

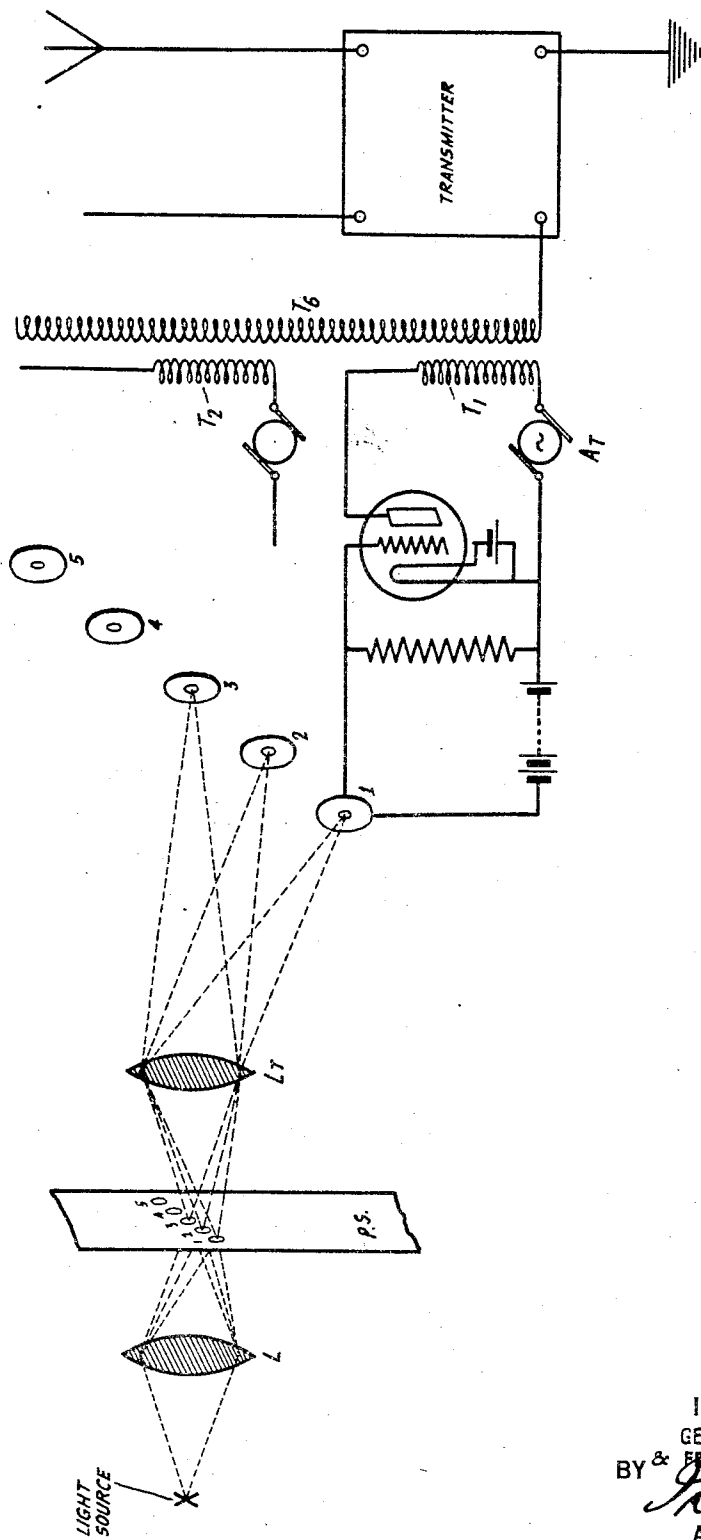
March 31, 1931.

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TELEGRAPHY METHOD USING THE FIVE-UNIT ALPHABET
OR SIMILAR TELEGRAPHIC SYSTEM
Filed May 9, 1927

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2 Sheets-Sheet 1

Fig. 1



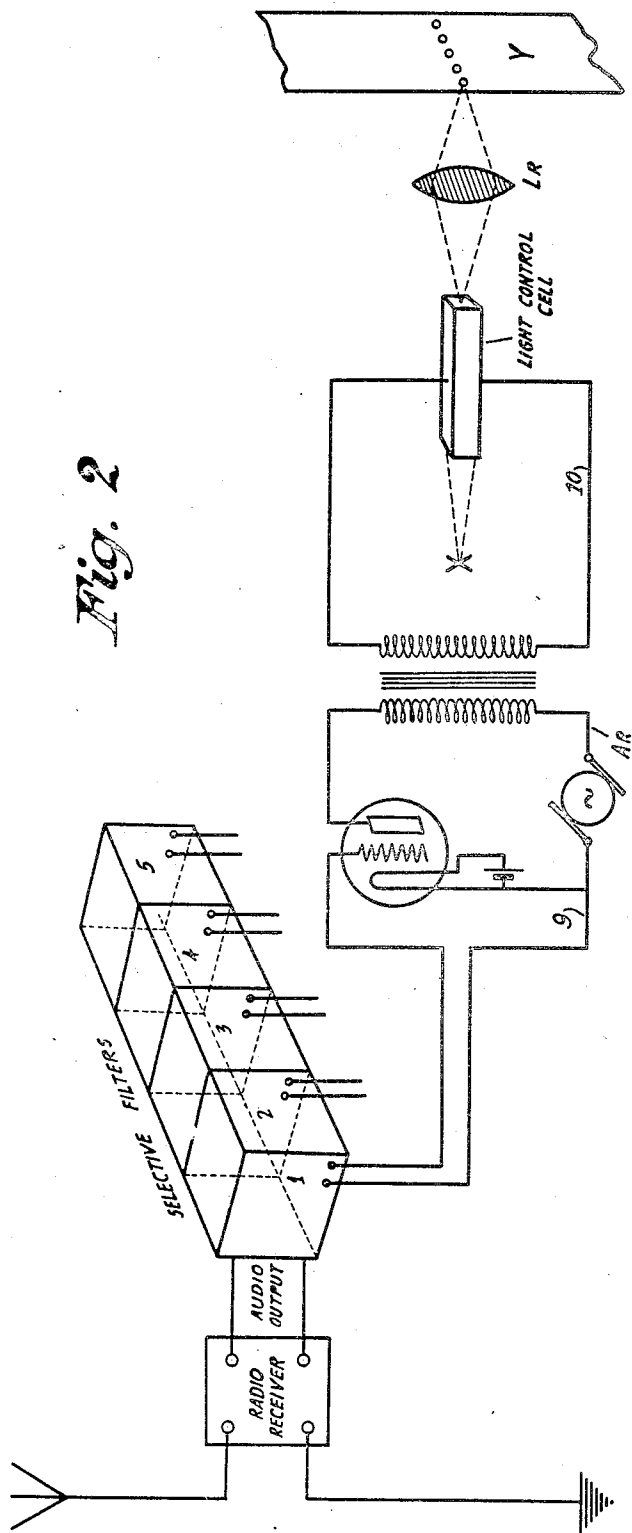
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TELEGRAPHY METHOD USING THE FIVE-UNIT ALPHABET OR SIMILAR TELEGRAPHIC SYSTEM

Application filed May 9, 1927, Serial No. 189,851, and in Germany May 20, 1926.

This invention relates to telegraphy using the five unit alphabet and is especially adapted to radio transmission.

The primary object of the invention is to increase the speed of transmission.

Other objects and advantages will become apparent from the specification when read in connection with the drawing on which:

Fig. 1 is a diagrammatic view of the apparatus used at the transmitter and,

Fig. 2 is a view of the apparatus used at the receiver.

For high speed telegraphy work the so-called five unit alphabet, that is to say, a method in which the letters are reproduced by different combinations and key manipulation of five impulses following one another at equal intervals, is the most economical and efficient system. Its maximum speed limit is primarily due to and governed by the fact that perforated strips or tapes, in which from two to five holes are punched in five superposed rows to make up the letters of the alphabet, are used in a practical application of this method. These perforations or holes must be changed at the transmitter point by mechanical key means into rapid current impulses, whereas at the receiving end they are converted into printed letters also by keys and relay. In both cases mechanical motions of sluggish masses are involved, and this circumstance tends to set a limitation to the transmission rate.

Now, the aim of the present invention is to obviate this speed limitation by having recourse to optical means designed and adapted to take the place of mechanical key work. For instance, the perforated strip may be passed between a light source and five photo-electric sensitive cells so that all mechanical inertia in the conversion into electrical currents to be transmitted by wire or by radio or else by wire guided radio is obviated.

At the receiving end, conformably with this invention, the incoming currents may be converted into a combination formed by the contrast of dark and light similar to the perforated strip by the aid of five separate light control elements such as Karolus cells based upon the Kerr effect or glow-discharge tubes,

said contrast being produced upon a photographic sensitive paper strip, the speed of transmission, if desired, being made so high that the evaluation and conversion into printed type has to be effected subsequently by the use of several simultaneously working translators. The illuminator exposed photographic paper or film strip or tape may then take the place of the perforated strip which by means of a translator device of well-known type can be rendered into printed letter type.

The considerable reduction in transmission time is of particular practical advantage and value whenever the transmission is effected by radio telegraphy, especially in short wave work, because a short-wave transmitter in this manner, in case of traffic in different directions, can be used to much greater advantage and because its particularly favorable transmission time can be put to advantage.

The inertialess optico-electrical translation or production of the strip can also be utilized to obtain, with a simpler apparatus equipment and at a higher rate of speed by means of a typewriter, a black-white non-perforated five-unit strip which during the printing process need not be accelerated in the same manner as a perforated strip either in a positive or negative sense, indeed, its speed may be nearly or perfectly continuous in spite of the blackening process.

The present method make it also possible to preserve and utilize a large part of the apparatus built for perforated strips and the use of the five unit alphabet also in this novel transmission system; all that is necessary is to provide certain additional apparatus, which, at the transmitter end, will allow of the change from the perforated strip to the light-dark strip for optico-electrical exploration instead of contact keying by "feeler" levers, while at the receiving end they allow of the use of the light-dark strip to actuate the translator means by optico-electric method in lieu of the contact method.

Such an arrangement is operated most conveniently by that, in accordance with the five rows of the strip and the corresponding five photo-electric exploring elements, five modulation frequencies of different values are

adopted at the transmitter end for the control of the five receiving cells, which, by the aid of two synchronously running contact apparatus at the transmitter and receiver ends, are operated at the proper correspondence.

At the receiving end the incoming signals or signs are fed in the usual manner to wireless receiving apparatus, and the said five modulation frequencies are fed to the respectively tuned resonant system. Instead of resonators or filter circuits for the different frequencies there may also be used rotating commutators comprising different stages or graduation for the frequency, whereby the different frequencies are automatically separated in well known manner and supplied to the various light-control means corresponding thereto. The method before described is particularly efficient in operation on the ground that the transmission of all elements of a signal or sign is affected simultaneously in the form of the different frequencies, several of which are active, according to the signal combination to result in the combination picture of the perforated strip heretofore used. The obviation of atmospheric disturbances in the case of wireless transmission is then simply affected by that each signal is made to last longer than the average duration of the atmospheric disturbance. And since the length of the latter is mostly very small, the resultant transmission rate is very high in spite of the above consideration.

In Fig. 1 of the drawings is shown a conventional form of the apparatus necessary to replace the mechanical keys, levers and relays necessary to transmit the signals. The perforated strip P. S. is passed between a light source and a lens, L. The ray of light passing through a perforation in each of the five rows in P. S. pass through L. Each ray of light is focused on a photo-electric sensitive cell as for instance, a selenium cell. The number of photo-electric cells will correspond to the numbers of rows of perforations in P. S., and the photo cells are indicated in the drawings by the numerals 1 to 5 inclusive. Each of the photo-electric sensitive cells controls a circuit. As the circuits are all similar except for the frequencies at which the alternator AT operates only one circuit has been shown. The alternators AT, AT1, AT2, AT3 and AT4 each operate at a different frequency, say at 1,000, 1,250, 1,500, 1,750, and 2,000. The five different modulation frequencies set up in the coils T₁ and T₂ shown, and T₃, T₄ and T₅ not shown, which are all coupled to T₆, are transmitted.

In Fig. 2 is shown a conventional form of the apparatus necessary at the receiving station. The signals sent by the transmitter in Fig. 1 are received by the single radio receiver and fed to a plurality of selective filters, the number of filters being equal to

the number of different frequencies sent. The different frequencies are separated and each is set up in a vacuum tube circuit 9, the anode circuit of which is excited by an alternator AR, which is maintained in synchronism with the alternator AT shown in Fig. 1. This circuit is coupled to a circuit 10, which controls a light control cell. It will be readily seen that the variation of intensity of the impulses in the circuit 10 will vary the amount of light which is allowed to pass from the light source X through the light control cell to the lens LR and on to the photographic sensitive strip Y where the light rays of different intensity will be recorded in light and dark contrasts.

As each of the filters, 2, 3, 4, and 5 operate through means similar to the circuits 9 and 10 to control light cells it is thought that the circuit shown is sufficient. The alternator AR shown and AR1, AR2, AR3, and AR4, not shown, are operated at different frequencies and are operated in proper correspondence with AT, AT1, AT2, AT3 and AT4 respectively.

Instead of using a maximum of five tones of frequency simultaneously, the five combinations or coordinations could also be distinguished from one another by that the phase relations resorted to. In this way, for instance, three different frequencies may be made to suffice, two thereof being used twice, that is, with a phase angle of 180 degrees. By virtue of the synchronism existent between transmitter and receiver, it is thus made possible to automatically insure the accurate selection of the light control device to which a certain frequency is to be supplied.

Although we have fully shown and described one form of our invention, it is to be understood that we do not limit ourselves thereto except as marked out in the following claims.

We claim:

1. The method of five unit alphabet telegraphy by means of a strip having rows of perforations which consists of, converting the perforations in each row of perforation into electrical impulses of different frequencies, modulating a carrier frequency with said impulses, transmitting said modulated carrier frequency and receiving said modulated carrier frequency.

2. The method of five unit alphabet telegraphy by means of a perforated strip which consists of, converting the perforations in each perforated strip into electrical impulses, modulating a carrier frequency with said impulses, transmitting said carrier frequency, receiving said carrier frequency and converting the components of said received carrier frequency into legible symbols.

3. The method of five unit alphabet telegraphy by means of a strip having rows of perforations which consist in converting the

perforations of each row of perforations into electrical impulses of different frequencies, generating a carrier frequency, modulating said carrier frequency in accordance with said impulses, transmitting said modulated carrier frequency, receiving said modulated carrier frequency, demodulating said modulated carrier frequency, and converting a component thereof into dark and light contrasts.

4. The method of five unit alphabet telegraphy by means of a strip having five superposed rows of perforations which consists in converting the perforations in each row of perforations into electrical impulses, the impulse derived from each row having a different frequency, of transmitting said impulses by a single transmitter, receiving said impulses by a single receiver, and converting said impulses into dark and light contrasts.

5. The method of five unit alphabet or similar telegraphy system, consisting in the use of as many light control elements at the transmitter end and light sensitive exploring cells at the receiving end as there are vertical superposed rows for letter transmission and providing different modulation frequencies for each superposed row, each frequency at the transmitter being synchronized with the corresponding frequency at the receiver.

6. The method of five unit alphabet telegraphy by means of strips having rows of perforations which consists of converting each row of perforations into a series of light rays, converting each series of light rays into a series of electrical impulses of different frequencies and transmitting said impulses.

7. The method of telegraphy which consists of converting a plurality of series of light rays into a plurality of series of electrical impulses of different frequencies, transmitting said impulses receiving said impulses and converting each of said received series of impulses into legible symbols.

8. The method of five unit alphabet telegraphy by means of a perforated strip which consists in converting each row of perforations into a series of electrical impulses each series being of a frequency different from the frequency of the impulses from the other rows, generating a carrier frequency, modulating the carrier frequency in accordance with said electrical impulses, transmitting said modulated carrier frequency receiving said modulated carrier frequency by a single receiver and converting said modulated carrier frequency into a plurality of light and dark contrasts.

9. In apparatus for five unit telegraphy, a perforated strip, the perforations of which are in a plurality of superposed rows, a light source on one side of the strip, a plurality of light sensitive elements on the opposite side of the strips, a plurality of lenses so arranged that the rays of light through each

of the rows of perforations are concentrated on one of the light sensitive elements, a circuit controlled by each of said light sensitive elements, each of said circuits being operated at a different frequency, a single transmitter coupled to all of said circuits, and means to receive and separate said different frequencies.

10. In apparatus for five unit telegraphy, a perforated strip, the perforations of which are in plurality of superposed rows, means to convert each row of perforations into a series of impulses of different frequencies, a single means to transmit said impulses, a single means to receive said impulses, a photographic sensitive strip, and means to convert said received impulses into dark and light contrasts on said photographic strip.

11. In apparatus for five unit telegraphy by means of a perforated strip, the perforations of which are in a plurality of superposed rows, means to convert each of said rows into a series of impulses of different frequencies, means to transmit said frequencies, a single receiver to receive said frequencies, a plurality of sifters to separate the different frequencies, there being a sifter for each row of perforations, a vacuum tube associated with each sifter, a light control cell associated with the anode circuit of each of said tubes and a photographic sensitive strip so arranged as to be exposed to the rays of light set up by each of said light cells by said impulses of different frequencies.

12. In apparatus for five unit telegraphy, a perforated strip, the perforations of which are in a plurality of superposed rows, a light source on one side of the strip, a plurality of light sensitive elements on the opposite side of the strip, a plurality of lenses so arranged that the rays of light through each of the rows of perforations are concentrated on one of the light sensitive elements, a circuit controlled by each of the light sensitive elements each of said circuits being operated at a different frequency, a single transmitter coupled to all of said circuits, means to transmit said frequencies, a single receiver to receive said frequencies, a plurality of sifters to separate the different frequencies, there being a sifter for each row of perforations, a vacuum tube associated with each sifter, a light control cell associated with the anode circuit of each of said vacuum tubes, and a photographic sensitive strip so arranged as to be exposed to the rays of light set up by each of said light cells by said impulses of different frequencies.

13. In apparatus for five unit telegraphy, a perforated strip, the perforations of which are in superposed rows, means to convert each of said light cells by said impulses of different frequencies, means to transmit each series of impulse, means to receive each series of transmitted impulses, and a separate

means for each series to convert said impulses into legible symbols.

14. The method of five unit alphabet or similar telegraphy by the use of as many light control elements at the transmitter end and light sensitive exploring cells at the receiving end as there are vertical superposed rows for letter transmission which consists in setting up a different modulation frequency for each superposed row, impressing said modulation frequencies on a carrier frequency, transmitting said frequencies, receiving said frequencies and synchronizing the frequencies at the transmitting end with the frequencies at the receiving end.

15. The method of telegraphy which consists of converting a plurality of series of light rays into a plurality of series of electrical impulses of different frequencies, generating a single carrier frequency, modulating said carrier with said impulses, transmitting said impulses, receiving said impulses, and converting each of said received series of impulses into legible symbols.

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