May 7, 1957 J. E. BERRY 2,791,762

SENSORY AID FOR THE BLIND

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FIG. 1.

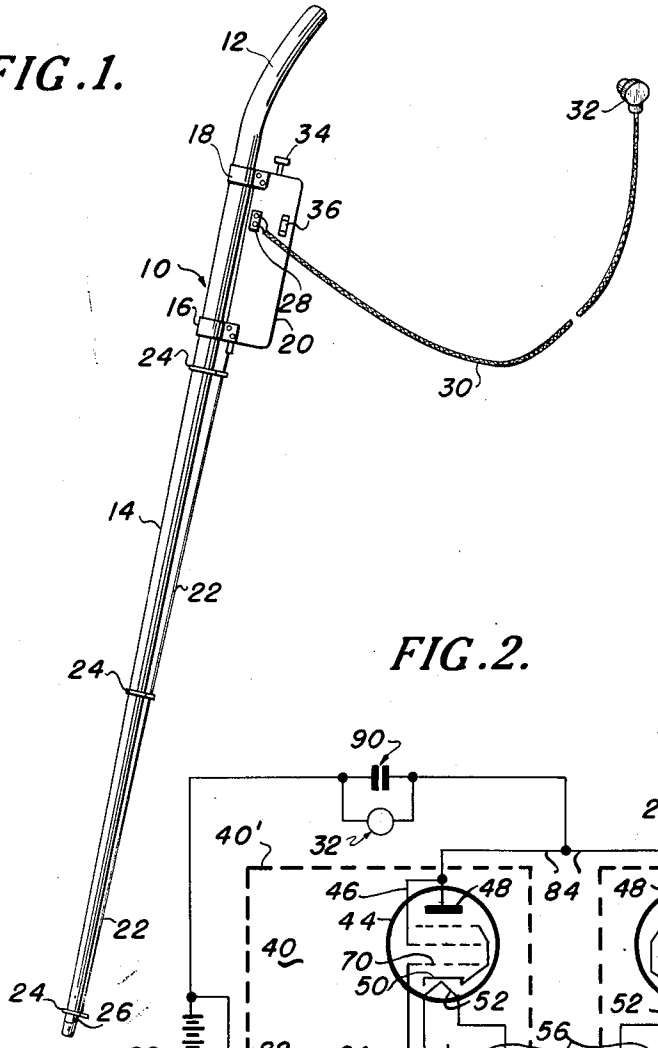
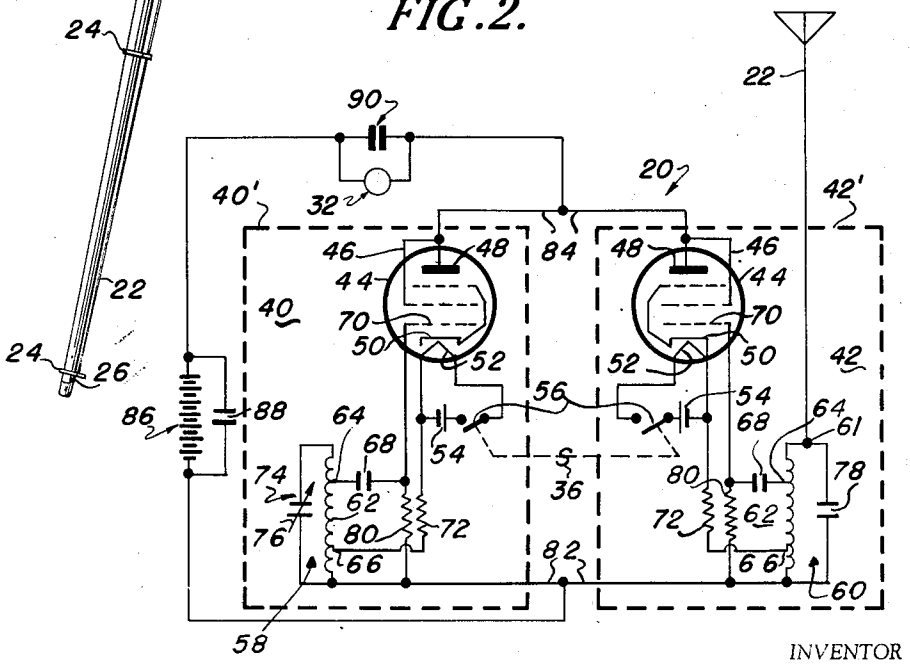


FIG. 2.



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SENSORY AID FOR THE BLIND

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The primary object of this invention is to provide a sensory aid for blind persons, and more particularly, the provision of an electrically equipped cane or the like which senses and indicates the nature of the area surrounding the cane.

The invention embodies an oscillation system which is made to produce an audible tone upon the change of capacitance reflected into a circuit by means of a probing antenna. In other words, movement of an object or other variable factor in predeterminable relation to an apparatus embodying the invention, or movement of the apparatus relative to an object, causes variations in the capacity of the oscillating system, which in turn brings about variations in the frequency of oscillation of the system and such frequency variations provide audible tones.

With the use of a cane equipped with electrical apparatus according to this invention, a blind person may have better contact with his environment. As he moves through a room, along the sidewalk, across the street, etc., the omnipresent electrostatic fields of his immediate surroundings combine to have a definite, capacitive effect upon the probing antenna. Different surroundings will produce different capacitive effects, and therefore, a variety of audio tones are available.

These different tones soon become distinctive to a blind person, and each will apprise him of a particular condition in his surroundings. For example, they will inform him of the presence or approach of objects in his pathway and give him the relative distance to such objects. They will give him warning when he is approaching a sudden change of contour in his path or his surroundings and will provide a constant signal when he is walking along a sidewalk, for example, or beside a building. Thus, with this invention a blind person no longer needs to feel his way along with an ordinary cane in the conventional tapping manner.

Therefore, another object of this invention is to provide electrical apparatus for a blind person, so that he may easily be apprised of the condition of his surroundings.

More specifically, an object of the invention is to cause said electrical apparatus to produce an audible tone, the frequency of which is relative mainly to the non-atmospheric environment.

It is another object of this invention to produce said audible tone for the stated purposes by the principle of heterodyning.

Other objects of the invention and the full scope thereof will be apparent from the following specification and appended claims in combination with the appurtenant drawings in which:

Figure 1 illustrates exemplary apparatus embodying the invention; and

Figure 2 is a schematic drawing of an exemplary oscillation system suitable for practicing the invention.

In reference to Figure 1, there is shown an exemplary sensory aid in accordance with this invention comprising a cane 10 having a handle 12 and a leg portion 14. Affixed to the upper part of the leg 14 by clamps 16

and 18 is an oscillation system in a unit 20. The antenna comprises a wire or flexible lead 22 which is mounted by antenna clips 24 to the leg 14 at intervals during its extension therealong from the oscillation unit 20 to the tip 26. Antenna 22 has a definite normal capacity, and this capacity is affected by surrounding objects, the result of which is to change the frequency of the oscillation system in unit 20. Connected to unit 20 by connector 28 and leads 30 is a hearing aid type earphone 32 which reproduces audibly the result of frequency changes in the oscillation system. The audio frequency may be adjusted by tuning knob 34 (to be explained more fully hereinafter), and switch 36 turns the electrical unit 20 off or on.

It will be appreciated that many varieties of oscillators may be utilized within the unit 20 to produce an audio tone, the only criterion being that the circuit be capable of responding suitably to changes reflected thereto by the antenna. Therefore, not only a regular audio oscillator but beat-frequency or heterodyne oscillators may be used. Figure 2 illustrates the use of heterodyning oscillators, this being the preferable method of obtaining the audio tones. The two oscillator circuits 40 and 42 contained within dash lines 40′ and 42″, respectively, are each illustrated as a species of the well known Hartley oscillator. Again this is merely an exemplary showing, the shunt-feed Hartley, Colpitts, Meissner, tickler feedback, reverse feedback, tuned-plate, tuned-grid, crystal, magnetostriction, negative-resistance, relaxation, transistor, or saturable reactor oscillators, to name but a few, being just as suitable. Also, even though the two oscillator circuits 40 and 42 are illustrated as being of the same type, no limitation thereto is intended since, for example, oscillator 40 could be a crystal controlled circuit while oscillator 42 could be any of the other type oscillators.

With reference now to Figure 2 in detail, it will be noted that each exemplary oscillator circuit 40, 42 contains a pentode tube 44 whose screen grid is connected by a line 46 to its plate electrode 48 and whose suppressor grid is tied to its cathode 50. The filament 52 for each pentode 44 is supplied with heating power by batteries 54, respectively, and a double pole single throw switch 36 having a pole 56 in each filament-battery circuit.

Producing the oscillations in conjunction with each tube 44 is a tank circuit 58 for oscillation circuit 40 and a similar tank circuit 60 for oscillation circuit 42. Each tank circuit 58, 60 has an oscillator coil 62 which is tapped at points 64 and 66, the former tap being coupled by grid-leak condenser 68 to the control grid 70 and the latter via resistor 72 to cathode 50. Across the whole of coil 62 is connected a condenser to complete each tank circuit 58, 60. The condenser 74 in parallel with coil 62 in tank circuit 58 is preferably (but need not be) a variable condenser, as indicated by the arrow 76, and may be varied by the tuning knob 34 shown in Figure 1. However, the condenser 78, paralleling coil 62 in tank circuit 60, is preferably (but need not be) a fixed condenser, but attached to the tank circuit 60 at junction 61 is antenna 22 whose capacitance is effectively varied according to its surroundings, as previously explained. The effective capacity of antenna 22 may be considered to be in parallel with condenser 78 at all times and therefore effects the impedance of tank circuit 60 to vary the frequency thereof. Each tube 44 obtains its control grid 70 operating bias through resistor 80 which is connected thereto and to the bottom of each coil 62.

The oscillations circuits 40 and 42 are connected in parallel with each other by interconnecting the tank circuits with a line 82 and the plate electrodes 48 with a line 84. Between lines 82 and 84 is connected the oscil-

lation sustaining battery **86** and earphone **32**, each of which is paralleled by an R.-F. bypass condenser **88** and **90**, respectively. Since the two oscillation circuits are in parallel, their frequencies of oscillation beat together and by well known heterodyne principles form a difference frequency when their frequencies of oscillation differ in the least. The difference frequency is utilized directly, in this example, as the audio tone in the earphone **32**.

The operation of the sensory aid is as follows: The blind person first turns on switch **36** which immediately allows each self-excited oscillation circuit **40**, **42** to begin generating oscillations to produce an audio tone in earphone **32** if the oscillations in the two circuits differ in frequency. The operator may then adjust reference oscillator **40** with tuning knob **34** to cause a definite and familiarly pitched audio tone (or, alternatively, a zero beat—no audio tone) to appear in earphone **32** while he has the cane leg **14**, and consequently the antenna **22**, related in a predetermined position to a predetermined object or the like. Upon moving the cane leg **14**, the operator will hear a new audio tone if the surrounding objects, terrain, and/or contours become different, since the effective antenna capacitance varies with the surroundings. In a short time, a blind person with his acute senses will be able to distinguish a multitude of tones and relate each to particular surroundings.

The cane can, of course, be utilized in the conventional manner at the same time as it is being used in accordance with this invention. However, it is not necessary at all that a cane per se be used in the practice of this invention as long as the oscillation system has some sort of holder for the operator to handle and a movable antenna. The invention may be practiced without the condenser **76** being variable and, therefore, with no tuning knob **34**. However, it is notable that seasonal weather and daily temperature variations may cause the antenna capacity to change (the rate of change of which is comparatively slow), and the adjustability of the reference frequency of oscillation of circuit **40** by tuning knob **34** sufficiently compensates for such weather changes.

The sensitivity of the sensing aid can be varied by varying the basic operating oscillation frequencies, for the higher the operating frequency of oscillation circuits **40** and **42**, the less percentage change is necessary in the frequency of circuit **42**, and consequently, in the antenna capacity, to produce the same audio-difference frequency. Therefore, the system can be made to respond to changes in surroundings when said changes are within predetermined large or small distance limits according to the operating frequency of the system. Satisfactory sensitivity has been found to exist with apparatus of the type illustrated when the operating frequency thereof was in the 75 kc. band. Values of circuit elements for operation at that frequency are as follows, although it will be understood that the invention is not limited to the frequency noted or the values listed:

Tubes **44**	CK–542 pentode
Condensers **68**	150 mmf.
Condenser **74**	0–45 mmf.
Condensers **78**	5 mmf.
Condenser **88**	1 mf.
Condenser **90**	.002 mf.
Resistors **72**	1200 ohms, ⅓ watt.
Resistors **80**	1 megohm, ⅓ watt.
Batteries **54**	1½ volts.
Battery **86**	22½ volts.

Modifications of this invention not described herein will become apparent to those skilled in the art. Therefore, it is intended that the matter contained in the foregoing description be interpreted as illustrative and not limitative, the scope of the invention being defined by the appended claims.

I claim:

1. A sensory aid for the blind comprising an oscillation system for producing frequencies in the audio range, said system having a tank circuit of variable impedance, and said frequencies in the audio range corresponding respectively to the variations of said tank circuit impedance, an antenna coupled to said tank circuit for varying the impedance thereof in accordance with the surroundings of said antenna, and means for holding said oscillation system and said antenna, said holding means comprising a cane-like structure.

2. A sensory aid for the blind comprising an oscillation system for producing frequencies in the audio range, an antenna coupled to the oscillation system, said antenna having a variable effective capacitance and said frequencies in the audio range corresponding respectively to the variations of said effective capacitance, and means comprising a cane-like structure for holding said oscillation system and antenna, the arrangement being such that the effective capacitance of the antenna varies in accordance with its surroundings.

3. A sensory aid for the blind comprising an oscillation system for producing difference frequencies in the audio range, an antenna connected to the oscillation system, said antenna having a variable effective capacitance and said difference frequencies corresponding respectively to the variations of said effective capacitance, and means comprising a cane-like structure for holding said oscillation system and antenna, the arrangement being such that the effective capacitance of the antenna varies in accordance with its surroundings.

4. A sensory aid for the blind comprising a cane-like structure for holding a unit including a reference frequency oscillator and a variable frequency oscillator interconnected in parallel to produce difference frequencies in the audio range, and an antenna connected to the variable frequency oscillator, said antenna having a variable effective capacitance and said difference frequencies corresponding respectively to the operating frequencies of said variable frequency oscillator and thereby to the variations of said effective capacitance, the arrangement being such that the effective capacitance of the antenna varies in accordance with its surroundings.

5. A sensory aid for the blind comprising a cane-like structure for holding a unit including an adjustable reference frequency oscillator and a variable frequency oscillator interconnected in parallel to produce difference frequencies in the audio range, and an antenna having a variable effective capacitance and said difference frequencies corresponding respectively to the operating frequencies of said variable frequency oscillator and thereby to the variations of said effective capacitance, the arrangement being such that the effective capacitance of the antenna varies in accordance with its surroundings.

6. A sensory aid for the blind comprising a cane-like structure for holding a unit including a Hartley type reference frequency oscillator and a Hartley type variable frequency oscillator interconnected in parallel to produce difference frequencies in the audio range, means to detect said difference frequencies and an antenna having a variable effective capacitance and said difference frequencies corresponding respectively to the operating frequency of said variable frequency oscillator and thereby to the variations of said effective capacitance, the arrangement being such that the effective capacitance of the antenna varies in accordance with its surroundings.

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