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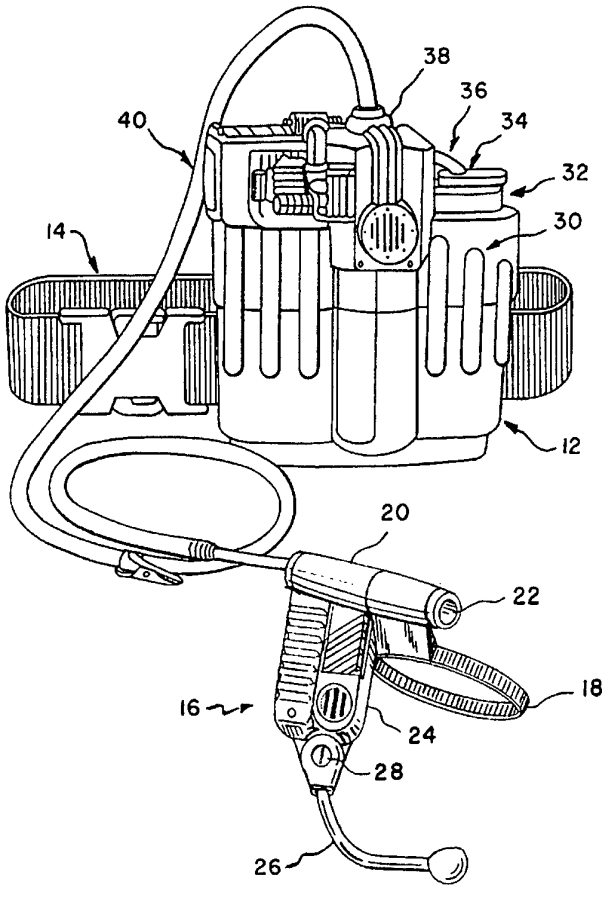
(54) Title: VOICE RESPONSIVE EJECTING TOY

(57) Abstract

A projectile ejecting device has a housing (12) for containing a projectile, electrically operable release mechanism for the release of pressurized air, water or other projectiles, has an auditory input element (26) for receiving an input auditory signal and providing an output electrical signal in response thereto and a switch element for receiving the output electrical signal and for operating the release mechanism in response thereto.



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SPECIFICATION

VOICE RESPONSIVE EJECTING TOY

FIELD OF THE INVENTION

The present invention relates to a toy for ejecting a projectile that is activated by a voice-controlled switch.

BACKGROUND OF THE INVENTION

Toys for ejecting projectiles such as foam balls or a burst of water are known, and typically comprise a hand-held device including a manually-operated switch or trigger to actuate the ejecting mechanism. Actuation of such devices is typically effected when the user aims the device at a target and manually depresses the trigger on the device thereby actuating the ejecting mechanism and ejecting a projectile or the like.

It is an object of the present invention to enhance play value and to provide a device for ejecting a projectile that is voice responsive whereby the release of a projectile is effected by voice command rather than by the manual operation of a trigger.

SUMMARY OF THE INVENTION

In order to accomplish these and other objects, in one aspect of the present invention there is provided a device for ejecting a projectile comprising a housing for containing a projectile, an output port for ejection of the projectile, an electrical power source, i.e., a battery pack, and electrically operable releasing means for ejecting the projectile. A voice responsive actuating means is connected between the power source and the releasing means and is operative for selectively actuating the releasing

means to eject the projectile from the output port. The voice responsive actuating means comprises auditory input means for receiving an auditory input from the user and producing an electrical output signal in response thereto, and a switch means for receiving the output signal and for actuating the releasing means in response thereto.

In a preferred embodiment, the device is a water ejecting toy adapted to be worn on or about the head of the user and the releasing means is a battery-operated pump. During use, the user need only point his or her head upon which the device is worn in the direction of a selected target, and issue a verbal command. An electrical connection is made between the power source and the releasing means, thereby activating the electrical pump and commencing the ejection of a pressurized water from the output port to the target.

In another preferred embodiment, the device includes a manually-operated pump to accumulate pressurized air, and the releasing means is an electrically operable valve mechanism to release the pressurized air to eject a projectile.

The novel features which are considered characteristic of the invention are set forth in particular in the appended claims. The invention itself, its construction and its method of operation, together with additional objects and advantages thereof, will be understood from the following description of specific embodiments when read in connection with the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a perspective view of a projectile-ejecting device adapted to eject a stream of water accordance with the present invention;

FIG. 2 is a schematic diagram of the voice responsive actuating means;

FIG. 3 is another embodiment of the projectile-ejecting device of FIG. 1;

FIG. 4 is a perspective view of a projectile-ejecting device adapted to eject foam balls in accordance with the present invention;

FIG. 5(a) is a cross-sectional diagram of the release mechanism of the device of FIG. 4 illustrating the valve in an open position.

FIG. 5(b) is a side view of the valve and transport tube of FIG. 5(a) showing valve in a closed position.

FIGS. 5(c)-(e) illustrate the various positions of the gears of the release mechanism of FIG. 5(a).

FIG. 6 is an alternative embodiment of the release mechanism of FIG. 5.

FIG. 7 illustrates a magnetic release mechanism.

FIG. 8 illustrates a release mechanism for a ball-ejecting device adapted to release one ball at a time.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

FIG. 1 illustrates the voice-activated projectile-ejecting device of the present invention embodied in a device for ejecting a stream of water. The device 10 includes a housing 12 which is preferably made of an injection or blow-molded synthetic plastic material of high-impact resistance and durability.

The illustrated housing 12 is adapted to be worn about the user's waist and is provided with belt loops (not shown) and a belt 14 in order to accomplish this. It will be appreciated that the housing may have any external appearance, such as that of any vehicle, ship or the like, or may resemble a common household item such as a telephone, walkie-talkie, or camera and may be adapted to be worn about

the user's head or body, or may be a freely standing or hand-held unit.

In the illustrative embodiment, a headset 16 is provided and is adapted to be worn on or about the user's head. The headset 16 includes headband 18 and side member 20. A discharge nozzle 22 is mounted in side member 20 for the dispersion of water and an earpiece 24 mounted to the headset 16 contains the voice responsive switch circuitry and provides an additional degree of stability for the headset 16.

A mouthpiece 26 extends from the earpiece 24 and terminates proximate the user's mouth when the headset 16 is worn in its intended position on the user's head. The mouthpiece 26 is mounted on a pivot member 28 which permits the mouthpiece 26 to be rotated towards and away from the user's mouth in order to vary the sensitivity of the device to sound coming from the user's mouth.

A reservoir tank 30 is mounted within the housing 12. The reservoir tank 30 has a threaded annular offset extending above the upper surface of the housing 12 and a threaded cap 32 which may be screwed on the offset to accomplish the selective opening or closing of the reservoir tank 30. The cap 32 includes a central opening 34 containing a flexible tubing 36 extending within the reservoir tank 30. When the cap 32 is removed from the offset, fluid, particularly water, may be introduced into the reservoir tank 30. When the cap 32 is again tightened, the tube 36 extends into the supply of water.

Water in the reservoir tank 30 is withdrawn therefrom through the flexible feed tube 36 extending from the reservoir 30 to an input port of a conventional battery-powered water pump (not shown) located within the housing 12. Water pumps for use in water guns and the like are well known, such as the geared-down reciprocating pump disclosed

in United States Patent Number 4,022,350 to provide an intermittent pulse of water. A preferred pump includes a rotary vane pump driven by a battery-powered motor to provide a continuous stream of water while the pump is activated as would be understood by those skilled in the art, and detailed description thereof is therefore omitted.

The pump has an output port 38 atop the housing 12 and has connected thereto one end of an elongated flexible tube 40. The opposite end of the elongated flexible tube 40 is connected to the discharge nozzle 22 for conveyance of pressurized water from the reservoir tank 30 to the discharge nozzle 22.

FIG. 2 is a schematic diagram of the voice responsive actuating means of the present invention. A microphone 42 is located within the mouthpiece 26 for receiving verbal commands from the user. The microphone 42 is preferably a condensor microphone of conventional design and construction and produces an electrical output signal in response to verbal commands or sounds made by the user. However, the microphone 42 may be a piezoelectric device, diaphragm, or strain gage which provides an output electrical signal in response and corresponding to the level of an auditory input signal. A first output of the microphone 42 is grounded. The second output of the microphone 42 is connected to the switch circuit 44. Power is provided to the circuit by battery pack 45 located within the housing 12.

Operation of the circuit will now be described. The circuit 44 is placed in an active mode by depressing momentary contact switch 48, whereupon the transistors become properly biased to receive a signal from the microphone 42 of a level permitting current to flow through the motor 50 in response thereto. Upon depression of switch 48, power source 45 charges capacitor 62 through the switch 48 thereby activating transistor 68. As a result, transistor 70 becomes activated. Transistor 70 provides DC

bias to transistor 52 through resistor 53. Thus, whenever the circuit is in an active mode, that is, when capacitor 62 remains charged, transistor 52 is held in an active state.

When the user speaks into the microphone 42, the output signal of the microphone 42 is amplified by transistor 52. As a result of the amplified signal appearing at the collector of transistor 52, transistor 54 becomes activated, thereby activating transistors 56 and 58. Activation of transistor 58 permits current to flow from the power source 46 through the motor 50 and through transistor 58, thereby causing the dispersion of pressurized water from the discharge nozzle 22.

The collector of transistor 56 is also connected through diode 60 to capacitor 62. Thus, when the user continues to speak, capacitor 62 remains charged and the circuit is held in an active mode.

When the user is no longer speaking, capacitor 62 eventually discharges through the series combination of resistors 64 and 66 and the base of transistor 68 thereby deactivating transistor 52. The time required for capacitor 62 to discharge is dependent upon the values of capacitor 62, resistors 64, 66, and upon the junction resistance of transistor 68. Once capacitor 62 is discharged, transistors 68 and 70 become deactivated, thereby deactivating transistor 52. Thus, an auditory input will not be amplified and current cannot pass through transistor 58.

As will be appreciated, selected values of resistors 64 and 66 and capacitor 62 may be used to hold the circuit in its active mode for a predetermined time. Moreover, a conventional timer circuit may be provided at the output of transistor 58 in order to permit current to flow through the motor 50 for a predetermined period of time. Using such a circuit, the motor 50 can be operated to provide consistent,

regulated bursts of an equal amount of water upon each activation.

In operation, the user places the headset 16 over his or her head. The housing 12 is mounted to the user's waist via the belt 14 or the belt-clip (not shown) provided on its side. It is, however, assumed that water has been added to the reservoir 30 and that the cap 32 has been replaced prior to attachment of the housing 12 to the user's waist.

Thereupon, the user merely points his or her head upon which the headset 16 and discharge nozzle 22 are mounted, at any prospective target and actuates switch 48. Next, by merely issuing a verbal command, such as "Fire," or a continuous verbal command, such as "Firrrrrre," the electrical motor 50 is energized and the water pump draws water from the reservoir 30 into the pump cylinder and flexible transport tube 40 and ejects the water from the discharge nozzle 22. This operation will continue as long as the verbal command continues and the circuit will remain active until capacitor 62 discharges. When this occurs, the user need only depress the momentary contact switch S1 in order to recharge capacitor 62.

While the invention has been illustrated and described as embodied in a fluid device worn by a user, it is not intended to be limited to the precise details shown above, since various modifications and structural changes may be made without departing in any way from the spirit of the present invention.

In FIG. 3, the projectile-ejecting device similar to that of FIG. 1, which is worn on the head of the user. The device comprises a helmet 31. The helmet 16 encloses a water reservoir 30, a battery-powered water pump 31, voice responsive actuating switch 44 and a discharge nozzle 22. Operation of the device is similar to that of the device of FIG. 1 with the primary difference being that the water

reservoir, pump and battery pack are fully enclosed within the helmet.

FIG. 4 illustrates another embodiment of the present invention, a voice-activated projectile-ejecting device driven by a manually-operated pump. The device includes a housing 70, a headset 72 and an elongated flexible tube 74. A manually-operated pump having a shaft 76 and handle 78 extending beyond the housing 70 is contained within the housing 70 for accumulating adequate air pressure to eject the projectile. Manually-operated pumps for use in projectile-ejecting devices for ejecting water, foam balls, or other projectiles are known, such as the pump disclosed in U.S. Patent No. 4,239,129 and detailed description thereof is therefore omitted.

The release means of the device of FIG. 4 is illustrated in FIG. 5. An electrically-operable valve 80 is interposed in a conduit leading to the transport tube 74 to selectively regulate the flow of pressurized fluid and to provide regulated bursts as described above. An electric motor 82 is connected to the voice responsive switch circuit 44 in the manner described above. The motor 82 drives first and second D-type or half-gears 86, 88 for opening the valve 80. A torsion spring 90 serves to bias the valve in a normally-closed position as shown in FIG. 5(b). When current is permitted to flow through the motor 82 by the voice responsive switch circuit 44, the motor 82 is caused to rotate. As shown in FIG. 5(d), the first half-gear 86 engages the second gear 88 causing it to rotate the valve 80 against the bias of the torsion spring 90 and towards the open position illustrated by FIG. 5(a). When the valve 80 is fully opened, the gears 86, 88 become disengaged from one another. As a result, the second gear 88 is forced by torsion spring 90 to return to its original position and the valve 80 is closed as shown in FIG. 5(e). The motor 80 continues to rotate the first gear 86 in accordance with the time constant of the timer circuit provided at the output of

transistor 58 described above until it returns to its original position, i.e., until one full revolution is completed. The cycle is then ready to be repeated upon further voice input from the user. Continuous voice input will cause the motor 82 of the release mechanism to rotate continuously.

FIG. 6 illustrates an alternative form of the valve means of FIG. 5. The valve 80 has radially extending arms 92, 98 mounted at opposite ends thereof. A first arm 92 is attached to a spring 94 which is mounted its opposite end to a stationary wall 96 in the device. A second arm 98 is abutted by a rotating lever 100 attached to the shaft of the motor through suitable gearing (not shown). Activation of the motor in the above described manner causes the rotating lever 100 to rotate, thereby permitting a regulated burst to pass the valve 80 each time it is activated. During each cycle, the valve remains open while the rotating lever 100 and second arm 98 remain in contact. When the rotating lever 100 and second arm 98 are no longer in contact, the valve 80 is forced to closed by the force of the spring 94.

FIG. 7 illustrates a solenoid valve release means comprised of a ball 104 and pin shaft 106 interposed within the transport tube and preventing flow within the transport tube. The pin shaft 106 is biased by a spring such that it holds the ball 104 in a position preventing flow within the tube. When the release means of FIG. 7 is connected to the circuit of FIG. 2, in the manner described above, current is supplied to the magnetic coil 108 by the circuit 44. When current is permitted to flow through the magnetic coil 108 by the switch circuit 44, the current in the coil 108 draws the pin shaft 106 and ball 104 upwards and the ball may move out of the transport tube thereby permitting flow within the tube. By providing a timer circuit as described above, the coil 108 may be activated for a predetermined period of time to regulate the flow within the tube.

FIGS. 8(a) and (b) illustrate projectile-ejecting devices having release means for releasing one foam ball at a time into the barrel 112 of the projectile-ejecting device 110. A rotating cam 114 has radially extending projections 116 extending within the chamber 118 and into the path of the balls 120 such that the projections 116 serve to prevent the balls 120 from entering the barrel 112. The cam 114 is caused to rotate precisely the amount required to feed one ball 120 into the barrel 112 whereupon a firing means 122 is activated to eject the ball 120.

While the illustrative embodiments described above include a device adapted to be mounted about the user's waist and head, it is not intended to limit the invention to such a device. For instance, the tank, pumping means, voice responsive actuating means and/or power supply may be enclosed together in a suitable housing having any desired external appearance. In addition, these individual elements may be enclosed in separate freely-standing or hand-held housings in the manner illustrated above or in another manner. The microphone, or other auditory input means may be mounted in a hand-held microphone housing, in a headset or directly in the device.

I CLAIM:

1. A device for ejecting a projectile comprising a housing for containing a projectile, a discharge port, an electrical power source, electrically operable releasing means for ejecting the projectile, voice responsive actuating means connected between the power source and the releasing means operative for selectively actuating the releasing means to eject the projectile from the device, said voice responsive actuating means comprising auditory input means for receiving an auditory input from a user and producing an electrical output signal in response thereto, and a switch means for receiving said output signal and for actuating the releasing means in response thereto.

2. The device of Claim 1, wherein said release means comprises an electrically operable pumping means.

3. The device of Claim 1, wherein said release means comprises an electrically operable valve means.

4. The device of Claim 1, wherein said power source, releasing means, output port and actuating means are enclosed in a housing adapted to be worn on or about the head of a user.

5. The device of Claim 1, wherein said auditory input means comprises a microphone.

6. The device of Claim 1, wherein said auditory input means comprises a piezoelectric device.

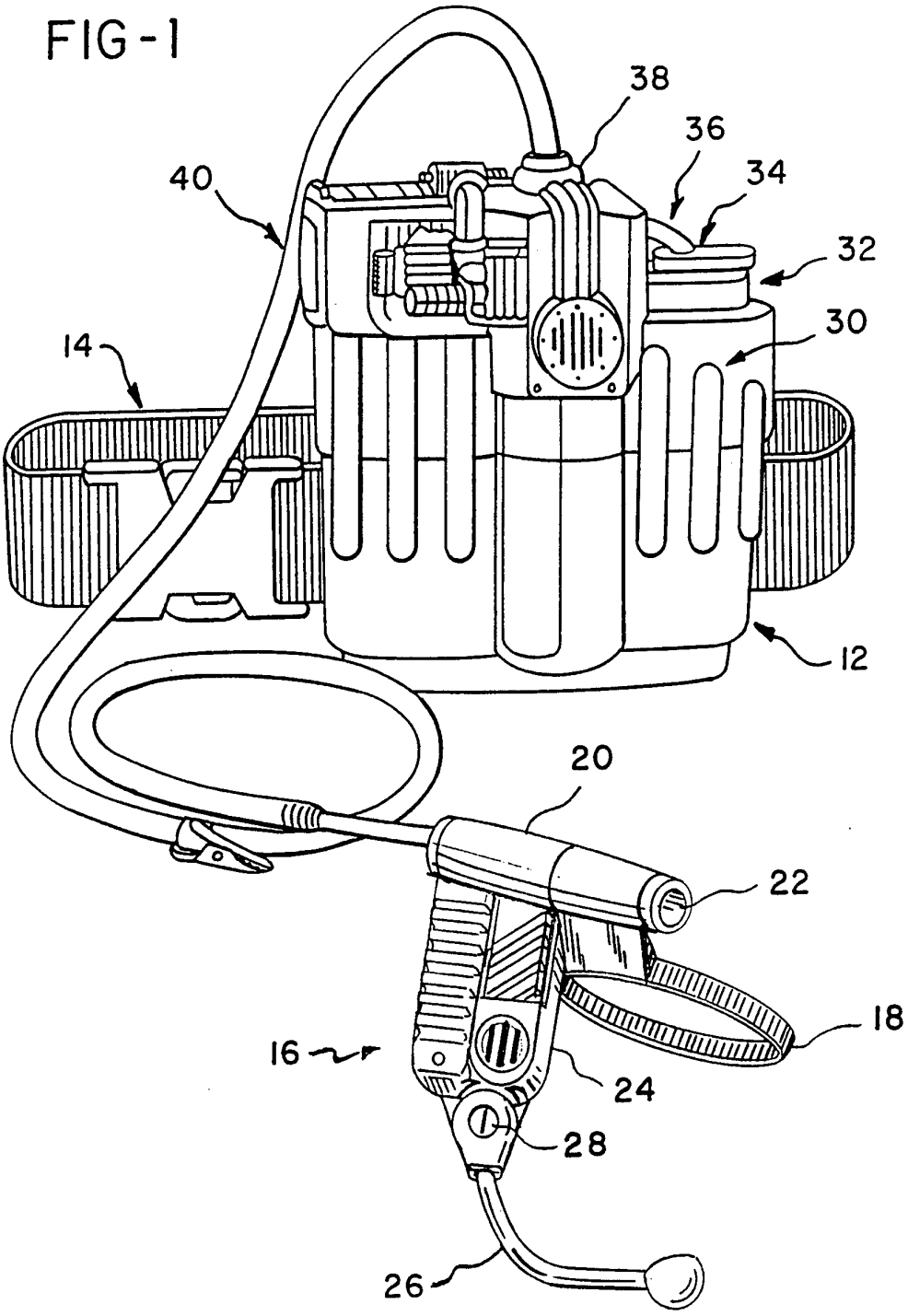
7. The device of Claim 1, wherein said auditory input means comprises a strain gage which provides an output electrical signal in response and corresponding to the level of said auditory input signal.

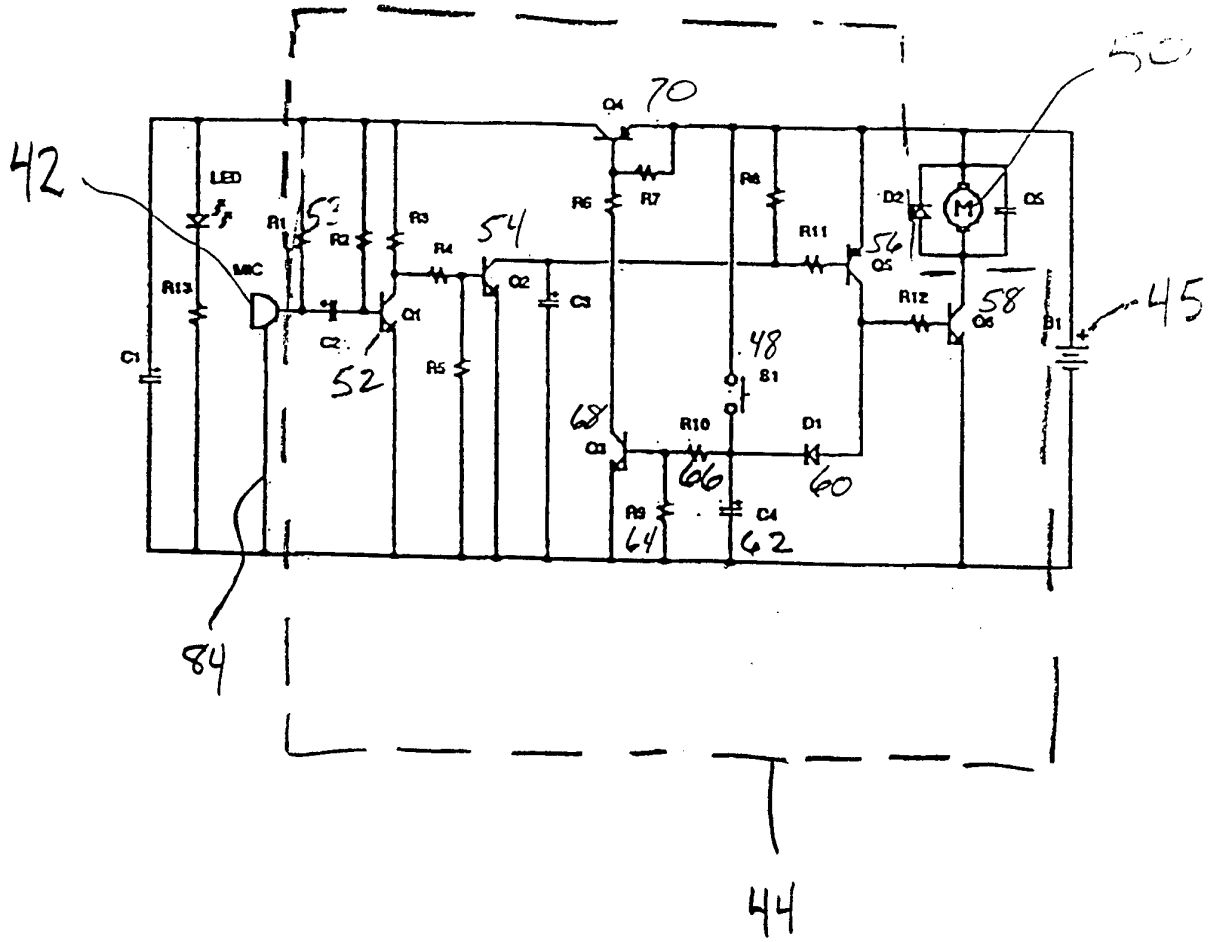
8. The device of Claim 1, wherein said electrically operable release means comprises a valve means biased in a normally-closed manner and operable by an electric motor, said motor being electrically connected to the output of said switch means such that the valve means is controlled by said voice responsive actuating means.

9. The device of Claim 1, wherein said electrically operable release means comprises a solenoid biased in a normally-closed position, said solenoid controlled by said voice responsive actuating means.

10. The device of Claim 1, wherein said electrically operable release means comprises an electrically driven rotating cam having an extension projecting in said housing in the path of said projectile, said cam adapted to engage said projectile and controlled by said voice responsive actuating means.

FIG-1




42
LED
R1
R2
R3
R4
R5
R6
R7
R8
R9
R10
R11
R12
R13
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C2
C3
C4
C5
Q1
Q2
Q3
Q4
Q5
Q6
D1
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52
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44

FIG. 2

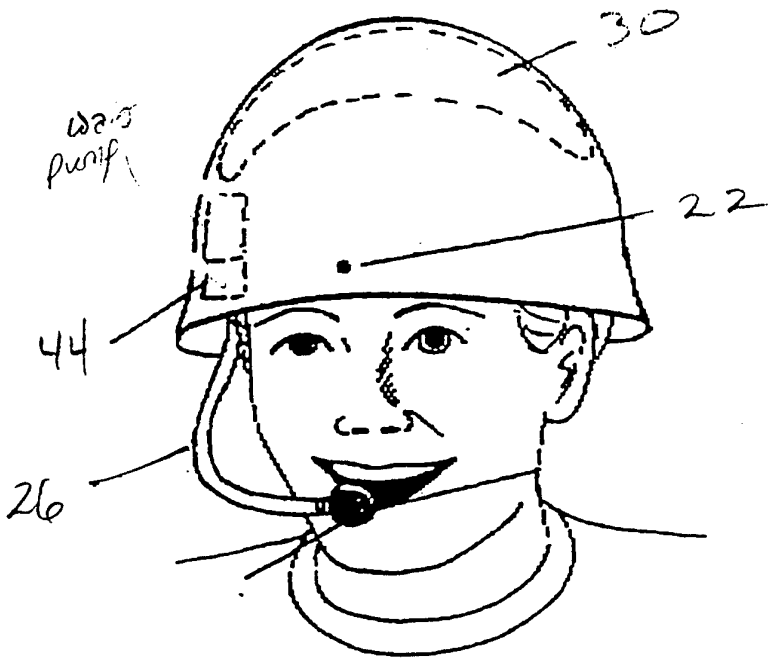

FIG. 3

FIG-4

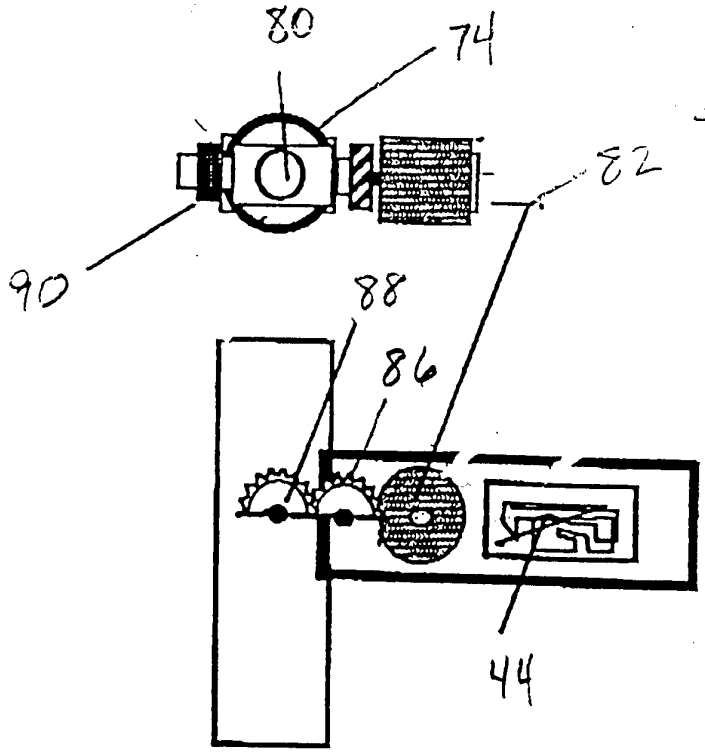

FIG. 5(a)

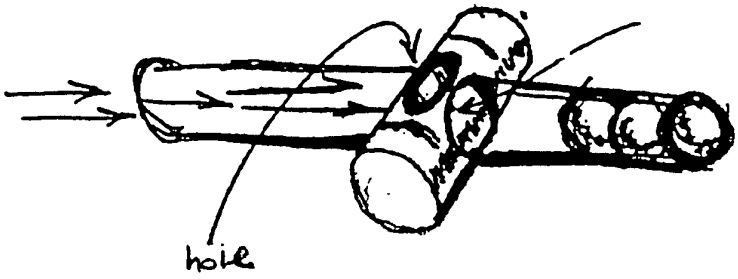

FIG. 5(b)

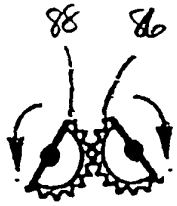

FIG. 5(c)

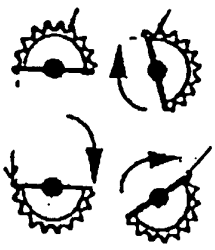

FIG. 5(d)

FIG. 5(e)

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US94/04622

A. CLASSIFICATION OF SUBJECT MATTER
IPC(5) :F41B 9/00, 11/00, 15/00
US CL :124/77, 78; 222/175, 192, 333; 446/175, 475
According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

U.S. : 124/10, 54, 72, 77, 78; 222/175, 192, 333; 446/27, 175, 473, 475

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

NONE

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

NONE

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X --- Y	US, A, 5,158,212, (SIRHAN), 27 October 1992. See the entire document.	1-5, 7 --- 6, 8-10
A	US, A, 3,119,201. (W. BROWN ET AL.), 28 January 1964. See column 1, lines 41-51.	1-10
A	US, A, 3,400,703, (B. V. RHODES), 10 September 1968. See the entire document.	1-10
Y	US, A, 3,538,900, (SAMUELS), 10 November 1968. See the entire document.	1-10

[X] Further documents are listed in the continuation of Box C. [ ] See patent family annex.

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Date of the actual completion of the international search
07 JUNE 1994

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INTERNATIONAL SEARCH REPORT

International application No.
PCT/US94/04622

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	US, A, 4,097,917, (McCASLIN), 27 June 1978. See column 2 lines 13-23; column 3, lines 45-64; column 4 line 62 - column 5 line 4.	1, 5-7, 9