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MULTIPLEX TRANSMISSION

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My invention concerns means for the simultaneous transmission of a multiplicity of sets of electric impulses or messages over one transmission line, wave or wire and means for separating said collectively transmitted multiplicity of messages at the receiving end into the various messages and for singularly delivering said messages. My novel transmission is adaptable for the multiple transmission of any messages, which, individually, can be transmitted in telegraphy, telephony, telautography, television, etc.

An outstanding object of my invention is to provide multiplex transmission of similar messages.

A further object of my invention is to enable multiplex transmission without synchronous or synchronized means at the sending and receiving end.

A further object of my invention is to provide multiplex transmission in which each message is transmitted with and separated from other messages in its uninterrupted continuity.

Another object of my invention is to provide multiplex transmission means which permit immediate delivery or recording of the transmitted messages, as they are collectively transmitted, or when separated, the records made allowing conservation and repetition or reproduction with altered intensity or at a different speed of the messages at any time as circumstances may require.

Other objects which have guided me in the development of my invention and which I have attained thereby will be more clearly seen from the following description and the drawing which is made part thereof, and which, schematically and exemplarily, explains one modification of my invention in detail.

Telephonic means are largely instrumental in the execution of my improvements. In telegraphonic means electric impulses are electromagnetically recorded upon traveling bands, wires or faces, consecutive parts of which are adapted to be temporarily or permanently magnetized directly in proportion to the distribution of said impulses over a period of time and to the magnitude thereof at each point of time.

The schematic representation of my invention in the drawing is limited to duplex telephone transmission. The main Figure 1 shows the transmitting and receiving stations. Figures 2 and 3 are graphical representations of the messages as recorded on the wires of the transmitter and receiver, respectively. A transmitting set T is indicated to the left of Fig. 1 and a receiving set R is shown to the right. To facilitate the

understanding of my novel system of multiplex transmission, I show separate wires for each recordation made in the transmitter, whereas in a practical instance all these recordations may be placed onto one and the same wire. The drawing shows four endless wires, 1, 2, 3 and 4, coextensively and synchronously moving between a driving cylinder 5 and a driven cylinder 6, the driving means of cylinder 5 being indicated by a motor 7. I illustrate my device in this manner because the various wires extend substantially parallel, in straight lines, during the important steps of recordation and transmission and it facilitates following the happenings at the transmitting and receiving stations, in the manner in which they interlock. In a practical application elements which are adapted to be magnetically influenced are disposed peripherally on circular supporting means and a plurality of such endless circular elements may be driven in absolute synchronism and coextensiveness when coaxially aligned.

Two microphones 8 and 9 are indicated as the sources of two distinct messages which are to be simultaneously transmitted by my improved device. These messages travel as electrical impulses through the circuits 10 and 11 and excite the electro-magnets 12 and 13, and 14 and 15, respectively. The windings of the electro-magnets 12 and 13 are arranged in such manner that the ends of the respective pole pieces which face the endless wires 1 and 2, are similarly magnetized by the electric impulses flowing through the circuit 10.

The windings of the electro-magnets 14 and 15 are oppositely wound so that the ends of the respective pole pieces which respectively face the endless wire 3 and 4 are oppositely magnetized.

The endless wires 1, 2, 3 and 4 continuously travel in a downward direction, as indicated by arrows, over the fronts of the driving cylinder 5 and driven cylinder 6. According to the principles of telephony the messages transmitted into the microphones 8 and 9 are impressed by the electro-magnets 12, 13, 14 and 15, onto the respective endless wires 1, 2, 3 and 4, while said wires travel past the poles of said electro-magnets in a downward direction. The endless wires 1, 2, 3 and 4 pass, below the electro-magnets 12, 13, 14 and 15, a set of electro-magnets 16, 17, 18 and 19. The latter electro-magnets are similarly wound, so that corresponding poles face the four endless wires and their windings are connected in series into a circuit 20, one end of which is grounded, the other end of which connects to the receiving station, and, after there having passed

through a transformer coil 28, again to the ground, so that the circuit 20 is completed.

The return loops 21, 22, 23 and 24 of the endless wires 1, 2, 3 and 4 pass between strong sets of electro-magnets 25 which are energized by a source of current 26. When switch 27 is closed, these magnets remove from the wires 1, 2, 3 and 4 the messages which have been imposed upon said wires by the electro-magnets 12, 13, 14 and 15, so that the endless wires are demagnetized and free to receive new messages, when they come again to face the electro-magnets 12, 13, 14 and 15 after having passed over the driven cylinder 6.

The manner in which messages are imposed upon the wires 1, 2, 3 and 4 is illustrated in Fig. 2, to the left of the transmitter diagram, the sections of the front parts of the four wires 1, 2, 3 and 4 being schematically indicated by four lines which are similarly numbered and which are in horizontal alignment with said four endless wires.

The electro-magnet 12 is spaced at a vertical distance X from the electro-magnet 13 and the electro-magnet 14 is similarly spaced from the electro-magnet 15. Since the four electro-magnets 16, 17, 18 and 19 are substantially in horizontal alignment the messages of the endless wires 1 and 3 are impressed upon the circuit 20 at a lag behind the messages written onto the wires 2 and 4; that lag corresponds to the distance X. Each of the messages is therefore transmitted twice to the circuit 20, the two transmissions of each message lagging behind each other for the distance X.

When the messages, which are thus transmitted by the circuit 20, arrive at the receiving station, the electric impulses are stepped up by a coil of transformer 28.

The impulses of the combined messages, as they have been received at the receiving station, are tensified by the amplifier 29. By means of the battery 30 the tensified, combined messages are now impressed upon the endless wires 31 and 32, similar electro-magnets 33 and 34, which are connected in series with the battery 30, facing said endless wires substantially in horizontal alignment. The arrangement of the telegraphone wires of the receiving station is shown in substantial analogy to the wires of the transmitting station. There is a driving cylinder 35 driven by a motor 37 and the telegraphone wires endlessly extend from said driving cylinder 35 to the driven cylinder 36. In addition to the endless wires 31 and 32 a pair of endless telegraphone wires 38 and 39 extend between the cylinders 35 and 36.

The messages as transmitted are written onto each of the wires 31 and 32 and the schematic arrangement to the right of the drawing of Fig. 3 indicates the messages as impressed upon the wires of the receiving station. A demagnetizing circuit 40 is shown in the diagram of the receiving station; the current of a battery 41 excites the magnets 42 between which the endless wires 31, 32, 38 and 39 travel upwardly from the back of the cylinder 35 to the back of the cylinder 36. A set of electro-magnets 43 and 44 faces the endless wire 31 upon which the messages have collectively been impressed by magnet 33 after having been received by the receiving station.

Presuming that the endless wires 31, 32, 38 and 39 are driven by the cylinder 35 at the same rectilinear speed at which the endless wires 1, 2, 3 and 4 are driven by the cylinder 5, I space the electro-magnets 43 and 44 at the distance X from each other, so that similar parts of a message,

transmitted twice in succession from the endless wires 1 and 2 onto wire 31, face said electro-magnets at the same time, respectively.

In like manner the magnets 45 and 46 face the endless wire 32; they are also spaced apart at the distance X.

The magnet coil 47 of electro-magnet 43 and the magnet coil 48 of electro-magnet 44 are similar to each other. Those two coils are in a closed circuit 50 with the receiver 49. Since the coils 47 and 48 are similarly wound, similar parts of the messages received from endless wires 1 and 2, as written down on wire 31, are received by receiver 49, the respective registering parts of said messages facing the electro-magnets 43 and 44 at the same time.

The two successive transmissions of the message transmitted from the wires 3 and 4 also face the electro-magnets 43 and 44 at like times, since all the messages of wires 1, 2, 3 and 4 have been compiled on wire 31. But the flux set up by the message of wire 3 in electro-magnet 43 is opposed to the flux which is simultaneously set up by the message of wire 4 in electro-magnet 44. Since the coils 47 and 48 are similarly wound, the message transmitted from wire 3 sets up in the receiver circuit 50 an electric current which is equal to, but opposed in the direction of flow to, the current set up by the flux created in electro-magnet 44 by the message transmitted from wire 4. Therefore the current set up in circuit 50 by similar parts of a message transmitted from wires 3 and 4 offset and balance each other completely.

The windings 51 and 52 of the electro-magnets 45 and 46, respectively, are also of similar characteristics. But these windings are directionally opposed to each other in the same manner in which the windings of electro-magnets 43 and 44 are opposed to each other at the transmitter station. The similar parts of a message, as transmitted from wires 3 and 4 and as contained on the endless wires 32, therefore set up in the circuit 53, which includes the receiver 54, currents which represent the message which has been doubly transmitted from wires 3 and 4 and that message is received by receiver 54. The two similar parts of a message of wires 1 and 2, which are imposed on wire 32 together with the messages of wires 3 and 4 also set up a flux in electro-magnets 45 and 46. But since the windings of coils 51 and 52 are opposed to each other, the currents set up in said coils by said similar consecutive parts of the first message received from wires 1 and 2 offset and completely balance each other so that they are not heard at the receiver 54.

According to the above description it would be possible to receive at the receiver 49 the message, which has been twice transmitted from the endless wires 1 and 2, respectively, and at the receiver 54 the message, which has been twice transmitted from the endless wires 3 and 4, respectively, if the additional occurrences of the messages, as first transmitted from the endless wires 2 and 4, would not likewise set up an additional flux in the electro-magnets 43 and 45, as they pass the latter. But since these additional occurrences appear in exactly the same manner on both the endless wires 31 and 32, the flux set up by said additional occurrences in the electro-magnets 43 and 45 may be offset from one of said magnets to the other by auxiliary coils 55 and 56 which have similar characteristics, but which are oppositely disposed, so that the currents set up in the circuit 57 by 150

means of the opposed coils 55 and 56 due to said additional occurrences of said messages offset and completely balance each other.

It is true that the coils 55 and 56 may also set up reactionary currents in circuit 57, by means of which the messages received by the receivers 49, and 54 would be transmitted to and impressed upon the respective other electro-magnets 45 and 43. To contend with such a secondary reaction I have provided a set of compensating coils 58 and 59 upon the electro-magnets 43 and 45, which are respectively connected into the receiver circuits 53 and 50; the messages which arrive at the receivers 54 and 49 are thereby secondarily transmitted to the electro-magnets 43 and 45 on the respective opposite sides of the receiving station. These currents set up in the compensating coils 58 and 59 are of course displaced in phase from the currents which are set up in the respective electro-magnets by the auxiliary circuit 57 and the auxiliary coils 55 and 56. To swing the compensating currents into phase with the currents to be compensated thereby I provide in the respective circuits the adjustable resistances and capacitances 60 and 61, and 62 and 63, respectively, each of which represents an adjustable reactance by which the compensating currents may be suitably retarded to offset the secondary effects of the two messages received by the opposite sides of the receiving station.

In parallel arrangement with the compensating coils 59 and 58, as they are coupled into the circuits 50 and 53, said circuits also include the step-up transformers 64 and 65, respectively, in which the messages of receivers 49 and 54 are stepped up and then are intensified by the amplifiers 66 and 67, to be written down by means of electro-magnets 68 and 69, respectively, upon the endless telegraphophone wires 38 and 39.

When the first transmission of the first words of each one of the two messages, as received from the wires 2 and 4 and as written onto the wires 31 and 32 at the receiving station, come to face the electro-magnets 44 and 46, none of the second occurrences of said messages, as transmitted from the wires 1 and 3, have as yet reached those positions of the wires 31 and 32 and the said second occurrences can therefore not, collaterally, set up disturbing currents in the magnet coils 48 and 52. But after the first words transmitted from wires 2 and 4 have travelled downward from magnets 48 and 52 for a distance X, the second occurrences of said first words would also come to face these magnets and would disturb the rendition of the two messages by the receivers 49 and 54. I prevent a disturbance of this kind by irradiating the second occurrences of the messages transmitted by wires 1 and 3 from wires 31 and 32, after said wires have passed the electro-magnets 43 and 45, but before they reach the magnets 44 and 46. This process of deleting the second occurrences of the messages of wires 1 and 3 is brought about by taking the separate messages, as contained on the wires 48 and 49, by intensifying said messages, by combining them and by imposing the intensified combined messages upon the wires 31 and 32 between the magnets 43 and 44, and 45 and 46, respectively, at such points, where at the same time the combined messages, which are to be deleted, are passing. This process is illustrated in the diagram of the receiving station in the following manner:

The two messages of the receivers 49 and 54, as they separately have been written by the electro-magnets 68 and 69 onto the endless wires 38

and 39 are taken off those wires by electro-magnets 70 and 71; each one of said messages, as it is induced into the respective electro-magnet coils, is stepped up by transformers 72 and 73, respectively; the stepped up currents are intensified by amplifier units 74 and 75; and the amplified messages are sent, in series connection, through the coils of electro-magnets 76 and 77. The strength of the flux set up by the electro-magnets 76 and 77 must of course be such that it is sufficient to delete the secondary appearances of the respective messages on the endless wires 31 and 32. Proper means to adjust the strength of the respective currents must be provided in the circuit of the receiving station. Such means, which are known to the electrical engineer, are not shown, so as not to encumber the visibility of the diagram of the receiving station.

The deleting process must occur at the exact time at which the words to be deleted on the wires 31 and 32 pass the electro-magnets 76 and 77. Assuming that the wires 31, 32, 38 and 39 travel at the same, fixed, uniform speed the deleting process by electro-magnets 76 and 77 is readily brought about by making the distance between the electro-magnets 68 and 70, and between 69 and 71 on one side, and between electro-magnets 43 and 76, and between 45 and 77 on the other side, the same. In other words, there is the same fixed distance Y between the magnets by which the messages are written onto wires 38 and 39 and the magnets by which those messages are taken off said wires on one side, and between the magnets which take said messages from the wires 31 and 32 and the magnets by which said messages are super-imposed and deleted from said wires 31 and 32, on the other side.

This distance Y may under certain circumstances become the same as the distance X between the electro-magnets 43 and 45, and between the electro-magnets 44 and 46, so that the magnet 76 comes into alignment with magnet 44 and magnet 77 aligns with magnet 46, under which circumstances the respective magnet coils may be united on the same magnet cores. In that case the coils of the electro-magnets 76 and 77 are not of such strength as to delete the respective messages, but they are balanced in such a manner that they exactly oppose and nullify the flux which otherwise would be set up by said messages in the electro-magnets 48 and 52.

It has been mentioned before, that the arrangement of the wires 1, 2, 3 and 4, as endless wires between the cylinders 5 and 6, is an arbitrary method for arranging the telegraphonic moving means, which has been considered by me as best suitable for schematically illustrating my invention. These wires may be replaced by any telegraphonic moving elements which may be known to the respective art; and in a most appropriate manner these wires, and also the wires 31, 32, 38 and 39 of the receiving station may be circularly arranged, parallel to each other.

It is readily seen that no synchronism is required between the moving means of the transmitting and of the receiving stations. The telegraphonic moving elements should travel at fixed speeds but these fixed speeds do not have to be the same at the transmitting and at the receiving stations. However, for different fixed speeds at the two stations, the ratios of the respective speeds to the respective distances X, for which the messages respectively lag behind each other, must always be constant.

The messages of the transmitting station, as

imposed by one set of magnets 12 and 14 upon the wires 1 and 3, are transmitted from said wires in substantially the same manner and in substantially the same form of electric impulses in which they had issued from the microphones 8 and 9. It is therefore possible to omit the magnets 12 and 14 and the telegraphonic wires 1 and 3, as well as the electro-magnets 16 and 18, and to impose said electric impulses directly upon the circuit 20 by substituting microphones 8 and 9 for electro-magnets 16 and 18, respectively. In that case the transmissions from the electro-magnets 13 and 15, which are magnetically opposed to each other, lag behind said directly transmitted transmissions of the messages for the distance between the magnets 13 and 17, or the distance between the magnets 15 and 19. If the distance X between the electro-magnets 43 and 44 and between the electro-magnets 45 and 46 of the receiving station is now made to be equal to the distance between the electro-magnets 13 and 17, or between the electro-magnets 15 and 19 of the transmitting station, (assuming that all endless wires travel at the same rectilinear speed), the two messages, each of which has been twice transmitted, can be separated in exactly the same manner as it is brought about by the modification shown in the schematic drawing.

In Fig. 3 which shows two messages as carried by corresponding sections of the endless wires 31, 38, 39 and 32 of the receiving station, the different transmissions are identified by bracketed members (1), (2), (3) and (4) with the endless wires of the transmitting station, which they have been transmitted from. The first message in question reads: Have developed the present novel method of multiplex telegraphonic transmission of electri, ending in the middle of the word electrical which the sender is just pronouncing into the microphone 8. Similarly the second message reads: Arzkopf of Thirty-three Eightieth Street Jackson Heights Long Isl. The messages on wires 31 and 32 end at the horizontal level of magnets 33 and 34, the continuation of said messages, as they are presently to be transmitted showing above the level of magnets 16, 17, 18 and 19 on the wires 1, 2, 3 and 4 of the transmitting station. The deletion of some of the transmissions by the magnets 76 and 77 shows on the corresponding level of transmissions (1) and (3) on wires 31 and 32. The separate messages are written onto wires 38 and 39 at the horizontal level of magnets 68 and 69, as they are taken from transmissions (1) and (2), and (3) and (4) from wires 31 and 32 at the levels of magnets 43, 44, 45 and 46 respectively.

The number of endless telegraphonic wires used at the transmitting station may be reduced to two as described above, and it is further possible to replace the two wires 2 and 4 by one wire which is disposed between the magnets 13 and 15 in one place and between the electro-magnets 17 and 19 further below. In like manner the wires 1 and 3 and 2 and 4 of the arrangement shown in the drawing may respectively be combined into one wire; under certain circumstances wires 1, 2, 3 and 4 may be combined into one wire and all the magnets face said wire; under such circumstances it is only necessary to use a certain degree of care to avoid disagreeable reflections, resonances or other kinds of reactions between the magnetic elements which face each other, or of the impressions made by the telegraphonic wires upon the second set of electro-magnets and their respective circuits, when they pass the latter.

In a similar manner and using similar precautions the wires 31 and 32 of the receiving station may be combined with each other, the magnets 43, 44, 45, 46, 76 and 77 (76 and 77 may be replaced by a single magnet) facing one such wire only. The arrangement shown has but the advantage of making the functions of the apparatus more readily understandable. The wires 38 and 39 each carry a separate record of each of the messages and these records may be preserved for future reference, if the wires are wound from a spool which takes the place of cylinder 36 onto a spool which takes the place of cylinder 35. In that case the final deleting circuit 40 is not used; but the messages, which are contained and which may be preserved on the spools onto which the wires 38 and 39 have been wound, may be reproduced at any time, faster or slower, stronger or weaker, according to the adaptability peculiar to telegraphonic records.

A great variety of modifications of the balancing, compensating and deleting means used at the receiving stations suggest themselves to the electrical engineer who is experienced in telegraphy. He will also recognize, that on the principles of the duplex transmission described a quadruplex transmission is readily developed by the following procedure:

Two sets of the apparatus of the transmitting station receive four messages, each set two messages. But the respective transmitting circuits 20, instead of being connected to the receiving station, are connected to a third transmitting set, said circuit 20 of the first two sets being connected into the circuits 10 and 11 of the third set in place of the microphones 8 and 9, respectively. The circuit 20 of the third set now connects to the receiving station, being transmitted on a wireless wave or by a single wire, and there the receiving set divides the four messages, each of which has twice been transmitted, into two sets of messages,—as they come forth from the two first sets of the transmitting station,—said two sets of messages being recorded on the wires 38 and 39. Each one of the two sets of two messages each may then be taken at the points of the receivers 49 and 54 and can be sent, separately, into two other, similarly arranged receiving sets, entering upon said last two receiving sets through a set-up transformer 28, until finally the four messages appear separately at the receivers 49 and 54 of the two last mentioned receiving sets. A quadruplex transmitting arrangement, as described above, may again be doubled up into an octoplex system, in the same manner in which the change from a duplex system to a quadruplex has been described above, etc.

Telegraphonic transmitting and receiving means have been indicated in Fig. 1 as simple means to which my novel system of multiplex transmission may usefully be applied. Transmitting and receiving apparatus, as used in other arts, for instance in television, may readily be substituted for said transmitting and receiving means. Television is here mentioned in particular, because that art, above all others, for the transmission of a great number of messages, which, in respect to time, are in close proximity, which may frequently overlap, and which must be fully separated from each other at the receiving end, can make excellent use of my improvements in multiplex transmission.

Although I have shown and described one form of embodiment of my invention in detail, yet I do not wish to be limited thereby, except as the state

of the art and the appended claims may require, for it is obvious that various modifications and changes may be made in the form of embodiment and method of my invention, without departing from the spirit and scope thereof.

I claim:

1. The method of simultaneously sending a multiplicity of messages over one transmitting means so that they may be completely separated from each other at the receiving end of said transmitting means, comprising, converting said messages into electric impulses suitable for transmission, telegraphically recording said electric impulses, transmitting said electric impulses, and transmitting after a predetermined interval of time impulses of said messages reproduced from said telegraphically recorded impulses.

2. The method of simultaneously sending a multiplicity of messages over one transmitting means so that they may be completely separated from each other at the receiving end of said transmitting means, comprising, converting said messages into electric impulses suitable for transmission, telegraphically recording said electric impulses, transmitting said electric impulses, and transmitting after a predetermined interval of time impulses of said messages reproduced from said telegraphically recorded impulses, the different reproductions of said impulses differing from each other in respect to the direction of flow of the respective currents, corresponding ones of said telegraphically recorded impulses being electromagnetically opposed to each other.

3. The method of simultaneously transmitting two electric messages over one transmitting means, comprising transmitting each of said messages twice, in two transmissions between which an interval of time is interposed, and the electric impulses of the two transmissions of one of said messages being opposed to each other in regard to the respective direction of flow of electricity, combining at the receiving station the transmissions of messages, between which an interval of time had been interposed, into circuits, and separately rendering said messages according to the direction flow of electricity of corresponding transmissions.

4. The method of duplex transmission, comprising transmitting a first message twice, in the same form of impulses, the second transmission of said first message lagging behind the first transmission of said first message for a predetermined interval of time, simultaneously transmitting a second message twice, the form of impulses of the second transmission of said second message being, in respect to the electromagnetic effect of said impulses, opposed to the first transmission of said second message, and said second transmission of said second message lagging behind the first transmission of said second message for a predetermined interval of time, collectively electromagnetically recording said messages at the receiving station, and separately reproducing said messages by electromagnetically opposed induction and by superimposed compensation.

5. In a system for simultaneously transmitting a plurality of messages over a single transmitting means to a receiving station, sending means issuing onto said transmitting means a plurality of transmissions of each message at predetermined intervals of time, means recording said plurality of transmissions of said plurality of

messages as transmitted to said receiving station, and a plurality of receiving means connected to the said recording means and each responsive to the constellation of the multiplicity of transmissions of one of said messages.

6. In a system for simultaneously transmitting a plurality of messages over a single transmitting means to a receiving station, means transforming said messages into electric impulses, telegraphonic means adapted to record said impulses, and means adapted repeatedly to withdraw reproductions of said electric impulses from said telegraphonic means at predetermined intervals of time, said reproductions of said impulses being imposed onto said transmitting means, and the reproductions of some of said messages differing from each other in respect to direction of flow of the currents of corresponding impulses.

7. In a system for simultaneously transmitting two messages to a receiving station, telegraphonic means adapted to receive said messages and twice to transmit said messages with predetermined lapses of time between the two transmissions of each message, the transmissions of like messages being in the same form and in electrically opposed form respectively, and single transmitting means repeatedly transmitting each message at intervals of said predetermined lapses of time to said receiving station.

8. In a system for simultaneously transmitting two messages to a receiving station, telegraphonic means adapted to receive said messages and twice to transmit said messages interposing predetermined lapses of time between the two transmissions of each message, the transmissions of like messages being in the same form and in electrically opposed form respectively, single transmitting means repeatedly transmitting each message at intervals of said predetermined lapses of time to said receiving station, telegraphonic means at said receiving station on which said repeatedly transmitted messages are recorded, means reproducing from said telegraphonic means at said receiving station said message repeatedly transmitted in the same form, and means reproducing from said telegraphonic means at said receiving station said message repeatedly transmitted in electrically opposed form.

9. In a duplex transmission system in which two messages are repeatedly, at predetermined time intervals, transmitted in the same and in electrically opposed form, respectively, over single transmitting means, moving telegraphonic means recording said messages as repeatedly transmitted, and two sets of telegraphonic reproducing means facing said moving telegraphonic recording means at points spaced at the distance at which said repeatedly transmitted messages are spaced on said telegraphonic recording means, said sets being respectively adapted to reproduce said message repeatedly transmitted in the same form and said message repeatedly transmitted in electrically opposed form.

10. In a duplex transmission system in which two messages are repeatedly, at predetermined time intervals, transmitted in the same and in electrically opposed form, respectively, over single transmitting means, moving telegraphonic means recording said messages as repeatedly transmitted, two sets of telegraphonic reproducing means facing said moving telegraphonic recording means at points spaced at the distance at which said repeatedly transmitted messages

are spaced on said telegraphic recording means, said sets being respectively adapted to reproduce said message repeatedly transmitted in the same form and said message repeatedly transmitted in electrically opposed form, and means counteracting the flow adapted to be set up at said points by the repetition of said messages on said telegraphic recording means.

11. A device for separating two messages which are collectively and, respectively, twice recorded on telegraphic recording means, the magnetic records of each message being disposed on said means at a predetermined distance from each other, and the magnetic records of one of said messages being similar to each other, whereas the magnetic records of the other message are magnetically opposed to each other, comprising a set of similarly wound electromagnets facing said means at the distance between the records of said first message, a set of oppositely wound electromagnets facing said means at the distance between the records of said second message, receiving circuits for said messages respectively comprising one of said sets of electromagnets, means balancing the flux set up by the first magnetic records of said messages when they face the first electromagnets of said sets, and means offsetting the second magnetic records of said messages after they have passed the first electromagnets of said sets.

12. A device for separating two messages which are collectively and, respectively, twice recorded on each of two telegraphic recording means, the magnetic records of each message being disposed on said means at a predetermined distance from each other, and the magnetic records of one of said messages being similar to each other, whereas the magnetic records of the other message are magnetically opposed to each other, comprising a set of similarly wound electromagnets facing the first of said means at the distance

between the records of said first message, a set of oppositely wound electromagnets facing the second of said means at the distance between the records of said second message, receiving circuits for said messages respectively comprising one of said sets of electromagnets, means balancing the flux set up by the first magnetic records of said messages on said means against each other when they face the first electromagnets of said sets, and means offsetting the second magnetic records of said messages after they have passed the first electromagnets of said sets.

13. A device for separating two messages which are collectively and, respectively, twice recorded on each of two telegraphic recording means, the magnetic records of each message being disposed on said means at a predetermined distance from each other, and the magnetic records of one of said messages being similar to each other, whereas the magnetic records of the other message are magnetically opposed to each other, comprising a set of similarly wound electromagnets facing the first of said means at the distance between the records of said first message, a set of oppositely wound electromagnets facing the second of said means at the distance between the records of said second message, receiving circuits for said messages respectively comprising one of said sets of electromagnets, means balancing the flux set up by the first magnetic records of said messages of said means against each other when they face the first electromagnets of said sets, telegraphic recording means connected with said receiving circuits, and electromagnetic means actuated by said last mentioned telegraphic recording means and adapted to offset the second magnetic records of said messages on said first mentioned telegraphic recording means after they have passed the first electromagnets of said sets.

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