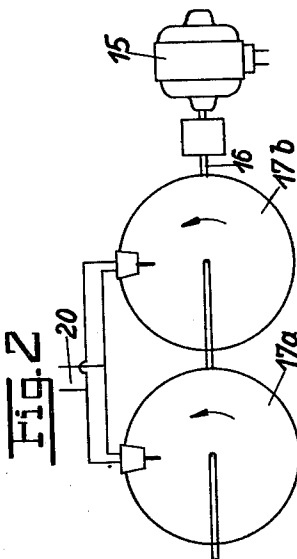
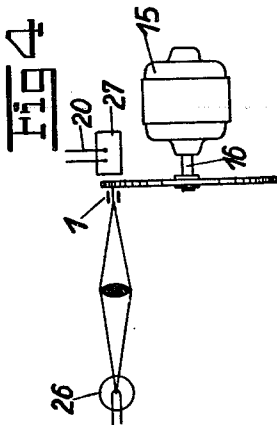
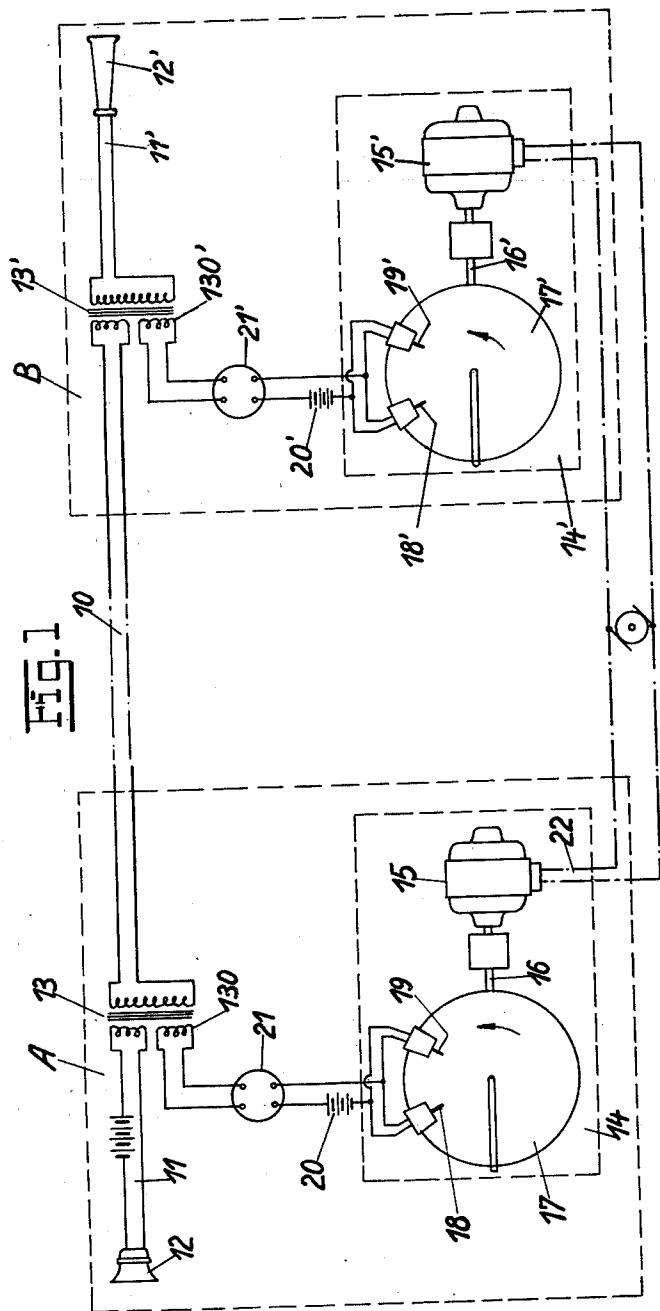


June 15, 1937.

E. KÄSEMANN
TRANSMISSION SYSTEM
Filed March 30, 1933

2,083,653

2 Sheets-Sheet 1



INVENTOR:
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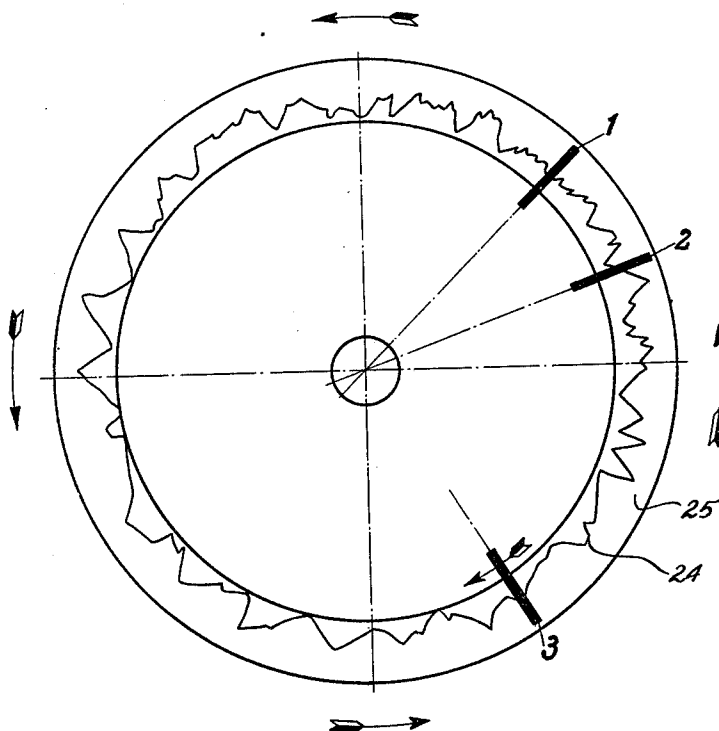
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2 Sheets-Sheet 2

Fig. 3.



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UNITED STATES PATENT OFFICE

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TRANSMISSION SYSTEM

Erwin Käsemann, Steinstücken, near Berlin,
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7 Claims. (Cl. 179—1.5)

My invention relates to improvements in transmission systems and more particularly to a method of producing distorting and compensating currents which are used to maintain secrecy in the transmission of messages between a sending station and a receiving station.

To clearly comprehend the purpose of the invention, it is desired to point out that, in order to maintain secrecy in the transmission of messages, in known transmission systems the outgoing message currents are distorted by superimposing thereon at the sending station a distorting alternating current, whereupon the effect of said superimposed current is neutralized at the receiving station by superimposing on the distorted current at the receiving station a compensating alternating current opposite in phase to the distorting current, and that said distorting and compensating currents are produced by picking up at each of said stations, a single point of a single finite phonograph record. These transmission systems have been found to be unable to fulfill their purposes of maintaining the desired secrecy, since the individual records of a single phonograph record picked up at only a single point, repeat after a certain time, so that unauthorized persons may easily determine the distorting alternating currents by oscillographing the transmitted messages and then may decipher further messages. Moreover, it is impossible to give the distorting or compensating currents produced by picking up a single point of a single phonograph record any desired shape of curve. These currents, however, will have always the shape of curve of the used phonograph record.

With the foregoing in mind it is an object of the present invention to provide a method in the transmission of messages, which entirely prevents a deciphering of the transmitted messages by unauthorized persons.

Another object of the present invention is to provide a method of producing distorting and compensating currents, which allows the shape of curve of said currents to vary in any desired manner, although phonograph records with unvariable records are used, so that, even if the phonograph records used would be known to an unauthorized person, the latter will not be able to decipher the messages.

I accomplish the purposes of my invention by a method which consists in producing the distorting and compensating currents used in the above described method for maintaining secrecy in the transmission of messages by picking up one or

more phonograph records at the sending station and the receiving station at a plurality of places phonograph record. Thus, the resultant curves of the distorting or compensating current, which are a function of two or more points of the phonograph record, are entirely different from the original curve of the used phonograph record, and without knowledge of the relative position of the picking up points to each other, it is impossible to decipher the transmitted messages.

Another feature of my invention is to vary the relative effective position of said picking up points to each other during the picking up operation, so that a deciphering by unauthorized persons is rendered still more difficult.

In the accompanying drawings which form a part of this specification and in which like characters of reference indicate the same parts:—

Fig. 1 is a diagrammatical view of an arrangement of a transmission system embodying the features of my invention, whereby single phonograph records with two picking up points are used at the sending and receiving stations;

Fig. 2 is a diagrammatical view of the device producing distorting or compensating currents, showing the use of two phonograph records with one picking up point for each phonograph record;

Fig. 3 is a diagrammatical plan view of a plate carrying a record; and

Fig. 4 is a diagrammatical side elevational view, showing the arrangement of the plate carrying the record in combination with photoelectrical means to pick up the record.

Referring to Fig. 1, A designates a sending station, and B, a receiving station connected to the former by the transmission line 10. The telephone variations produced in the circuit 11 by the operation of the microphone 12 at the sending station A will be transmitted through the transformer 13 to the line 10. The message current outgoing from the microphone 12 is undistorted during its flow through the circuit 11. In order to maintain secrecy in the transmission of the messages between the stations A and B, a device 14 is provided, which produces a distorting alternating current to be superimposed on the outgoing message current, so that a distorted and unintelligible currents flows through the transmission line 10. Said device 14 comprises a motor 15, to the shaft 16 of which a plate 17 carrying a record is secured. The motor 15 rotates the plate 17, and the phonograph record is contacted at two points 18 and 19 by suitable means comprising for example a transmitter provided with a needle. The transmitters 18 and 19 are con-

nected to each other and to the circuit 20, which
 in turn is connected to the winding 130 of the
 transformer 13 and includes an amplifier 21 if
 desired. Thus the transmitters produce a dis-
 torting alternating current in the circuit 20, and
 the resultant curve of which is a function of two
 points of the phonograph record, so that this
 curve is entirely different from the original curve
 of the phonograph record. The distorting cur-
 rent of the circuit 20 is superimposed on the out-
 going message current by the transformer 13, so
 that a distorted current flows through the line
 10. In order to neutralize the effect of the super-
 imposed distorting current at the receiving sta-
 tion B, the latter is equipped with a device 14',
 which produces a compensating alternating cur-
 rent to be superimposed to the distorted current
 arriving from the line 10. Said device 14' com-
 prises a motor 15', which is connected to the
 motor 15 of the device 14 through a circuit 22 in
 such a way, that the motors will operate syn-
 chronously. The shaft 16' of the motor 15' car-
 ries a plate 17' provided with a record and identi-
 cal to the plate 17 of the device 14 at the send-
 ing station A. During the rotation of the plate
 17' driven by the motor 15', the phonograph
 record is picked up at two points 18' and 19', the
 effective positions of which being spaced apart
 from each other the same distance as the posi-
 tions of the points 18 and 19. The phonograph
 transmitters 18' and 19' are connected to each
 other and to the circuit 20', which in turn is con-
 nected to the winding 130', of the transformer
 13' and includes an amplifier 21' if desired. Thus
 the transmitters produce a compensating alter-
 nating current in the circuit 20', and the shape
 of curve of said compensating current is equal
 to the shape of curve of the distorting current.
 The connection of the circuit 20' to the winding
 130' of the transformer 13' is made in such a
 way, that the phase of the compensating current
 superimposed on the arriving distorted current
 by the transformer 13' is displaced at an angle of
 180° with respect to the phase of the distorting
 current. Thus the effect of the distorting cur-
 rent is neutralized, and the receiver 12' con-
 nected to the transformer 13' through the circuit
 11' will respond only to the telephonic variations
 transmitted from the microphone 12 of the send-
 ing station A. The distorted currents in the
 transmission line 10, however, are entirely unin-
 telligible to anyone who might have access to
 the line 10.

It is obvious that the station A may also be
 equipped with a receiver and the station B with
 a transmitter, by a simple supplement of the wire
 connections, so that each of both stations forms
 a sending and receiving station. Furthermore,
 the microphones and receivers may be replaced
 by telegraph keys and recorders respectively, so
 that the described transmission system serves to
 maintain secrecy in the transmission of signals.
 Moreover the metallic transmission line 10 may
 be replaced by any wireless transmission system.

The relative effective positions of the picking
 up points 18, 19 and 18' and 19' to each other
 may be adjusted according to a certain key
 agreed between the two stations. In order to
 render an undesired deciphering still more dif-
 ficult, preferably the relative effective positions
 of said picking up points 18, 19 and 18', 19' to each
 other are continuously varied in synchronism
 with the movement of the phonograph records
 during the operation.

While Fig. 1 shows the use of a single phono-

graph record 17 with two picking up points 18,
 19 at each of the stations, Fig. 2 shows the use of
 two phonograph records 17a and 17b with a single
 picking up point 18a and 19a respectively for
 each thereof. In both embodiments the same ef-
 fect will be obtained, because in the circuit 20
 an alternating current flows, the curve of which
 being a function of two different points of the
 phonograph record or phonograph records and
 thus entirely different from the original curve or
 curves of the phonograph record or phonograph
 records, so that a deciphering by unauthorized
 persons is impossible, even if the phonograph
 records used would be known. It is obvious that
 also a single phonograph record with three
 or even more picking up points or several
 phonograph records with one or several picking
 up points may be used to produce the distorting
 and compensating currents respectively.

The records to be used may be either of the
 finite type, such as a usual phonograph record,
 or of the endless type, such as a plate with an
 endless record curve 24 (Fig. 3) or an endless
 band with a record curve. Under certain cir-
 cumstances, it may be advisable to use a single
 record of the endless type with a single picking
 up point at each of the stations, and such an
 arrangement has yet the advantage that the ad-
 justment of the synchronism of the records at
 the stations is considerably facilitated in com-
 parison with the records of the finite type as
 hitherto used.

The means carrying the records may be formed
 by an iron disc provided with an irregularly se-
 rated circumference and rotated in a magnetic
 field or by phonograph records or endless bands,
 which have a record. Preferably, however, a
 plate of transparent material provided with a rec-
 ord is employed, which allows the record curve to
 be picked up by a photo-electrical ray. Fig.
 3 shows such a glass plate 25 carrying on its sur-
 face a photographic emulsion layer, on which a
 complicated distorting noise is recorded by means
 of the so-called transverse method, and Fig. 4 il-
 lustrates diagrammatically the arrangement of
 such a transparent plate in a photoelectrical de-
 vice. A light source 25 is arranged in front of
 the glass plate 25 mounted on the shaft 16 of the
 motor 15, and a photo-sensitive cell 27 is disposed
 behind the rotating glass plate 25. The record,
 24 disposed on the plate 25, is lighted by the light
 source 26, and the photosensitive cell 27 receives
 the light rays passed through the record and
 transforms the same into electrical currents led
 to the circuit 20. There are three gaps 1, 2, and 3
 shown in Fig. 3 through which light rays may pass
 to photo-sensitive cells correspondingly ar-
 ranged, behind the plate 25, so that the records
 24 are picked up at three points by photo elec-
 trical ray.

The phonograph records 17 are replaceably ar-
 ranged on the shaft 16, so that at different times,
 different phonograph records may be employed.
 Endless phonograph records are rotated with
 such a number of revolutions, that the funda-
 mental frequency resulting from the number of
 revolutions lies below the limit of audibility.

Preferably the phonograph records are provided
 with identifying marks spaced apart from each
 other in predetermined uniform distances to fa-
 cilitate the adjustment of the synchronism of the
 phonograph records at the sending station and
 receiving station. In order to obtain a perfect
 synchronism of the phonograph records during
 the operation, preferably the movement of one

of the phonograph records, especially that of the phonograph record at the sending station, is used to impart an impulse to the means driving the other phonograph record, so that the latter positively and synchronously follows in its movements to the movements of the former. Furthermore, suitable adjusting devices may be provided, by means of which at the receiving station, the desired synchronism may be established, after the movement of the phonograph record has been started.

In order to avoid an overcompensation, the intensity of the distorting alternating currents may be determined by controlling means being independent of frequency. Furthermore, any line distortions, to which the distorting alternating current is subjected, may be eliminated at the receiving station by so-called artificial lines or combinations of ohmic capacities and inductive resistances, which are connected in the circuit of the compensating alternating current.

From the foregoing disclosures an important feature of my new method is that the shape of curve of the produced distorting or compensating current is entirely different from the shape of curve of the phonograph record or phonograph records used. As the phonograph record or phonograph records are picked up at a plurality of points, the shape of curve of the produced current will be always a function of a plurality of points of the curve of the phonograph record or phonograph records. Furthermore, the resultant curves of the currents may be different for each operation, although the same phonograph record or phonograph records are used, if the relative effective positions of the picking up points will be changed.

I have shown a preferred embodiment of my invention but it is clear that numerous changes and omissions may be made without departing from the spirit of my invention.

I claim:—

1. A transmission system for maintaining secrecy in the transmission of messages between a sending station and a receiving station by distorting the outgoing message currents by superimposing thereon at the sending station a distorting alternating current and by neutralizing the effect of said superimposed current at the receiving station by superimposing on the distorted current at the receiving station a compensating alternating current opposite in phase to the distorting current, comprising at each of said stations, means including a phonograph record, and a plurality of pick-ups adapted to pick up said phonograph record at a plurality of places thereon to produce said distorting and compensating currents respectively.

2. A transmission system for maintaining secrecy in the transmission of messages between a sending station and a receiving station by distorting the outgoing message currents by superimposing thereon at the sending station a distorting alternating current and by neutralizing the effect of said superimposed current at the receiving station by superimposing on the distorted current at the receiving station a compensating alternating current opposite in phase to the distorting current, comprising at each of said stations, a single phonograph record, and a plurality of pickups adapted to pick up said single phonograph record at a plurality of places thereon to produce said distorting and compensating currents respectively.

3. A transmission system for maintaining

secrecy in the transmission of messages between a sending station and a receiving station by distorting the outgoing message currents by superimposing thereon at the sending station a distorting alternating current and by neutralizing the effect of said superimposed current at the receiving station by superimposing on the distorted current at the receiving station a compensating alternating current opposite in phase to the distorting current, comprising at each of said stations, a plurality of phonograph records, and a plurality of pickups adapted to pick up said plurality of phonograph records at a plurality of places thereon to produce said distorting and compensating currents respectively.

4. A transmission system for maintaining secrecy in the transmission of messages between a sending station and a receiving station by distorting the outgoing message currents by superimposing thereon at the sending station a distorting alternating current and by neutralizing the effect of said superimposed current at the receiving station by superimposing on the distorted current at the receiving station a compensating alternating current opposite in phase to the distorting current, comprising at each of said stations, means including an endless phonograph record, and a plurality of pickups adapted to pick up said endless phonograph record at a plurality of places thereon to produce said distorting and compensating currents respectively.

5. A transmission system for maintaining secrecy in the transmission of messages between a sending station and a receiving station by distorting the outgoing message currents by superimposing thereon at the sending station a distorting alternating current and by neutralizing the effect of said superimposed current at the receiving station by superimposing on the distorted current at the receiving station a compensating alternating current opposite in phase to the distorting current, comprising at each of said stations, means including a phonograph record, and a plurality of photo-electrical pickups adapted to pick-up said phonograph record at a plurality of places thereon to produce said distorting and compensating currents respectively.

6. A transmission system for maintaining secrecy in the transmission of messages between a sending station and a receiving station by distorting the outgoing message currents by superimposing thereon at the sending station a distorting alternating current and by neutralizing the effect of said superimposed current at the receiving station by superimposing on the distorted current at the receiving station a compensating alternating current opposite in phase to the distorting current, comprising at each of said stations, means including a phonograph record, a plurality of pickups adapted to pick up said phonograph record at a plurality of places thereon to produce said distorting and compensating currents respectively, and means for simultaneously varying the relative effective positions of said places to each other.

7. A transmission system for maintaining secrecy in the transmission of messages between a sending station and a receiving station by distorting the outgoing message currents by superimposing thereon at the sending station a distorting alternating current and by neutralizing the effect of said superimposed current at the receiving station by superimposing on the distorted current at the receiving station a compensating alternating current opposite in phase to

the distorting current, comprising at each of said stations, movable means including a phonograph record, a plurality of pickups adapted to pick up said phonograph record at a plurality of places thereon to produce said distorting and compensating currents respectively, and means for simultaneously and continuously varying the relative effective positions of said places to each other in synchronism with the movement of said means including a phonograph record.

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