun type wherein the cartridges are moved from the magazine to the barrel by manual operation of the fore-end.

Fig. 2 is a fragmentary sectional elevational view of the receiver and associated parts of the firearm of Fig. 1.

Fig. 3 is a sectional elevation taken at the line 3—3 of Fig. 2.

Fig. 4 is a cross sectional view of the receiver per se of the firearm shown in Fig. 1.

Fig. 5 is a cross sectional view of the insert used in the gun shown in Figs. 1 to 4 inclusive.

Fig. 6 is an end view of the insert of Fig. 5, the holes along the center line not being indicated for the sake of simplicity.

Fig. 7 is a plan view of the insert of Fig. 5 looking from the interior of the receiver.

Fig. 8 is a diagrammatic cross sectional view of a die-casting mold which may be used to produce the receiver of Figs. 1 to 4.

Fig. 9 is a fragmentary elevational view showing one manner by which the insert may be supported in the die-casting mold.

There are two general types of firearms of the shoulder supported variety, one wherein the barrel is fixed to the receiver and one wherein the barrel has a reciprocating movement relative to the receiver. The gun shown in Figs. 1 to 5 is of the first-mentioned type wherein the barrel is fixed to the receiver. The type shown in Figs. 1 to 4 is generally illustrated, for example, by the patent to Loomis, No. 1,834,410. An example of the type of gun wherein the barrel is slidable relative to the receiver is shown in the patent to Browning, No. 710,094.

There has been a constant search for better methods of construction of guns and better materials for use therein, particularly in the interest of lightness and of improved balance of the guns. By this invention it has been found that the conventional steel receiver may have a die-cast light metal or light metal alloy receiver substituted for the steel, which will result in an improvement in the operation and handling of the gun. By die-casting the receiver, a marked economy in manufacture is effected. Formerly, the receiver was milled from a solid block necessitating expensive machinery, a large expenditure of time to complete the milling operation, and waste of expensive metal. By using die-casting, the receiver may be produced in practically finished form, it being necessary only to make a few interior cuts and to drill a few holes to complete the casting.

In Fig. 1 is shown a gun of the type having a barrel **20**, receiver **21**, stock **23** and fore-end **24**. A magazine tube **25** of the conventional type may be used to deliver cartridges contained therein onto a carrier **26**. A slide **27** carrying a bolt **28** may be employed to close the breech end **29** of the barrel **20**. The bolt **28** may have a firing pin **30** contained in a suitable aperture **31** therein. The firing pin **30** may be struck by a hammer **32** when the hammer is released by means of the trigger **33**. The slide **27** is connected to the fore-end **24** by means of a suitable action bar **34**. When it is desired to load the gun, the fore-end **24** is moved rearwardly, which in turn moves the slide **27** rearwardly. The initial movement of slide **27** causes the bolt **28** to move downwardly because of the engagement of cam surface **35** with cam **36** of the bolt. This withdraws the bolt from locking engagement with the locking shoulder **37** and allows the bolt and slide to move rearwardly. The carrier **26** having a cartridge thereon which has been delivered from the magazine

tube 25 moves forwardly at the correct time. This movement is timed so that a shell which has just been fired and extracted by bolt 28 will not interfere with the upward movement of the new shell, the old shell being ejected from ejection port 38. Then as the fore-end is manually moved forward, the bolt 28 will move the shell on carrier 26 into the chamber at the breech end of the barrel 20. A suitable safety mechanism may be provided which will prevent opening of the breech block until the shell therein has been fired or the breech block manually unlocked. This is not a part of the present invention and may be accomplished, for example, as described in the patents to Loomis, No. 1,834,410, No. 1,855,403, and No. 2,039,814. In general, 39 may constitute a slide lock which contacts slide 27 at 40 and locks the slide in its forward position. The slide lock 39 is pivoted at 41 and is suitably interrelated with the trigger and hammer so that, as the hammer falls, the slide lock 29 will be withdrawn from its locking position and allow rearward movement of the slide. A stock 43 may be suitably fastened to the rear end of the receiver 21 by means of a stock bolt 44. The force of explosion of the cartridge is transmitted through the breech bolt to the receiver at the locking shoulder 37. A narrow rib 55 may be provided on the breech bolt if desired. It is to be understood, of course, that such a rib may be omitted. With the use of die-cast aluminum alloys, it has been found desirable to strengthen this point because otherwise continued firing of the gun will deform the locking shoulder so that when the breech block 28 is in closed position it will be displaced from its original position and create what is called "excessive head space." Head space is the space between the front face of the breech closing means and the rear end of the barrel, and, when this is excessive, the shell will not be fully forward in position in the chamber of the gun, and a portion of the head will be unsupported. This is a dangerous condition and will cause malfunction of the gun because the unsupported portion of the head of the shell will expand outwardly and is liable to burst or crack. In order to prevent such a set-back in the receiver, it is proposed that a metal insert of a suitable metal, such as steel, for example, be cast in place during the die-casting operation. Such an insert will distribute the impact imparted to the receiver by the explosion of the cartridge. It is to be understood that other ferrous metals or other metals of the desired strength and characteristics may be used for the insert. It is evident that an insert would be difficult to fit and would require expensive machining operations, unless it is cast in place during the die-casting operation. Such an insert may take the form shown, for example, at 45 in the drawing.

By the employment of die-casting technique, a product is obtained which has smooth external and internal faces requiring little, if any, machining. The outlines will be sharp, and sections can be made which would not be possible with a sand casting. Die casting refers to a casting which has been made in a metallic mold or die into which molten metal has been introduced by the application of hydraulic, pneumatic or mechanical pressure. One example of a type of mold which may be used for the production of a die-cast receiver is shown diagrammatically in Figs. 8 and 9, wherein an insert similar to that shown in Figs. 5 to 7 is to be placed in the receiver. It is to be distinctly understood that the mold shown is merely an example and is not necessarily the one that must be used. The mold of Fig. 8 comprises three parts, 46, 47 and 48, which are separable in the direction shown by the arrows placed therein. The metal is introduced into the cavity 49 by any conventional method and forced in under pressure so that the mold is completely filled. In order to correctly position the insert 45 in the receiver, a screw threaded hole 50 may be provided, into which a screw 51 may be threaded so as to hold the insert in its proper location in the mold during casting. To further assist the positioning of the insert, the holes 52 may be provided to cooperate with suitable studs 53 located on the mold portion 46. The holes 54 provided in the insert are for the purpose of allowing some of the metal to flow therein so as to more securely hold the insert in position. After the metal has been placed in the mold and has cooled sufficiently, the screw 51 may be turned and disengaged from the insert 45, whereupon the mold portions may be separated and the receiver withdrawn. A portion 56 extends downwardly from part 46 of the die to make the cavity 57 and rib 55 the desired shape, and is designed accordingly. It is evident that many types of die-cast molds may be designed, and the parting lines changed in various ways. It is also possible to provide cores of different constructions and to provide different ways of moving the various parts of the molds.

Previously constructed firearms, as shown in Figs. 1 to 4 for example, have always used steel or similar material for the receiver. By the invention described herein, it has been found that a die-cast aluminum alloy or similar light metal alloy may be substituted for the steel and such alloys have a specific gravity of less than about 3.5 as compared to 7.8 for steel. A considerable saving in weight may be made in the completed gun. The modulus of elasticity of aluminum or similar light alloys is much less than that of steel; aluminum alloys, for example, having a modulus of elasticity of about 10,300,000 as compared with steel having a modulus of elasticity of about 30,000,000. The center of gravity of a gun constructed in accordance with Fig. 1, for example, and having a conventional steel receiver is at a point about 19½" from the butt of the stock. With an aluminum alloy substituted for the steel receiver, the center of gravity is moved slightly forward and to a point about 20" from the butt. It is apparent, therefore, that there is a negligible change in the center of gravity. The total weight of the steel receiver gun is about 7 pounds 7 ounces as compared to a weight of 6 pounds 6 ounces for the aluminum receiver gun. Another important item is the balance of the gun, which is always critically examined by expert shots. The gun is not usually carried with the butt against the shoulder in readiness to be fired and it is necessary, therefore, to bring the gun to the shoulder in order to properly aim and fire the same. In the game of skeet, the gun cannot be placed against the shoulder until the target has been released from the trap. As the gun is carried into position or held in the ready position, it is supported usually by the left hand at the fore-end (for example, 24 of Fig. 1) and by the right hand grasping the stock near the pistol grip or small of the stock. If the gun is swung into firing position with the butt against the shoulder, the right hand swings the gun upwardly about the left hand as a pivot.

Because the center of gravity is between the left hand and the stock, it is evident that the decreased weight of the gun will allow the gun to be pivoted with greater ease to shooting position. The lighter weight of the gun and the retention of the center of gravity in substantially the same location is also a distinct advantage in firing at moving objects because the gun can be swung with more ease by the shooter.

Various types of light metal alloys suitable for die-casting may be employed. One of these is an alloy with the following characteristics:

Example I

	Per cent
Magnesium	8
Aluminum	92

Such an alloy has a specific gravity of about 2.6, an ultimate strength of about 38,000 pounds per square inch and a yield strength of about 23,000 pounds per square inch.

Another alloy that might be used is one that contains:

Example II

	Per cent
Copper	14
Silicon	5
Aluminum	81

The ultimate strength of such an alloy is about 44,000 pounds per square inch and it has a specific gravity of about 3.5.

Example III

	Per cent
Copper	4
Silicon	2
Nickel	4
Aluminum	90

Ultimate strength—about 33,000 pounds per square inch; yield strength—about 20,000 pounds per square inch; and specific gravity—about 3.2.

Example IV

	Per cent
Aluminum	9.0
Zinc	.6
Silicon (maximum)	.3
Manganese (minimum)	.1
Magnesium	90.0

Ultimate strength—about 34,000 pounds per square inch; yield strength—about 20,000 pounds per square inch; and specific gravity—about 1.8.

Suitable coatings may be placed on the receivers described in this invention. An example of this for an aluminum receiver is an oxide coating placed thereon by anodizing, such as, for example, in a 15% sulphuric acid electrolyte for a period of about 40 minutes, using a suitable current density. This general process is described in the patents to Gower, No. 1,869,058, or Bengston, No. 1,869,042. It is understood of course that the insert should be "stopped off" in some suitable manner so that it will not be affected by the anodizing. This may be accomplished, for example, by the use of a paint or other coating. The article may then be washed and the oxide coating dyed with some suitable dye, such as nigrosine black. This is generally described, for example, in the patent to Tosterud, No. 1,946,148. The receiver can then be surface-sealed by using water (Tosterud, No. 1,946,148) or by using a metallic acetate such as a ½% nickel acetate solution as described in Tosterud, No. 2,008,733. The receiver, after suitable rinsing, may, if desired, be dipped into a bath of hot oil, which will be absorbed by the coating. It is also possible to further protect the surface by dipping the receiver into paraffin wax or a solution thereof.

There has been disclosed herein a gun which has a better balance, is lighter, has better corrosion resistance, and yet meets all the strength characteristics necessary for proper performance. The receiver thereof may be manufactured by a die-casting method which is considerably cheaper than present methods and gives a superior product. The invention is not limited to the details and compositions herein shown, described and illustrated in the drawing, but is to be construed broadly and as covering all equivalent devices falling within the scope of the appended claims.

What is claimed is:

1. A firearm having a barrel; operating parts associated with said barrel; and a die cast receiver with a specific gravity of less than 3½ serving as a support for at least some of said operating parts, said receiver having an insert of hard wear-resistant metal at a point of particular stress.

2. A firearm having a barrel; operating parts associated with said barrel; and a die cast aluminum alloy receiver serving as a support for the barrel and at least some of said operating parts, said receiver having a ferrous metal insert at a point of particular stress.

3. A firearm having a barrel; a movable breech closing means associated with said barrel; a die cast aluminum alloy receiver supporting said barrel and breech closing means, said breech closing means being movable into barrel-closing position and into locking contact with said receiver; and a ferrous metal insert in said receiver at said point of locking contact to take the stress of firing.

4. A firearm having a barrel; a reciprocating movable breech closing means associated with said barrel; a die cast receiver having a specific gravity of less than 3½ supporting said barrel and breech closing means, said breech closing means being movable into barrel-closing position and into locking contact with said receiver; and a hard wear-resistant metal insert in said receiver at said point of locking contact to take the stress of firing.

5. A firearm having a barrel; operating parts associated with said barrel; and a die cast receiver having a specific gravity of less than about 3½ serving as a support for at least some of said operating parts, said receiver having a cast-in-place hard wear-resistant metal insert located at a point subjected to particular stress.

6. A firearm having a barrel; operating parts associated with said barrel; and a die cast aluminum alloy receiver having a specific gravity of less than about 3½ serving as a support for at least some of said operating parts, said receiver having an insert of hard wear-resistant metal located at a point subjected to particular stress.

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