March 31, 1953 J. A. RAYDER 2,633,205

MANUALLY ADJUSTABLE SOUND DETECTOR FOR ACCURATELY LOCATING DEFECTS IN HIGH OR LOW SPEED MOTORS AND MACHINERY

Filed May 13, 1952

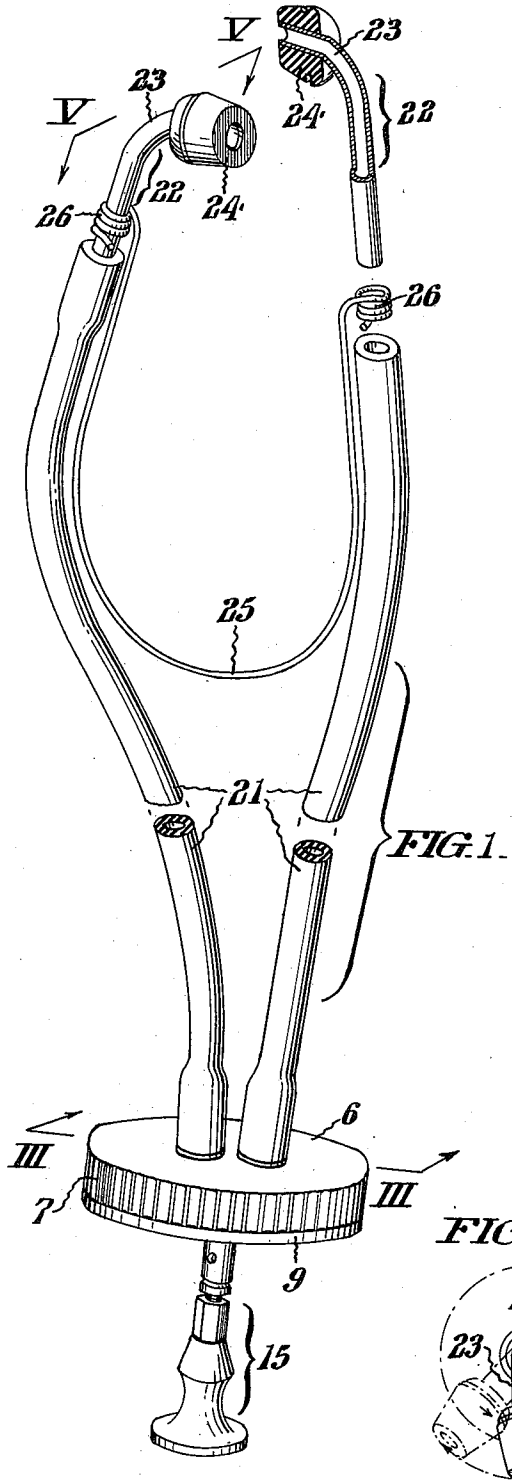


FIG. 1.

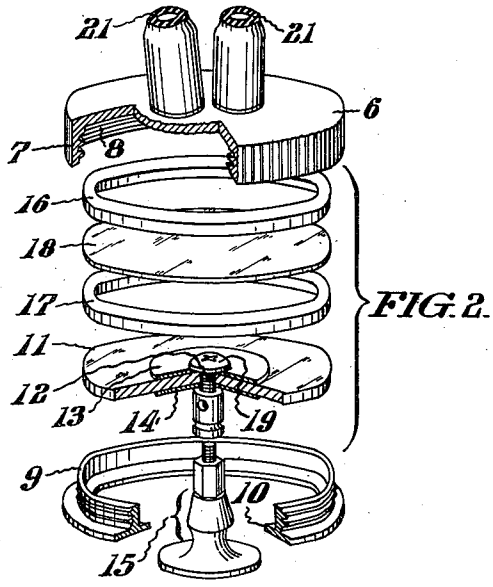


FIG. 2.

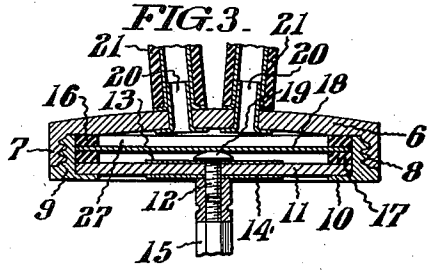


FIG. 3.

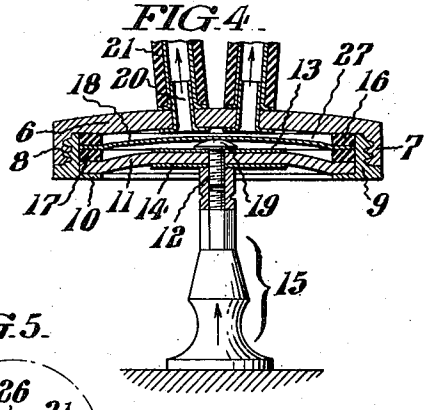


FIG. 4.

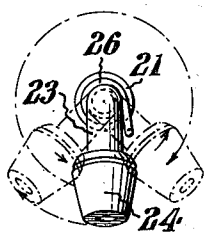


FIG. 5.

Joseph A Rayder

INVENTOR

Patented Mar. 31, 1953

2,633,205

UNITED STATES PATENT OFFICE

2,633,205

MANUALLY ADJUSTABLE SOUND DETECTOR FOR ACCURATELY LOCATING DEFECTS IN HIGH OR LOW SPEED MOTORS AND MACHINERY

Joseph A. Rayder, Philadelphia, Pa.

Application May 13, 1952, Serial No. 287,657

1 Claim. (Cl. 181—24)

1

This invention relates to what I preferably term a sound locator or detector that enables the user to promptly determine and accurately establish the correct position of "knocks and other defects" caused by worn bearings, bent shafts, out of balance conditions, lack of adequate local lubrication, and air or liquid leaks, as well as lack of proper operating clearance conditions; and/or excessively worn parts.

A primary object of this invention is the provision of a device, of the above indicated species, that is functionally superior to all previously known devices of an analogous character; and which gives the user super-sensitive indications as to the accurate location of any operating defects. In other words by the use of my new and useful detector device, normally inaudible defect-caused noises or sounds are greatly amplified and recognized, before a serious breakdown may develop, which thereby enables rectification before any such defect is permitted to increase to an extent that may create a dangerous hazard.

Another object of my invention is to provide a sound detector, of the type above indicated species, including relatively spaced diaphragms, one of which serves to pick up the sound vibrations; whereas the other functions to amplify and transmit the magnified vibrations for direct conduction only into aural tubes and the ears of the user.

With the foregoing and subsidiary objects in view, this invention essentially consists of a sound detector device embodying a substantially-rigid amplifying diaphragm, with an axially-spaced flexible pick-up diaphragm; and means enabling the pick-up diaphragm to be flexed into substantially point-contact centrally of the amplifying-diaphragm; whereas the latter is positively prevented from similar contact with the "inner" ends of the aural tubes: in combination with swivelly-mounted variably-adjustable ear-plugs for engagement in the user's ears of the said sound detector device.

In order that my invention may be clearly understood, I will now describe the same with reference to the accompanying sheet of illustrative drawings, wherein like characters of reference are applied to corresponding parts in all the views.

In the drawings:

Fig. 1 is a broken perspective view of a typical embodiment of my improved or novel sound detector.

Fig. 2 is an exploded perspective view of the elements included in the sound detector and amplifying structural portion of my invention.

2

Fig. 3 is a diametric section through the structure portion defined by Fig. 3, or taken as indicated by the angled-arrows III—III in Fig. 1, with the parts in normal position.

Fig. 4 is a similar section to Fig. 3, but showing the parts in active relation with respect to an element being examined; and,

Fig. 5 is a detail view of one of the improved earplugs preferably included in my invention, said view being taken as conventionally indicated by the angled-arrows V—V in Fig. 1.

In describing the typical embodiment of my invention illustrated by the drawings like characters of descriptive reference are applied to corresponding parts in all the views; while specific terms are preferably employed for the sake of clarity, each term however being intended to embrace all equivalents which perform the same function for an analogous purpose.

Referring now more in detail to the drawings, my improved or novel sound locator and amplifier comprise a dished housing 6, preferably of hard rubber or other appropriate material, including a surrounding or annular flange 7 that is interiorly screw-threaded at 8, for reception of a somewhat T-section assembly or clamp-ring 9 that embodies an inwardly-directed rim-portion 10, see Figs. 2–4 to best advantage. The rim-portion 10 in turn affords bearing for a readily flexible pick-up diaphragm 11, to which are centrally secured, as by an axially located set-screw 12, a pair of inner and outer thin substantially rigid sheet material washers 13, 14, respectively, whereas the outer or free end portion of the threaded-shank of said set-screw 12 serves for coupler-attachment of a conventional contact-rod or pick-up device 15, as readily understood by those conversant with the art.

Snugly fitted within the housing 6 are a pair of insulate-material or flexible rubber spacer rings 16, 17, intermediate which is perimetrically held a second or sound-amplifying diaphragm 18; said diaphragm 18 being conveniently, although not essentially, of comparatively thin sheet plastic or analogous material. At this juncture it is to be particularly noted that the pick-up diaphragm 11 serves only to pick-up the sound vibrations or waves originating at, or emanating from, the defect or fault being sought by the users of my improved device and thereby prevent telegraphing or transmittal of such sound waves otherwise than directly to the amplifying diaphragm 18. Furthermore, it is also to be particularly remarked that the preferably rigid washers 13, 14, function to protect the pick-up diaphragm 11 regionally of its center portion

from unnecessary flexure relative to the amplifier-diaphragm 18. In other words the washers 13, 14 expand the pick-up area as the diaphragm 11 is moved into substantially point contact, by the convexed head 19 of the set-screw 12, against the amplifying-diaphragm 18, as hereinafter again referred to.

Referring back again to the housing 6, said housing is, in accordance with known practice, equipped with diametrically-spaced outlet nipples 20, for application of flexible sound conducting tubes 21; the free ends whereof are equipped with, torsionally-influenced ear-plugs 22. Each such ear-plug 22, see Figs. 1 and 5, is preferably of L-shaped or elbowed with the shorter or bent portions 23 having truncated tips 24 for obvious insertion into the ears of the user. These plugs 22 are torsionally-influenced by aid of a length of stirrup or U-shaped wire 25 having the leg end portions spirally-coiled at 26 to a determinate diameter, for frictional grippage of the elbow-shaped straight portions of the ear-plugs 22, as clearly appreciable from Figs. 1 and 5. It will, furthermore, be readily understood that by turning the plugs 22 in one direction they can be easily adjusted and, incident to the inherent recoil action of the spiral portion 26, held in the best position for most effective placement in, and removal from, the user's ear-holes. Still further, by the use of the wire 25 the device, as a whole, is not only materially lightened in weight, when compared with analogous known instruments, but it is rendered capable of more facile flexture in use, or when out of use.

In use it will now be quite clear that the operator, when the center of the defect or the accurate source of the trouble is definitely located and heard, by lateral manipulation of the device, in accordance with known practice, the user simply exerts a down pressure on the housing 6, and appropriately marks the exact location of the picked-up defect, it being clearly understood that the density of the noise or sounds, caused by the defect, is transmitted from the sound chamber 27, of the device 6, acoustically, to inform the user of said device, of the exact region of the fault sought to be located.

I claim:

In a device of the type described, a dished housing embodying an annular flange, an associated relatively-inverted clamp-ring threadedly-engaged therein, and said clamp-ring having the leg portion vertical with the cross-portion horizontal; a pick-up device comprising a sheet-plastic diaphragm engageable on the clamp-ring cross-bar inner portion, said diaphragm having upper and lower substantially rigid sheet-metal concentric washers, and a convex-headed screw co-axially maintaining the pick-up diaphragm and washers in co-active assembly for attachment to a conventional contact-rod or similar element; a sound-amplifying diaphragm of imperforate sheet plastic supported, inwardly of the pick-up diaphragm, within the dished housing and clamp-ring by flexible insulating-material lower and upper spacer-rings, and said spacer rings jointly serving to normally maintain the sound-amplifying diaphragm free of direct contact against the assembly-screw convex-head and to define a sound chamber intermediate such diaphragm and the confronting inner face of the dished-housing, as well as to enable manual pressure of such amplifying-diaphragm into direct contact against the screw-head; sound conducting tubes extending from the dished-housing with angled ear-plugs in their free ends; a U-shaped wire element spacedly connecting said ear-plugs in assembled relation; and the leg-sections of said element each embodying a spirally-coiled section having capacity for expansion and recoil-grippage to effect attachment and radial adjustment of the respectively associated ear-plug.

JOSEPH A. RAYDER.

REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

Number	Name	Date
599,064	Papendell	Feb. 15, 1898
1,811,558	Porter	June 23, 1931
1,994,008	Torrance	Mar. 12, 1935

FOREIGN PATENTS

Number	Country	Date
14,059	Great Britain	Aug. 26, 1899