Sept. 26, 1950 J. H. MALONEY ET AL 2,523,769

CALLING UNIT

Filed Jan. 12, 1949

Fig. 1

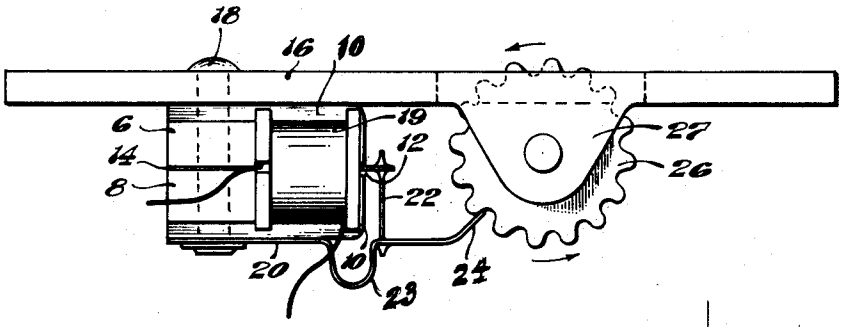
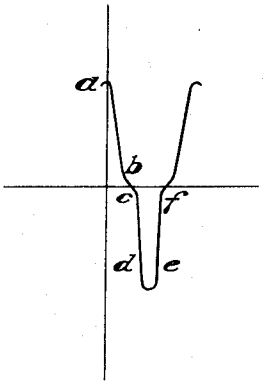



Fig. 2



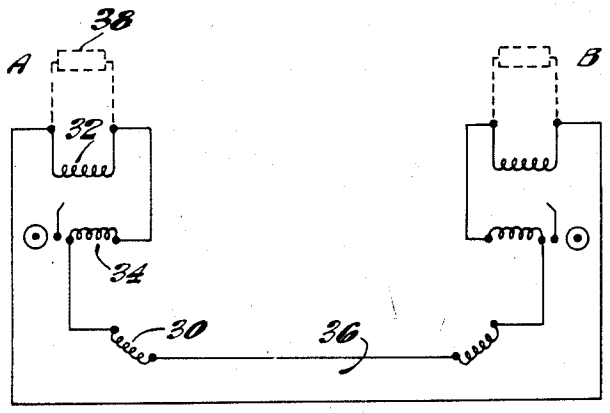




Fig. 3

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2,523,769

## CALLING UNIT

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Application January 12, 1949, Serial No. 70,476

2 Claims. (Cl. 171—209)

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The present invention relates to calling units, particularly suitable for use in telephone circuits of the sound-powered type such as described in the Muldoon application, Serial No. 670,585, filed May 17, 1946.

Since a sound-powered unit has no battery or other external source of power, it is desirable to provide a calling unit which likewise is independent of any external source. The principal object of the present invention is to provide such a calling unit which is simple and inexpensive and which will give an audible signal over a suitable calling range.

With this object in view, the principal feature of the present invention comprises a unit which is associated with the telephone and arranged in the circuit so that upon manual operation it generates an audible signal which can be heard in the receivers of both instruments. In its best form the unit comprises a series magnetic circuit having a vibrating armature constructed in a manner similar to that shown for the transducer in the above-mentioned Muldoon application. However, a feature of the present invention comprises a unit in which the armature is caused to move into and break away from actual contact with the pole pieces whereby a high-energy signal is generated. Other features of the invention consist of certain novel features of construction and combinations and arrangements of parts hereinafter described and particularly defined in the claims.

In the accompanying drawings Fig. 1 is a side elevation on an enlarged scale of the preferred form of ringing or calling unit; Fig. 2 is a diagram illustrating the change of flux through the armature upon operation of the unit; and Fig. 3 is a diagram of the preferred circuit.

The calling unit comprises two magnets of the permanent-magnet type, preferably of high coercive material. The magnets are shown at 6 and 8 and consist of small blocks of permanently magnetized material. The magnets are connected in series, that is with the north pole of one magnet adjacent to the south pole of the other. The magnets are provided with pole pieces 10 extending outwardly from the magnets and curved together to form a small air gap 12. An armature of flexible magnetic material indicated at 14 is secured between the two magnets and extends through the gap 12. The magnets, the pole pieces and armature as well as a base 16 are all secured together preferably by a single securing member shown as a rivet 18. A winding 19 surrounds the armature.

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A flat spring member 20, preferably a copper beryllium, is mounted along one of the pole pieces and is secured by the rivet 18. It is connected by a pin 22 with the end of the armature and is stressed in such a direction as normally to hold the armature 14 against one of the pole pieces (shown as the upper pole piece of Fig. 1). The spring has a bend 23 to give some flexibility and is curved so that its end portion 24 normally lies between two teeth of a manually operable wheel 26. The wheel 26 is journaled in a yoke 27, and a portion of the wheel extends through a slot in the base, whereby it may be engaged by the thumb for rotation in a counterclockwise direction. The wheel has a series of steep cam teeth, so that when the end 24 of the spring rises up on a tooth the spring pulls the armature away from the upper pole piece and causes it to snap into engagement with the lower pole piece. Upon further rotation the spring falls off the tooth and the spring forces the armature away from the lower pole piece into contact with the upper piece. Upon rapid rotation of the wheel this snap action of the armature occurs a number of times in rapid succession. A voltage dependent upon the rate of change of flux through the armature is then generated in the winding 19.

The flux changes are represented in Fig. 2. This is a graph illustrating the variation of flux with angular displacement of the wheel 26. At the zero position representing the wheel at rest, the flux through the armature is represented by the ordinate *a*. The armature is first pulled away from the pole piece thereby causing an extremely rapid change of flux represented by the portion of the curve *ab*. From *b* to *c* the armature is in motion across the gap and the variation of flux occurs at a slower rate. The steep portion of the curve from *c* to *d* represents the change of flux due to actual contact of the armature with the lower pole piece. From *d* to *e* the spring is riding on top of a tooth. From *e* to *f* the spring is falling into the space between two teeth at which time the spring pushes the armature away from the lower pole piece and moves it toward the upper one; this portion of the curve is similar to portion *ab* but in the reverse direction. As the spring passes over and between the teeth in succession, the curve repeats the foregoing steep changes in rapid succession. Since the voltage in the winding 19 is proportional to the rate of change in flux in the armature, a relatively high voltage is generated by reason of the extremely rapid changes

of flux occasioned by the actual attraction of the armature into contact with a pole piece and the breaking away of the armature from a pole piece. Thus a signal of considerable intensity may be transmitted, even with only the mechanical energy that can be supplied through the thumb wheel **26**.

The diagram of the preferred circuit is shown in Fig. 3. Two handsets A and B are shown diagrammatically, each preferably having a sound-powdered transmitting and a sound-powdered receiving transducer of the type shown in the above-mentioned Muldoon application. The construction of the handset is preferably as shown in the Baker application Serial No. 70,475, filed January 12, 1949. The transducers are shown diagrammatically at **30** and **32** respectively for handset A and are identical for handset B. A calling unit of the present invention is shown diagrammatically at **34** for each handset. The several unit of each unit are conveniently connected in series, and the two handsets are connected together by wires **36**. The receiver of each handset may be supplied with a shunt condenser **38** to provide a low-impedance path for the higher frequencies generated by the calling device, without materially impairing the speech characteristics of the telephone. With this circuit, operation of either calling device **34** causes a squawking noise to be emitted from the transducers of both handsets. Since the signal is emitted at the calling end, as well as at the receiving end, the circuit provides supervision against a broken connection.

The calling unit as herein shown is suitable for mounting in the handset itself, as shown in the above-mentioned Baker application. However, it may be provided with a wall mounting, and may, if desired, be arranged for crank operation in order to give a calling signal of higher energy level or of longer sustained duration than can be obtained by a thumb wheel.

Having thus described the invention, we claim:

1. A calling unit for telephones comprising two permanent magnets in series, the magnets having pole pieces forming a small air gap, an armature of magnetic material secured at one end between the magnets and having its other end portion between the pole pieces, a spring member normally holding the armature against one of the pole pieces, and a manually operated cam member to engage the spring member to vibrate the armature rapidly into actual contact with the two pole pieces alternately, and a winding inductively associated with the armature.

2. A calling unit for telephones comprising two permanent magnets in series, the magnets having pole pieces forming a small air gap, an armature of magnetic material secured at one end between the magnets and having its other end portion between the pole pieces, a spring member normally holding the armature against one of the pole pieces, and a manually operated member having a series of steep teeth to engage the spring member to vibrate the armature rapidly into actual contact with the two pole pieces alternately, and a winding inductively associated with the armature.

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RANDALL B. BAKER.

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## Certificate of Correction

Patent No. 2,523,769 September 26, 1950

JOHN H. MALONEY ET AL.

It is hereby certified that the name of the assignee in the above numbered patent was erroneously described and specified as "Wheeler Insulated Wire Co. Incorporated" whereas said name should have been described and specified as *The Wheeler Insulated Wire Company, Incorporated*; and that the said Letters Patent should be read as corrected above, so that the same may conform to the record of the case in the Patent Office.

Signed and sealed this 12th day of December, A. D. 1950.

[SEAL]

THOMAS F. MURPHY,
*Assistant Commissioner of Patents.*

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