

Feb. 18, 1947.

D. S. BOND

2,415,929

RADIO PULSE SYSTEM

Filed Sept. 26, 1942

2 Sheets-Sheet 1

FIG. 1.

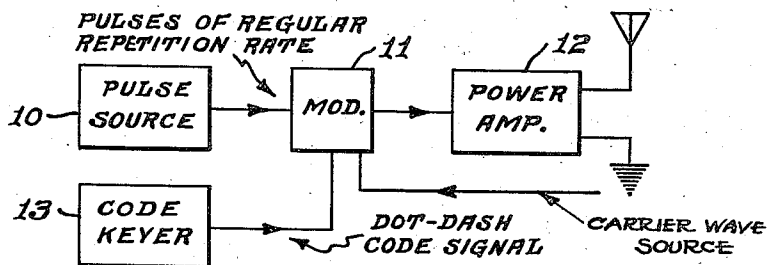


FIG. 2.

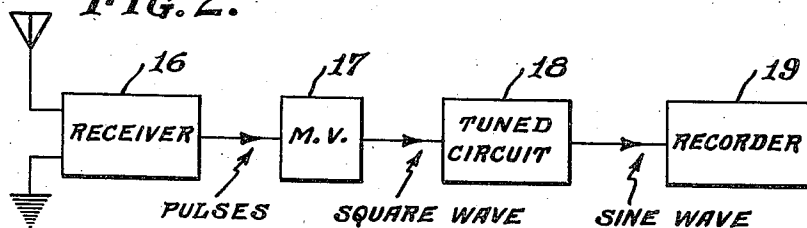
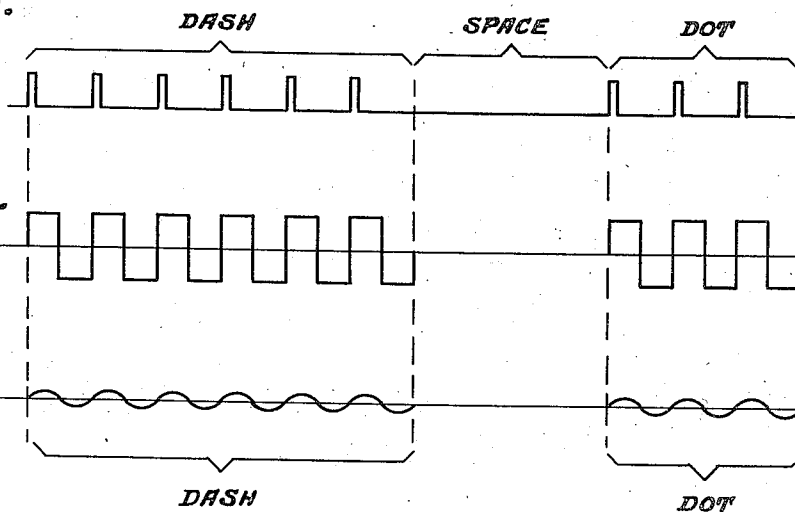


FIG. 3.



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2 Sheets-Sheet 2

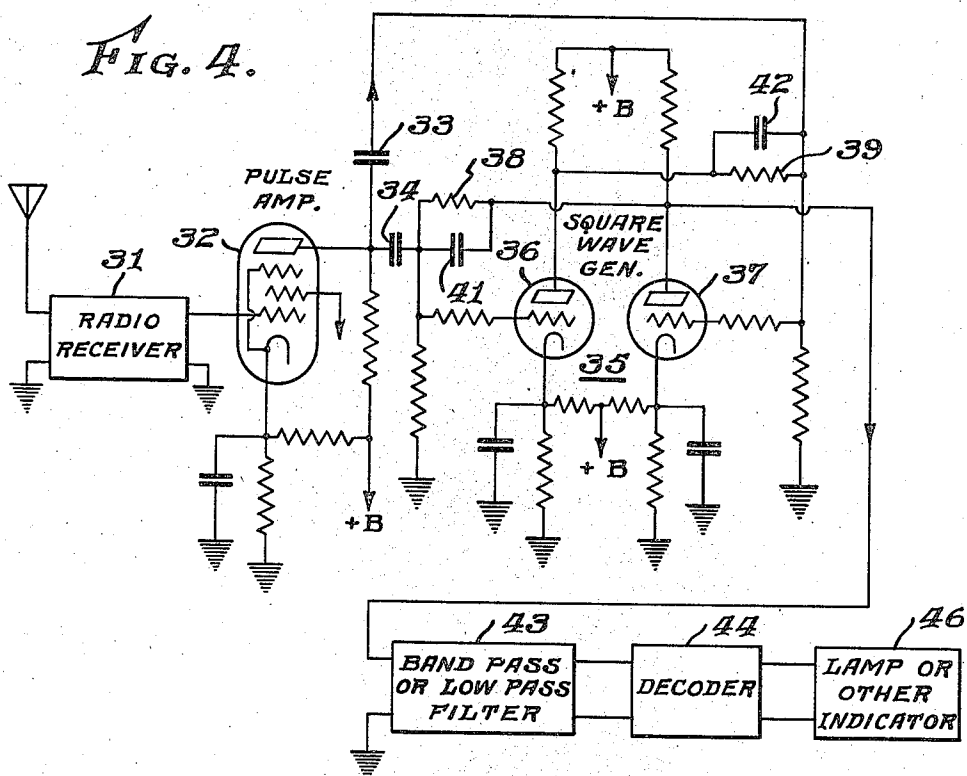
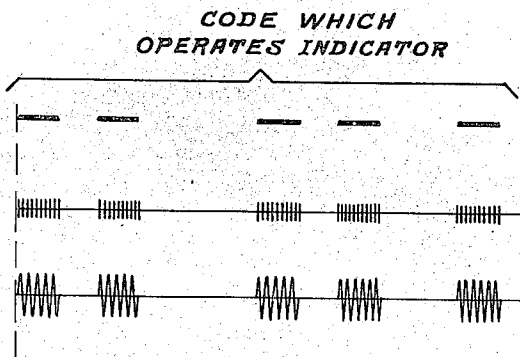


FIG. 5.

FIG. 5a.

FIG. 5b.



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RADIO PULSE SYSTEM

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4 Claims. (Cl. 250—8)

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My invention relates to the art of radio signaling or communication and particularly to radio systems wherein pulses of high peak power are transmitted.

One object of the invention is to provide an improved means for and method of actuating an indicator or other apparatus at a remote point.

Another object of the invention is to provide an improved means for and method of communicating with a telegraphic code.

In a preferred embodiment of the invention radio pulses of high peak power are transmitted at a regular repetition rate and in prearranged pulse groups. At the receiver the received pulses trigger a square wave generator to produce a square wave signal that is passed through a filter or tuned circuit to convert the signal into a sine wave current. The converted signal has high average power and will be produced in groups of sine wave cycles corresponding to the received groups of pulses. It may be utilized for operating apparatus that is responsive only to a prearranged code or it may be utilized to operate a recorder in the case of telegraphic communication.

The invention will be better understood from the following description taken in connection with the accompanying drawings in which:

Figs. 1 and 2 are block diagrams of a transmitter and a receiver, respectively, embodying the invention.

Figs. 3, 3a and 3b are graphs illustrating the use of the invention for telegraphic communication.

Fig. 4 is a block and circuit diagram of a receiver embodying the invention, and

Figs. 5, 5a and 5b are graphs that are referred to in explaining the use of the invention for actuating apparatus in response to a prearranged code signal.

Fig. 1 illustrates a transmitter for transmitting telegraphic signals. It comprises a pulse source 10 for producing electrical pulses occurring at a regular repetition rate, a modulator 11 and a power amplifier 12. The pulses modulate the amplifier 12 to drive it to substantially its maximum instantaneous or peak power output. A code keyer 13 supplies dot-dash or other communication signals to the modulator 11 whereby the radio pulses are transmitted in corresponding dot-dash groups or the like as shown in Fig. 3.

Fig. 2 shows the receiver which may comprise a radio receiver 16. The receiver demodulates the incoming signals and supplies the pulses of Fig. 3 to a square wave generator such as a mul-

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tivibrator 17. The multivibrator 17 is so adjusted that it is triggered to go through one cycle of operation upon the application of each pulse to produce a square wave signal as shown in Fig. 3a.

This signal is then passed through a tuned circuit 18 to convert it to a sine wave signal, as shown in Fig. 3b, which may be supplied to a suitable signal recording device 19.

It will be seen that the received pulses (Fig. 3) of low average energy content are converted to sine wave signals of high average energy content for actuating a recording mechanism or for producing a strong audible signal. Each dot or dash signal period contains a plurality of pulses, the number of pulses that should be included in a signal period depending in part upon the transient response characteristic of the receiver. The proper spacing between dots and/or dashes also depends upon the receiver transient response.

Fig. 4 shows the invention as applied to a receiving system that is to actuate an indicator, put a transmitter into operation, or operate some other apparatus in response to the reception of a prearranged code signal. This receiving system comprises a radio receiver 31 which demodulates the radio pulses and supplies the resulting audio pulses to a pulse amplifier 32. The amplified pulses are supplied through coupling capacitors 33 and 34 to a square wave generator 35 comprising vacuum tubes 36 and 37.

In this particular example the square wave generator 35 is of a well known type commonly referred to as the "scale-of-two" type. It has two equilibrium conditions, one when tube 37 is at plate current cut-off and the tube 36 is drawing maximum plate current, and the other when tube 36 is cut off and tube 37 is drawing maximum current. A positive pulse applied simultaneously to both grids of tubes 36 and 37 has but little effect on the tube that is drawing plate current (tube 36, for example) because its grid is approximately at zero potential and because the series grid resistor prevents appreciable current rise in the grid circuit; but this pulse starts the flow of plate current in the other tube (tube 37) in trigger fashion, thereby driving the first tube (tube 36) to plate current cut-off by virtue of the plate to grid coupling.

Since square wave generators of this type are well known, its circuit will not be described in detail, but it will be noted that the plate of each tube is direct-current connected to the grid circuit of the other tube through a resistor shunted by a capacitor, these resistors and shunting capacitors being indicated at 38, 39 and 41, 42.

The square wave output is passed through a filter or tuned circuit 43 to obtain a sine wave output which is supplied to a suitable decoder 44. If the correct code signal is received, the decoder 44 actuates an indicating lamp 46 or any other apparatus that is to be put into operation.

It may be assumed, for example, that the decoder responds to the prearranged code signal shown in Fig. 5b. This code signal is obtained by the production at the transmitter of the signal shown in Fig. 5 by means of suitable coding apparatus corresponding to the code keyer 13 (Fig. 1). Each dash of the code signal causes a group of pulses to be transmitted, as shown in Fig. 5a. These pulses trigger the square wave generator 35 of the receiver to produce the dashes of sine wave signal supplied to the decoder 44 as indicated in Fig. 5b. It may be mentioned merely by way of example that the repetition rate of the pulses may be 600 per second and each dot may include about 10 pulses.

The decoder 44 and the corresponding coding device at the transmitter may be of any suitable type such as the units sold by the RCA Mfg. Co., Inc., Camden, N. J., under the name "Selective calling system" and comprising station transmitter coding equipment MI-7827 and mobile receiver decoding unit MI-7632, both described in the instruction book IB-33009.

I claim as my invention:

1. The method of transmitting code signals which comprises producing electrical pulses which have a regular repetition rate, transmitting groups of said pulses, said groups forming code signals, receiving said pulses and converting them to signals substantially of square wave form, converting said square wave signals to sine wave signals, and utilizing said sine wave signals to reproduce said code signals.

2. The method of transmitting a signal consisting of signal periods and signal spaces which comprises transmitting a plurality of regularly recurring electrical pulses during each signal period, receiving said pulses, converting said pulses

into a signal of substantially square wave form, and converting said square wave pulses into a signal of sine wave form whereby said signal periods and signal spaces are reproduced at the receiver by a signal of large average power.

3. A signal transmission system which comprises means for producing electrical pulses which have a regular repetition rate, means for transmitting said pulses in groups which form code signals, means for receiving said pulses and converting them into signals substantially of square wave form, means for converting said square wave signals to sine wave currents, and means for utilizing said sine wave currents for recording said code signals.

4. A signal transmission system which comprises means for producing electrical pulses which have a regular repetition rate, means for transmitting said pulses in groups which form code signals, means for receiving said pulses and converting them into signals substantially of square wave form, means for converting said square wave signals to sine wave currents, and means for utilizing said sine wave currents to actuate a device responsive to said code signals only.

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