June 1, 1926. 1,586,672

E. L. HACKETT

CRYSTAL DETECTOR

Filed Sept. 5, 1922 2 Sheets-Sheet 1

FIGURE 1

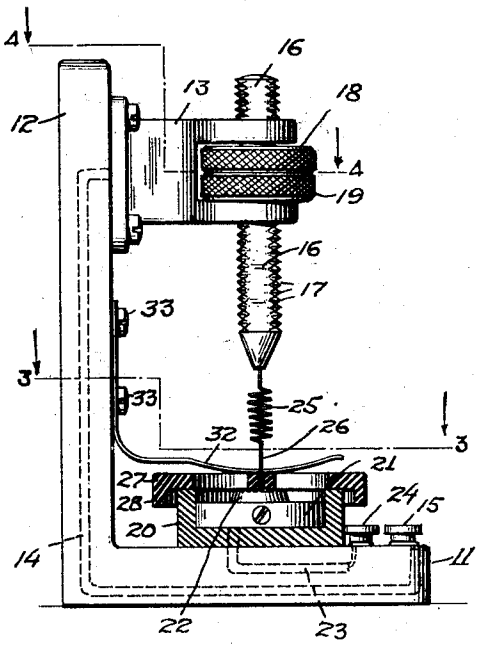


FIGURE 2

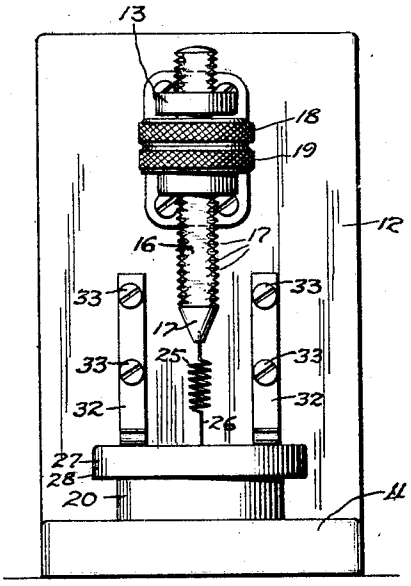


FIGURE 3

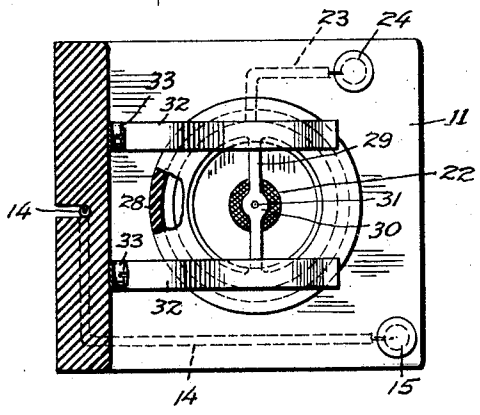
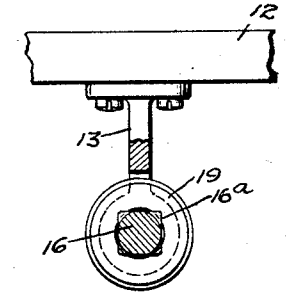


FIGURE 4



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CRYSTAL DETECTOR

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FIGURE 5

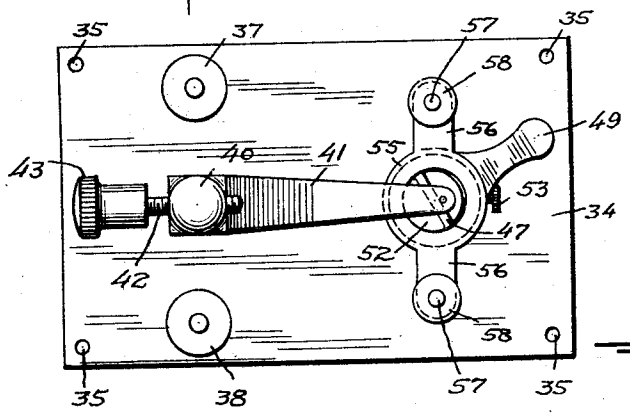


FIGURE 10

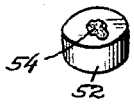


FIGURE 9

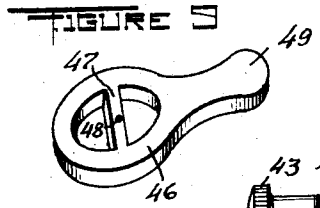


FIGURE 6

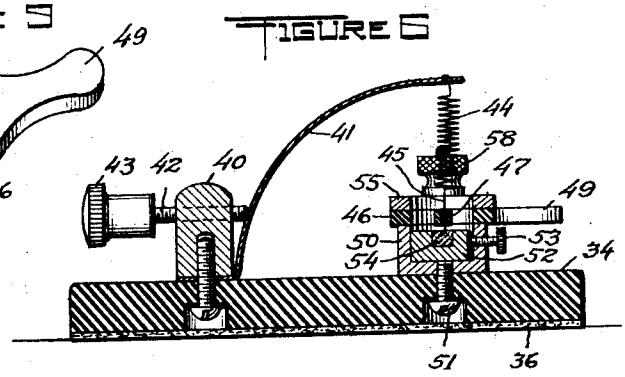


FIGURE 7

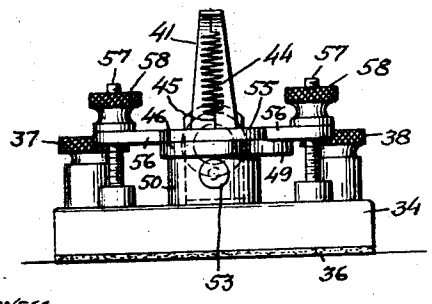
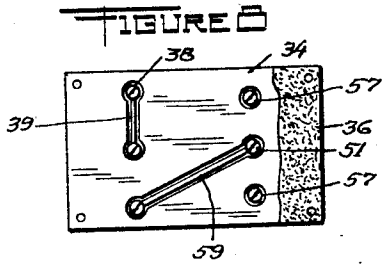


FIGURE 8



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UNITED STATES PATENT OFFICE.

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CRYSTAL DETECTOR.

Application filed September 5, 1922. Serial No. 586,176.

My invention relates to crystal detectors, used in radio receiving mechanism, my purpose being to improve the adjustability of certain parts movable relatively to the crystal and coacting directly therewith.

In crystal detectors of ordinary construction there is a crystal having a surface more or less sensitive to electrical impulses and for this purpose controllable by the reception of wave energy, and in contact with this surface is a small and delicate electrode, known as a whisker, made usually of wire. With crystal detectors constructed and operated in the usual manner, it is in practice found necessary to repeatedly shift the whisker slightly in its position relatively to the crystal, in order that the received signals may be rendered clear.

I have made the discovery that if the whisker when once properly adjusted upon the crystal be held rather firmly in the position in which it is thus adjusted, it is not necessary to repeat the adjustment as often as heretofore usually been considered necessary.

What I seek to do, therefore, is to provide means for enabling the operator to obtain a very delicate adjustment of the whisker upon the crystal and to automatically hold that adjustment until the operator sees proper to disturb it by another adjustment.

Reference is made to the accompanying drawing forming a part of the specification, and in which like reference characters indicate like parts throughout the several figures.

Figure 1 is a substantially central vertical section through a crystal detector provided with one form of my invention.

Figure 2 is a front elevation of the mechanism shown at Figure 1.

Figure 3 is a section on the line 3—3 of Figure 1, looking in the direction indicated by the arrows.

Figure 4 is a fragmentary view, partly in plan and partly in section, of the screw stem shown in Figures 1 and 2 and parts immediately associated with said screw stem.

Figure 5 is a plan view of a crystal detector equipped with another form of my invention.

Figure 6 is a substantially central vertical section through the mechanism shown in Figure 5.

Figure 7 is a front elevation of the mechanism shown in Figure 5.

Figure 8 is an inverted plan of the mechanism appearing in Figure 5, and partly broken away.

Figure 9 is a perspective of the spider shown in Figures 5, 6 and 7 as a means for enabling the operator to adjust the whisker relatively to the detector crystal.

Figure 10 is a perspective of the crystal and its setting.

A base 11 is provided with an upwardly-extending portion 12, these parts being made of insulating material as indicated in Figure 3.

Mounted upon the portion 12 is a bracket 13, made of metal and having the form shown. A wire 14 leads from the bearing 13 to a binding post 15.

Extending through the bracket 13 is a screw stem 16 having in cross section the form of a so-called screw, as indicated in Figures 1, 2 and 4; that is to say, it is flattened upon four sides, in such manner as to leave fragmentary threads 17 at the four corners thus formed. The screw stem extends loosely through two openings in the bracket 13, one of these openings being shown in Figure 4 at 16^a. Two nuts 18 and 19 are fitted upon the screw 16 and thus carried by the bracket 13. The nut 18 serves as a nut lock for holding the nut 19 against rotation. The operator, by loosening the nut-lock 18, can turn the nut 19 so as to release the screw stem 16; and this done, the nut-lock 18 and the nut 19 may be together turned practically as a unit. By this arrangement the screw stem 16 may be raised or lowered at the will of the operator. When the screw stem is properly adjusted, the nut 18 is tightened upon the nut 19.

Mounted upon the base 11 is a cup 20, and within this cup is a setting 21, carrying the crystal which appears at 22. The setting 21 is connected by wire 23 with a binding post 24.

The whisker is shown at 25, and depends from the lower end of the screw stem 16. The whisker has a general helical form, and is provided with a straight portion 26 which rests upon the crystal.

Resting upon the cup 20 is a spider 27, made of insulating material, such as hard rubber or celluloid. The spider 27 has in this instance a general circular form, and is provided with an annular flange 28 and with a cross bar 29, these parts being preferably integral with it. The cross bar 29 is provided with an enlarged portion 30, and with a hole 31 extending centrally through this enlarged portion.

A pair of leaf springs 32 are secured upon the portion 12 of the base by means of screws 33. The springs 32 press gently upon the spider 27, and hold it firmly in the various positions into which it is moved from time to time by hand. The flange portion 28 of the spider 27 has an internal diameter somewhat greater than the external diameter of the cup 20 so that the spider 27 can be moved slightly in relation to the cup 20 in an infinte number of directions, parallel with the upper face of the crystal.

The binding posts 15 and 24 are connected with an aerial and a ground wire, or with such other conductors as may be employed for the purpose of guiding the received energy through the instrument.

The operation of the form of my device illustrated in Figures 1 to 4, inclusive, may be readily understood from the foregoing discription.

The parts being assembled and arranged as shown in the drawing and above described, and the binding posts 15 and 24 being properly connected, the signals are received in the manner well known in this art. Whenever the detector needs adjustment, the operator grasps the spider 27 and by a sliding movement shifts it a slight distance relatively to the cup 20 upon which it rests. By doing this he shifts the portion 26 of the whisker relatively to the crystal 22. When the operator finds the adjustment to be the best obtainable he simply removes his hand from the spider 27, and the adjustment thus obtained now remains until something goes wrong so that another adjustment is called for, and then the operation is repeated.

In the form of my device shown in Figures 5 to 8 inclusive, the base 34 is made of insulating material and is provided with holes 35 for receiving screws for holding it down upon a table or the like.

The base carries a mat 36 for engaging the surface of the table.

Mounted upon the base 34 are a pair of binding posts 37 and 38. A conductor 39 (see Figure 8) leads from the binding post 38 to a stationary post 40, and extending through this stationary post is a screw 42, provided with a head 43 in the form of a knob.

A tongue 41 is connected with a stationary post 40, and is engaged by the screw 42. The tongue 41 is made of spring metal and carries a whisker, shown at 44. The whisker has a general overcoil form and is provided with a straight portion 45. A spider 46, made of insulating material, is provided with a cross bar 47 through which extends a hole 48. The spider is further provided with an extending portion 49, serving as a handle.

The spider 46 rests upon a cup 50, and this cup is held in position upon the base by means of a screw 51. Mounted within the cup 50 is a setting 52, carrying the detector crystal 54. The setting 52 is held rigidly within the cup 50 by means of a screw 53.

A clamping ring 55 rests upon the spider 46 and is provided with extending portions 56, and extending through holes in these portions are stationary screws 57. Fitted upon these screws are milled nuts 58, which engage the extending portions 56.

The operator by grasping the handle 49 can slide or turn the spider 46 relatively to the cup 50, and by so doing can shift the portion 45 of the whisker into different positions relatively to the crystal. When the spider is thus shifted from one position to another, it is held firmly in position by pressure of the clamping ring 55.

The operator may at will from time to time adjust the pressure of the clamping ring 55 upon the spider 46. This he does by simply turning the nuts 58.

As the spider 46 is located a little above the top of the crystal, the cross bar 47 is at all times out of engagement with the crystal. Such being the case the straight portion 45 of the whisker extends snugly but loosely through the hole in the cross bar, and thus rests upon the crystal. If at any time the operator wishes for the portion 45 of the whisker to press a little upon the crystal, or if he wishes to cause it to relax its pressure thereupon, he grasps the knob 43 and turns the screw 42 so as to increase or diminish the pressure of this screw upon the spring tongue 41. By doing this he adjusts the tension of the whisker relatively to the crystal. If he so desires, he can so turn the screw 42 that the spring tongue 41 lifts the whisker entirely out of engagement with the crystal.

With either form of my device, an adjustment once made is retained for a long time. Where the device is carried by a vessel at sea, the rolling and pitching of the vessel do not serve to disarrange the adjustment. With the parts properly proportioned, even the firing of heavy guns at a reasonable distance from the detector does not disturb its adjustment.

Except as above otherwise specified, the structure and action of the form of my device shown in Figures 5 to 10 inclusive is like the structure and action previously de-

scribed with reference to the other figures.

I claim:

1. In a crystal detector the combination, with a crystal and a whisker engaging the same, of mechanism engaging said whisker at a point in immediate proximity to the crystal, said mechanism while thus engaging said whisker being normally stationary but movable by the operator for the purpose of shifting the whisker relatively to the crystal.

2. In a device of the character described the combination, with a crystal, a whisker engaging the same and means for supporting the whisker, of a member movable relatively to the crystal and engaging a portion of the whisker at a point very close to the crystal, for the purpose of adjusting said portion of the whisker relatively to said crystal, said member while thus engaging said whisker being normally stationary, but movable by the operator for the purpose of shifting the whisker relatively to the crystal.

3. A device of the character described comprising a crystal, a mounting for said crystal, a whisker provided with an end portion resting upon said crystal, and mechanism engaging said end portion at a point in immediate proximity to the crystal, said mechanism while thus engaging said whisker being normally stationary, but movable by hand for the purpose of adjusting the whisker relatively to the crystal.

4. The combination of a crystal provided with a face, a whisker provided with an end portion resting upon said face, means controllable at the will of the operator for tensioning said whisker thus resting upon said face, and a member engaging said whisker at a point immediately adjacent the crystal, said member while thus engaging said whisker being normally stationary but movable by the operator in a direction substantially parallel with said face, for the purpose of adjusting the whisker relatively to the face of the crystal.

5. A device of the character described comprising a crystal, means for supporting the same, a spider provided with a portion disposed in immediate proximity to said crystal and for the purpose of engaging a whisker resting upon the crystal, and means for supporting said spider so as to render it normally stationary while engaging said whisker, and yet allow freedom of movement between said crystal and said whisker.

6. A device of the character described comprising a crystal, a mounting for supporting the crystal, a whisker engaging the crystal, means for supporting the whisker, and a spider located in close proximity to the crystal and provided with a hole through which extends a portion of the whisker, said spider being movable by hand in a plane crossing the direction in which said portion of the whisker extends.

7. A device of the character described comprising a crystal, a mounting for supporting the crystal, a whisker for engaging the crystal, means for supporting said whisker and for controlling its pressure upon the crystal, and mechanism independent of said means and provided with a movable member engaging said whisker, for the double purpose of shifting the portion of the whisker in immediate proximity to the crystal and of holding said portion in the position into which it is thus shifted.

8. A device of the character described comprising a crystal, a mounting for supporting the same, a whisker made of wire and having a straight portion for engaging the crystal, means for supporting the whisker and for controlling its pressure upon the crystal, and mechanism connected with the straight portion of the whisker and controllable by the operator for the purpose of confining the straight portion of the whisker to a predetermined portion of the crystal.

EDWIN L. HACKETT.