Jan. 4, 1955 M. L. GROSH 2,698,700

TOY PISTOL

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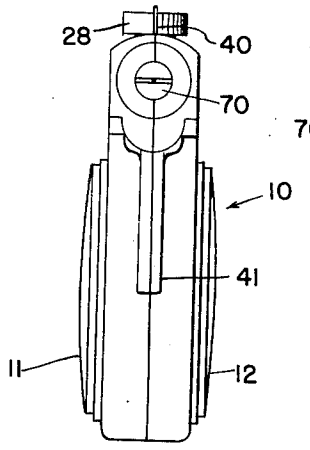

FIG. 2

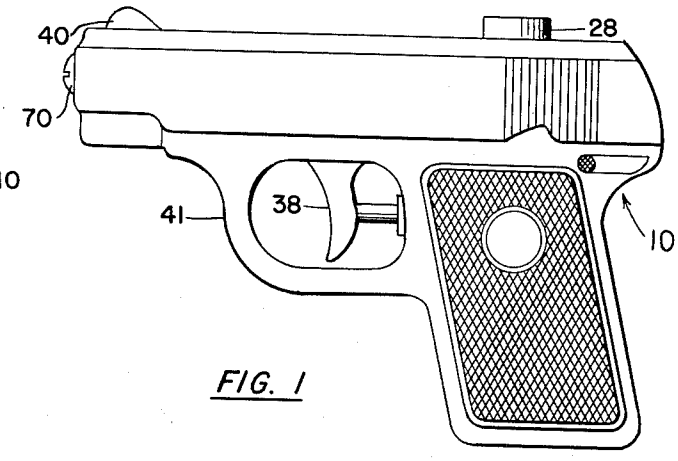

FIG. 1

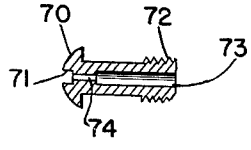

FIG. 5

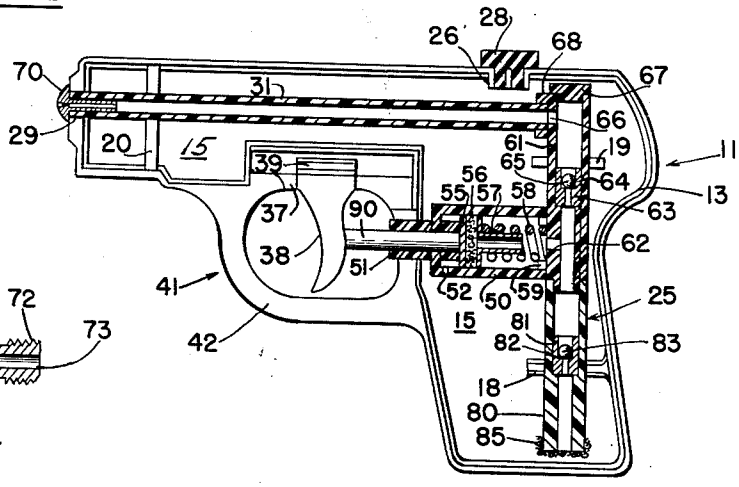

FIG. 3

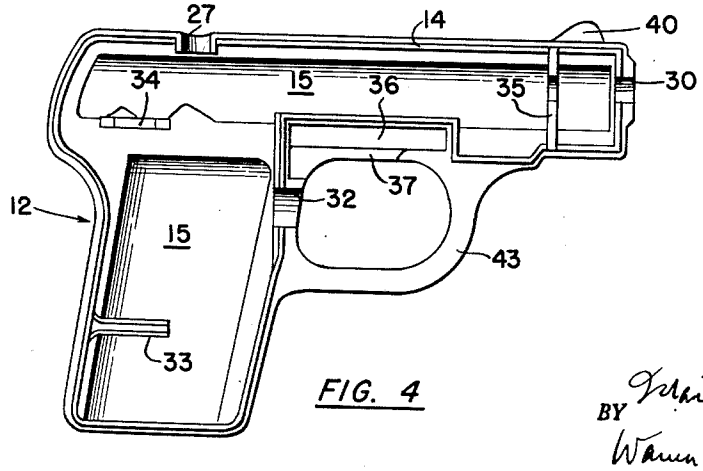

FIG. 4

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TOY PISTOL

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2 Claims. (Cl. 222—79)

This invention relates to pistols, and more particularly to a toy pistol adapted to discharge fluid under pressure.

One of the objects of this invention is to provide a light weight, economically constructed, and efficiently operating toy pistol adapted to discharge a jet or squirt of fluid under sufficient pressure to carry a substantial distance, and to repeat this operation a large number of times without requiring the piston to be refilled.

Another object of the invention is to provide a water pistol constructed to utilize substantially the entire interior of the pistol casing as a storage chamber for fluid, which has a pumping mechanism for discharging this fluid mounted within the fluid chamber, and which operates automatically in response to a trigger-pull to discharge the fluid with a squirting action.

It is also an object to provide a pistol of the character described constructed to eliminate fluid leakage from the interior of the pistol casing, particularly around the trigger mechanism and muzzle.

It is another object to provide in a pistol of the type set forth a nozzle for squirting fluid under pressure which is quickly and easily removed from the muzzle for cleaning purposes, and thereafter replaced without requiring the use of special tools and skill.

An additional object is to provide a pumping mechanism for a water pistol constructed to operate within the fluid chamber of the pistol, and which provides for fluid leakage past the piston being returned to the fluid reservoir.

Further objects and advantages of the present invention will be apparent from the following description, reference being had to the accompanying drawings wherein a preferred form of embodiment of the invention is clearly shown.

In the drawings:

Fig. 1 is a full size side elevational view illustrating the pistol as seen from the left-hand side thereof;

Fig. 2 is a front elevational view of the pistol shown in Fig. 1;

Fig. 3 is a view, partly in elevation and in section, taken on the center line of Fig. 1 and illustrating the interior of the right-hand side member with the pump assembly mounted therein;

Fig. 4 is a side elevational view showing the interior of the left-hand side member; and

Fig. 5 is an enlarged vertical sectional view taken on the center line to illustrate the construction of the nozzle.

Referring further to the drawings, the pistol illustrated comprises in general a casing **10** formed from a pair of interengaging right and left-hand side members **11** and **12**. In the preferred form the members **11** and **12** are cast from plastic material. A resin such as polystyrene, for example, has been found to be suitable for this purpose. The use of such material is preferred in the construction of these members since it does not corrode from contact with water. Furthermore, this materail absorbs very little water and consequently deformation from water absorption is negligible.

The right-hand member **11** is formed with a recessed edge or groove **13** extending substantially around the periphery of this portion of the casing as shown in Fig. 3. A raised rib **14**, spaced inwardly from the outer edge to register with groove **13**, is formed on the left-hand member **12** and extends substantially around this portion of the casing as illustrated in Fig. 4. Thus, when

the right and left-hand members are fitted together, the rib **14** is received within the groove **13**. The two halves can then be sealed together to form the enclosed pistol casing as seen in Figs. 1 and 2. It is to be noted that the members **11** and **12** are each hollowed out so when joined together substantially the greater part of the interior of the pistol casing **10** can be used as a fluid chamber **15**. Such a chamber holds a sufficient volume of fluid to provide for a large number of discharges before requiring refilling.

As seen in Figs. 3 and 4, members **11** and **12** form complementary parts of the pistol casing. In forming the right hand member **11**, for example, raised supporting members or ribs as illustrated at **18**, **19** and **20**, Fig. 3, are cast as integral parts of the casing. These members are each formed with a central groove which provides a seat for receiving and retaining the pumping mechanism **25** in position. Member **11** is further provided with a groove opening **26** at the top which is adapted to align opposite a similarly formed groove **27** in member **12** to provide a fluid inlet for filling the interior of casing **10** with liquid. A rubber plug **28** is inserted to close this opening when the casing has been filled with fluid. This plug is easily pulled out for refilling purposes and returned to provide a closure member preventing the spilling or leakage of fluid from the interior of the casing **10**. At the muzzle or nozzle end the members **11** and **12** are formed with grooves **29** and **30** which align opposite each other to provide a seat for the outer end of the spaghetti tube forming outlet pipe **31**. Similarly formed grooves in both members, as indicated at **32** in Fig. 4, also provide a seat for the cylinder end of the pumping assembly **25**.

The left-hand member **12** is also formed with raised supporting members or ribs, as seen at **33**, **34** and **35** in Fig. 4. These members are positioned to align opposite the members **18**, **19** and **20** when the two halves are joined, and thereby form means for retaining the pump assembly **25** in position within the pistol casing **10**. It will be seen also from reference to Figs. 3 and 4 that the casing members **11** and **12** are so formed as to provide an enclosed guideway **36**. This guideway, when members **11** and **12** are joined, is closed on three sides so that fluid from the interior area **15** of the casing **10** does not enter the same. The guideway is open on the lower side or bottom only. This opening **37** is in the form of a slot in which the upper end of the trigger **38** is free to reciprocate. As seen in Fig. 3, the upper end of the trigger **38** is formed with an inwardly extending shoulder portion **39** which is hooked over and slides along on the lower edge of the guideway **36**. To complete the outer portions of the casing **10**, a front sight **40** is formed on the side member **12**. The trigger guard **41**, Fig. 1, is formed when the side portions **42** and **43**, Figs. 3 and 4, of the guard are joined together.

The pump assembly, indicated generally at **25**, is provided for discharging fluid from the interior chambers **15** under pressure. Such fluid is discharged as a jet or squirt and with sufficient force to carry for a distance of approximately 20 feet. This assembly in the preferred form is cast from plastic material. Resins such as butyrate and cellulose acetate, for example, has been found to be suitable for the main portions of this assembly.

The pumping mechanism utilizes a cylinder **50**. This cylinder, when formed, is open at one end, for example, the right-hand end as seen in Fig. 3. The other end of the cylinder is closed about the outwardly projecting sleeve **51**. Also formed in this end of the cylinder, below the sleeve **51**, is a drainage port or outlet **52**. In assembling the pumping mechanism, prior to placing it in position as seen in Fig. 3, a thin, circular, flat plate **55** is placed in the cylinder **50**. The diameter of this plate is slightly less than the inside diameter of the cylinder **50** so that the plate can be moved freely back and forth. In the position shown the plate is resting in contact with the open inner end of sleeve **51**. A circular leather piston **56** having a slip fit with the inner surface of the cylinder is inserted next to the plate **55**. To hold the piston upright a brass grommet **57** is placed on the other side. Grommet **57** in turn is held in posi-

tion by means of a stainless steel coil spring **58** which is received over the inwardly extending collar portion of the grommet. The other end of the spring is retained in the collar **59** which is formed as a part of the top piece **61**.

Cylinder **50** is sealed to the top piece **61** which is formed from a molded plastic casting. An orifice **62** formed in the side wall of casting **61** communicates with the interior of cylinder **50** through the collar **59**. Mounted within casting **61** in a position above the orifice **62** is a fluid check valve **63**. This valve is formed from a small brass cage **64** having a stainless steel ball **65** retained therein. The cage is formed with a restricted passage adapted to be opened and closed to the flow of fluid therethrough depending upon the seating of the ball **65**. At the upper end casting **61** is provided with an orifice **66** and the open end sealed with a cap **67**.

The outlet pipe **31**, which is also formed of plastic material, has its inner end sealed to pipe **61**, being received within the collar **68** provided to secure alignment with the orifice **66**. The outer end of pipe **31** is sealed in the grooves **29** and **30**, and thus communicates to the exterior of the casing **10**, i. e., to the atmosphere. Closing the outer end of pipe **31** is a nozzle **70** shown most clearly in Figs. 3 and 5.

In the preferred form the nozzle is threadedly connected to the outer end of pipe **31**. A satisfactory nozzle for this pistol is formed from a brass screw, for example, having a slotted head **71**. The exteriorly threaded shank **72** of the screw is provided with a central bore **73** enlarged at the inner end and communicating with the open slot in the head through a restricted passage **74**. Passage **74**, in the preferred form, has an inner diameter of about .025 of an inch. With this construction, it will be readily apparent that the threaded connection with the outer end of pipe **31** permits the nozzle **70** to be removed and replaced easily and quickly when it is desired to clean the same. It is thus a simple matter to remove the nozzle, for example, in the event it becomes clogged, and run a needle or fine wire through the passages **73** and **74**. The nozzle is then screwed back into position in the end of pipe **31**, and no special tools or skill are required for this operation.

A bottom piece **80** formed from a plastic casting, for example, is sealed to the lower end of tube **61**. A second fluid check valve **81** is mounted within this piece in a position below the orifice **62**. This valve is identical to valve **63**, also having a brass cage **82** with a stainless steel ball **83** retained therein. The lower end of tube **80** is open and covered with a piece of copper screen **85**. This screen forms a filter preventing foreign particles, which may be contained within the fluid in chamber **15**, from being drawn up into the interior of the nozzle and piece **80**.

To reciprocate the piston **56** within the cylinder **50**, a piston rod **90** is provided. This rod is connected to the back of the trigger **38**, and is adapted to be slidably inserted through the open end of sleeve **51**. The inner end of this rod thus contacts the plate **55** and piston **56** on one side while the grommet **57** contacts them from the other side. Spring **58** exerts sufficient force to hold these members against the inner end of rod **90**.

In assembling the pistol for use, the pumping mechanism is first completed. That is, plate **55**, piston **56**, grommet **57** and spring **58** are inserted in the cylinder **50**. This cylinder is then sealed to the top piece or tube **61** with its open end in alignment with the orifice **62**. As previously described, a ball check valve **63** is retained within tube **61** above the orifice **62**. The outlet pipe **31** is then sealed to the upper end of tube **61**. Its inner end is in communication with the interior of tube **61** through the orifice **66**, which is positioned above the fluid check valve **63**. The open upper end of tube **61** is sealed with a cap **67**. To complete the pumping assembly, the bottom piece or tube **80** is sealed to the lower end of casting **61**. As previously stated, this tube is also provided with a ball check valve **81**. The lower end of this tube is covered with a screen filter **85** to prevent dirt or other foreign particles from being drawn into the interior of the pumping mechanism.

The pump assembly is then placed in the right-hand member **11** of the pistol casing. As shown in Fig. 3, the pump assembly is supported in position on the ribs **18**, **19** and **20**. The trigger **38** is mounted with the shoulder **39** sliding in the enclosed guideway **36**. The piston rod **90**, which is connected to the back of trigger **38**, has its inner end inserted through the sleeve **51** and contacts plate **55**.

When the left-hand member **12** is sealed to member **11**, the ribs **33**, **34** and **35** align opposite the ribs **18**, **19** and **20** and press against the pump assembly to hold the same securely. The outer end of sleeve **51**, retained within the grooves **32**, may project slightly from the edge of the casing **10**. To prevent leakage from the interior of the casing **10** at this point, the sleeve is sealed to the casing around the groove **32** in each of the members **11** and **12**. A similar seal is provided between the casing and the outer end of pipe **31** at the nozzle for the same reason.

In securing the various members of the pistol assembly together, it has been found that where the sleeve **51** is formed, for example, from butyrate and the casing members **11** and **12** from polystyrene a liquid-tight seal therebetween can be obtained by using a solvent, such as, Dow Chemical Company solvent No. 8, or its equivalent, and pressing these members together. The pump assembly members, such as the cylinder **50** and pieces **61** and **80**, when formed of butyrate can be joined together by using acetone as a solvent, for example, and applying pressure. Nitro-cellulose cement is used in securing the inner end of outlet pipe **31** to casting **61**, where pipe **31** is formed from cellulose acetate, for example, because of the difference in sealing characteristics. Similarly, the outer end of pipe **31** is secured to the casing members **11** and **12** with a liquid-tight seal by using the same solvent as described for the sealing of the outer end of cylinder **50** since these members have different sealing characteristics, i. e., they are cellulose acetate and polystyrene, respectively. The casing members **11** and **12**, which are formed of polystyrene, can be secured together so as not to leak liquid from the interior thereof with pressure and methyl ethyl ketone as a solvent.

The pistol assembly is completed by screwing the nozzle **70** into the open end of pipe **31** until the slotted head **71** seats against the casing **10**. The interior of the pistol casing **10** is filled with fluid admitted through the top opening in the casing formed by the grooves **26** and **27**. When full, the plug **28** is inserted to prevent liquid leaking therefrom.

To operate the pistol when first filled, for example, the trigger **38** is pulled back. Such movement drives the piston rod **90** and piston **56** inwardly against the action of spring **58** which is compressed thereby. This movement of the piston expels air from the cylinder through the orifice **62**. When the trigger is released, spring **58** forces the piston **56** back to its original position as shown in Fig. 3. This movement creates a partial vacuum or suction action in cylinder **50** which is sufficient to draw a quantity of fluid from the interior **15** of the casing **10** up through the interior of piece **80**, which unseats ball **83** in valve **81**, and which enters cylinder **50** through the orifice **62**. Then when trigger **38** is pulled back again, this fluid is discharged from the cylinder back through the orifice **62** under pressure. This movement of the fluid seats ball **83** and closes valve **81**. It also unseats the upper ball **65** and opens valve **63** thereby. The fluid is then free to enter the outlet pipe **31** by means of orifice **66** from pipe **61**. This fluid, which is substantially the quantity discharged from the cylinder **50** by the piston and that contained in the pipes between the valves **63** and **81**, then discharges through the restricted passage **74** in the nozzle **70** to the atmosphere. Where the piston **56** has a diameter of approximately $\frac{3}{8}$ of an inch and a stroke of about $\frac{1}{4}$ inch, the fluid is discharged under sufficient pressure when leaving the nozzle to squirt for a distance of approximately 20 feet. There is such a small quantity of fluid discharged with each such shot where, for example, the inside diameter of tube **31** is approximately $\frac{1}{8}$ of an inch and that of pieces **61** and **80** is about $\frac{3}{16}$ of an inch, and the pistol casing of the size illustrated in the drawings, that about 100 to 125 "shots" can be discharged before refilling is necessary.

It will be apparent from the above description of the operation that after the piston **56** has discharged a quantity or "shot" of fluid the spring **58** returns it to the opposite end of the cylinder again as soon as the trigger is released. The filling operation is then automatically repeated and the pistol is ready to discharge another "shot" of fluid when the trigger is pulled. Any fluid retained in the tubes **31** and **61** after a discharge is prevented from reentering the cylinder by the closing of the upper check valve **63** in response to each suction stroke of the piston. The pressure stroke of the piston has the reverse effect,

that is, valve **81** is closed by the movement of fluid out of the cylinder and valve **63** is opened thereby.

It will be apparent also that any fluid that leaks past the piston during the operation thereof will be discharged from the port **52** in the end of the cylinder and flow back into the fluid reservoir **15**. Sufficient air under atmospheric pressure enters the fluid chambers **15** to replace the fluid discharged and prevents the pumping mechanism from locking. This air enters the interior of the casing **10** around the nozzle **70**, sleeve **51**, and the filler plug **28**. These members seal against liquid leakage but not against the entry of air under atmospheric pressure. Some air may enter the casing by flowing back through the nozzle in pipe **31**, orifice **66**, pipe **61**, valve **63**, orifice **62**, and either through cylinder **50**, and out through the port **52** into chamber **15**, or through valve **81** and piece **80** to chamber **15**.

From the above description it will be further apparent that a water pistol is provided which is efficient in operation, and which is constructed to eliminate leakage from the fluid chamber or reservoir. Furthermore, the pistol is provided with fluid chamber which is formed by the interior of the pistol casing whereby a large number of discharges can be obtained without frequent refillings being necessary. Also, the construction of the pistol provides for a filter screen to protect the pumping mechanism from foreign particles in the fluid whereby long and efficient operation is assured, and an easily removed and cleaned nozzle which permits the pistol to be refilled from puddles or pools which may contain mud or the like.

While the form of embodiment of the present invention as herein disclosed constitutes a preferred form, it is to be understood that other forms might be adopted, all coming within the scope of the claims which follow.

I claim:

1. A water pistol comprising a hollow casing having a barrel simulating section and a grip section, said casing comprising complementary side members hermetically sealed to one another along the adjoining edges to form a sealed water chamber; a water pumping assembly within the casing including a pump within the grip section of the casing; and means extending through the casing for manually actuating the pump, each of said side members having inwardly extending ribs, the inner ends of the ribs providing seats engaging parts of the water pump assembly for retaining said pump in operative position in the grip section upon application of force to the pump by said means.

2. A water pistol comprising a hollow casing having a barrel simulating section and a grip section, said casing comprising complementary side members sealed to one another along the adjoining edges; a water pumping assembly within the casing including a pump within the grip section of the casing, tubing leading to and from the pump, the tubing leading to the pump having the inlet end thereof adjacent the bottom of the casing and the tubing leading from the pump being disposed in the barrel section, each of said side members having inwardly extending ribs on the barrel and grip sections, the ribs on the side members of the barrel section confronting one another and the ribs on the side members of the grip section confronting one another, the ends of the ribs being arranged to engage the tubings, at least one of the ribs on each section having a groove for receiving the tubings for locating and holding the tubings in position.

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