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R. O. HOOD

TELEPHONE SYSTEM

Filed Aug. 23, 1923

2 Sheets-Sheet 1

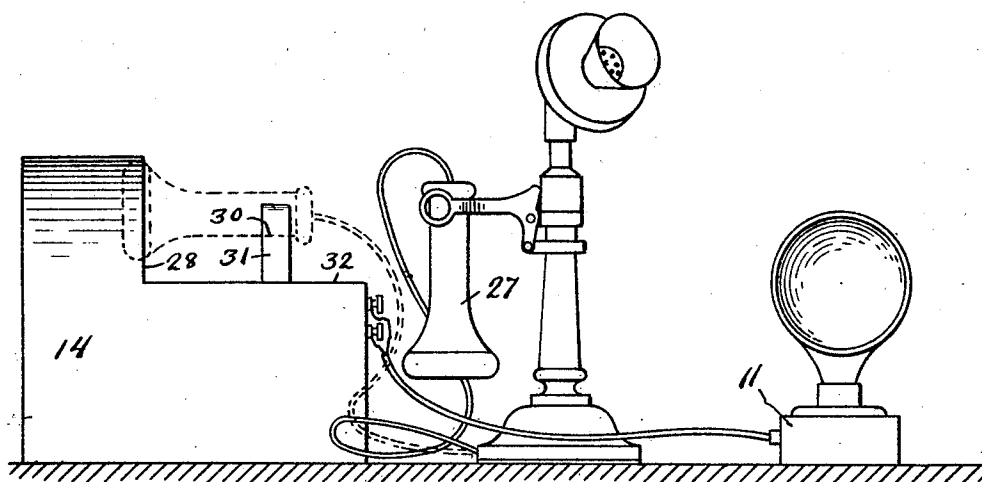


Fig. 1.

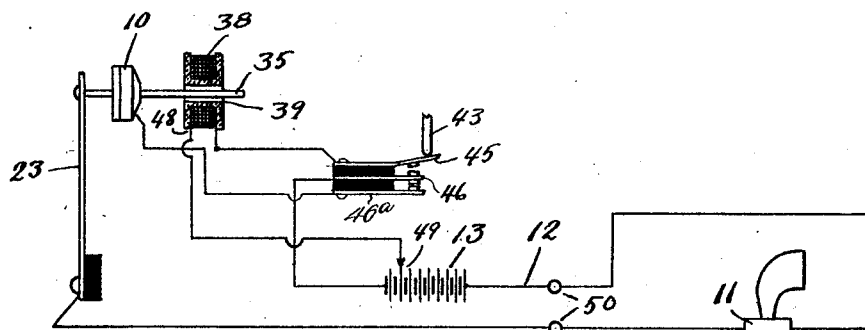


Fig. 6.

Inventor.

Ralph O. Hood

W. J. Hammond
att'y

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2 Sheets-Sheet 2

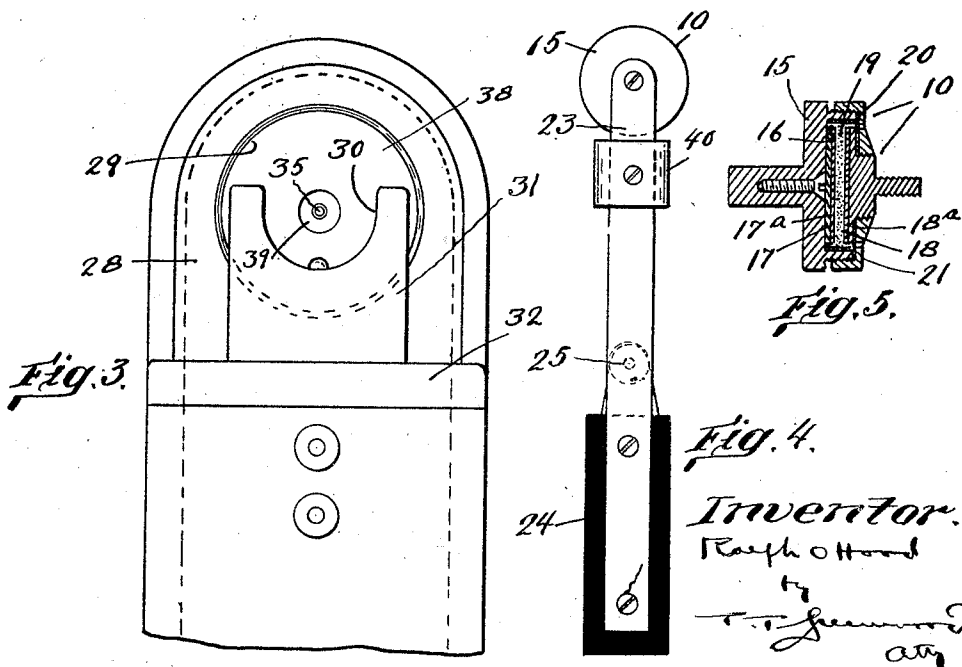
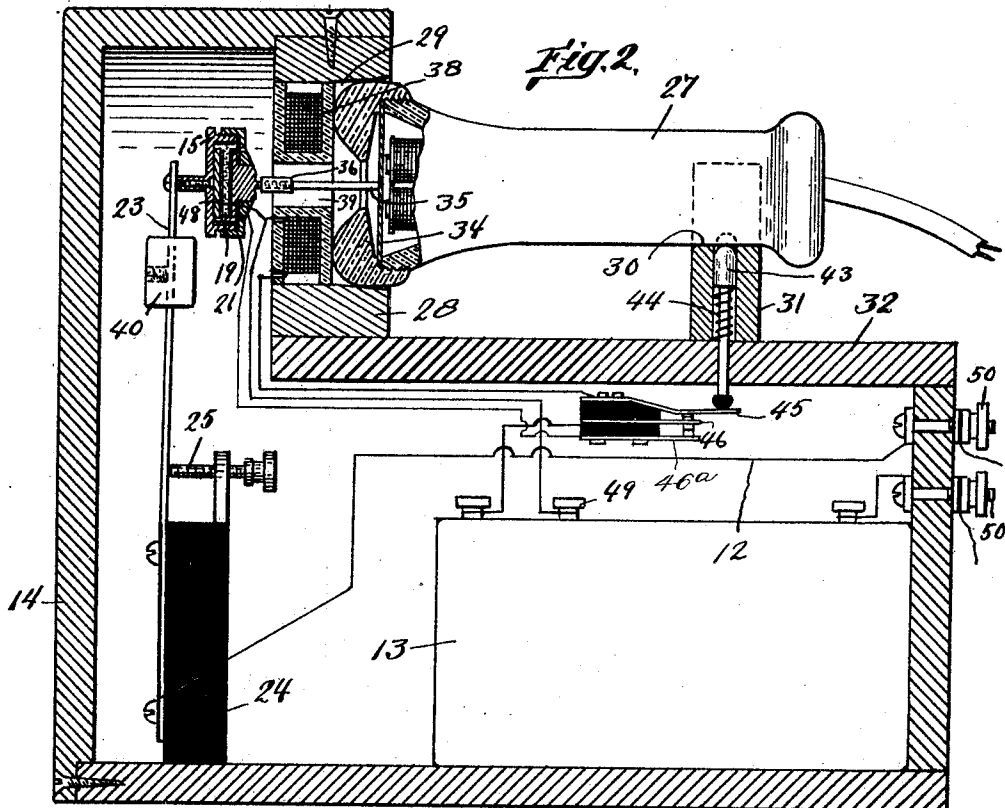


Fig. 4.
Inventor.
 Ralph O. Hood
 by *R. J. Gumm*
 atty.

UNITED STATES PATENT OFFICE.

RALPH O. HOOD, OF DANVERS, MASSACHUSETTS, ASSIGNOR TO WALTER CHANNING,
OF BOSTON, MASSACHUSETTS.

TELEPHONE SYSTEM.

Application filed August 23, 1923. Serial No. 659,018.

This invention relates to telephone systems and has particular reference to apparatus and systems adapted to be actuated by and amplify the sounds reproduced in the usual telephone receiver.

For many purposes, it is desirable to provide a loud speaking apparatus which may be associated with the usual wire telephone set and actuated by the telephone receiver of the set to amplify the action of the receiver in such a manner that there will be no necessity of placing a receiving instrument to the ear in order to understand clearly the message passing over the wire. Consequently, an object of this invention is to provide a loud speaking attachment for the usual telephone set which may be actuated by a telephone receiver to reproduce with increased amplitude the signals impressed upon the usual telephone receiver.

A further object is to provide a loud speaking telephone system adapted to be actuated by a telephone receiver and improved means to transmit the vibrations of the diaphragm of the telephone receiver to and vibrate the diaphragm of the transmitter of the loud speaking apparatus.

A yet further object of the invention is to provide a loud speaking apparatus, including a transmitter and loud speaking receiver and a local circuit therefor with means governed by the receiver of the usual telephone set to condition the local circuit in readiness for operation.

A further object of the invention is generally to improve the construction and operation of telephonic apparatus.

In the drawings

Fig. 1 is a side elevation of apparatus embodying the invention and illustrating more particularly the manner of using said apparatus.

Fig. 2 is a longitudinal sectional elevation of the transmitter unit of the loud speaking apparatus.

Fig. 3 is a partial end view of the apparatus of Fig. 2.

Fig. 4 is an elevation in detail of the yielding supporting means for the loud speaking transmitter button.

Fig. 5 is an enlarged longitudinal sectional detail of the loud speaking transmitter button.

Fig. 6 is a diagram of the local circuit of the loud speaking apparatus.

As here shown, the apparatus embodying the invention may include a loud speaker transmitter button 10 and a loud speaking receiver 11 both of which may be included in the local circuit 12, which circuit may include the battery 13. The battery and transmitter button may be contained in an enclosing cabinet 14 and the loud speaker 11 preferably is separate from said cabinet and is placed in some position relatively remote from said cabinet whereby to avoid a detrimental action of the sound produced by the loud speaker upon the transmitter button 10. Said transmitter button 10 may be constructed in a more or less common manner and may comprise a shell 15, which shell may be formed with a recess 16 therein adapted to contain two spaced plates 17 and 18 of carbon or the equivalent; and said plates may be mounted upon backing plates 17^a and 18^a respectively. Carbon granules 19 may occupy the space between said plates and the motion of one of said plates relative to the other serves to vary the pressure upon said carbon granules in proportion to the movement of the plate and thereby vary the strength of the current passing through said plates and the carbon granules.

A relatively flexible diaphragm 20, as mica, may be secured over said recess 16 by suitable means as by the ring 21 and one of said backing plates, as the plate 18^a, may be secured in the middle of said diaphragm and may be free to move with said diaphragm. Said transmitter button is preferably secured rigidly to the upper end of a vertically-extended flexible strip of spring material 23, the lower end of which strip may be secured to a fixed post 24, which post may be disposed in the lower portion of the cabinet. An adjusting screw 25 may be carried by said post and arranged to bear adjustably against said supporting strip 23 whereby to vary the position of the transmitter button with respect to the diaphragm of a telephone receiver as will hereinafter be set forth.

The diaphragm of said transmitter button is adapted to be detachably connected mechanically with the diaphragm of a

telephone receiver 27, which telephone receiver may be a receiver of the usual wire telephone instrument or it may be the telephone receiver of a radio-receiving instrument, for instance. Said telephone receiver is adapted to be placed in a certain predetermined position on said cabinet 14 whereby automatically to make mechanical engagement with the transmitter-diaphragm and also to complete the local circuit including said transmitter whereby to condition the loud speaker system for amplified reproduction in the loud speaker receiver 11 of the vibrations of the diaphragm of the telephone receiver. For this purpose, a wall 28 of the cabinet 14 may be formed or provided with an aperture 29 therein, which aperture is preferably co-incident with the axis of the transmitter 10. The diaphragm-end of the telephone transmitter 27 is adapted to be received within said aperture 29 and the rear body-portion of the receiver is adapted to be received within the semi-circular recess 30 of a supporting member 31, which supporting member may be disposed upon a top wall 32 of the cabinet 14. The means mechanically connecting the transmitter diaphragm with the diaphragm 34 of the telephone transmitter 27 may comprise a relatively slender rod or needle 35. Said needle 35 is preferably secured rigidly to the backing plate 18^a carried by the flexible diaphragm 20 of the transmitter; and said needle may be secured in such relation by suitable means as the internally screw-threaded sleeve 36 which sleeve may have a screw-threaded connection with said needle and also with said backing plate 18^a. Preferably the axis of said needle is arranged to co-incide with the axes of the transmitter and receiver diaphragms. Preferably said needle 35 is arranged just in contact with the outer face of the diaphragm 34 of the telephone receiver and without bearing with any substantial degree of pressure against said diaphragm and the free end of said supporting spring 23 may be adjusted toward and away from the telephone receiver by the adjusting screw 25 for this purpose.

Means are preferably provided to connect said rod or needle 35 securely with the receiver-diaphragm 34 and without placing either said diaphragm or the transmitter-diaphragm under unusual stress, whereby to cause the transmitter-diaphragm to reproduce faithfully the vibrating movement of the receiver-diaphragm. Said means may include magnetic means to cause the needle to adhere securely to the diaphragm 34 and faithfully follow the movements thereof, said diaphragm being of usually soft iron. For this purpose, I may make said needle 35 of steel and permanently magnetize it whereby to cause it to adhere

to the telephone receiver diaphragm 34. Preferably, however, I make said needle of soft iron and magnetize it temporarily or only while the loud speaker apparatus is conditioned for operation and cause it to become de-magnetized when the telephone receiver 27 is to be removed from its operative relation with the apparatus.

In order to magnetize said needle 35, I may dispose a magnetizing coil 38 about said needle and said needle may pass freely through the axial opening 39 of said coil without mechanical contact therewith. It is obvious that when said coil 38 is energized, a magnetic field will be set up which will magnetize said needle 35 for so long as said coil is energized, thereby to cause said needle to adhere magnetically to the diaphragm 34 of the telephone receiver. As thus arranged, the diaphragms of the transmitter and the telephone receiver may each be without unusual initial stress and thereby be free for unrestricted movement and yet be securely mechanically connected so that the vibratory movement of the diaphragm 34 of the telephone receiver will be faithfully reproduced in the transmitter-diaphragm.

Said coil 38 is preferably disposed within the aperture 29 of said cabinet and is adapted to form a stop or abutment against which the end of the telephone receiver 27 is adapted to bear whereby to define the position of the telephone receiver with respect to the transmitter 10 and the needle 35 and thereby ensure the proper operative relation of the telephone receiver and said transmitter button and needle whenever the telephone receiver is placed in position on the cabinet 14. Obviously, however, other means not necessarily shown may be provided to define the position of the telephone receiver on the cabinet.

As above set forth, the transmitter button 10 is mounted yieldingly within the cabinet in order to provide for its proper adjustment with respect to the telephone receiver. Due to the yielding support for the transmitter button, it may be that said transmitter button may move bodily in response to the vibratory movement of the telephone receiver and consequently, a corresponding vibratory current may not be set in the local circuit including said transmitter, thereby to impair the effectiveness of the apparatus. For this reason, means are preferably provided to support the shell 15 of the transmitter 10 immovably as against the vibratory movement of the diaphragm 20 thereof and the diaphragm of the telephone receiver. Said means may include the relatively massive weight 40, which weight may be disposed adjustably upon and fixed to the flexible supporting strip 23 and is preferably located on said supporting strip adjacent the transmit-

ter 10. Said weight 40, by virtue of its relatively great mass and consequent relatively great inertia, is incapable of following the relatively rapid vibratory movement of the telephone receiver diaphragm 34 and consequently serves to maintain the shell 15 of the transmitter fixed against such movement and thereby permits the diaphragm of said transmitter button to respond faithfully and with full amplitude to the corresponding movements of the receiver-diaphragm 34.

Preferably the act of positioning the telephone receiver in proper position on the cabinet 14 serves to complete the local circuit for the apparatus and thereby condition it in readiness for operation. For this purpose, a spring-pressed pin 43 may be vertically-disposed slidably in the supporting member and is adapted to be depressed by the telephone receiver to complete the local circuit. In normal position, and with the telephone receiver removed from the cabinet, said pin 43 is adapted to protrude slightly above the lower face of the recess 30 in said supporting member 31 as is illustrated. The weight of the telephone receiver 27 is adapted to depress said pin 43 against the action of its spring 44 and cause it to engage a contact member 45 and depress said contact member into electrical engagement with cooperating contact members 46 and 46^a, which contact members are or may be disposed within the cabinet 14. Said contact members are adapted to control the local circuit which includes the battery 13 and the transmitter and loud speaker. Said contact members are arranged to separate when the pin 43 is moved to an elevated position by its spring, by reason of the removal of the telephone receiver, and thereby interrupt the local circuit.

Preferably said transmitter button and loud speaker receiver are included in series in the local circuit. The magnetizing coil 38, however, may be connected directly across a portion of the battery 13 by the closing of the contact members 45 and 46 and, for this purpose, a terminal 48 of said coil may be connected with a terminal 49 of an intermediate cell of the battery 13, whereby to provide said coil with a reduced potential. Suitable binding posts 50 may be secured externally to said cabinet 14 and the loud speaker receiver 11 may be connected to the apparatus by said binding posts.

Preferably the arrangement of the contact members 45 and 46 is such that said members are separated and caused to de-energize said coil 38 and therefore demagnetize the needle 35 before the telephone receiver has been withdrawn to any substantial degree from the aperture 39 thereby to prevent the transmitter button 10 from following the withdrawal movement of the telephone receiver as it might otherwise do if the

needle 35 remained magnetized during such withdrawal movement of the receiver.

The structure may be otherwise modified without departing from the spirit of the invention.

I claim:

1. A telephone system including a transmitter having a diaphragm, a receiver having a diaphragm, and magnetic means including a magnetized member arranged to attach itself magnetically to at least one of said diaphragms whereby to connect said diaphragms mechanically.

2. The combination of two diaphragms and magnetic means including a magnetized member arranged to attach itself magnetically to at least one of said diaphragms whereby to connect them mechanically, whereby to reproduce the vibrating movement of one diaphragm in the other.

3. The combination of two diaphragms and a magnetized rod connecting said diaphragms mechanically and magnetically attached to at least one of said diaphragms, whereby to reproduce the movement of one diaphragm in the other.

4. The combination of two diaphragms and means to reproduce the movement of one diaphragm in the other including a rod extending between said diaphragms, and magnetic means to attach said rod to one of said diaphragms by its magnetic attraction therewith.

5. The combination of two diaphragms and means to reproduced the movement of one diaphragm in the other including a rod extended between said diaphragms, and magnetic means to attach said rod to one of said diaphragms by its magnetic attraction therewith including a magnetizing coil surrounding said rod.

6. The combination of two diaphragms and means to produce the movement of one diaphragm in the other including a rod secured to one of said diaphragms and magnetic means to magnetize said rod and cause it to attach itself magnetically to said other diaphragm.

7. A telephone system including a transmitter having a diaphragm, and means to actuate said diaphragm by a second diaphragm including a magnetic member connected with said transmitter diaphragm and arranged to be magnetically attached to said second diaphragm.

8. A telephone system including an enclosing cabinet, a transmitter having a diaphragm and contained within said cabinet, a rod fixed to said diaphragm and extending therefrom and adapted to engage the diaphragm of a receiver, and a magnetizing coil disposed within said cabinet and surrounding and free from said rod, whereby to magnetize it and cause it to be attached to the receiver-diaphragm.

9. A telephone system including an enclosing cabinet, a transmitter having a diaphragm and enclosed within said cabinet, said cabinet having an aperture there-
 5 through aligned with said transmitter, a rod fixed to said transmitter diaphragm and extended freely into said aperture, and a magnetizing coil surrounding and free from said rod, said cabinet having means to support a
 10 receiver externally thereon in alignment with said aperture and with the diaphragm thereof in engagement with said rod.
10. A telephone system including a transmitter having a shell and a diaphragm carried by said shell, yielding supporting means
 15 for said shell, and means to support said shell substantially immovably against the vibration of said diaphragm, including a weight slidable on said yielding supporting means
 20 toward and away from said transmitter.
11. A telephone system including a transmitter having a shell and a diaphragm carried by said shell, yielding supporting means
 25 for said shell, and means to support said shell substantially immovably against the vibration of said diaphragm including a relatively massive weight having a sliding connection with said yielding supporting means.
12. A telephone system including a trans-
 30 mitter having a shell and a diaphragm carried by said shell, yielding supporting means for said shell, and means to support said shell attached to said shell at one end and to a fixed support at the other end substan-
 35 tially immovably against the vibration of said diaphragm, including a relatively massive weight carried by said yielding supporting means intermediate its ends and adjacent said shell.
- 40 13. A telephone system including a transmitter having a shell and a diaphragm carried by said shell, a flexible strip rigidly supported at one end and connected rigidly with said shell at the other end, and a rela-
 tively massive weight carried by said flexible
 45 strip adjacent said shell.
14. A telephone system including a flexible strip rigidly supported at one end and free to move at the other end, a transmitter
 50 mounted on said free end of said flexible strip, said transmitter having a shell and a diaphragm carried by the shell, and means to support said transmitter shell against the vibration of its diaphragm including a rela-
 55 tively massive weight fixed to said flexible strip adjacent said transmitter.
15. A telephone system including a receiver, a flexible strip rigidly supported at one end and free to move toward and away
 60 from the receiver-support, a transmitter fixed to the free end of said flexible strip and free to move therewith, said transmitter having a diaphragm, means arranged to connect said transmitter-diaphragm mechanically
 65 with the diaphragm of the receiver, a magnetizing coil surrounding said connecting means, and a relatively massive weight fixed to said flexible strip adjacent said trans-
 70 mitter.
16. A telephone system including a trans-
 75 mitter arranged to be actuated by a receiver, a second receiver electrically connected with and arranged to be actuated by said transmitter and means governed by said first receiver arranged to control the electrical con-
 80 nection between said second receiver and said transmitter.
17. A telephone system including a trans-
 85 mitter, means to support a receiver in operative relation with said transmitter, a second receiver electrically connected with said transmitter, and means governed by the first receiver on said supporting means to control the electrical connection of said second receiver and said transmitter.
- In testimony whereof, I have signed my name to this specification.

RALPH O. HOOD.