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- (54) **Gun for neutralising explosives and the like**
- (57) A gun for neutralising explosives and the like, comprising a barrel, the cartridge chamber of which is accessible by way of removable breech closure member, characterised in that the barrel is internally subdivided into a first bore portion of smaller diameter, for receiving a cartridge containing the propellant charge, and a second bore portion of larger diameter, for receiving a working load.

GB 2 083 894 A

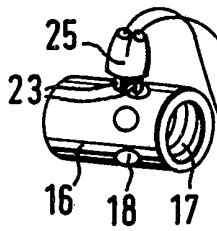
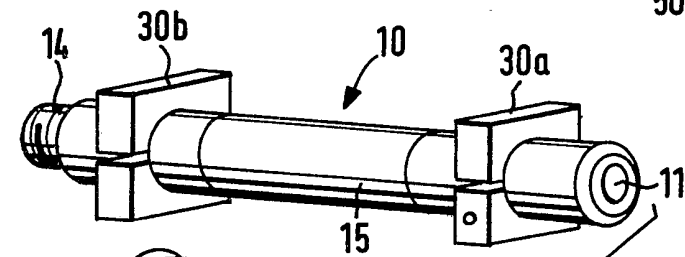
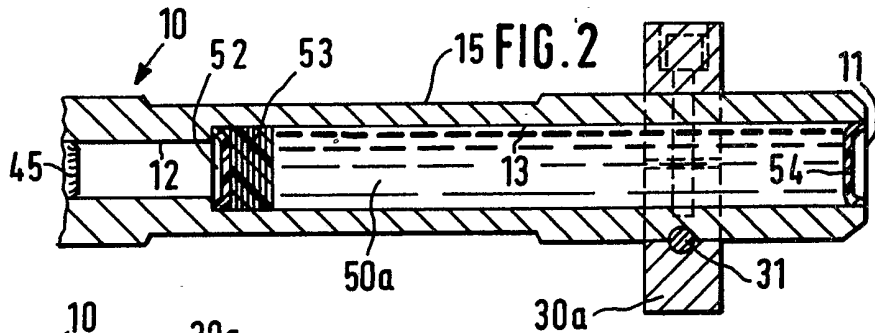
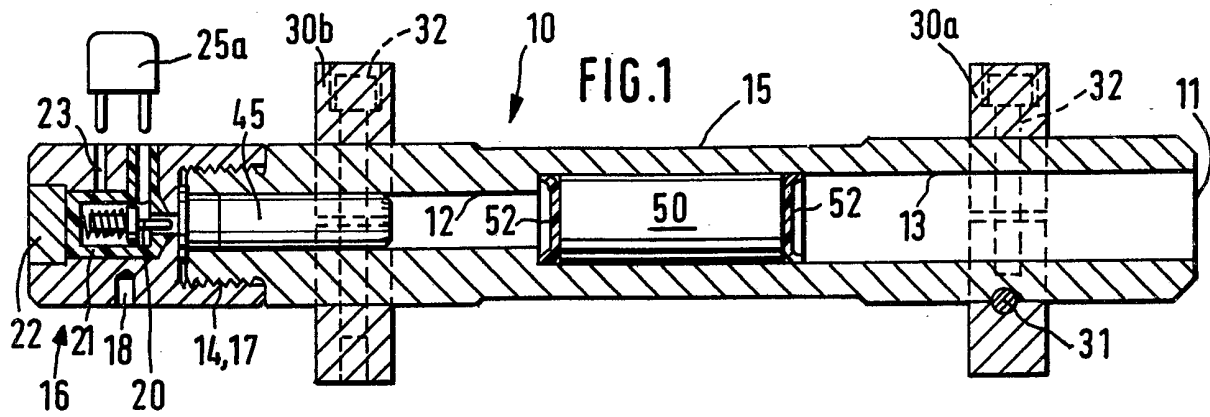


FIG. 3

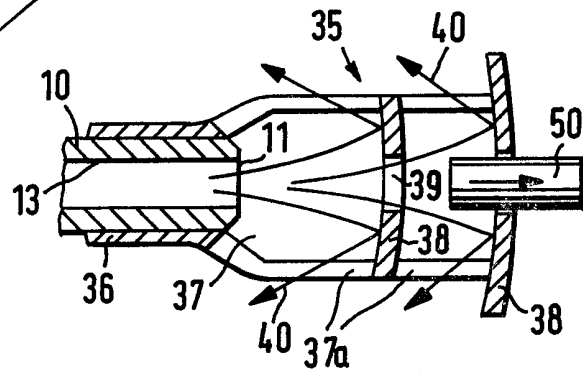


FIG. 4

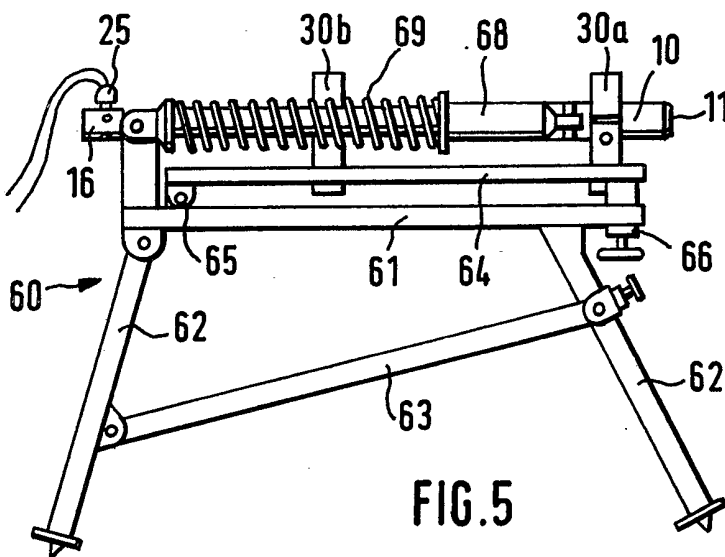


FIG. 5

SPECIFICATION

Gun for neutralising explosives and the like

The invention relates to a gun for neutralising explosives and the like, comprising a barrel, the
 5 cartridge chamber of which is accessible by way of a removable breech closure member.

Apparatuses and systems of this kind have been developed in various countries in about the
 last ten years, in order, on the one hand when
 10 removing combat material in military operations but in particular when neutralising improvised
 combat materials when fighting against crime and the like, to reduce the occupational hazard to
 persons who are to deal with such tasks, and to
 15 avoid the damage involved in any explosion.

However, all previously known devices suffer from the disadvantage that, in order to be
 successful, they must always be moved into a
 position very close to the object which is to be de-
 20 activated.

Difficulties occur with many of the casings used on explosives; known systems can only ever be
 used for a given kind of casing.

The object of the present invention is to provide
 25 a gun for neutralising explosives, which can be used in all conceivable situations of disarming
 explosives, and which, by virtue of a higher degree of firing or operative reliability, results in a
 substantial increase in the prospects of success,
 30 even at longer ranges, when faced with all disarming problems.

The solution according to the invention, to the above-identified object, is set forth in brief terms
 in claim 1.

Advantageous developments of the basic
 35 concept of the invention are characterised in subsidiary claims.

By virtue of the particular construction of the
 gun according to the invention, the most suitable
 40 working load can be selected depending on the individual situation in question, for example a steel
 bolt, for positively ripping open a thick-walled vessel which is thought to contain firing devices,
 for shooting off closure means or locks on
 45 suspicious pressure vessels, for shooting off or opening closure caps on tubular bombs, or the
 like.

When using a working load comprising water, a
 casing can be torn open by hydrodynamic energy,
 50 firing devices or means for preventing dismantling can be catapulted out of a firing circuit, possible
 explosive charges can be swirled out, external firing devices such as for example time clocks or
 light container closure means can be shot off
 55 without a harmful in-depth effect, or for example even door closures can be destroyed without a
 harmful in-depth effect. In principle, using water or other fluids for firing purposes is appropriate
 whenever a bullet-type effect is to be avoided, at
 60 the target object. There is no muzzle flash when using fluids for firing purposes.

When using lead shot as the working load, which can be 320 g with a barrel diameter of
 28 mm, normal shot scatter is utilised. If desired,

65 the scatter angle can be altered. When firing at a suspicious article with a larger charge of shot from
 a 28 mm barrel, the effect is either that, at close range, the casing of the object is shot through and
 a larger area on the target object is raked,

70 depending on the angle of the cone of shot, or, from a longer range, the shot spreads out to cover
 the target object. In this way, containers can be opened and cables severed.

Besides lead shot, if required it is also possible
 75 to shoot metal powder, sand, steel bolts or other particles.

The propellant charge used is preferably a propellant charge powder, which does not
 produce a muzzle flash, from a 12 caliber cartridge
 80 with electrical firing, which is similar externally to a standard shot cartridge.

If required, for example for the purposes of training personnel, an insertion barrel for a smaller
 caliber, for example the 4 mm M 20 caliber, can
 85 be inserted into the barrel from the cartridge chamber. Target training operations and
 adjustment operations can be carried out with this arrangement, in an inexpensive manner. The
 safety range is also substantially shortened by
 90 virtue of that arrangement.

Externally, the barrel is of reduced diameter and can thus be fixedly clamped for example to a
 remote-controlled vehicle, a mounting or the like.

Preferably, two support plate members are
 95 releasably secured to the barrel. These support members can be used for fixing the barrel for
 example on a gun mount or carriage, so that the barrel can be aimed precisely at the target, in
 respect of elevation and in a lateral direction. The
 100 gun mount or carriage can make it possible to reduce the recoil.

For precise aiming, for example an angled
 telescopic sight (for example US Elbow Telescope
 M 109) can be inserted into the larger bore
 105 portion of the barrel from the muzzle, and thus lined up with respect to the axis of the bore of the
 28 mm barrel. The optical system of the angled telescopic sight includes a cross wire sight
 graticule. In this way, the gun can be aimed in a
 110 parallax-free and highly accurate manner. The telescopic sight is then removed from the muzzle.

If the gun is secured to a remotely-controlled
 vehicle, aim can be taken for example by means of
 an aiming camera or a laser beam aiming device.

A realistic firing range can be specified at 20
 115 metres, but on-target firing is possible even beyond that range. Up to a 20 metre range, a fired
 steel member has such a straight projectory that exterior-ballistic deviations are negligibly small,
 120 when aiming along the line of sight. With a muzzle velocity of 280 to 300 m/s, a steel projectile
 weighing 320 g has a muzzle energy of about 15000 kg. In this way, even strong metal
 containers can be torn open by grazing shots.

In addition, for example closure caps on tubular
 bombs can be opened remotely by firing at an
 125 angle using a steel member, at an impact angle of from 3 to 10°.

For safety reasons, the closure portion of the

gun according to the invention is provided with an electrical firing device. In this way, the gun can be triggered easily and accurately from a remote location; firing can also be effected without
 5 difficulty from an on-board power system of a remotely controlled vehicle. When using a plurality of similar guns, a number of guns can be connected in a series circuit, by means of the electrical firing device, and fired at the same time,
 10 for example when used in relation to larger objects or a number of objects.

The breech member is preferably releasably connected to the rearward end of the barrel by way of a trapezoidal screwthread. Blind holes
 15 formed laterally in the breech closure member make it easier to fit holders or tools to the breech closure member. By using the blind bores, the gun can be set in a perpendicularly hanging position, for example, even when suspicious objects are
 20 found in constricted spaces, such as for example in motor vehicles or gully shafts.

In addition, a muzzle brake means may be mounted at the muzzle of the barrel of the gun, which contributes to reducing the recoil when
 25 firing, by virtue of deflection of the burnt gases.

An embodiment having the features of the invention is described in greater detail hereinafter with reference to a drawing in which:

Figure 1 shows a view in longitudinal section
 30 through a gun according to the invention, for neutralising explosive and the like,

Figure 2 shows a view in section of part of the gun which, unlike Figure 1, is filled with water,

Figure 3 shows a perspective view of the gun of
 35 Figures 1 and 2, with the breech closure member removed,

Figure 4 shows a sectional view of a muzzle brake means fitted to the muzzle of the gun, and

Figure 5 shows a side view of the gun mounted
 40 on a gun mount.

The gun described hereinafter is suitable for precisely and positively neutralising explosives and the like, at ranges of 20 metres and more. Depending on the situation of use, the working
 45 load to be fired is a steel bolt, a quantity of liquid, lead shot, metal powder or a charge comprising steel bolts or other particles.

The basic components of the gun are a barrel
 50 10 and a breech closure member 16, which is releasably connected to the barrel and which contains an electrical firing device. In its rearward region, the barrel 10 has a first, narrower bore portion 12 which is bored out cylindrically to a 12 caliber bore. A second bore portion 13 of larger
 55 diameter adjoins the bore portion 12, concentrically with respect thereto, in the forward portion of the barrel, up to the muzzle 11 thereof. The second bore portion 13 serves to receive a working load and in the present case is 28 mm in diameter.
 60

Incorporated into the middle portion of the barrel is a portion 15 of reduced outside diameter which can be used for mounting the gun in a mounting or the like. The rearward end of the
 65 barrel is formed as a screwthreaded portion 14

having a trapezoidal screwthread which engages into a matching female screwthread 17 in the breech closure member 16. The pitch of the trapezoidal screwthread is so selected that, when
 70 fitting the breech member 16 to the gun, the breech member 16 is in the closed condition after about seven revolutions. A plurality of blind bores 18 are distributed over the outside periphery of the breech member 16, which bores can be used
 75 for fitting a tool thereto when closing the breech member, or for positioning the gun.

A spring-loaded contact pin 20 is disposed in a stepped axial bore in the breech closure member 16, within an insulating sleeve or bush 21. When
 80 using electrical cartridge firing, the contact pin 20 serves as a contact element. The axial bore in the member 16 is closed by a cover member 22. A pair of female terminal members 23 which extend radially through the wall of the breech closure
 85 member 16 provide for electrical connection of the electrical firing device within the breech closure member 16. Of the female terminal members 23, one female terminal member (at the right in Figure 1) is insulated, while the other is
 90 directly connected to the metal of the breech closure member 16.

In use, a two-pole electrical connecting cable 25 with plug is fitted into the pair of female terminal members 23. While preparing for firing,
 95 the gun which is already loaded, as shown in Figure 1, may be rendered safe by inserting a short-circuit plug 25a into the pair of terminal members 23.

For mounting and guiding the barrel 10, the
 100 barrel has a respective support plate or disc member 30a and 30b, in each of the forward and rearward portions of the barrel. The support plate members 30a and 30b which are of an integral construction are secured to the outer periphery of
 105 the barrel 10 by means of screws 32, while the forward member 30a is additionally prevented from moving axially by a blocking pin 31.

The propellant charge in the form of a muzzle flash-free powder is disposed in a 12-bore
 110 cartridge 45, the outside dimensions of which, in the present case, are the same as a commercially available 12-bore shot cartridge.

In Figure 1, the barrel 10 contains a working load in the form of a projectile body 50 comprising
 115 steel, which weighs about 320 g and which is closed at both ends by respective small cup-shaped sleeve members 52. The projectile 50 can be used for opening pressure containers or heavy containers containing explosives, shooting off
 120 closure members or closure caps on suspicious pressure containers or tubular bombs, shooting out detonators or fuses in bombs or artillery ammunition, or positively shooting through pressure or acid lines in missiles.

In Figure 2, the barrel 10 is loaded with a quantity of water 50a as the working load. The water 50a can be used at a range of from about 2 to 5 cm for hydrodynamically breaking open the casing of an object, flinging detonator devices out
 130 of explosives, swirling explosive material out of

the casing after the casing has been penetrated, shooting off external firing devices, while avoiding a projectile having a depth effect, or for example destroying door locks or closures, without causing damage therearound.

At the end which is towards the first bore portion 12, the water 50a is sealed off by a small cup-shaped sleeve member 52 and is also supported by means of a pressure transmission member 53 of plastics material. A water-tight muzzle closure cap member 54 is provided at the muzzle 11.

For the purposes of reducing firing recoil, a muzzle brake means 35 which is shown in section in Figure 4 can be secured to the forward end of the barrel 10. The muzzle brake means 35 has a fixing sleeve 36 which can be connected to the end of the barrel for example by way of a screw connection, a casing 37 which is provided with longitudinal slots 37a, and spherically curved baffle surfaces 38 which are carried by the casing 37, each having a bore 39 in line with the bore 12/13 of the barrel 10. Figure 4 shows the situation upon discharge of the projectile 50. The propellant gases which are produced in that case are illustrated in Figure 4 by arrows 40. The propellant gases 40 which travel at high speed at deflected outwardly away and back by the surfaces 38, and in so doing transmit a force which is opposed to the recoil force, to the barrel 10.

For a number of situations of use, the gun shown in Figures 1 to 4 can be mounted on a tripod gun mount 60 as shown in Figure 5, which permits the gun to be accurately aimed at a target. The two support plate members 30a and 30b are mounted displaceably in the longitudinal direction of the mount 60 in a barrel cradle 64, and the forward member 30a is connected to a base portion 61 of the mount 60 by way of a return device 68 comprising two guide columns with compression springs 69. The devices 68 resiliently absorb the recoil of the barrel 10 when the gun is fired.

At the rearward end of the barrel 10, the barrel cradle 64 is rotatably connected to the base portion 61 by way of a pivot 65, while at the forward end of the barrel, the cradle 64 can be adjusted in respect of elevation, accurately and in a reproducible manner, by an elevation control means 66. The three legs 62 of the gun mount 60 are supported relative to each other by a transverse strut 64 and are also at least partly adjustable in respect of position and/or length.

Before firing the gun, the gun which is mounted for example on the gun mount 60 is aimed accurately at the selected target point by means of an angled telescopic sight which is inserted into the muzzle 11 of the barrel 10 and which is thereby precisely aligned with respect to the axis of the bore of the 28 mm barrel. Aim is taken at the target point, without parallax, by means of the optical sighting line containing the cross wire graticule. The aiming device is then removed from the muzzle 11.

If the gun is used for example on a remotely-controlled vehicle, then the gun may be aimed for example by way of an aiming camera or a laser beam aiming device.

For training purposes, an insert barrel which is externally adapted to a 12-bore can be fitted into the stepped inside bore of the barrel 10. Firing training operations and other adjustment operations can be inexpensively carried out in this way. 4 mm M 20 caliber cartridges for example can be shot from such an insert bore; the necessary safety range is substantially shortened by virtue of that fact.

For certain situations of use, bullet cartridges can also be used, with a suitable insert bore. In this case also, the gun according to the invention provides the advantages of electrical firing in conjunction with precise aiming capability.

Firing of the gun can be reliably effected from any desired distance, by means of a suitable length of electrical connecting cable 25. A number of guns can also be electrically connected in series and thus fired simultaneously. Electrical firing can be combined with the on-board system of a vehicle.

When using a short cartridge, the electrical breech closure member 16 is removed and replaced by an electromechanical breech closure means (not shown in the drawing). In this way, the gun is also available for using any 12-bore shot cartridges simply by replacing the breech closure system.

CLAIMS

1. A gun for neutralising explosives and the like, comprising a barrel, the cartridge chamber of which is accessible by way of removable breech closure member, characterised in that the barrel is internally subdivided into a first bore portion of smaller diameter, for receiving a cartridge containing the propellant charge, and a second bore portion of larger diameter, for receiving a working load.

2. A gun according to claim 1 characterised in that the working load is a projectile of steel.

3. A gun according to claim 1 characterised in that the working load comprises a quantity of a fluid such as for example water, which is sealed into the second bore portion of the barrel.

4. A gun according to claim 3 characterised in that the quantity of fluid is sealed and retained at both ends by respective cup-shaped or cap-shaped sealing members.

5. A gun according to claim 3 or claim 4 characterised in that a pressure transmission member of plastics or the like is inserted between the cartridge and the quantity of fluid.

6. A gun according to claim 1 characterised in that the working load comprises lead shot, metal powder, sand or other particles.

7. A gun according to claim 1 characterised in that the first bore portion is of 12-bore caliber and the second bore portion is 28 mm in diameter.

8. A gun according to claim 1 characterised in that the removable breech closure member is

connected to the rearward end of the barrel by screwthread means.

9. A gun according to claim 1 or claim 8 characterised in that the breech closure member includes an electrical firing device.

10. A gun according to claim 9 characterised in that the electrical firing device has two electrical female connecting members which are accessible from the outside and which can be connected to a remote triggering means by way of a twin-wire electrical line and which are rendered safe in the rest condition by insertion of a short-circuit plug.

11. A gun according to claim 9 characterised in that the releasable breech closure member has outwardly open blind bores, for fitting mountings, tools or the like thereto.

12. A gun according to claim 9 characterised in that the electrical firing device is provided with a contact detonator means.

13. A gun according to claim 1 characterised in that the barrel has a reduced outside diameter portion for mounting a fixing means or the like.

14. A gun according to claim 1 characterised in that a respective support plate member is releasably secured to the outside periphery of the barrel at the front and at the rear thereof.

15. A gun according to claim 14 characterised in that the front support member is positively

secured to the barrel by a locking pin or the like.

16. A gun according to claim 1 characterised in that a muzzle brake means which has baffle surface means for deflecting the propellant gases can be secured to the muzzle of the barrel.

17. A gun according to claim 1 characterised in that the cartridge substantially corresponds in its dimensions to a standard 12-bore shot cartridge, and has an electrical firing means.

18. A gun according to claim 17 characterised in that the muzzle flash-free propellant charge powder is contained in the cartridge.

19. A gun according to claim 18 characterised in that the propellant charge is of such a size that a muzzle velocity of from about 280 to about 300 m/s can be produced.

20. A gun according to claim 1 characterised by an angled telescopic sight which is capable of being inserted into the second bore portion of the barrel.

21. A gun according to claim 1 characterised by at least one additional insertion bore for insertion into the bore of the barrel, in order to shoot therefrom training ammunition or the like.

22. A gun for neutralising explosives and the like, constructed and arranged substantially as herein described and as shown in the several figures of the accompanying drawing.