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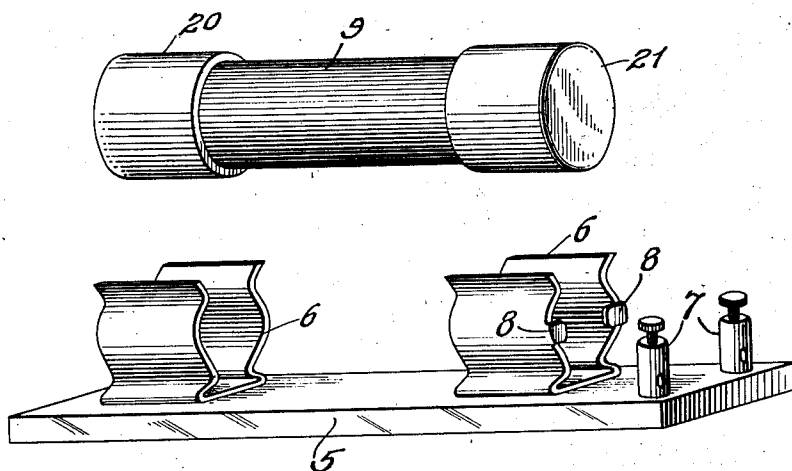
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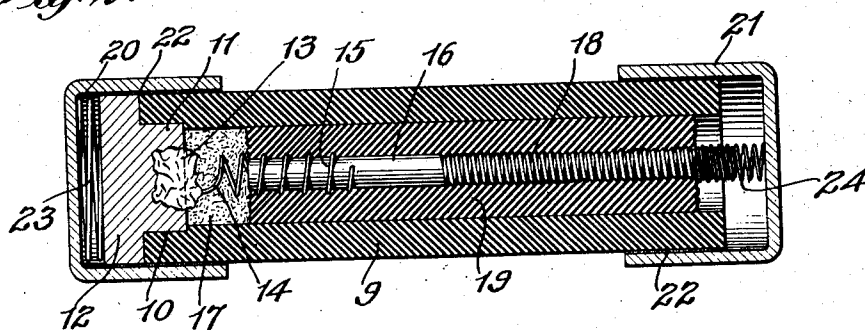
CRYSTAL DETECTOR

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*Fig. 1.*



*Fig. 2.*



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## UNITED STATES PATENT OFFICE.

FREDERICK MICHELS AND ADOLPH ERISMAN, OF NEW YORK, N. Y.

## CRYSTAL DETECTOR.

Application filed September 16, 1922. Serial No. 538,539.

*To all whom it may concern:*

Be it known that we, FREDERICK MICHELS and ADOLPH ERISMAN, both citizens of the United States, and residents of New York city, county and State of New York, have invented certain new and useful Improvements in Crystal Detectors, of which the following is a specification.

This invention relates to crystal detectors such as are identified with the art of radio communication.

The primary object and purpose of our present invention is to provide a crystal detector of the fixed type, namely, one wherein the conducting wire or cat whisker is permanently located upon the most sensitive point of the exposed face of the galena, silicon or other crystal material. One of the prominent characteristics of our instrument resides in the fact that the several parts are so constructed and assembled that notwithstanding severe shocks or jars incident to accident or abuse, the conducting element will not be dislodged or moved from the sensitive spot on the crystal face.

In a preferred embodiment of the invention, we construct the device in the form of a cartridge which is adapted for removable engagement in a holder or adaptor connected in the line circuit so that the said cartridge can be easily removed, and a new cartridge inserted therein. Thus the maximum efficiency in detection is obtained by simply attaching the device to the radio set.

It is another object of our invention to provide a fixed crystal detector in which the surface of the crystal is protected against the accumulation of dust particles thereon which would interfere with the sensitivity of the device.

With the above and other objects in view, the invention resides in the improved form, construction and relative arrangement of the several parts as will be hereinafter more fully described, illustrated in the accompanying drawings and subsequently incorporated in the subjoined claims.

In the drawing wherein we have disclosed one desirable and practical embodiment of the invention and in which similar reference characters designate corresponding parts throughout the several views,

Figure 1 is a perspective view showing

the detector cartridge separate from the holder or adaptor; and

Figure 2 is a longitudinal sectional view through the detector cartridge.

In the drawing for purposes of illustration, we have shown the holder or adaptor as composed of an elongated base or slab 5 of a suitable insulating material and upon which the spaced spring metal clips 6 of suitable form and construction, are secured. These clips are respectively connected on the under side of the base by means of wires with the binding post 7 to which the line circuit wires of the radio set are adapted to be connected. The opposed side portions of each clip 6 is provided at one of its edges with an inwardly projecting lug 8. These lugs prevent longitudinal shifting movement of the detector cartridge in the holding clips.

In the form of our invention which we have selected as best illustrating the structural features thereof, the body of the cartridge consists of a cylindrical tube 9 of non-conducting material. This tube at one of its ends is counterbored as at 10, to receive the reduced portion 11 of a metal block or crystal holder 12. In this reduced portion of the holder, the galena or silicon 13 is molded and projects from the face thereof.

After the crystal holder has been inserted in the end of the cartridge body, one end of the conducting wire or cat whisker 14 is engaged with the face of the crystal. This wire has a coil portion 15 closely engaged upon one end of a rod 16. The cartridge body is arranged in a vertical position with the metal block 12 resting upon a suitable support and the rod 16 is manipulated until the free end of the wire 14 is engaged upon the most sensitive spot on the crystal face. This may be readily determined by making suitable tests. After properly adjusting the wire 14 on the crystal, a suitable non-conducting material in powdered or comminuted form, as shown at 17, is poured into the tubular body 9 so that it will pack closely upon the crystal face and around the end portion of the wire 14 projecting from the rod 16. This rod for a portion of its length is formed with threads 18 so that when the non-conducting material 19 such as wax or other composition in fluid form

is poured into the cartridge body 9, it will collect in the threads 18 and around the rod 16 and the coils of the wire 14. Thus upon the hardening of this non-conducting material, these parts are held in fixed relation to each other so that the conducting wire 14 cannot shift on the rod 16. At the same time, it will be observed that the end portion of the wire projecting beyond said rod is held against any movement relative to the crystal by the closely packed non-conducting material 17.

Over the ends of the tubular body 9, metal caps 20 and 21 respectively, are engaged and are permanently secured thereon by a coating or film of shellac indicated at 22, applied to the ends of the cartridge body. However, it is apparent that other means might be utilized for fixing the metal caps in position. Between the end wall of the cap 20 and the crystal holder block 12, a wire spring 23 is arranged and a smaller spring 24 is engaged upon the threaded end of the rod 16 and bears against the end wall of the other cap 21. These springs 23 and 24 merely act as conductors to electrically connect the crystal and the rod 16 with the respective metal caps.

In the use of our device, it is merely necessary to insert the cartridge in the adapter shown in Figure 1, the metal caps at the ends thereof being engaged in the respective spring clips 6 whereby the circuit is closed. No further adjustment of any kind is required and in the operation of the radio set the highest degree of sensitiveness is obtained. It has been determined in practice that owing to our construction of the cartridge and the manner of assembling the several parts as above explained, the device will withstand very rough handling or abuse and even after being repeatedly dropped will possess its original responsiveness, thus indicating that no displacement of the conducting wire from the sensitive spot on the crystal face had occurred. It sometimes happens, however, that due to static or other natural forces, the sensitiveness of the detector is destroyed. In such cases it is merely necessary to detach the cartridge from the clips 6 and insert a new cartridge in its place.

From the foregoing, it will be appreciated that we have devised a very simply constructed and inexpensive crystal detector for use in connection with radio signaling apparatus and one which is also of rugged and substantial construction. We have herein referred to a particular form and relative arrangement of the several elements comprising the device, but it is evident that in practice it might be found desirable to make numerous alterations therein. Accordingly, it is to be understood that the invention may be embodied in numer-

ous other alternative constructions and, we therefore, reserve the privilege of resorting to all such legitimate changes as may be fairly incorporated within the spirit and scope of the appended claims.

We claim:

1. A crystal detector for radio apparatus comprising a tubular body, a crystal holder extending into one end of said body, an insulated conductor extending through said body, a crystal in said holder, a flexible conducting element connected to said insulated conductor and engaged at one of its ends upon the face of the crystal, a comminuted non-conducting material surrounding the crystal and said flexible conducting element to prevent displacement of the latter, and circuit closing contact members fixed upon the ends of the tubular body.

2. A crystal detector for radio apparatus comprising a tubular body of non-conducting material, a crystal holder engaged in one end of said tubular body and provided with detector crystal, a rigid conducting rod, a flexible conducting wire connected to one end of said rod and engaged at its other end upon the crystal face, a comminuted non-conducting material closely packed against the crystal face and around said conductor wire to prevent displacement of the latter, means for fixing the conductor rod against movement relative to the tubular body, and metal contact caps permanently secured upon opposite ends of said body and closing the same and connected respectively with the contact rod and said crystal holder.

3. As a new article of manufacture, a crystal detector for radio apparatus in the form of a cartridge for detachable engagement in an adaptor connected in the radio line circuit, said cartridge consisting of a tubular body of non-conducting material, a detector crystal enclosed within one end of said body, conducting means extending through the body and including a coiled flexible wire engaged with the sensitive point of the crystal, a comminuted insulating material confining said wire against movement relative to the crystal and metal caps permanently closing the opposite ends of the cartridge body connected with the crystal and the conducting means respectively and constituting circuit closing contacts.

4. The method of permanently fixing a cat whisker upon the most sensitive point of a radio detector crystal, which consists in mounting the crystal within one end of a tubular body, then positioning the end of the cat whisker upon the sensitive point of the crystal face and connecting said cat whisker with a conductor, then packing a dry comminuted insulating material within

said body against the crystal face and around the end of the cat whisker to hold the latter against displacement from the sensitive point on the crystal face, and finally anchoring the cat whisker and the conductor within said tubular body and against bodily movement relative to each other.

5 5. The method of permanently fixing a cat whisker upon the most sensitive point  
10 of a radio detector crystal, which consists in mounting the crystal within one end of a tubular body, then positioning the end of the cat whisker upon the sensitive point of the crystal face and connecting said cat  
15 whisker with a conductor, then packing a dry comminuted insulating material within

said body against the crystal face and around the end of the cat whisker to hold the latter against displacement from the sensitive point on the crystal face, and finally filling the remaining space within said tubular body with an insulating material in fluid form to solidify around and upon said conductor and upon a part of the cat whisker to thereby permanently anchor the  
20 same within said tubular body against movement relative to each other.

In testimony that we claim the foregoing as our invention, we have signed our names hereunder.

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