(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) EP 0 932 013 A2

(12) EUROPEAN PATENT APPLICATION

(43) Date of publication:
28.07.1999 Bulletin 1999/30

(51) Int. Cl.[6]: **F41B 11/06**, F41B 11/26

(21) Application number: **99300316.9**

(22) Date of filing: **18.01.1999**

(84) Designated Contracting States:
AT BE CH CY DE DK ES FI FR GB GR IE IT LI LU MC NL PT SE
Designated Extension States:
AL LT LV MK RO SI

(30) Priority: **22.01.1998 GB 9801296**
30.04.1998 GB 9809396
20.07.1998 GB 9815565

(71) Applicant:
Camilleri, Luciano Joseph
Wirral, Merseyside L46 4TT (GB)

(72) Inventors:
- **Camilleri, Luciano Joseph,**
  Champion House
  Wirral, Merseyside L46 4TT (GB)
- **McManus, Martin**
  Wallasey, Merseyside L44 7ER (GB)

(74) Representative:
Gilmour, David Cedric Franklyn et al
POTTS, KERR & CO.
15 Hamilton Square
Birkenhead Merseyside L41 6BR (GB)

(54) Improved gas bottle and air gun

(57) A re-pressurisable gas reservoir for a gas powered pistol, rifle or other gun having a known piercing pin provided for piercing a known sealed carbon dioxide cartridge in its reduced diameter end, or narrow neck or such reservoir whenever used in such a gun, characterised by the feature that the reservoir comprises a re-pressurisable gas bottle or cartridge with a reduced diameter end or narrow neck and which is re-pressurisable by air, and said bottle or cartridge having an opening in its narrow end or neck provided for receiving the cartridge piercing pin of the gun with said opening communicating with an inlet/outlet passage in which a valve is located and said valve is such as to be openable by said pin to enable pressurisation of the gun.

EP 0 932 013 A2

Description

[0001] The present invention relates to an improved gas bottle for use in air/gas pistols and air/gas rifles subsequently referred to herein as "air" guns and to an improved air gun.

[0002] It is known to use pressurised carbon dioxide cylinders/bottles or ampoules/cartridges formed of pressed metal with a sealed opening in the end of the neck at one end in gas pistols/rifles or guns as the propelling device for pellets and slugs. Cartridges of such type are also used in domestic devices for carbonating drinks such as in "Sparklets" (TM) soda syphons. The seal in the neck is broken by being penetrated by a hollow, open ended tube or pin located in the pressure ducting of the pistol/gun when the cartridge is loaded and when the end around the seal in the neck has sealed against a seat surrounding the pin in the pistol/gun. Such known cartridges may be pressurised to two foot pounds and may provide perhaps 80-100 shots and only be used once.

[0003] According to a broad aspect, the present invention comprises a gas powered gun having a detachable or disconnectable re-pressurisable gas reservoir and also comprises such a repressurisable gas reservoir for an air gun. Preferably the gas is air and preferably the reservoir is detachable or disconnectable from the gun and connectable to a manual or foot operable high pressure pump for recharging prior to reattachment/reconnection to the gun.

[0004] More specifically in a broad aspect, an improved gas powered gun is provided which has a re-pressurisable gas reservoir, characterised by the feature that the reservoir comprises:

(1) a pressurisable gas cartridge which is re-pressurisable by air or other gas by having at its end for receiving a hollow cartridge piercing pin of the gun, an opening and a valve openable by said pin and which is openable by pressurised gas during recharging; and/or

(2) the reservoir comprises a repressurisable gas cartridge or chamber having a first aperture connectable to be in gas communication with the gas powered projectile propulsion and firing mechanism of a gas gun and having a second aperture for recharging and/or comprises other pressurised gas ducting means, with the cartridge, chamber or ducting means being connectable to the gun to be in gas communication with the propulsion/firing mechanism and said cartridge, chamber or ducting means being connected to or connectable by a duct, such as a pipe which may be a flexible pipe, to a second rechargeable pressure vessel externally of said gun or attached thereto as an extension thereof.

[0005] According to the first aspect "(1)" of the present invention an improved pressurisable gas bottle for a gas pistol, rifle or gun comprises a re-pressurisable gas bottle or cartridge having an outlet passage in which a valve is located and wherein said valve is such as to enable said cartridge to be rechargeable and wherein the valve is openable by being urged against an external projection or piercing pin of a gun when the end of the cartridge is sealed against a seat in the gun with said pin hitherto being provided for piercing the seal of sealed pressurised gas cartridges.

[0006] The valve is such as to close when the cartridge is pressurised and the pressure supply removed and is openable from exteriorly to enable the gun to be pressurised for powering the pellets/slugs and is such as to enable the cartridge to be re-pressurised by application of pressurised gas, such as air, from the exterior of the valve. Valves of such nature may be as used in pneumatic vehicle tyres or may be of other design such as a spring bias ball valve or, preferably, a spring biassed valve mechanically openable by pressure from the outside and also preferably openably by externally applied gas pressure. As mentioned, the valve closure member must be such as to be openable by a hollow piercing pin of a pistol or rifle (gun) and a locating notch for receiving the pin may be provided therein especially if the closure member is a disc.

[0007] A bottle or special cartridge according to this aspect of the invention will preferably be machined in at least two main body parts to enable the installation of the valve in the neck portion with the main body parts and securable together, for example, by sealingly interengaging threaded portions.

[0008] It is intended that the cartridge of the present invention be pressurisable, for example, for up to six foot pounds for a pistol and up to twelve foot pounds for a rifle.

[0009] Preferably the cartridge according to this first aspect of the invention will have connection means, such as an external thread, on the neck to enable connection of a pressurising means such as a car tyre foot pump or a scuba-diver bottle or the like for re-pressurisation of the bottle with air, for example, 40psi with a pump or 100 bar with a diver's bottle. Considerably more shots are obtainable from charged cartridges according to the invention (possibly between 1,000 and 2,000 shots) and economy is possible because a bottle is reusable.

[0010] Also according to a development of the first aspect of the present invention there is provided a connection device interconnectable with connection means on the neck of a cartridge as defined above, such as by means of a cooperating internally threaded duct. The connectable has means at its other end connectable to a foot pump or diver's gas bottle or to a garage air-line or the like.

[0011] Thus according to the first aspect of the invention there is provided a gas bottle or special cartridge for an air gun with valve means normally closing such but

openable by the piercing pin of the gun.

[0012] It is important to appreciate that the rechargeable gas bottle or cartridge according to the invention is preferably one which may be used in existing guns in which hitherto single use bottles for a limited number of shots are used, and without modification of the gun and the piercing pins of such guns instead opens the cartridge valve rather than hitherto piercing the seal of known cartridges.

[0013] Also according to the present invention is an existing gun with a known gas cartridge seal piercing pin or the like in combination with a cartridge according to the present invention.

[0014] Also according to the present invention there is provided the use of a rechargeable, pressurised gas bottle or cartridge with valve means openable by a bottle piercing pin of a gun in a gun with such a piercing pin.

[0015] According to the second aspect "(2)" of the present invention there is provided an improved gas cartridge or first pressurisable vessel having a first opening in its end, normally narrow end, abuttable with the gas inlet of the projectile propulsion means of the gun, and a second opening elsewhere with means enabling it to be connectable to a flexible tube or other duct or pipe leading to a re-pressurisable source and being of such shape and dimension as to be insertable into a standard CO_2 gun or pistol. It is envisaged that both the first and second apertures in the cartridge or vessel may have valves located therein and at least openable by pressurised gas with the valve in the neck when such is provided, also being openable by a hollow cartridge piercing pin of the gun.

[0016] It is also envisaged that a cartridge (or other vessel) may be provided either with or without a valve in the narrow neck (or in the end of the vessel which is to be in gas communication with the gun), and for an extension conduit or pipe to be provided at the side (either a lateral side or the bottom side or end) of the cartridge and communicating with the interior thereof and extending into or through a passage in the stock or butt and be detachably connectable to a separate recharging vessel or other pressurised gas supply means. A one way valve and/or on/off tap may be provided in the conduit or pipe to enable recharging to be effected externally of the butt. In the case of an on/off tap, a suitable access point therefor may be provided if necessary in the butt for operation of such by an Allen key or the like device. Instead of a pipe, simply a communicating passage with one way valve may be provided in the side or end of the cartridge and also in the butt/stock to enable connection of pressurised gas recharging means. Thus the cartridge can, if desired, be recharged in situ in the butt or have additional/auxiliary pressure vessels/bottles connectable thereto or the gun may be used with disposable cartridges.

[0017] Also according to the second aspect "(2)" of the present invention there is also provided a re-pressurisable gas powered gun including a known gas powered projectile firing mechanism having a first connection means connectable to a first aperture in a first cartridge or chamber for containing or ducting pressurised gas, said cartridge or chamber being connectable or connected via a second aperture to recharging means or to an additional chamber for pressurised gas and one which is preferably rechargeable. The second aperture is preferably connected to a first end of a duct such as a stem or pipe such as a flexible pipe to be in gas communication therewith and said duct or pipe is detachably connected at its other, remote end, possibly spaced from the gun, to a rechargeable second pressure vessel or reservoir.

[0018] The cartridge or chamber for containing pressurised gas is such as will be locatable in the space of known guns normally provided for carbon dioxide cartridges and may be simply a modified version thereof modified by having said second aperture provided in its normally closed larger end or in a side thereof. Alternatively, an especially prepared vessel or gas ducting means will be provided of a shape and dimension to fit in the space provided for known gas cartridges. It will thus be appreciated that such a gun, which may be provided as a simple modification of an existing cartridge gun, is capable of using standard gas cartridges in known manner but of limited capacity and not reusable but can also utilise the rechargeable cartridge of the first aspect of the invention or utilise the adapted cartridge or chamber of the second aspect of the present invention connected via the pipe such as a flexible pipe, or a tube to the normally larger, remote second rechargeable pressure vessel and with greater capacity and optionally greater pressurisation, if desired.

[0019] To modify the design of existing guns or existing guns themselves to implement the second aspect, it is merely necessary to provide passages for the insertion and connection of the connecting duct or pipe, such as the flexible pipe, to the first cartridge or chamber. If connection of the duct, tube or pipe is to be via the hitherto normally closed, larger end of a pressure cartridge, then passages/apertures will have to be provided in the rotary cartridge pressure screw or disc and its pivoted support arm and also in the cartridge pressure plate. Preferably the second aperture will have an internally threaded portion adjacent the exterior engageable with an externally threaded portion or part of the first end of the duct or flexible pipe which end when secured abuts in sealing engagement against a shoulder or seat of the passage. As mentioned, alternatively the reusable tube connecting or second aperture may be provided in a cartridge in the side of the cartridge.

[0020] Whilst not normally necessary, this second aperture may have a valve therein openable by pressurized gas from said preferably flexible pipe and the cartridge may also have a valve in its narrow neck portion operable by the piercing pin of the gun and according to the first aspect of the invention to provide for many alternative possibilities of use.

[0021] Whilst a gun according to the invention may use any pressurised gas such as carbon dioxide, considerable advantages by using pressurized air can result especially since compressed air is more consistent and less subject to variations in weather and temperature and thus is more stable than carbon dioxide. As mentioned, carbon dioxide is weather susceptible and thus changes in weather will cause the carbon dioxide to perform differently in the gun causing different firing effects. Also a jump in velocity of perhaps 20 to 30 fps above normal may result because of carbon dioxide fluctuations and such gun "spikes" are undesirable. Also carbon dioxide has impurities which can harm a gun and prevent it from working properly. Furthermore, carbon dioxide is a liquid and does not always dissipate into gas form before it goes into the gun and thus when in the gun in liquid form it may cause jamming, power surges or gun spikes and eventually damage the gun. Compressed air is very stable and consistent and can be charged from a high pressure hand or foot pump if a divers gas bottle is not convenient thus has many advantages.

[0022] Where a remote second, additional repressurisable chamber is envisaged the rechargeable, second pressure vessel is preferably detachably connectable to the end of a flexible pipe remote from the gun and preferably via through threaded means and via a manually operable valve such as a needle valve, and a pressure gauge will preferably be incorporated to indicate the pressure of gas within the bottle. A quick-release connection with the flexible pipe and recharging means will preferably be provided.

[0023] In a preferred embodiment of the second aspect of the invention where a second and preferably larger, rechargeable pressure vessel is connectable to the first vessel which is locatable on or in the gun, there is provided said first rechargeable pressure vessel having a first passage or opening sealingly abuttable against the gas inlet of a projectile propulsion mechanism of a gun, and a second passage or opening connectable to one end of an extension or first connection means having a through-passage and a one-way valve therein to permit pressurised gas to flow therethrough and into the first vessel, and said connection means being connectable at its other end to a source of pressurised gas which may be a foot pump or other pressurised gas supply means and/or may be second connection means with a second openable valve of a second pressure vessel which itself is connectable by said second connection means to a pump or other pressurised gas supply means either following detachment via the opening connectable to the first connection means or via a second aperture in the second vessel having a valve therein to permit pressurized recharging; the first connection means will have displacing means, such as a pin like the piercing pin of the gun or other projection, such as its end, when threadingly engaging, which opens the valve in said second connection means to permit gas to flow therethrough and through the first connection means and into the first vessel.

[0024] Thus with this preferred embodiment, it is possible for the shooter to use the first vessel (normally a small cartridge) in the gun/pistol for about 30 to 40 shots and recharge such as required via the first connection means or to attach the second and normally larger and pressurised rechargeable pressure vessel, via the second connection means connecting to the first connection means, to the first cartridge/vessel to possibly give in the region of 500 shots. Of course, recharging with pressurised gas preferably air, is then possible.

[0025] As mentioned recharging may be by any suitable manner although preferably a high pressure manually operable pump will be provided and such as available with pressures up to a region of 240 bar. Because the present system of the invention does not need to utilise any divers gas bottles which especially in the USA require a licence, the provision of a manually operable high pressure pump with the non-divers pressure vessel thus provides advantage herein at greater access to the system is available. Pressures up to 4,500 psi are envisaged.

[0026] As a result of the present invention it is also possible to vary the pressure and therefore the power applied to the projectile of the gun. Current regulations are such that no licence is required for guns up to a limit of 6 fps and thus a greater power than existing carbon dioxide cartridges can be utilized with the present invention without requiring any licence. Furthermore, it is also envisaged that because of the increased power available, the system may be adapted for use in firearms or rifles where bullets might be fired and such may be useful in training the police or army or other armed personnel without unnecessarily using explosive propellant.

[0027] The maximum pressure valve or gun might be 2,000 psi.

[0028] In a broad aspect of the invention an improved gas powered gun is provided of the type for receiving a pressurized CO_2 cartridge pierceable by a hollow pin of the gun, characterized by the feature that a cartridge is provided which is re-pressurisable after use by either having a valve at its narrow end openable by said pin or pressurized and/or rechargeable or by having a second aperture connected or connectable by a pipe with a second external or auxiliary rechargeable pressure vessel or chamber. In the second option, the opening which seals with the gun propulsion mechanism gas inlet need not have a valve therein.

[0029] In a further embodiment of the invention the reservoir is in the form of a cartridge in which a gas flow restriction means is located in the chamber thereof and upstream of the outlet opening in the neck and upstream of any openable valve therein with respect to the gas flow from the main volume of the chamber to the outlet opening, and in which downstream of flow restriction means is a gas space substantially sufficient for propelling one shot of the gun. Preferably the flow

restriction means and gas space are provided by a tubular member closed at one end and open at the other end which is connectable to be in flow communication with a passage leading to the outlet, and in which a tubular member small aperture or bore extends through the wall of the tubular member such as to reduce the flow and pressure in said space to enable more shots from the gun at lower pressure than occurs when the flow restriction means is detached.

[0030] Embodiments of the present invention will be described further, by way of example, with reference to the accompanying drawings, in which:

Fig. 1 is a schematic cross section of a gas pistol/rifle re-pressurized gas bottle or cartridge and connector device therefore comprising a first embodiment of the invention;

Fig. 2 is a schematic illustration of an known gun with CO_2 cartridge indicated as being inserted into the butt of the gun prior to screwing up of the pressure disc and clamping of the lower pressure arm;

Fig. 3 is a schematic fragmentary illustration of the known pistol of Fig. 2 but modified according to the present invention to be connectable to a flexible pipe in turn detachably connected to a rechargeable pressure vessel or bottle;

Fig. 4 is an enlarged schematic illustration of a gun according to the present invention with the gas cartridge located in position;

Fig. 5 is a schematic illustration of the whole system according to the second aspect of the present invention including the gun of Fig. 4 with a cartridge adapted as ducting means and connected by a flexible tube to a larger rechargeable gas bottle;

Fig. 6 is a schematic section through a preferred embodiment of the invention where two rechargeable pressure vessels are provided and two connection means with valves to enable recharging and operative interconnection;

Fig. 7 is a schematic sectional view of a further embodiment according to the first aspect of the invention of a rechargeable cartridge usable in existing cartridge air guns and including an optional pressure stabilising or regulating chamber;

Fig. 8 is a plan of the regulating chamber and Fig. 7;

Fig. 8A is a section through the chamber of Fig. 8;

Fig. 9 is an enlarged elevation of a known valve which is located in the narrow neck of the cartridge of Fig. 7;

Fig. 10 is an enlarged section through a sealing cap or collar located at the outlet opening of the cartridge and which surrounds the valve pin;

Fig. 11 is an enlarged fragmentary detail of the end of the cartridge or "cylinder cap" schematically illustrating the relationship of the valve and pin of a gun;

Fig. 12 is a schematic elevation of a gun in the form of an air rifle hitherto for being powered by single use pierceable CO_2 cartridges/cylinders but illustrated having a rechargeable reservoir forming an embodiment according to the invention;

Fig. 13 is an enlarged elevation of the reservoir of Fig. 12; and

Fig. 14 is a schematic cross section through the reservoir of Fig. 13 with its end cap unscrewed but not illustrating the normally pressed valve - similar to those described earlier.

[0031] The bottle or cartridge 1 illustrated in Fig. 1 will be of some 6 or 8 cm length (equivalent to the length of existing non-rechargeable, pierceable carbon dioxide containers/ampoules as used in existing guns) comprising a lower cartridge section 2 with a threaded interior portion 3 at its upper end engageable with a cooperating externally threaded portion 4 on a shoulder of an upper cartridge portion 5 with a reduced diameter neck portion 6 and outlet/inlet aperture 7 in which a valve 8 having a spring biassed valve closure member 9 is located. The valve 8 has a stem 10 connected at one end to closure member 9 and slides through an aperture 17 in a locating crosspiece 11 which piece 11 is fixed to the inside of upper bottle portion 5 The other end of stem 10 has a stop 12 thereon to prevent stem 10 from escaping from crosspiece 11. A compression spring 13 is coiled around stem 10 and acts between the underside of closure member 9 and crosspiece 11 to urge the closure member 9 into sealing engagement with a valve seat 14 surrounding the outlet aperture 7. The closure member 9 is a disc-like member sealingly engageable with the seat has a central centering notch/recess for receiving engagement through the aperture 7 by a piercing pin 15 normally provided for such a gun to open the seal of hitherto known once-only usable cartridges. The end of the cartridge 1 in the region of the outlet 7 and the height/length of the bottle corresponds to such of existing sealed, non-reusable bottles and otherwise has similar dimensions to fit existing guns.

[0032] The neck portion 6 has an externally threaded portion 16 sealingly engageable with an internally threaded portion 17 at one end of a duct 18 in a connector device 19 which has connection means 20 at its other end for connection to a diver's gas bottle or the like or may have a suitable shape (not shown) similar to that of the part of a valve of a pneumatic vehicle tyre engageable by a foot pump or air-line.

[0033] A known air pistol 21 is illustrated in Fig. 2 comprising a butt portion 22 which has a recess 23 for receiving a sealed pressurized carbon dioxide cartridge 24 which is normally sealed at its upper narrower end 24' (partly obscured by the gun casing) and in which a hollow piercing pin 25 (see Fig. 4) is located as part of the gun 21. Beneath the lower end of the cartridge 24 a circular disc-like topped cartridge adjustment screw 26 is provided threadingly and rotatably mounted on a pivot arm 27 pivotably mounted at one side 28 of the butt 22 and pivotally displaceable downwardly to allow insertion

of the cartridge 24 whereupon the disc screw 26 may be screwed towards and against the bottom of the cartridge 22 once inserted to urge such against a valve seat 25' and hollow piercing pin 25 (shown in Fig. 4) whereupon a lower, pivotally mounted (at 29) cartridge clamping plate 30 is pivoted upwardly so that a cam 31 at the left-hand end thereof acts against the pivot arm 27 urging such and screw 26 upwardly against the base of the cartridge 24 forcing the sealed narrow end 24' against the seat and piercing pin 25 which penetrates a seal in the narrow neck 24 and the CO_2 in the cartridge then pressurises the gun in known manner. Once the cartridge has been discharged possibly after some 80-100 shots, the cartridge 24 is discarded and replaced with a new sealed and pressurized cartridge.

[0034] As mentioned, the present invention enables the utilisation of cartridges to be minimised and also, because of the rechargeability, enables air rather than carbon dioxide to be used with its attendant advantages.

[0035] In the preferred embodiment of the invention illustrated in Figs. 3-5, a gas cartridge 32 is modified by having a second aperture 33 at the lower, larger end comprising an inner narrow portion 34 leading to a shouldered portion which provides a seat and then there is a larger and internally threaded portion 35 which threadingly receive externally threaded connection part 36 extending from the end of a flexible pipe 37 which has at its other end quick coupling means (not shown) connectable to a valve housing 38 with valve lever 39 in turn connectable to a re-pressurisable gas bottle 40 in communication with a pressure gauge 41. If desired, pressure regulating means may be provided. A needle valve is preferably provided.

[0036] The gun 21 has been modified in the embodiments of Figs. 3 and 5 by having a through passage 42 provided in the pivot support arm 27 and in circular adjustment screw 26 and also a slot 43 in the cartridge clamping a pressure plate 30' for the passage of the end part 36 flexible pipe 37 and the end coupling means thereof for sealing in connection with the second aperture 33 in the bottom of the gas cartridge 32. (It is envisaged within the scope of the present invention for such pipe 37 to be connected via other means such an aperture in the lateral cylindrical walls of the cartridge in which case alternative apertures in the butt wall would be being provided).

[0037] A flattened portion 44 is provided in the wall of the cartridge 32 against which may abut the end of a screw driver or the like (not shown) so as to prevent rotation of the cartridge 32 when the threaded end 36 of the flexible tube 37 is being tightened into the threaded aperture of the second aperture. In practice, the modified cartridge 32 according to the present invention will be located in position in the butt and the pressure disc screw 26 urged against the bottom thereof and then the cartridge pressure plate 30' pivoted into its second stable clamping position and then the threaded end 36 of the flexible pipe 37 inserted through the formed passages and into the threaded portion 35 of the second aperture 33 and then tightened against the seat or shoulder thereof whilst holding the cartridge 32 in position with a screw driver blade against slot 44 in the main aperture of the butt.

[0038] In practice, when modifying a gun the support arm 27 and screw disc 26 will be tapped out and larger thread provided and a dimple or recessed portion provided in the disc.

[0039] A preferred embodiment of the invention is illustrated in Fig. 6 in which two pressure vessels are illustrated - a first one in the form of a pressurisable cartridge 45 with narrow neck 45' with an open passage or first aperture 46 with clear 2mm outlet without any valve means sealingly abuttable against the inlet of the gas propulsion mechanism of an "air" gun (22) (not shown). A second, internally threaded aperture 47 is provided in the bottom of cartridge 45 leading into the interior thereof via a shoulder for sealing a piece 48 where located. The gun (not shown) with which the cartridge 45 is to be used will have to be modified so as to have through passage in the base of the butt 22 and the cartridge loading and pressurising mechanism (see 42,43 Figs. 3 and 4 for indications) to permit a first connection piece 48 to be inserted from outside when the cartridge is clamped and sealingly screwed by its first threaded end 48' into aperture 47.

[0040] The first connection piece 48 extends from the bottom of the butt 22 (only partly illustrated in broken line) and has a first valve member 49 with stem 49' spring biassed by spring 50 against a seat 51 in the through passage of piece 48 so as to close the passage when the cartridge 45 is pressurized. The connection piece 48 has a second externally threaded end 48" which may be sealingly connected to a pressure pump (not shown) or to the internally threaded first end 52' of a through passage in a second connection piece 52 which has an internally threaded second end 53 sealingly engageable by the externally threaded outer neck of a second pressure vessel 54. A valve is provided in second connection piece 52 and comprises a valve closure member 55 with stem 55' and a compression spring 56 biassing the closure member against its seat 55" to close the passage when vessel 54 is pressurized. The first connecting piece 48 may have a projection such as a pin 48"' or its end may extend when connected, to act against closure member 55 to open the valve when the second connecting piece 52 is secured to the first connecting piece 48 so as to communicate the pressured gas of the second vessel 54 with the first vessel 45. Instead of valve means, closure taps or like may be provided in the pieces 48 and/or 52.

[0041] Thus cartridge 45 can be used on its own and recharged via piece 48 and a pump or be used in combination with piece 52 and second vessel 54 to produce a greater number of shots with the option of ready recharging - possibly with a foot pump and suitable con-

nector.

[0042] A further embodiment according to the first aspect of the invention is illustrated in Figs. 7 to 10 comprising a pressurisable gas cartridge 57 similar to cartridge 1 in Fig. 1 and comprising two main parts namely a main air storage cylindrical body 58 of brass and having a rounded closed end and an internally threaded and stepped open end 59 into which an upper cartridge portion or cap 60 forming a narrow neck portion with external threads 61 and sealing 0-rings 62 is sealingly screwable. The cap 60 has a stepped through passage 63 in which the components are located. Normally a known high pressure "Schrader" valve 64 having a domed opening pin 65 is threadingly located by screw threads 65" in the inlet/outlet opening of the cap 60 and surrounded by an annular/torroidal sealing collar 66 which forms a seal and seals around the face 67 which surrounds the piercing pin 68 of an air gun (not shown in any further detail) and which leads to the pellet propulsion mechanism of the air gun (not shown).

[0043] The significant additional feature of this embodiment is provided by a pressure stabilising chamber or flow restrictor 69 which is provided in the embodiment by a cylindrical rod having a solid portion with knurled gripable end surface 70 and a blind bore or chamber 71 formed in the other part being open at the end 72 of the rod 69 in a region having an externally threaded portion 73 threadingly and sealingly engageable in an internally threaded shoulder 74 of cap 60. A small bore or hole 75 is provided in the wall of the hollow part (71) of rod 69 and, in use, connects the main body of pressurised air in body 58 with that in chamber 71 but the small bore restricts the flow into chamber 71 such that when the air gun is discharged the requisite amount of pressurised air passes from the chamber 71 into the pellet propulsion device of the gun but the repressurisation and recharging of chamber 71 by air flowing through bore 75 is restricted or delayed somewhat so that the amount of air discharged from the cartridge 52 with each firing and the pressure/power of each shot is less than is the case when the restrictor 69 is removed. Thus, with restrictor 60 in place, a greater number of shots at less pressure is achievable but when restrictor 60 is removed, a lesser number of shots but at greater pressure/power are available which may be required for certain uses. By way of example, a chamber 71 of 4 mm diameter and 10 mm length may be provided with a bore 75 of .75 mm. Pressures of 250 bar in the main chamber are envisaged. Thus the bore 75 restricts the air pressurized flow into chamber 71 and acts as a volume control for the air which passes through the air gun's own chambers. This gives a constant velocity of shot when in use.

[0044] In the embodiment of Figs. 12-14, a rechargeable reservoir 76 is illustrated but the valve in the neck portion 76' is not shown but will be similar to that (8;25;49;64;64,69) of any of the other embodiments and is preferably a Schrader valve as used in vehicle tyres. Also the reservoir may, as a modification, have any of the other additional features incorporated herein by reference.

[0045] The rifle 77 is of known type and has a chamber 78 with cartridge piercing pin (not shown) and ducting to the pellet propulsion mechanism and chamber 78 receives sealed, single use CO_2 cartridges similar to those described previously with a narrow neck and pierceable seal therein which is urged against the pin when a threaded member (not shown) engaged in threads 79 at the mouth of chamber 78 is screwed in to urge the cartridge end against the pin to pierce such in hitherto known manner.

[0046] Whilst the reservoir of the embodiment might simply be a rechargeable cartridge locatable wholly within the chamber 78 and held therein by the treaded member (not shown), the reservoir 76 of the embodiment is considerably larger (such as in the region of a quarter of a metre) and thus able to contain more air/gas and possibly at higher pressure than hitherto CO_2 cartridges. The reservoir 76 comprises a narrow neck portion 80 in which the Schrader valve is threadingly located to enable recharging and then there is a slightly larger diameter portion 81 which fits in the chamber 78, somewhat in the manner of the single-use cartridges, and then is an externally threaded shoulder 82 which is engageable in threads 79 in the chamber 78 and which then runs into a larger diameter and longer main chamber portion 83 which extends externally of rifle chamber 78 and under the barrel and has an end cap 84 screwable into threads on the end of chamber portion 83 in sealing manner and provided for sealing the chamber after machining.

The exterior of chamber portion 83 and cap 84 is knurled for improved gripping of the reservoir.

[0047] Thus the mentioned but not shown known CO_2 cartridge-driving threaded member engageable in threads 79 is omitted and the reservoir portion 76 and threaded shoulder 82 are so proportioned that when screwed-in, the end sealingly engages around the piercing pin of the rifle which opens the valve (not shown) in end 76' to power the rifle. Thus the outside of end 76' of reservoir 76 has a thread or other connection means to enable it to be connected to a pump or other power source for recharging and multi use of the reservoir which also provides increased volume and thus a greater number of shots. Also increase in power from the order of 6ft lb to the region of 12ft lb is envisaged as readily possible.

[0048] As will be appreciated from the earlier described embodiments, the valve member (such as a disc or opening part of a high pressure "Schrader" valve e.g. Ref: 9914A) of the valve means of the cartridge will be such as to be openable by the piercing pin of the rifle when the cartridge seals against the seat in the rifle. Such valves can satisfactorily operate up to the region of 5,000 psi although in use in the present invention pressures of up to the region of 250 bar (3,500-4,000

psi) are envisaged. A Schrader valve has an externally threaded portion for location and when used in a reservoir or cartridge according to the invention the air flow passage of the reservoir or cartridge which receive the valve will have a correspondingly internally threaded portion in which the Schrader valve is threadingly securable.

Claims

1. A combination of a gas powered gun and a detachable or disconnectable re-pressurisable gas reservoir or a re-pressurisable gas reservoir for a gas powered air gun whenever used in such a gun, and wherein the re-pressurising gas is air and the reservoir is detachable or disconnectable from the gun and connectable to a manual or foot operable high pressure pump or other pressurised air source for recharging prior to reattachment/reconnection to the gun.

2. A re-pressurisable gas reservoir for a gas powered pistol, rifle or other gun having a known piercing pin provided for piercing a known sealed carbon dioxide cartridge in its reduced diameter end, or narrow neck or such reservoir whenever used in such a gun, characterised by the feature that the reservoir comprises a re-pressurisable gas bottle or cartridge with a reduced diameter end or narrow neck and which is re-pressurisable by air, and said bottle or cartridge having an opening in its narrow end or neck provided for receiving the cartridge piercing pin of the gun with said opening communicating with an inlet/outlet passage in which a valve is located and said valve is such as to be openable by said pin to enable pressurisation of the gun.

3. A reservoir as claimed in claim 2, in which the valve closure member is spring biassed into the closed position and mechanically openable by pressure from the outside by a hollow piercing pin or other projection of an air gun, and in which the valve is also openable by externally applied gas pressure.

4. A reservoir as claimed in claim 3, in which the valve closure member has a locating notch provided therein for receiving the free end of the pin or projection.

5. A reservoir as claimed in claim 1, in which the bottle or cartridge comprises at least two interconnectable main body parts.

6. A reservoir as claimed in claim 2, in which the cartridge has connection means (such as an external thread) on its neck or narrow end in the region of the outlet to enable connection of a source of pressurized air for re-pressurisation of the cartridge with air.

7. A reservoir as claimed in claim 6, wherein there is also provided, in combination, a connection device interconnectable with the connection means on the neck of the cartridge and with said connection device having further connection means remote from the first connection means and in gas flow communication therewith and connectable to a foot pump or other source of pressurised air.

8. A gas cartridge or other vessel for use in and powering a gas powered gun, with the cartridge or vessel being provided either with or without a valve in the narrow neck of the cartridge or in the end of the vessel which is to be in gas communication with the gun, and recharging enabling means being provided either as a connecting passage with a valve in the cartridge wall and accessible from exteriorly of the gun butt or as an extension conduit or pipe provided at the side (either in a lateral side or the bottom side or end) of the cartridge and communicating with the interior thereof and extending into or through a passage in the stock or butt and being detachably connectable to a separate recharging vessel or other pressurized gas supply means or being detachably connected to a second rechargeable gas pressure vessel as an extension thereof.

9. A gas cartridge or other vessel as claimed in claim 8, in which a one way valve and/or on/off tap is provided in the conduit or pipe to enable recharging to be effected externally from the butt.

10. A cartridge as claimed in 9 in combination with a gun in which an on/off tap is provided and a suitable access point therefor is provided if necessary in the butt of the gun for operation of such by an Allen key or the like device.

11. A reservoir as claimed in claim 2, in which a gas outflow restriction means is located in the chamber thereof and upstream of the outlet opening in the neck and upstream of any openable valve therein with respect to the gas flow from the main volume of the chamber to the outlet opening, and in which, downstream of flow restriction means, is a gas space substantially sufficient for propelling one shot of the gun.

12. A reservoir as claimed in claim 11, in which the flow restriction means and gas space are provided by a tubular member closed at one end and open at the other end which is connectable to be in flow communication with a passage of the reservoir leading to the outlet, and in which tubular member a small aperture or bore extends through the wall of the

tubular member such as reduce the flow and pressure in said space to enable more shots from the gun than would occur were the tubular member removed.

13. A reservoir as claimed in claim 2 which is shaped and dimensioned identically to or similarly to a known pierceable single-use CO_2 cartridge for gas guns having a cylindrical main large body with a rounded closed end at one and having at the other end a short reduced diameter end or narrower neck portion having an inlet/outlet opening and in which is located a valve openable by the piercing pin of the gun.

14. A reservoir as claimed in claim 2 for use in a gun which is an air rifle with a chamber with piercing pin sealed CO_2 cartridge/bottle, and in which the reservoir has a reduced diameter gas reservoir portion with valve means in the inlet/outlet thereof openable by said piercing pin and which reduced diameter portion is locatable in said rifle chamber, and a larger diameter gas reservoir portion locatable externally of said rifle chamber, and an externally threaded portion or other connection means is provided between the reduced and larger diameter portions engageable with the threads or other connection means in the rifle chamber used to urge said reservoir into sealing engagement around said pin of the rifle.

15. A re-pressurisable gas reservoir for a gas powered pistol, rifle or other gun or whenever used in such a gun, characterized by the feature that the reservoir comprises a re-pressurisable gas cartridge or chamber having a first aperture connectable to be in gas communication with the gas powered projectile propulsion and firing mechanism of a gas gun and having a second aperture for enabling recharging and/or comprises other pressurized gas ducting means, with the cartridge or chamber being connectable to the gun to be in gas communication with the propulsion/firing mechanism and said cartridge or chamber means being connected to or connectable by a duct (such as a pipe which may be a flexible pipe) to a second rechargeable pressure vessel externally of said gun or attached thereto as an extension thereof.

16. A reservoir as claimed in claim 2 or 11, in which the valve is a high pressure Schrader valve, (for pressures for example in the region of 250 bar) or other valve having a valve closure member located in the inlet/outlet passage or adjacent thereto to be displaceable and openable by movement away from the passage opening towards the interior of the reservoir and by the cartridge piercing pin of a gun when the opening and passage is pressed over the pin.

17. In combination re-pressurisable gas powered gun and gas cartridge with said gun including a known gas powered projectile firing mechanism having a first connection means connectable to a first aperture in a first cartridge or chamber for containing or ducting pressurised gas and as claimed in at least claim 1 and 8 wherein the gun is modified or adapted such to enable said cartridge or chamber to be connectable or connected via a second aperture to recharging means or to an additional chamber for pressurised gas and one which is preferably rechargeable.

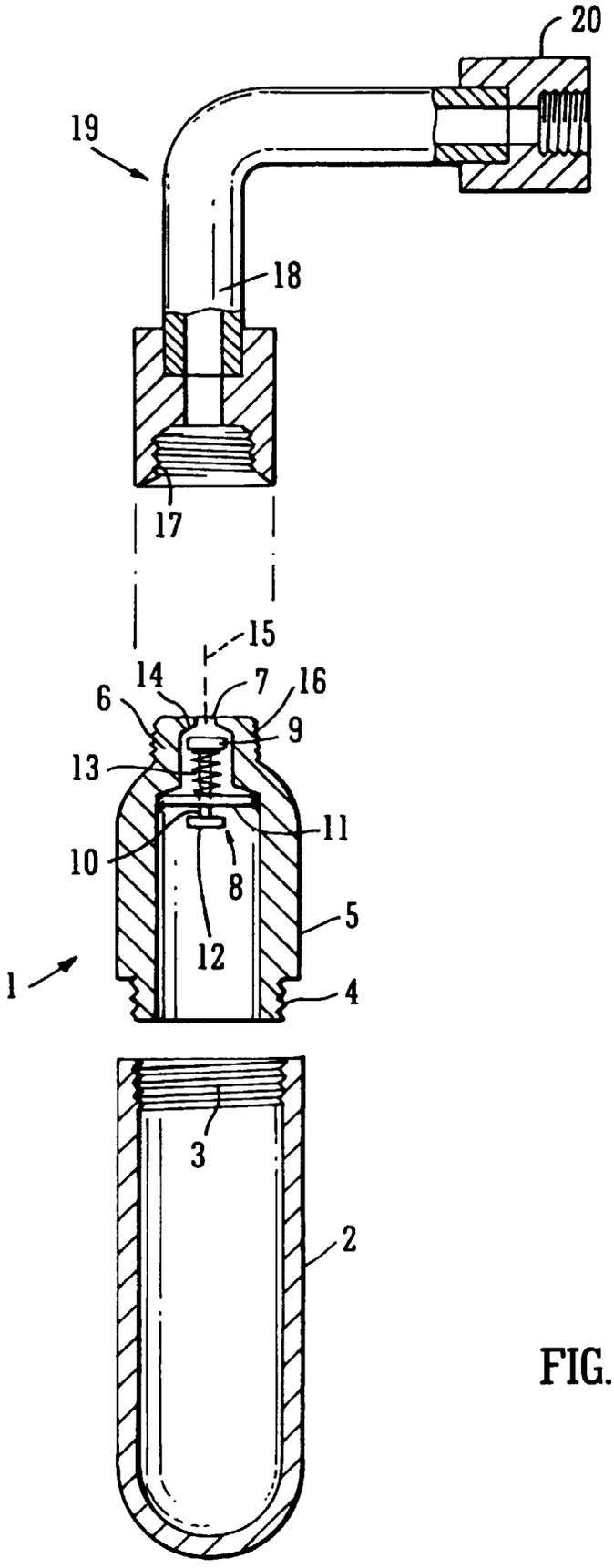

FIG. 1

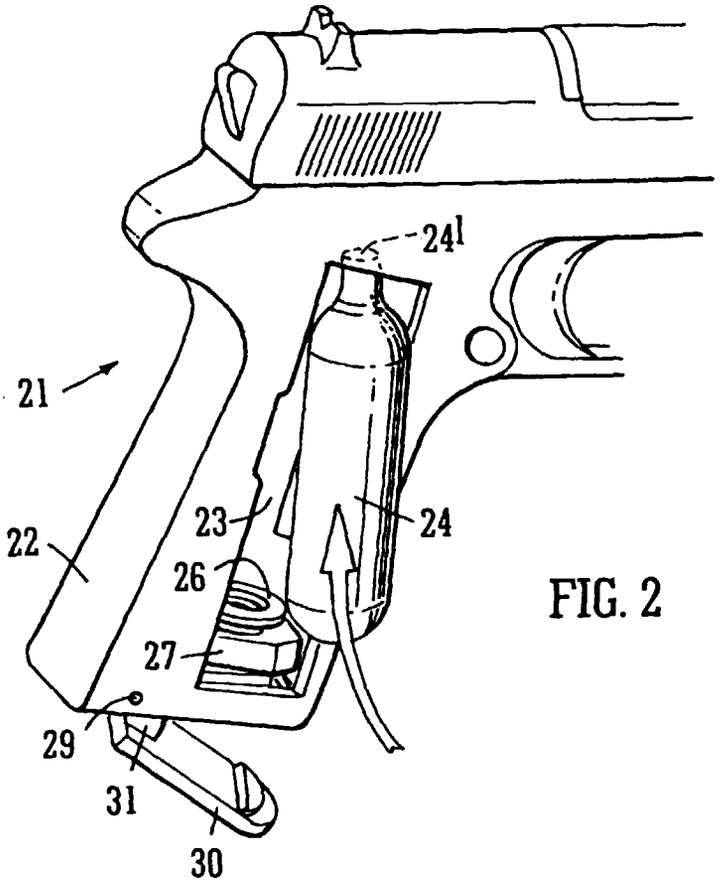

FIG. 2

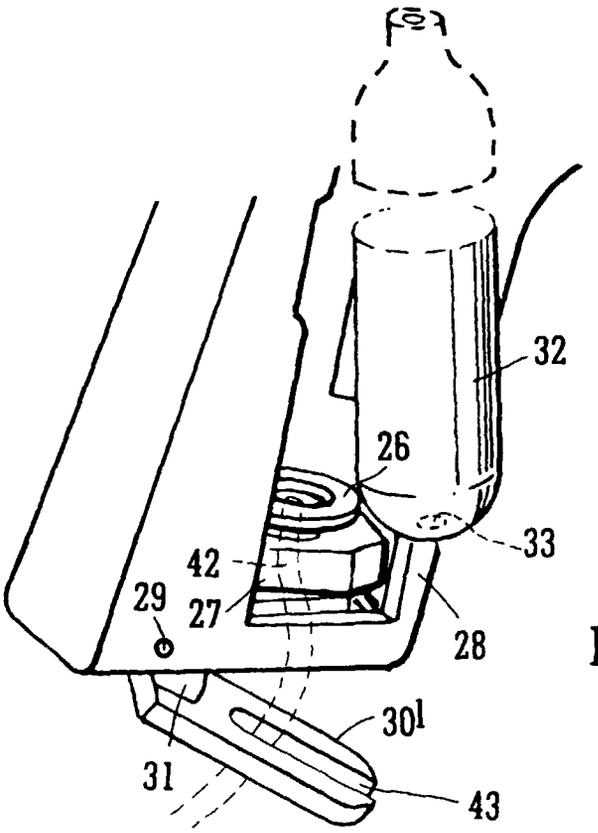

FIG. 3

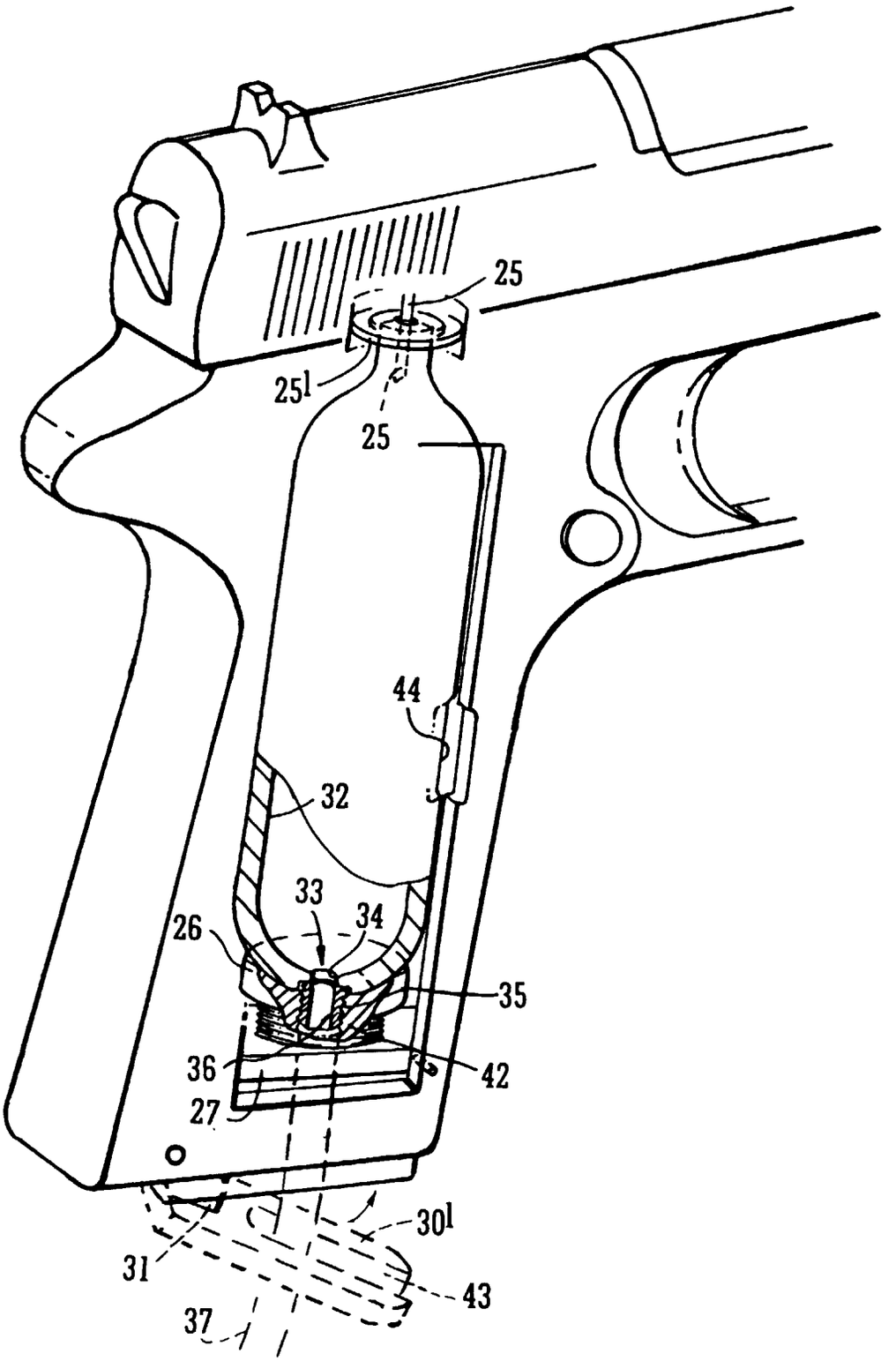

FIG. 4

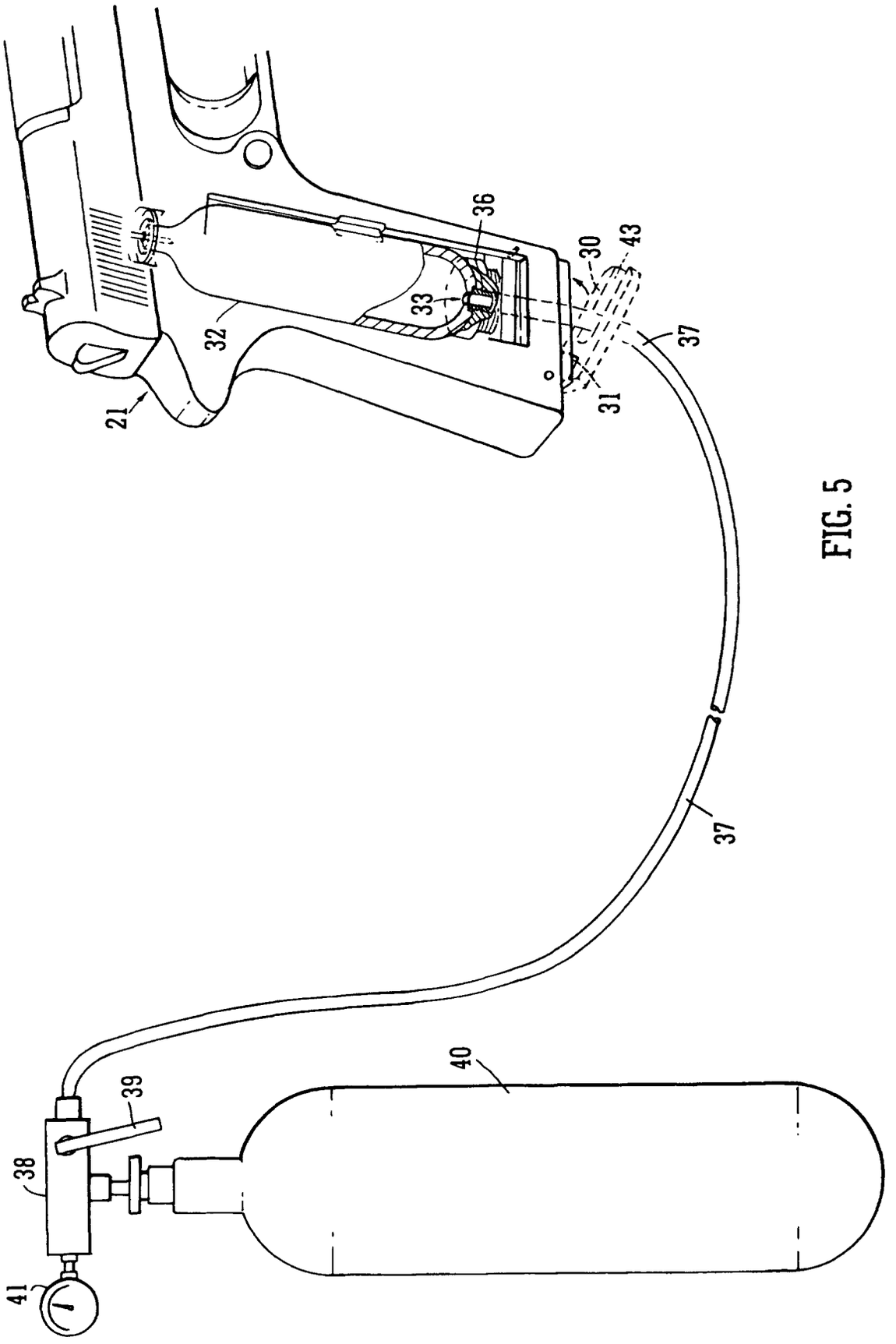

FIG. 5

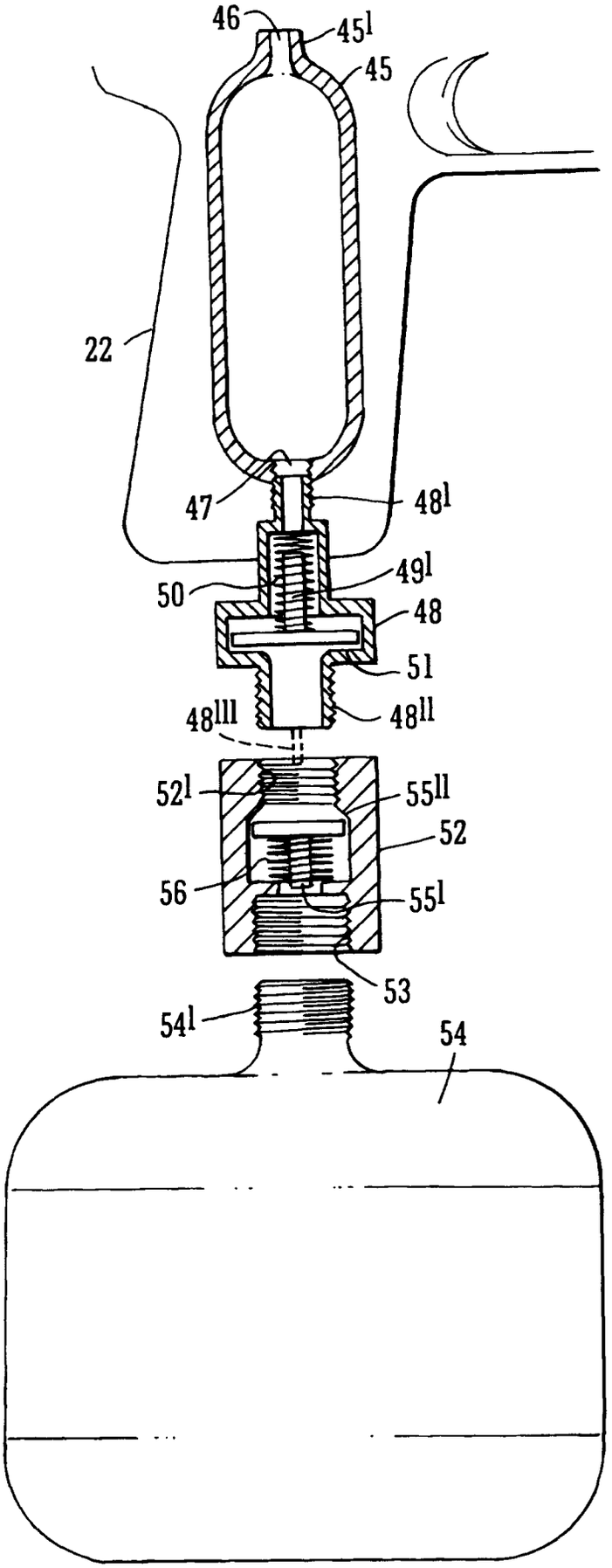
46
45I
45
22
47
48I
49I
50
48
51
48III
48II
52I
55II
52
56
55I
53
54I
54

FIG. 6

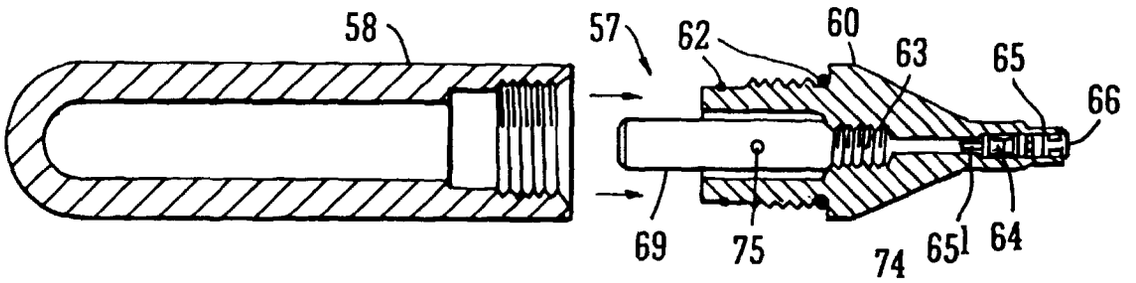

FIG. 7

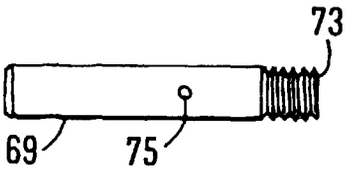

FIG. 8

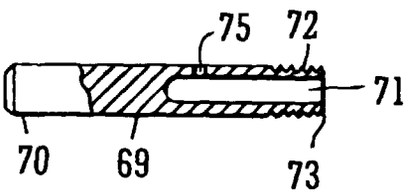

FIG. 8A

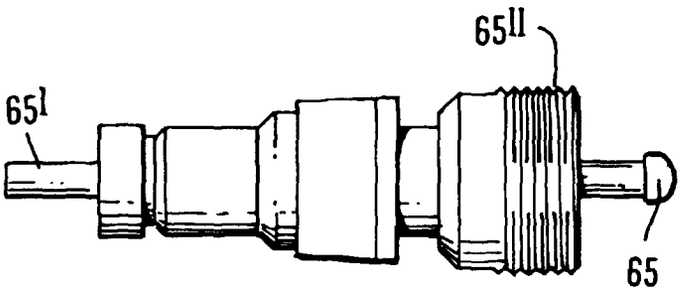

FIG. 9

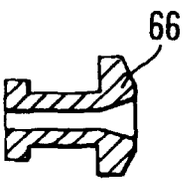

FIG. 10

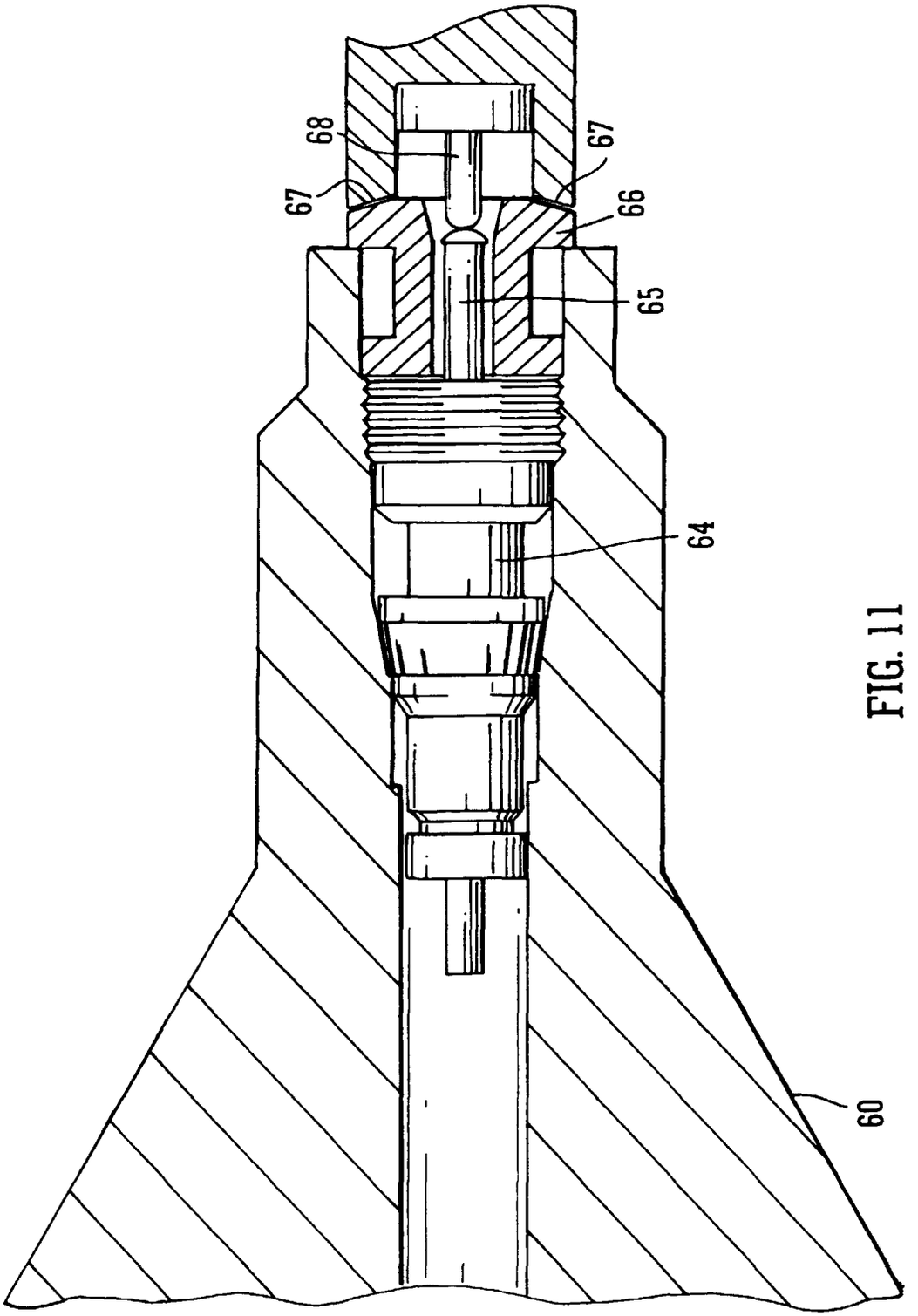

FIG. 11

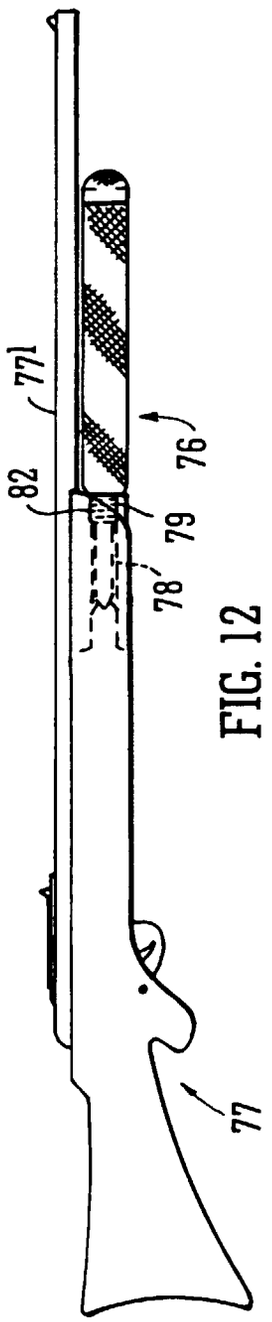

FIG. 12

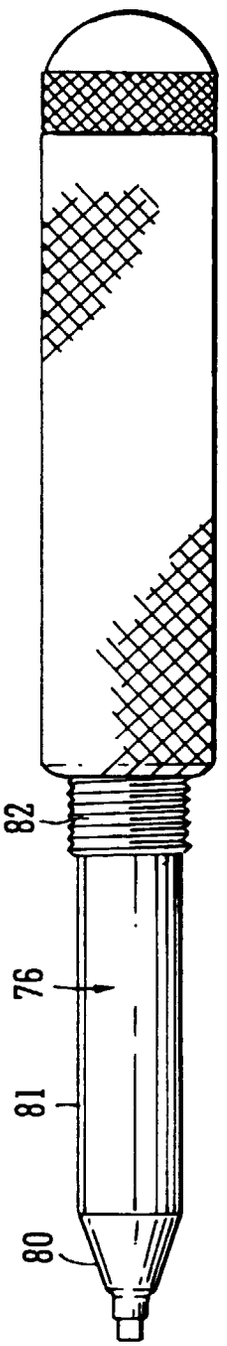

FIG. 13

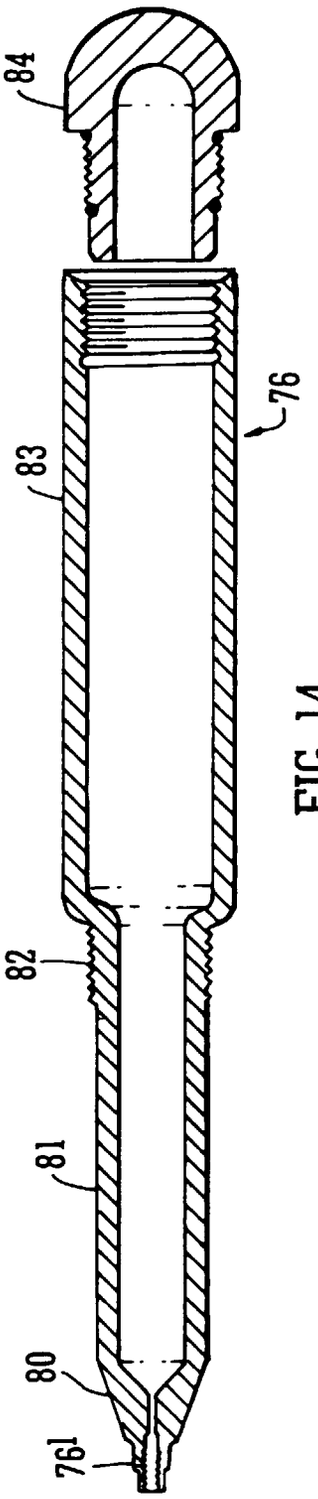

FIG. 14