

Aug. 17, 1965

M. J. AUCREMANNE ETAL

3,201,707

DEVICE FOR PRODUCING A SIGNAL FOR ACTUATION OF ACOUSTIC MINES

Filed June 28, 1957

2 Sheets-Sheet 1

FIG.1.

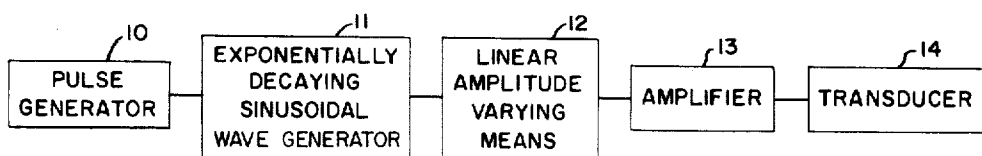


FIG.2.

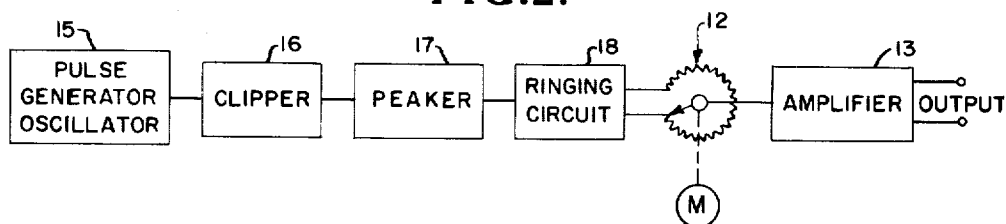


FIG.4.

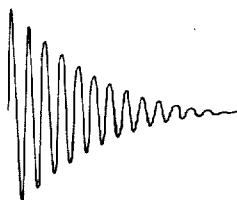
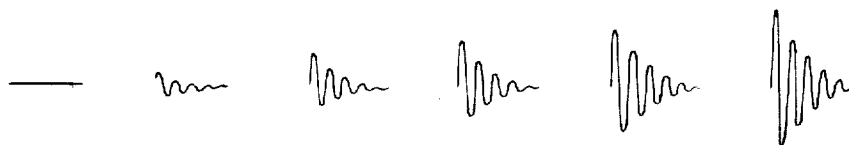


FIG.5.



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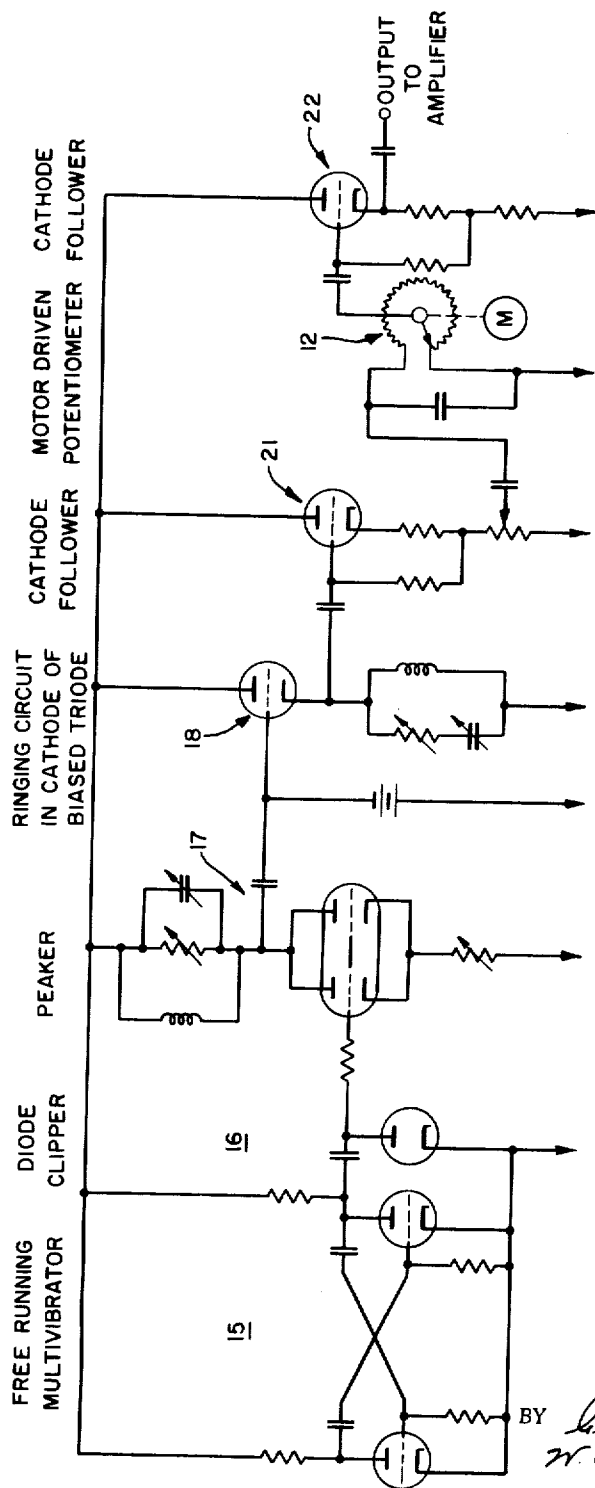
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FIG. 3.



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DEVICE FOR PRODUCING A SIGNAL FOR ACTUATION OF ACOUSTIC MINES

Marcel J. Aucremanne, Rockville, and Daniel D. Woolston, Silver Spring, Md., assignors to the United States of America as represented by the Secretary of the Navy
Filed June 28, 1957, Ser. No. 668,832
3 Claims. (Cl. 328-223)

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

The invention described herein may be manufactured and used by or for the Government of the United States of America for governmental purposes without the payment of any royalties thereon or therefor.

The present invention relates to a device for producing a signal for the actuation of acoustic mines and which may be adapted for use in the laboratory as a test device. The device of the present invention is also useful to simulate the signals produced by the device invented by William Byrd, Jr. and Normal Taslitt, which is claimed and disclosed in application Serial No. 565,747, filed February 15, 1956, now Patent No. 3,052,205. More specifically, the present invention relates to a device for producing a train of pulses of increasing amplitude from a minimum to a maximum amplitude, each of the said pulses comprising an exponentially decaying sinusoidal wave of a frequency higher than the repetition frequency of the pulses in the train.

It was found that the signal produced by a device such as that disclosed in application Serial No. 565,747 was effective to actuate the firing mechanism of an acoustic mine. This device produces an acoustic signal by firing projectiles into the water through a tube from which the water has been excluded by compressed air. The amplitude or intensity of the signal produced by the device is controlled by varying the depth of the water at which the projectile strikes the interface between the air in the tube and the surface of the water. An analysis of the signals produced by the device of application Serial No. 565,747 indicates that each of the projectiles striking the air water interface produces a signal having a form similar to that of an exponentially decaying sinusoidal wave.

It is therefore an object of the present invention to produce an exponentially decaying sinusoidal wave.

It is another object of the present invention to produce an exponential decaying sinusoidal waveform which can be varied in amplitude over a sequential train of signals.

It is a further object of the present invention to produce acoustical signals capable of actuating the firing mechanism of acoustic mines.

Further objects and many modifications of the present invention will be apparent from consideration of the following description taken in connection with the accompanying drawings of which:

FIG. 1 is a block diagram of a device of the present invention designed for use as a countermine device;

FIG. 2 is a block diagram illustrating a preferred embodiment of the invention;

FIG. 3 is a circuit diagram corresponding to FIG. 2;

FIG. 4 is the graphical illustration of the waveform of the pulse output from the device of the present invention; and

FIG. 5 illustrates the linear increase in amplitude of the exponentially decaying sinusoidal wave.

Referring now to FIG. 1 the pulse generator 10 is connected to a generator 11 of exponentially decaying sinusoidal waves the output of which is fed into a device 12 for varying the amplitude of the output signal in a linear manner. This in turn is fed through an

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amplifier 13 to a transducer 14. When the device of this invention is used as a test device, the transducer is omitted and the output of the amplifier 13 is fed directly into the electrical system of the acoustic mine thereby avoiding the necessity for conversion from electrical to acoustical energy at the transducer 14 and also the reconversion from acoustical to electrical energy at the transducer of the mine (not shown). Each time the exponentially decaying sinusoidal generator 11 is actuated by a pulse from generator 10 the output pulse takes the form illustrated in FIG. 4. The output from the system, that is, the output appearing at the output terminals of 13 consists of a series or train of such pulses which have been varied in amplitude by the device of 12 and which is illustrated graphically in FIG. 5.

FIG. 2 shows in more complete detail a preferred embodiment of the present invention. This embodiment comprises a pulse generator or oscillator 15, which may be of the multivibrator type as shown in FIG. 3, or any other type of oscillator which can be controlled to generate pulses of various selected frequencies. The output of the oscillator 15 is fed into a clipper circuit 16 which in turn is fed into a peaker circuit 17. The output of the oscillator and clipper circuit combine to produce a substantially square wave output which is fed into the peaker 17 which in turn controls the ringing circuit 18. In producing the signals to simulate the signals produced by the device of application Serial No. 565,747, it is desirable to have the initial sweep of the pulse conform as nearly as possible to a sinusoidal waveform and to produce the initial rise in this waveform. This is accomplished in the present device by a peaker circuit to produce a maximum shock action on the ringing oscillator 18. The output of the ringing circuit is fed through a motor driven potentiometer indicated generally at 12 to an amplifying circuit 13 which produces an output of the system as an electrical voltage which may be fed either to a transducer such, for example, as the transducer 14 of FIG. 1, when the device is used as a test device or may be connected directly to the electrical system of the mine to be tested. The oscillator 15, it will be recalled, may be of a conventional multivibrator type the frequency of oscillation of which is adjusted to correspond to the pulse repetition rate required to trigger the mine firing mechanism. The output of the multivibrator is clipped by a diode clipper at 16 and fed to a peaker 17. The peaker 17 applies a sharp voltage to the ringing circuit 18 to produce an exponentially decaying sinusoidal wave. This output of the ringing circuit is fed through a cathode follower 21 into a motor driven potentiometer 12 which has a motor M continuously driving the movable contact thereof and which linearly increases the amplitude of the successive pulses from the ringing circuit for each cycle of operations of the potentiometer. The output from the motor driven potentiometer is then fed through a second cathode follower 22. The cathode followers 21 and 22 are used merely to provide a low impedance input for the circuits which follow each follower respectively. It will be noted that the multivibrator, the clipper, the peaker, the ringing circuit and the cathode followers are of conventional design the normal operation of each of which is described in many publications.

Obviously many modifications of the present invention are possible in light of the above teachings. It is therefore to be understood that the invention may be practiced otherwise than as specifically described.

What is claimed as new and desired to be secured by Letters Patent of the United States is:

1. A device for producing a signal for the actuation of acoustic mines comprising; first means for generating

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pulses, said first means comprising a multivibrator, a clipping circuit connected to clip the output of said multivibrator and a peaking circuit connected to said clipping circuit, second means connected to said first means for producing exponentially decaying sine waves in response to pulses from said first means; and third means for linearly varying the amplitude of successive waves from said second means from a minimum to a maximum, the output thereof providing said signal.

2. A device as in claim 1 in which said second means comprises a ringing circuit.

3. A device as in claim 2 in which said third means comprises a motor driven potentiometer, the output of which is connected to a transducer.

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