

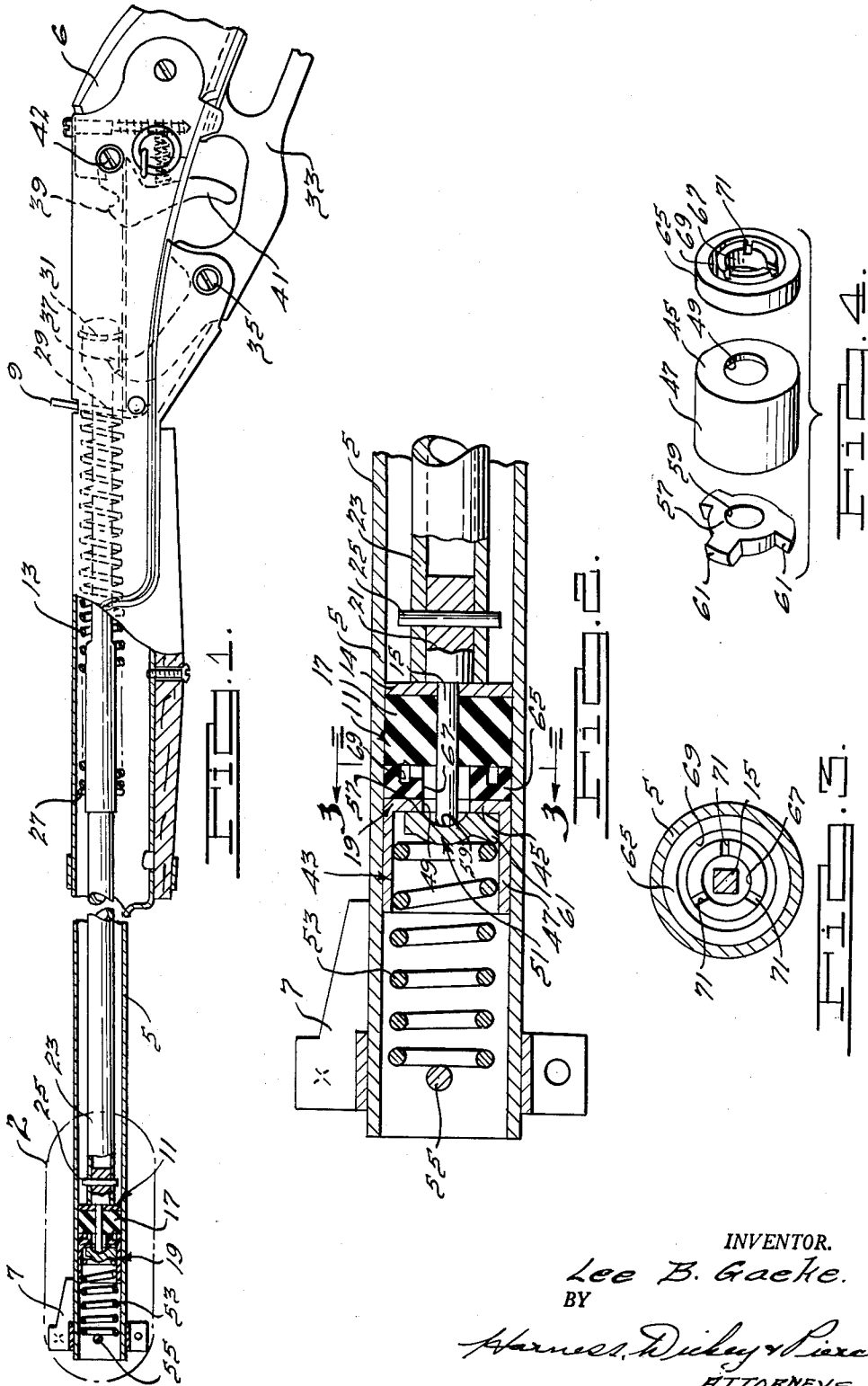
Jan. 3, 1956

L. B. GAEKE

2,729,208

POPGUN

Filed Sept. 11, 1953



INVENTOR.

Lee B. Gaekke.

BY

Harness, Dickey & Pierce
ATTORNEYS.

1

2,729,208

POPGUN

Lee B. Gaeke, Plymouth, Mich., assignor to Daisy Manufacturing Company, a corporation of Michigan

Application September 11, 1953, Serial No. 379,490

3 Claims. (Cl. 124—14)

This invention relates generally to toy guns and more particularly to a toy popgun.

For years youngsters have used and played with air rifles or BB guns, which propel projectiles in the form of round balls or BB shot. It is felt by some parents that relatively small youngsters are not capable of handling air rifles of this type and therefore applicant has devised the toy popgun of this invention, which simulates an air rifle or BB gun in appearance but which does not fire a projectile but merely makes a loud bang or noise. The aforementioned Roe patent illustrates a toy popgun of this general type, but it has been found that the gun illustrated in the Roe patent does not produce a sufficiently loud noise to be really attractive to children.

It is therefore an object of this invention to provide a toy popgun which, when fired, will produce an extremely loud bang or noise, but which will not fire or propel any projectile.

It is a further object of this invention to provide a gun of the aforementioned type, which will discharge smoke when the gun is fired.

It is a still further object of this invention to provide a novel and improved valve for a toy popgun.

It is a still further object of this invention to provide a toy popgun of the aforementioned type, which is rugged in construction, relatively inexpensive to manufacture, and simulates in appearance an air rifle or BB gun.

These and other objects of this invention become apparent from the following detailed description taken in conjunction with the accompanying drawing, in which:

Figure 1 is a side view, partially in section and partially in elevation, of the toy gun of this invention;

Fig. 2 is an enlarged sectional view of the structure illustrated in Figure 1, taken within the area of the dot and dash line designated at 2;

Fig. 3 is a sectional view of the structure illustrated in Fig. 2, taken along the line 3—3 thereof; and

Fig. 4 is an exploded perspective view of a portion of the valve mechanism of the gun.

Referring now to the drawing, it will be seen that the toy gun includes a barrel and frame 5, connected with a stock 6 to simulate an air rifle or BB gun, having front and rear sights 7 and 9 respectively. A plunger assembly 11 is disposed within the barrel 5, which is normally urged to the position illustrated in Fig. 2, by means of a spring 13. The plunger assembly 11 includes an annular, rigid plate 14, having a rod or pin 15, rigidly connected therewith and projecting forwardly therefrom, over which a resilient plunger element 17 is sleeved so as to slidably and sealingly engage the wall of the barrel and compress air or fluid against a valve assembly 19 at the front of the barrel when propelled forwardly by the spring 13. A projection 21 extends rearwardly from the plunger plate 14 and is connected with a plunger tube 23 by means of a pin 25. The plunger tube 23 is split intermediate its ends and the two sections are interconnected by means of a pin 27, which also acts as an abutment for the forward end of the spring 13. The rear end of spring 13

2

engages an abutment 29 which is an extension of sight 9 and is connected with the barrel frame. The rear end of the plunger tube 23 is split, with the opposed walls interconnected by a rigid plate 31.

A cocking lever 33 is pivotally connected intermediate its ends to the barrel frame at 35, and the forward end 37 thereof is adapted to engage the plate 31 at the back of the plunger tube, so that when the rear end of the cocking lever is swung downwardly, the forward end of the cocking lever will move rearwardly to move the plunger tube rearwardly and compress spring 13. The plate 31 rides over a sear 39 on a trigger 41, which is pivotally connected to the barrel frame at 42, so that the sear engages the plate and holds the plunger in its cocked position until the trigger is pulled rearwardly. Pulling on the trigger causes it to pivot relative to the barrel frame so that the sear 39 swings downwardly away from the plunger tube plate and permits the plunger to be propelled forwardly by the spring 13.

The valve structure 19, adjacent the front of the barrel 5, includes a housing member 43 having an end wall 45 and a cylindrical confining side wall 47. The member 43 is disposed in the barrel and tack or spot welded thereto. The end wall 45 is centrally apertured at 49 and a valve member 51 is disposed in the housing member 43 and resiliently held in engagement with the end wall 45, so as to close the aperture 49, by means of a coil spring 53, the rear end of which engages the valve member and the opposite end of which abuts a pin 55 connected with the barrel 5.

The valve member 51 has an annular surface 57 on the rear face thereof, which is of a lesser diameter than the diameter of the housing member 43 and which engages the end wall 45 and closes the aperture 49 against a flow of fluid or air therethrough. The valve member is provided with a central semi-spherical or domelike recess 59, around which the surface 57 extends, and which is disposed in substantial alignment with the housing member aperture 49. Extending laterally outwardly from the valve member surface 57 are three circumferentially spaced projections 61. The projections 61 extend angularly away from the plane of the annular surface 57 so that the outer portions of the projections 61 are spaced from the end wall 45 when the valve member surface 57 is in engagement therewith. The projections 61 provide therebetween spaces between the valve member and the housing member through which air or fluid can flow when the valve member is moved away from the housing member end wall and the outer ends of the projections are disposed in close proximity to the housing member wall 47 to properly center the valve member in the housing member.

A bore-fitting packing member 65 is disposed in the barrel 5 and abuts the rear face of the housing member end wall 45. The packing member is centrally apertured at 67 and the aperture 67 is in substantial alignment with the end wall aperture 49. The packing member 65 prevents leakage of fluid or air past the outer periphery of the housing member 43 when air or fluid is compressed by the plunger rearwardly of the valve assembly. In view of the fact that the housing member 43 is preferably only spot welded to the barrel, air or fluid could leak therepast if the packing 65 were not provided. The packing 65 illustrated is formed of rubber and is provided with an annular groove 69 extending around the aperture 67 and with notches 71 interconnecting the groove 69 with the aperture 67. The groove 69 provides more flexibility in the packing and enables the same to better seal with the barrel, while the notches 71 prevent the trapping of air or fluid in the groove 69 when the plunger is in its fully forward position, as illustrated in Fig. 2, so that when the plunger is withdrawn the

packing will not move or be pulled relative to the barrel. The notches 71 therefore prevent a suctionlike interlock between the packing and the plunger from occurring.

When the plunger has been cocked by the lever 33 and then released by the trigger 41, so that it is propelled forwardly by spring 13, air or fluid is compressed between the valve and the plunger. The spring 53 is of sufficient strength to retain the valve member 51 against the housing member end wall 45 until the forwardly projecting pin or rod 15 strikes the valve member and instantaneously moves the same away from the end wall 45 against the action of the spring 53. This sudden and instantaneous opening or movement of the valve member 51 permits the rapid expansion of the air or fluid that has been compressed and the air or fluid flows through the spaces between the valve member and the housing member and a loud bang or noise occurs. The length of the pin or rod 15 is calibrated so that it will only open the valve a slight amount, in the order of sixty thousandths of an inch, and the spring closes the valve immediately after it has been opened.

It has been found from considerable experimentation that the exact shape of the valve member 51, as previously described, is important in the obtainance of this loud noise. That is, the manner in which the projections 61 extend relative to the main body portion of the valve member is important in the obtainance of the aforementioned results.

It has been found that the relationship between the spring 53 and the spring 13 is important in producing as loud a noise as possible when the gun is fired. For example, in the particular gun illustrated the spring 13 has a stiffness coefficient or K factor of about twenty-one pounds per inch, while the spring 53 has a stiffness coefficient or K factor of about ninety-five pounds per inch. That is, the ratio of the K factors of the valve spring 53 to the main spring 13 in this particular gun is about four and a half to one. By using springs of the aforementioned character, in this particular gun, maximum results are obtained. It has, however, been found that while proper balance between the springs should be maintained at all times, the ratio of the K factors of the two springs may vary as the size and shape of the gun varies. It has been found in other cases that a K factor ratio as low as two and one-half to one has given the maximum noise results with certain small guns. It is, however, true in any event that the valve spring 53 must retain the valve 51 on its seat until the same is struck by the plunger rod 15, and then immediately close the valve after its instantaneous opening.

It should be noted that the domelike recess 59 in the valve member is in alignment with the plunger pin or rod 15, so that the pin or rod engages the bottom of the recess when it strikes the valve. The recess maintains the pin in its central position relative to the plunger and valve and adds to the durability of the popgun and reduces the possibility of breaking the pin or rod. Furthermore, it has been found that if a few drops of oil are introduced into the front or open end of the barrel, smoke will be generated each time the gun is fired due to specific diesel effect caused by the relatively high compression ratio. That is, the rapid expansion of the air passing through the valve, in the presence of oil produces a sort of combustion which generates smoke and adds a realistic effect to the gun. Thus the gun simulates a real gun to a considerable extent and makes it extremely attractive to children. It has also been found that oil need be added only every fifty to one hundred shots to maintain the smoke effect.

What is claimed is:

1. In a toy popgun, a barrel, a hollow housing member rigidly connected to said barrel and having an apertured end wall and a cylindrical confining side wall, a one-piece sheet metal valve member slidably disposed in said housing member and having the central portion of

one face thereof normally engaging said end wall and closing said aperture, the outer peripheral portion of said face extending out of the plane of the central portion thereof so as to be spaced away from said end wall when the central portion is in engagement therewith the periphery of said valve member having a plurality of circumferentially spaced notches providing spaces between said housing side wall and the periphery of said valve member through which fluid can flow when said valve member is moved away from said end wall, an apertured packing member in said barrel and abutting said housing member end wall, spring means resiliently retaining said valve member in engagement with said end wall, plunger means in said barrel movable to compress air between it and said valve member, means for propelling said plunger toward said housing member, and a projection on said plunger adapted to extend through said end wall aperture and strike said valve member to move the same way from said housing member end wall against said spring means when said plunger reaches a predetermined point in its travel toward said housing member.

2. In a toy popgun, a barrel, a hollow housing member disposed in said barrel and rigidly connected therewith, said housing member including a centrally apertured end wall and a cylindrical confining side wall, a one-piece sheet metal valve member slidably disposed in said housing member and having at least a portion of one face thereof normally engaging said end wall and closing said aperture, said valve member portion including an annular surface on said valve member face of a lesser diameter than the diameter of said housing member, said valve member having circumferentially spaced projections extending laterally from said valve member surface which are slidably engageable with said housing member side wall to center the valve member in said housing member and which provide therebetween spaces through which fluid can flow when said valve member is moved away from said end wall, the lateral extent of said projections being greater than the thickness thereof, the faces of said projections adjacent said valve member surface extending laterally outwardly and away from the plane of said surface so that the inner portions thereof are substantially in the plane of said surface and the outer portions thereof will be out of engagement with said housing member end wall when said surface is in engagement therewith, said valve member having a central domelike recess in said one face thereof around which said surface extends and which recess is in substantial alignment with said end wall aperture, a centrally apertured, resilient packing member disposed in bore-fitting relationship in said barrel and having one face thereof abutting said housing member end wall to prevent the leakage of fluid past the periphery of said housing member, the opposite face of said packing member having a groove therein surrounding said aperture and circumferentially spaced slots connecting said groove with said aperture, spring means engaging said valve member and resiliently retaining the same in engagement with said housing member end wall, plunger means in said barrel and movable to compress air in said barrel between it and said valve member, spring means for propelling said plunger toward said housing means, a rigid projection connected with and extending forwardly from said plunger means in alignment with said housing member end wall aperture and adapted to extend therethrough into engagement with the bottom of said valve member recess to move said valve member away from said housing member end wall when said plunger reaches a predetermined point in its travel toward said housing means, said spring means engaging said valve member being of sufficient strength to retain said valve member against said housing member end wall when said plunger member is in its fully forward static position.

5

3. In a toy popgun, a barrel, a hollow housing member rigidly connected in said barrel and having an apertured end wall, a stamped sheet metal valve member slidably disposed in said housing member and having at least a portion of one face thereof normally engaging said end wall and closing said aperture, a coil spring resiliently retaining said valve member in engagement with said end wall, plunger means in said barrel movable to compress air between it and said valve member, a coil spring disposed in said barrel and engaging said plunger for propelling the latter toward said housing member, the ratio of the K factor of said valve member spring to the K factor of said plunger means spring

5

10

6

being at least two and a half to one, and a projection on said plunger adapted to extend through said end wall aperture and strike said valve member to move the same away from said housing member end wall against said valve member coil spring when said plunger reaches a predetermined point in its travel toward said housing member.

References Cited in the file of this patent

UNITED STATES PATENTS

654,552	Morris	July 24, 1900
1,779,892	Roe	Oct. 28, 1930