June 29, 1937. M. H. A. LINDSAY 2,085,198

MICROPHONIC SWITCH

Original Filed June 22, 1934

Fig. 1.

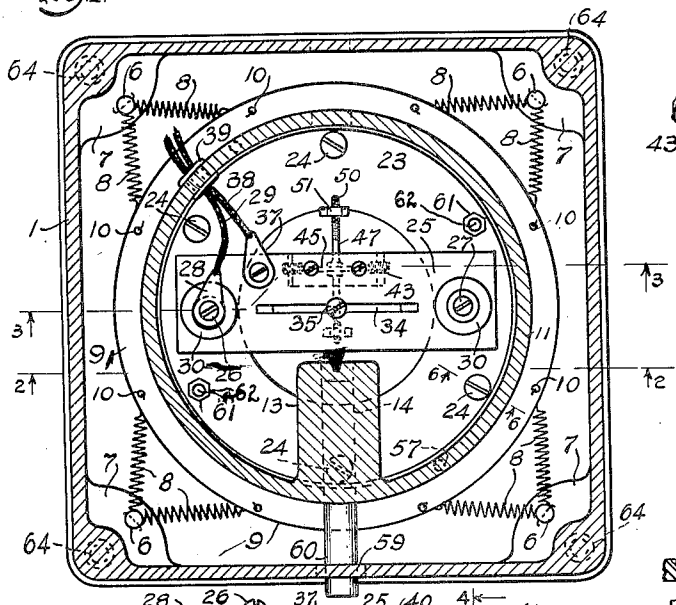


Fig. 5.

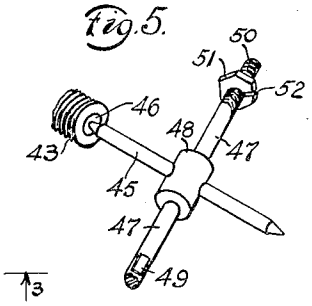


Fig. 3.

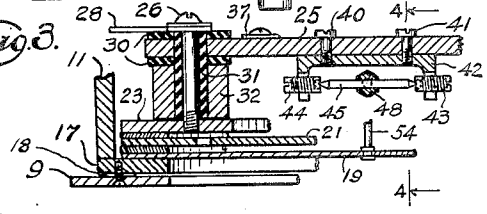


Fig. 4.

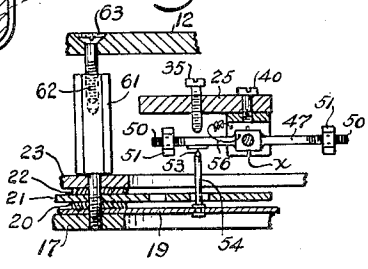


Fig. 2.

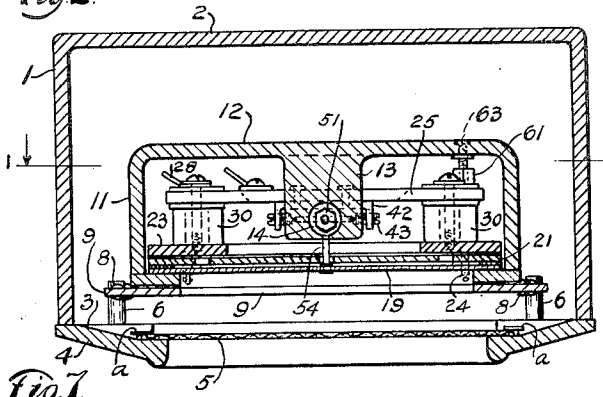


Fig. 6.

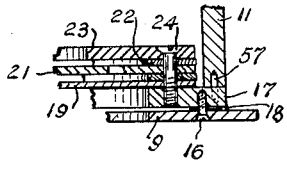
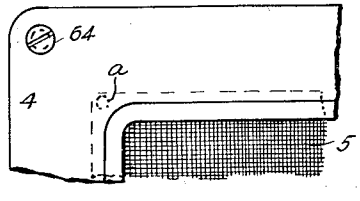


Fig. 7.



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MICROPHONIC SWITCH

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Application June 22, 1934, Serial No. 731,838
Renewed February 18, 1937

5 Claims. (Cl. 200—52)

The present invention relates to an improvement in microphonic switches and has for its object the provision of means for accurately and easily adjusting the coacting vibration-sensitive means to desired degrees of sensitivity.

One advantage of the present structure is that, due to the manner of operative connection of the vibration-sensitive means by contact pressure, any degree of sensitive pressure contact setting is maintained constant under all temperature variations.

Another advantage is that such pressure contact settings remain unchanged and constant under any buckling of the diaphragm from any cause.

A further advantage is that the settable pressure contact means may be adjusted to a minimum, or a maximum amount of vibration-sensitivity in adjustably utilizing the inertia of a given or fixed mass, thus excluding, or including, operative vibrations or sounds of different intensity, as desired.

These and other features of advantage will be apprehended as the description proceeds and it is obvious that modifications may be made in the structure herein, without departing from the spirit hereof or the scope of the appended claims.

In the drawing,

Fig. 1 is a sectional, plan view of the microphonic switch shown in its outer enclosing housing, taken on the line 1—1, Fig. 2, looking in the direction of the arrows;

Fig. 2 is a sectional view taken on line 2—2, Fig. 1, looking in the direction of the arrows;

Fig. 3 is a fragmentary sectional view taken on a side elevation of the inertia mechanism, and sectioned on line 3—3, Fig. 1, looking in the direction of the arrows;

Fig. 4 is a sectional view of the inertia mechanism taken on the line 4—4, Fig. 3, looking in the direction of the arrows;

Fig. 5 is an enlarged perspective view of the inertia mechanism, with one of its appurtenant jeweled bearings;

Fig. 6 is an enlarged fragmentary sectional view taken on line 6—6, Fig. 1, looking in the direction of the arrows, and

Fig. 7 is a fragmentary bottom view of one corner of the screen cover plate.

As in Fig. 2, the complete detector unit comprises a preferably rectangular outer housing 1, having an integral closed top 2 and an open bottom 3, the latter being protected by an apertured cover plate 4, which aperture is protected by a meshed wire screen 5. A plurality of upright standards 6 are rigidly mounted to the corner flanges 7 of cover plate 4, the upper ends thereof being drilled and acting as stays to support one end of the coiled suspension springs 8, the other ends of said springs being attached to a dielectric, supporting base ring 9, the ring being drilled at points 10—10, Fig. 1, thus to hold the sensitive microphone horizontally and in a resilient and shock absorbing manner.

The microphone is enclosed in a housing, having a circular wall 11, and an integral top 12 and has an interiorly located integral lug 13 therein, which is located against the inside face of circular wall 11 and the underface of top 12. The lug 13 extends radially towards the axis of housing and stops short of the center thereof, as in Fig. 1. The lug has a bore 14 extending throughout its length, the purpose of which will be later described.

The resiliently supported dielectric base ring 9, Figs. 2, 3, 4 and 6 acts as a foundation ring and has affixed thereto oy means of screws, such as 16, Fig. 6, a second superimposed metallic base ring 17, the plural screws 16 threadedly engaging and holding dielectric ring 9 and base ring 17, which is preferably of brass, in fixed assembly.

On each screw 16, is a small thin brass washer 18, these acting as spacers between rings 9 and 17.

Upon the top face of ring 17 is mounted a metallic diaphragm 19, and upon the diaphragm is mounted a thin metallic ring gasket 20 upon which is superposed a perforated restriction disc 21, which in turn has superposed thereon a thin metallic gasket ring 22. Upon the gasket 22 is mounted a metallic restriction and support ring 23. As in Fig. 6, all of the elements above noted, from 17 to 23 inclusive, are held together by flat head screws 24, Figs 1 and 6, these being entered from the top of support ring 23, and being threadedly connected to bottom ring 17.

Support ring 23, as in Figs 1, 2 and 3, has mounted thereto an inertia switch mounting plate 25, which is held in spaced aperture position on said ring 23 by two screws 26—27 at opposite ends. Under the head of screw 26 is mounted an electric connecter 28 to which is attached an electric conductor 29, for purposes later to be described

The screw 26, Fig 3, is in electrical contact with support ring 23, and is insulated from mounting plate 25 by two dielectric washers 30—30 and a dielectric bushing 31, which in turn is located in a spacer bushing 32. The other screw 27 is mounted as described above for screw 26, with

the exception that screw 27 does not act as a conductor

Support plate 25, as in Fig 1 has its mid-portion traversed by a saw kerf or slot 34, which at its center is threaded to receive therein an adjustable inertia bar stop screw 35, Fig 4, the function of which will be described later. Pinching of the plate 25 on opposite sides of the slot, causes the screw 35 to be frictionally held in any adjusted position.

Support plate 25, Fig. 1, has affixed thereto an electric connecter 37, to which conductor 38 is connected and said conductor with conductor 29 is let out through a dielectric bushing 39 in wall 11 of the housing, to a current source and a relay alarm circuit not shown.

Support plate 25, Figs. 1 and 3, supports on its underface, by means of screws 40—41 a channel shaped inertia switch bearing member 42, the opposed, channel forming legs of which, Fig. 3, mount threaded adjustable jewel bearing set screws 43—44.

Into the bearing seats of the jewels 46 is pivotally mounted a dual taper-ended staff 45. The staff 45 is, in turn centrally mounted transversely in the thickened central portion 48 of inertia balance bar 47, this being shown enlarged, in perspective, in Fig. 5, wherein one end of the staff 45 is shown in the jewel 46 of screw 43.

As in Figs. 4 and 5, the inertia balance bar 47 is threaded on both of its ends 50—50, and two inertia members in the form of balance or counter-weights 51—51 of fixed mass, are adjustably mounted on the threaded ends 50—50. The counterweights are preferably in the form of hexagonal nuts, and, as in Fig. 5, the nuts have one side split, as at 52, whereby they may be pinched slightly to close the threaded bore a slight increment, thereby to make the members 51 hold more firmly to their threaded ends. The bearing ends supporting the adjustable jewel screws are likewise split, as in Fig. 4 at X for the same purpose.

As in Fig. 5, one leg of the inertia balance bar 47 has attached thereto by welding, on its underface, as shown in Fig. 4, a platinum contact point 49. This point coacts with the platinum point 53 of the diaphragm affixed, centrally located stylus 54, to form and maintain a non-fusing, electrical contact therebetween.

Inasmuch as the mounting of the staff 45 in jewel bearings insulates the staff and inertia balance bar out of electrical contact with support ring 25, a flexible gold wire 56 of small diameter is connected between the balance bar center 48 and the pivot bearing 42, to establish electrical contact therebetween, with a minimum of resistance to free pivotal action of the inertia balance bar 47. As described, the inertia balance bar 47, which acts as an inertia switch, is very delicately mounted for free oscillatory movement in its jewelled bearings.

The stop screw 35, Fig. 4, is adjusted to limit the upward movement of the adjacent leg of the inertia balance bar 47 which is located over the top of contact stylus 54 of the diaphragm 19.

As a means to removably affix the cover 11—12 to proper registered position on supporting base ring 9, a rim pin 57, Fig. 6, located in ring 17 fits a corresponding bore in the rim of wall 11, shown dotted in Fig. 1, and thereby causes the registry of the bore 14 in cover 11—12 with one of the counterbalances 51, so that with the both covers 2 and 11—12 in closed position, a wrench may be inserted through joint registering bores 59 and 14, Fig. 1, to adjust said counterweight to or fro for sensitivity variation, as desired. If desired, adjusting orifices for moving both counterbalance members 51—51 may be provided.

A plug 60, Fig. 1, normally closes bore 14 tightly, and extends through enlarged bore 14*a* in housing 2, so as to be manually manipulated for removal and replacement. Thus the interior of the switch is kept dust free and tight.

To hold housing 11—12 to ring 17, two upright, hexagonal threaded end posts 61 threadedly and firmly engage the ring assembly 17 to 23 inclusive, Fig. 4, the upper ends of said posts having threaded bores, as at 62, to receive flat head screws 63 which hold the cover 11—12 to ring 17.

The screen cover 4 is held to the open bottom of housing 2 by four screws 64, shown dotted in Fig. 1, at each corner. The screen 5 is affixed to the frame of cover plate 4 by escutcheon pins *a*, as in Figs. 2 and 7.

As herein shown and described the microphonic switch is intended to guard desired protected areas such as bank vaults, safes and other closed places, and is normally connected up in primary closed circuit, not shown, to be broken when vibrations occur to operate the diaphragm, which moves the inertia switch about its axis, disconnecting the contact of tip 53 and contact 49, this breaking of the circuit being effective to operate a secondary electric, relay alarm circuit, not shown, and thus cause visible and audible alarms to be set off.

The current flows from a source not shown, through conductor 29, through screw 26 through bottom ring assembly 17 to 23, including diaphragm 19, through stylus 54, through the inertia switch element 47 through wire 56 to bearing 42, to support bar 25 and from thence through connecter 37 and conductor 38, back to source of current.

Due to the settability of the counter weights, upon assembly and the later adjustability for desired degree of vibration sensitivity, the herein described microphonic switch may be set to meet any condition of requirements.

As shown above, the housing 1 is closed at one side by the thin metal diaphragm 19. Immediately behind the diaphragm 19 and separated from it by a thin air gap is the perforated plate 21 which serves the double function of protecting the diaphragm from injury if struck from the outside, since its motion would then be limited by the distance to this plate, and also to provide a suitable damping for the diaphragm to suppress its amplitude at its resonant frequency. Were this damping not provided, the detector might be super-sensitive at the resonant frequency, and thereby initiate false alarms, if even weak sounds of this frequency continued for some time. Immediately above this plate 21 and separated from it by a small distance, is the restriction or baffle ring 22, which permits the air which is compressed between the diaphragm and the plate to vent into the housing cavity containing the detector mechanism 57 to 53. The size of this housing cavity has been determined by acoustical measurements so as to provide the necessary amplification of low frequency sounds to insure a relatively uniform frequency characteristic.

Having thus described the invention what is claimed is:

1. A microphonic switch detector comprising a diaphragm actuatable by sound vibrations; a contact part operatively connected to the dia-

phragm; a movable inertia switch member; a contact device connected to said member and in contact with the contact part, whereby the inertia member may be moved by the diaphragm to vary the pressure between said device and said contact part; and means for adjusting the pressure of said device on the contact part and adjusting the inertia effect of said member independently of said pressure.

2. A microphonic switch detector comprising a diaphragm actuatable by sound vibrations; a contact part operatively connected thereto; an intermediately fulcrumed inertia switch member; a contact device operatively connected with the member in contact with the contact part of the diaphragm whereby the member may be moved by the diaphragm to vary the pressure between said device and said contact part; and weights adjustable on opposite arms respectively of the member and disposed in position for adjusting the pressure of said member on the contact part of the diagram and adjusting the inertia effect on said member independently of said pressure.

3. A microphonic switch detector comprising a supporting ring; a metal diaphragm supported across said ring; a perforated plate immediately behind said diaphragm and forming with the diaphragm a thin air gap, and a contact switch operatively connected to the diaphragm.

4. A microphonic switch detector comprising a housing closed except at one side; a metal diaphragm closing said side; a perforated plate immediately behind said diaphragm said plate forming, with said housing, an amplifying cavity.

5. A microphonic switch detector comprising a diaphragm actuatable by sound vibrations and having a contact part thereon; a movable inertia switch member in contact with the contact part, whereby the inertia member may be moved by the diaphragm to disengage said member from the contact part; and means for adjusting the pressure of said member on the contact part; a movable weight; and adjustable means for adjustably connecting the weight to the switch member for adjusting the inertia effect of said member independently of said pressure.

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