

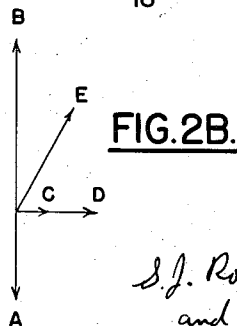
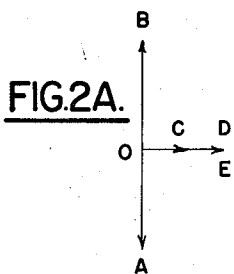
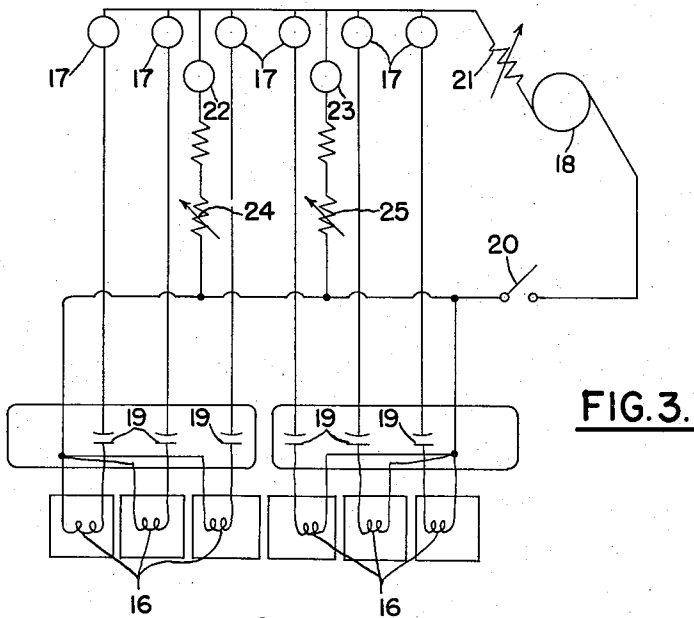
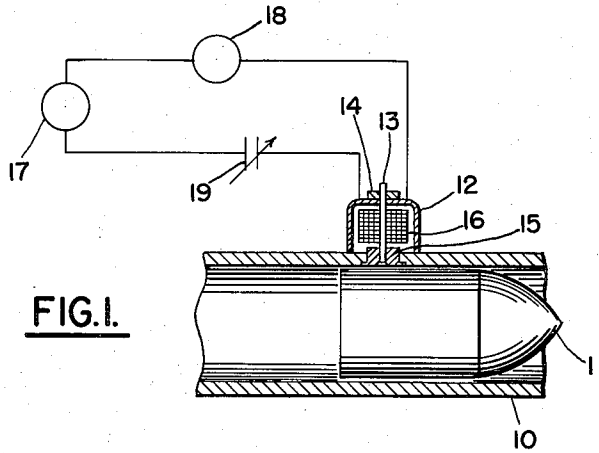
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PROJECTILE SENSING AND INDICATING DEVICE

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PROJECTILE SENSING AND INDICATING DEVICE

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2 Claims. (Cl. 340—280)

(Granted under Title 35, U.S. Code (1952), sec. 266)

The invention described herein may be manufactured and used by or for the Government for governmental purposes without the payment of any royalty thereon.

This invention relates to projectile sensing and indicating devices, and more particularly to an improved arrangement for indicating at a remote point the presence or absence of a projectile in the barrel of a gun.

This result is achieved by the establishment of a magnetic path which is so located with respect to the gun barrel that its reluctance changes from one value to another when the ammunition is chambered. This method of determining whether or not a gun is loaded has several important advantages. It is readily implemented by simple and relatively few parts. It is capable of transmitting the desired information to any desired point. It involves a type of apparatus which is rugged and not susceptible to rapid deterioration.

In the illustrated embodiment of the invention, a magnetic reluctance type pickup is mounted on the gun barrel at the position of the projectile bourrelet when the ammunition is chambered. This unit picks up and transmits information showing when a projectile is in the gun. Indication is by light in a control panel in front of the gunner who is stationed at some distance from the gun.

The invention will be better understood from the following description when considered in connection with the accompanying drawings and its scope is indicated by the appended claims.

Referring to the drawings:

FIG. 1 illustrates a preferred form of the invention,

FIGS. 2A and 2B are explanatory diagrams relating to the operation of the apparatus of FIG. 1, and

FIG. 3 illustrates a type of arrangement adapted to be used in connection with a group of guns such as are mounted on an anti-tank weapon.

FIG. 1 illustrates a gun barrel 10 containing a projectile 11. Associated with the barrel 10 in juxtaposition to the projectile 11 is a reluctance type pickup device which includes a cup-shaped magnetic member 12 held in contact with the outer surface of the barrel by a core 13 of magnetic material on which is threaded a nut 14. The core 13 extends through the wall of the barrel 10 and is surrounded by a bushing 15 of non-magnetic material to provide in the magnetic circuit a gap which is closed by the projectile.

Mounted within the member 12 is a coil 16. This coil is connected to alternating current supply means 18 through an indicator 17. A capacitor 19 may be provided for the purpose of tuning the circuit.

With the above-described connections, the electrical impedance of the coil will change according to the electrical laws concerning inductance, reluctance and impedance. This change in impedance causes the alternating current flowing in the circuit of FIG. 1 to change. Such

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change indicates the presence or absence of a projectile. The condenser 19 may be provided to produce a greater change in impedance.

When a projectile is absent and the circuit is tuned for this condition, the total impedance of the circuit is resistive and is a minimum as shown by the vector diagram of FIG. 2A. In this condition the alternating current flowing through the indicator is a maximum.

When a projectile is present, the impedance of the winding 16 is increased. This increased impedance, when added to the impedance of the capacitor 19 and the indicator 17, effects an increased total impedance as indicated by the vector diagram of FIG. 2B. In this condition, the current flowing through the indicator is a minimum.

Obviously, the circuit may be tuned with a projectile in the barrel. In this case, maximum current would indicate the presence of a projectile and minimum current would indicate the absence of a projectile.

FIG. 3 illustrates the application of the invention to a situation where the condition of a plurality of guns is to be indicated at a single control point. In this figure, corresponding parts are indicated by the same reference members as those of FIG. 1.

In addition to the features shown in FIG. 1, there is shown in FIG. 3 a switch 20 for completing the circuit of the alternating current source 18, a resistor 21 for adjusting the current delivered from this source 18 and a pair of comparison lamps 22 and 23. It will be noted that the lamps 22 and 23 are connected to the source 18 through resistors 24 and 25 which are readily adjusted to make the brightness of one of them correspond to the brightness of the lamps 17 when a projectile is present and to make the brightness of the other correspond to the brightness of the lamps 17 in the absence of a projectile.

I claim:

1. In a projectile sensing system, the combination of a projectile, a gun barrel for receiving and firing said projectile, a bushing of non-magnetic material fixed in an opening into said barrel, a cup-shaped magnetic member covering said bushing with its rim spaced therefrom and resting against said barrel, a core extending between said bushing and the bottom of said cup-shaped member and substantially flush with an inner surface of said gun barrel, a coil surrounding said core, a main indicator, and a circuit connecting a source of electrical current to said coil through said indicator, said circuit including means for tuning it to a predetermined impedance when said projectile is seated in said barrel adjacent to said cup-shaped member.

2. A device according to claim 1 wherein a pair of comparison indicators are connected to said source and are adjusted to provide reference indications one of which corresponds to the indication of said main indicator when a projectile is in said barrel and the other of which corresponds to the indication of said main indicator when no projectile is in said barrel.

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