W. KAISLING.

TELEPHONE TRANSMITTER.

APPLICATION FILED MAR. 15, 1906.

1,076,041. Patented Oct. 21, 1913.

Fig. 1

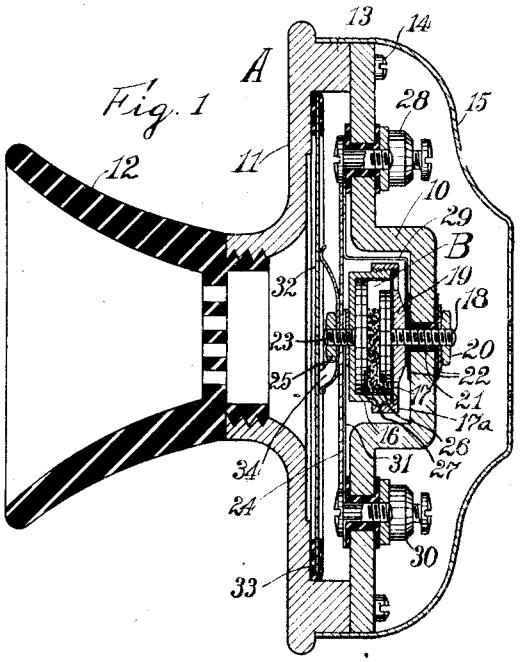


Fig. 2

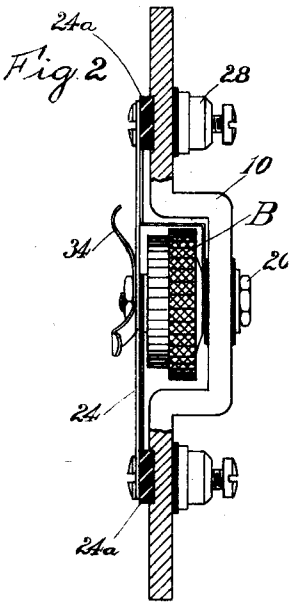


Fig. 3

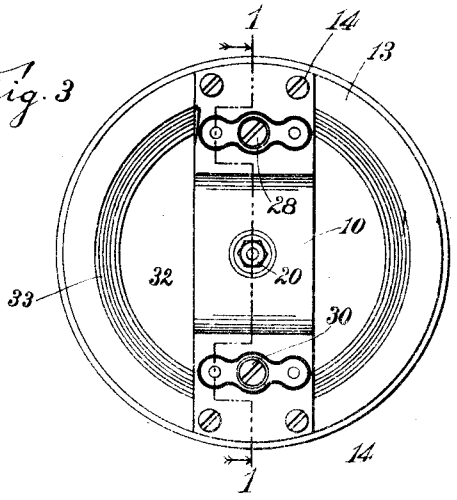
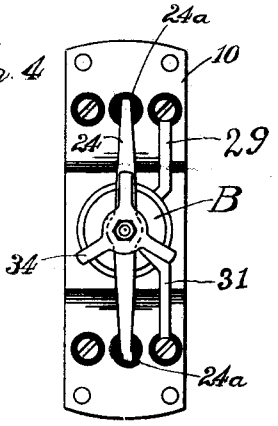


Fig. 4



Witnesses

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TELEPHONE-TRANSMITTER.

1,07 ,041. Specification of Letters Patent. **Patented Oct. 21, 1913.**

Application filed March 15, 1906. Serial No. 306,240.

To all whom it may concern:

Be it known that I, WILLIAM KAISLING, a citizen of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented a new and useful improvement in Telephone-Transmitters, of which the following is a specification.

The present invention relates to telephone transmitters of the so-called "granular" type, in which a body of finely divided carbon or other suitable resistance-varying material, disposed between suitable electrodes contained in an inclosing chamber, is caused to vary the resistance of the telephone circuit in substantial accordance with the sound waves directed against the sound-receiving diaphragm.

In the construction of transmitters of this type, it has been common practice heretofore to close the granule chamber by a membranous cover of mica or like material arranged so as to form a flexible mechanical connection which will permit relative movement of the electrodes. In such transmitters, the supplemental diaphragm is rigidly connected, at either its center or periphery, to the main diaphragm and, consequently, any buckling of the latter, due to the heat conveyed to it from the resistance-varying material during the operation of the instrument, causes objectionable stresses on the auxiliary diaphragm. The arrangement of the various parts of the transmitter is also commonly such that the slight inequalities and variations in manufacture cause normal stresses on the auxiliary diaphragm of an injurious character. All such stresses tend not only to distort the form of the impressed sound wave and thereby interfere with the talking properties of the instrument, but also to break down the auxiliary diaphragm and thereby materially shorten the life of the instrument.

The principal object of the invention is to devise an efficient transmitter which shall be free from the above defects, and which shall also avoid the objectionable packing, common to instruments of this class. To this end, I so construct and arrange the parts of the transmitter that all abnormal movements of the main diaphragm, which might be detrimental to the faithful reproduction of speech, or injurious to the auxiliary diaphragm, if transmitted thereto, are compensated or rendered ineffective. This is accomplished through the agency of springs disposed between the main diaphragm and the granule chamber. In the preferred construction, two such springs are employed. One of these springs is mounted directly on the bridge of the transmitter and yieldingly supports one of the electrodes, while the other electrode is fixedly secured to the bridge. The second spring, which is preferably secured to the center of the first spring, bears against the main diaphragm and is instrumental in transmitting its vibrations to the granule chamber while, at the same time, giving said diaphragm an initial flexure and damping its natural rate of vibration.

The invention also comprises other features which, together with the above, will be more fully understood upon reference to the following detailed description taken in connection with the accompanying drawing, while the scope of the invention will be particularly pointed out in the appended claims.

Figure 1 of said drawing is a sectional elevation of a transmitter constructed in accordance with my invention, the section being taken on a plane indicated by the line 1—1 of Fig. 3; Fig. 2 is a side elevation of the transmitter bridge and the parts mechanically connected thereto, parts being shown in section; Fig. 3 is a rear elevation of the transmitter, with the protective casing removed; and Fig. 4 is a front elevation of the parts illustrated in Fig. 2.

Referring to the drawing in detail, it will be noted that the frame A of the transmitter, by which the various parts are supported, is made up of the bridge 10 and the usual circular front plate 11 which is provided with a threaded central opening for the reception of the usual mouth-piece 12. The front plate 11 is provided with a peripheral flange 13, to which the ends of the bridge 10 are detachably secured by screws 14. The outer edge of this flange also forms a seat for the reception of the customary shell or cover 15, by which the parts of the transmitter are inclosed. The principal elements of the transmitter are preferably assembled directly upon the bridge 10, so as to form a compact unitary structure readily detachable from the other parts of the transmitter.

To this end, the central portion of the bridge is also preferably laterally deflected, as illustrated, so as to form a recess or space for the accommodation of the granule chamber B. This chamber comprises a metal cup 16 and a membranous cover 17 of mica or other suitable material, held in place by a clamping ring 17ª suitably secured to the cup by a threaded, driven, or like connection. The center of this auxiliary diaphragm is rigidly secured to the center of the deflected portion of the bridge 10 by means of a screw 18, having an enlarged flat head engaging the inner face of the mica disk 17 and having a shank extending through a suitable opening in the bridge 10. A washer 19 engages the outer face of the mica disk 17, and a nut 20, screwed on to the screw shank, securely clamps the parts in position. By means of the insulating bushing and washers 21 and 22, the screw 18 is insulated from the bridge 10. The cup 16, on the other hand, is secured by a screw 23 to the center of a stiff leaf spring 24 which spans the space formed by the deflected portion of the bridge 10 and rests upon insulating pins or blocks 24ª seated in the outer portions of the bridge. A nut 25 on the outer end of the shank of the screw 23 holds these parts together. As clearly illustrated, the head of the screw 23 fits snugly in the bottom of the cup 16. The heads of the screws 18 and 23 form in themselves or carry the electrodes of the instrument. In the former case, their adjacent surfaces are preferably plated with gold or platinum, while in the latter case these surfaces are provided with hard carbon disks 26 and 27. The space between the electrodes is partially filled by some suitable granular resistance-varying material such as finely divided carbon which, in response to the relative movements of the electrodes, varies the resistance of the electrical circuit completed therethrough. The electrode 26 and its supporting screw 18 are electrically connected to the binding post 28 by a suitable conductor, such as the metal strap 29, while the electrode 27 and its supporting screw 23 are connected to a similar binding post 30 by a similar conductor 31. The binding posts 28 and 30 are carried by, and suitably insulated from, the bridge 10. The inner ends of the conducting straps 29 and 31 are preferably perforated and surround the shanks of the screws 23 and 18, respectively. The space between the front plate 11 on the one hand and chamber B on the other is occupied by the sound-receiving diaphragm 32 which is provided with the usual soft rubber ring 33 extending around its periphery and resting against the inner wall of said front plate. This diaphragm is given an initial "bias" or flexure by means of a spring 34, preferably having three engaging points, carried by the shank of the screw 23. This spring, as previously indicated, also serves to damp the natural rate of vibration of the sound-receiving diaphragm and to transmit its vibrations to the granule chamber B.

In constructing the transmitter, the parts are so proportioned and related that when the granule chamber B has been mounted on the bridge 10 and the nut 20 screwed up tight, the central portion of the auxiliary diaphragm 17 occupies a position preferably slightly to the rear of a plane through its periphery. This flexure is very slight and, by reason of the stiffness of the parts which support the electrodes, and by reason of their being mounted upon a single piece, the bridge, the likelihood of variations in the size of the parts in manufacture, sufficient to cause an injurious flexure, is greatly reduced over similar transmitters of the prior art. When the parts are finally assembled in the frame A, and the spring 24 is subjected to the action of the transmitting spring 34, there will still be no injurious flexure of the auxiliary diaphragm 17 by reason of the relatively greater stiffness of the spring 24 over the spring 34. In fact, the displacement resulting therefrom need be no more than that which would occur in the operation of the instrument in transmitting speech and at no time will its direction of flexure be changed. Thus, it will follow that the cooling of the parts after operation will cause the electrodes to separate, rather than approach, and thereby reduce their pressure on the granular material and materially assist in maintaining it in unpacked condition.

From the above description, it will thus be apparent that I have devised a transmitter in which abnormal distortions or vibrations of the sound-receiving diaphragm, or the pressure to give it its initial flexure, are compensated by means of the springs 24 and 34 and are not transmitted to cause injurious flexure of the auxiliary diaphragm 17.

Obviously, in carrying out my invention, certain alterations and modifications may be made in the structural details shown and described without departing from the spirit and scope of my invention; for example, various parts may be adjustably mounted. I, therefore, do not wish to be limited to the specific detailed disclosure, but aim to cover, by the terms of the appended claims, all such alterations and modifications.

What I claim as new and desire to secure by Letters Patent of the United States is:—

1. A telephone transmitter comprising a supporting frame, a granule chamber carried thereby, coöperating electrodes located in said chamber, granular resistance-varying material between said electrodes, a sound-receiving diaphragm and a spring secured to said chamber and bearing against said dia-

phragm whereby the vibrations of the diaphragm are transmitted to the chamber to cause corresponding variations in the resistance of said granular material.

2. A telephone transmitter comprising a supporting frame, a cup carried by said frame, a membrane covering said cup so as to form a granule chamber therewith, electrodes located in said chamber, granular resistance-varying material between said electrodes, a sound-receiving diaphragm and a spring secured to said chamber and bearing against said diaphragm whereby the vibrations of the diaphragm are transmitted to the chamber to cause a relative movement of said membrane and cup to correspondingly vary the resistance of said granular material.

3. A telephone transmitter comprising a supporting frame, a cup carried by said frame, a membrane covering said cup so as to form a granule chamber therewith, cooperating electrodes carried by said cup and membrane respectively, granular resistance-varying material between said electrodes, a sound-receiving diaphragm and a spring secured to said chamber and bearing against said diaphragm whereby the vibrations of the diaphragm are transmitted to the chamber to cause a corresponding relative movement of said electrodes to correspondingly vary the resistance of said granular material.

4. A telephone transmitter comprising a supporting frame, a granule chamber carried thereby, said chamber having relatively movable parts, one of which is yieldingly held by said frame, suitable electrodes in said chamber, granular resistance-varying material between said electrodes, a sound-receiving diaphragm, and elastic means secured to said chamber and bearing against said diaphragm to transmit the vibrations of said diaphragm to said chamber to cause a corresponding relative movement of said chamber parts to correspondingly vary the resistance of said granular material.

5. A telephone transmitter comprising a supporting frame, a granule chamber having relatively movable parts, one of said parts being fixedly held and the other yieldingly held by said frame, suitable electrodes in said chamber, granular resistance-varying material between said electrodes, a sound-receiving diaphragm and elastic means secured to said chamber and bearing against said diaphragm to transmit the vibrations of said diaphragm to said chamber to cause corresponding relative movements of said chamber parts to correspondingly vary the resistance of said granular material.

6. A telephone transmitter comprising a supporting frame, a cup, a membrane covering said cup so as to form a granule chamber therewith, said membrane being fixedly secured at one point to said frame and said cup being yieldingly connected thereto, suitable electrodes in said chamber, granular resistance-varying material between said electrodes, a sound-receiving diaphragm, and a spring acting between said diaphragm and said chamber to transmit the vibrations of said diaphragm to said cup to correspondingly vary the resistance of said granular material.

7. A telephone transmitter comprising a leaf spring, a granule chamber secured thereto, suitable electrodes in said chamber, granular resistance-varying material between said electrodes, a sound-receiving diaphragm and a transmitting spring between said diaphragm and said leaf spring to transmit the vibrations of the former to the latter.

8. A telephone transmitter comprising a supporting frame, a leaf spring engaging said frame, a granule chamber having relatively movable walls connected respectively to said frame and leaf spring, suitable electrodes in said chamber, granular resistance-varying material between said electrodes, a sound-receiving diaphragm and a transmitting spring between said diaphragm and leaf spring to transmit the vibrations of the former to the latter.

9. A telephone transmitter comprising a supporting frame, a leaf spring engaging said frame, a granule chamber comprising a cup and a membranous cover therefor, said cup and cover being secured at opposite points to said leaf spring and frame, suitable electrodes in said chamber, granular resistance-varying material between said electrodes, a sound diaphragm and a transmitting spring between said diaphragm and leaf spring to transmit the vibrations of the former to the latter.

10. A telephone transmitter comprising a supporting frame, a leaf spring engaging the same, a cup secured to the center of said spring, a membrane covering said cup so as to form a granule chamber therewith and secured at its center to said frame, suitable electrodes in said chamber, granular resistance-varying material between said electrodes, a sound diaphragm and a transmitting spring between said diaphragm and leaf spring to transmit the vibrations of the former to the latter.

11. A telephone transmitter comprising a supporting frame having a member provided with a laterally deflected portion, a leaf spring spanning the space formed by said portion, a cup secured to said spring and lying within said space, a membrane for closing said cup so as to form a granule chamber therewith, said membrane being secured to the deflected portion of said member, suitable electrodes in said chamber, granular resistance-varying material between said electrodes, a sound-receiving diaphragm adjacent to said leaf spring, and

a second spring acting between said diaphragm and leaf spring to transmit the vibrations of the former to the latter.

12. A telephone transmitter comprising a sound-receiving diaphragm, a bridge having a deflected portion, a granule chamber lying in the space formed by said deflected portion, and having relatively movable walls, means for securing one of said walls to the deflected portion of said bridge, a leaf-spring spanning the space formed by said deflected portion, means for securing said leaf-spring to the other of said walls, suitable electrodes in said chamber, and granular resistance-varying material between said electrodes, said bridge, chamber and attached parts forming a detached unitary structure.

13. A telephone transmitter comprising a sound-receiving diaphragm, a cup, an auxiliary diaphragm covering said cup so as to form a granule chamber therewith, suitable electrodes in said chamber, granular resistance-varying material between said electrodes, means acting between said chamber and sound-receiving diaphragm to give the latter an initial flexure, and compensating means for preventing an undue resulting flexure of the auxiliary diaphragm.

14. A telephone transmitter comprising a sound-receiving diaphragm, a granule chamber having a flexible membranous wall, suitable electrodes in said chamber, granular resistance-varying material between said electrodes, and transmitting means between said diaphragm and membranous wall comprising means for giving said diaphragm an initial flexure and compensating therefor so as to prevent an undue resulting flexure of said membranous wall.

15. A telephone transmitter comprising a supporting frame, a spring supported granule chamber carried thereby, coöperating electrodes located in said chamber, granular resistance-varying material between said electrodes a sound receiving diaphragm and springs acting between said chamber and frame and diaphragm.

16. A telephone transmitter comprising a supporting frame, a yieldingly supported granule chamber carried thereby, relatively movable electrodes located in said chamber, granular resistance-varying material between said electrodes, a sound-receiving diaphragm and springs acting between one of said electrodes and said frame and diaphragm.

17. A telephone transmitter comprising a supporting frame, a cup flexibly carried by said frame, a membrane covering said cup so as to form a granule chamber therewith, electrodes located in said chamber, granular resistance-varying material between said electrodes, a sound-receiving diaphragm and springs acting between said chamber and frame and diaphragm.

18. A telephone transmitter comprising a supporting frame, a cup flexibly carried by said frame, a membrane covering said cup so as to form a granule chamber therewith, co-operating electrodes carried by said cup and membrane respectively, granular resistance-varying material between said electrodes, a sound-receiving diaphragm and springs acting between said chamber and frame and diaphragm.

19. A telephone transmitter comprising a supporting frame, a granule chamber flexibly carried thereby, said chamber having relatively movable parts, one of which is rigidly held by said frame, suitable electrodes in said chamber, granular resistance-varying material between said electrodes, a sound-receiving diaphragm and springs acting between a movable part of said chamber and said frame and diaphragm.

20. A telephone transmitter comprising a supporting frame, a cup, a membrane covering said cup so as to form a granule chamber therewith, said membrane being rigidly secured at one point to said frame, suitable electrodes in said chamber, granular resistance-varying material between said electrode, a sound-receiving diaphragm and springs acting between said cup and said frame and diaphragm.

21. A telephone transmitter comprising a front plate, a bridge, a flexibly supported granule chamber having relatively movable walls, suitable electrodes in said chamber, resistance-varying material between said electrodes, a sound-receiving diaphragm bearing at its periphery against said front plate, and a spring acting between said chamber and diaphragm, said bridge, chamber and attached parts forming a detachable unitary structure.

22. A telephone transmitter comprising a front plate, a bridge having a deflected portion, a granule chamber lying in the space formed by said deflected portion and having relatively movable walls, means for securing one of said walls to the deflected portion of said bridge, a leaf-spring spanning the space formed by said deflected portion, means for securing said leaf-spring to the other of said walls, suitable electrodes in said chamber, granular resistance-varying material between said electrodes, a sound-receiving diaphragm bearing at its periphery against said front plate, and a spring acting between said chamber and diaphragm, said bridge, chamber and attached parts forming a detachable unitary structure.

23. A telephone transmitter comprising three unitary structures, the first consisting of a front plate and mouthpiece, the second being a sound-receiving diaphragm, and the

third including a bridge member having a laterally deflected portion, a granule chamber secured thereto and lying within the space formed by said deflected portion, and yielding operative connecting means by which the vibrations of the sound-receiving diaphragm are communicated to said chamber when the parts are assembled.

24. A telephone transmitter comprising three unitary structures, the first consisting of a front plate and mouthpiece, the second being a sound-receiving diaphragm, and the third including a bridge member having a deflected portion, a granule chamber lying within the space formed by said deflected portion and having relatively movable walls, means for securing one of said walls to the deflected portion of said bridge member, a leaf-spring spanning the space formed by said deflected portion, means for securing said leaf-spring to the other of said walls, suitable electrodes in said chamber, granular resistance-varying material between said electrodes, and a spring secured to said leaf-spring and adapted to engage said sound-receiving diaphragm when the parts are assembled.

In witness whereof, I hereunto subscribe my name this 13 day of March, 1906.

WILLIAM KAISLING.

Witnesses:
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