United States Patent [19]

Kuhn

[11] **3,851,117**

[45] **Nov. 26, 1974**

[54] **ELECTROMAGNETIC SOUND PICKUP FOR THE REPRODUCTION OF QUADROPHONIC SOUND RECORDINGS AND THE LIKE**

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[22] Filed: **Apr. 18, 1973**

[21] Appl. No.: **352,189**

[30] **Foreign Application Priority Data**

June 21, 1972 Germany 2230203

[52] **U.S. Cl.** ..... **179/100.41 K**, 274/37

[51] **Int. Cl.** **H04r 11/12**

[58] **Field of Search** ..... 179/100.41 K, 100.41 C, 179/100.41 D, 100.41 M, 100.41 Z, 100.4 ST, 1 GQ, 100.1 TD; 274/37

[56] **References Cited**

UNITED STATES PATENTS

3,401,237	8/1968	Takayanagi	179/100.4 ST
3,576,955	5/1971	Obata	179/100.41 M
3,700,829	10/1972	Anneberg et al.	179/100.41 Z
3,720,796	3/1973	Honma	179/100.41 K

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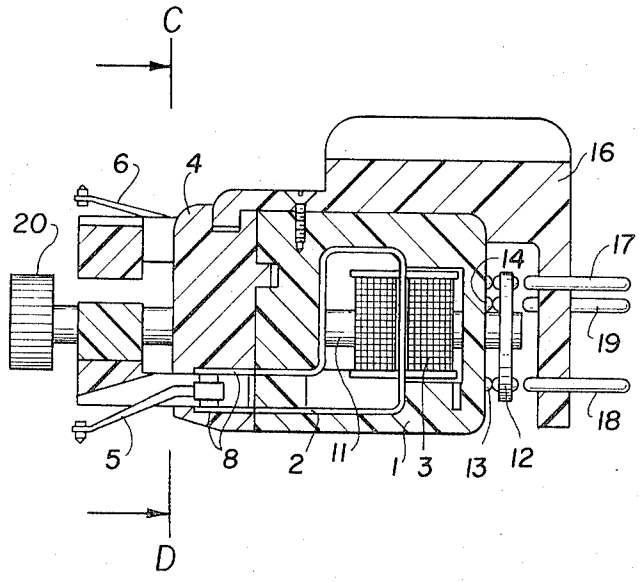
[57] **ABSTRACT**

An electromagnetic sound pickup for use in the production of quadrophonic sound recordings and the like includes at least two scanning devices each suited for different frequency ranges. Each scanning device is arranged on a common mounting means which is rotatably supported about its longitudinal axis in a sound pickup housing in such a manner that the pole piece ends associated with each scanning device can selectively be brought into contact with pole piece parts which are fixed with respect to the housing by rotating the mounting means about its longitudinal axis.

7 Claims, 3 Drawing Figures



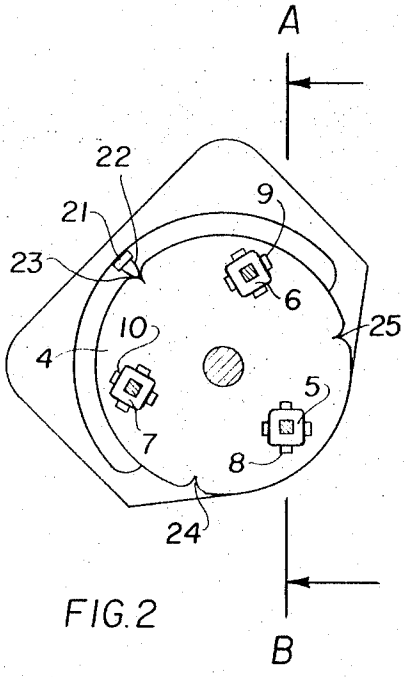


FIG. 2

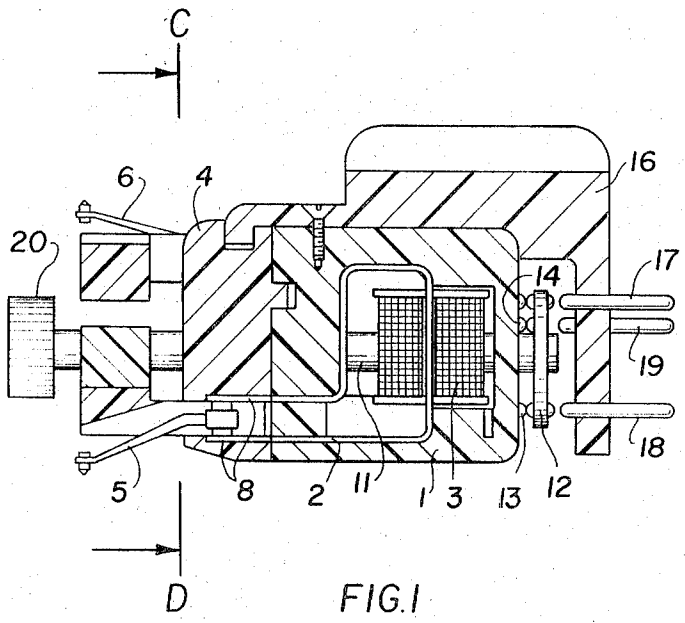


FIG. 1

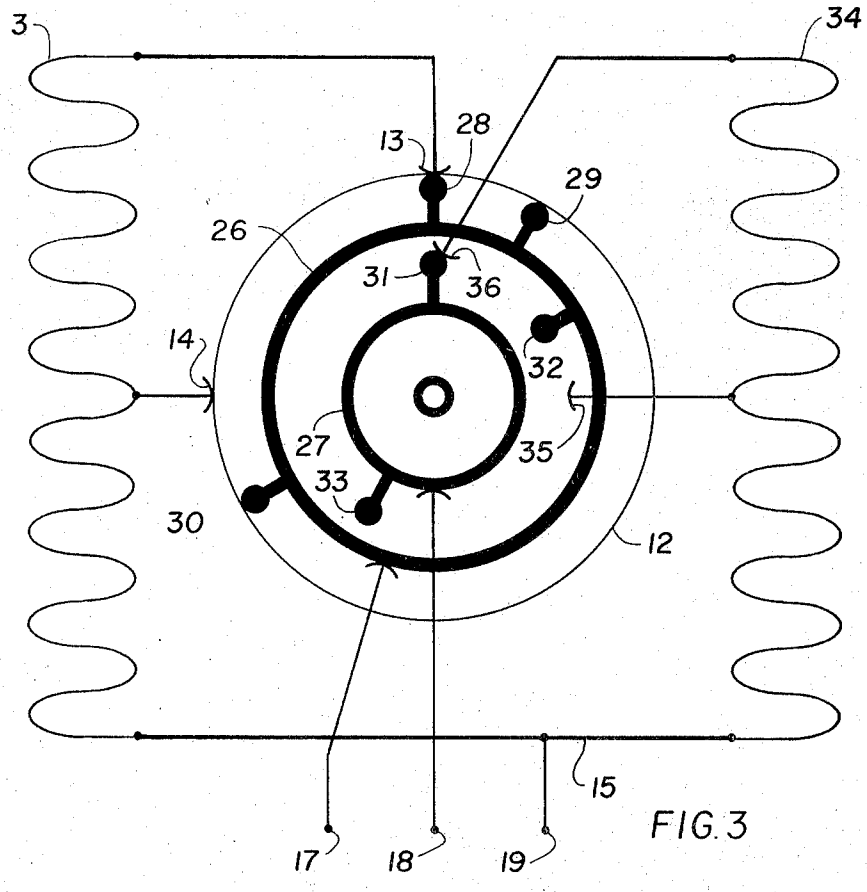


FIG. 3

ELECTROMAGNETIC SOUND PICKUP FOR THE REPRODUCTION OF QUADROPHONIC SOUND RECORDINGS AND THE LIKE

This invention relates to an electromagnetic sound pick-up, preferably for the reproduction of quadrophonic sound recordings, in which there are provided pole pieces each consisting of two separate parts. One of the parts, which carries induction coils, is attached in fixed relation in a sound pickup housing, and the other pole piece part or pole piece end is detachably assembled to the pole piece part which is fixed to the pickup housing. Located between or in front of each two pairs of pole piece ends is a magnetic armature which is firmly connected with a needle carrier, the latter being supported so that it can be elastically deflected. The armature, armature bearing, and the needle carrier are combined to define a structural unit forming a scanning device.

Two methods for quadrophonic sound recording have found acceptance. In one method, the audio-frequency voltages of each of two of the four channels are combined according to a matrix method, known per se, for the purpose of transmission over only two channels. In the other method, the audio-frequency voltages of two channels are additionally modulated, after encoding, onto an auxiliary carrier situated above the audio-frequency range.

Depending on the recording method used, pickup devices which have different mechanical properties and which are specially suited for different frequency ranges are required for the scanning of the records. In playing back records which have been recorded by these different methods, in order to avoid having to each time pull out one scanning device from the sound pickup and insert the other, there are provided, according to the present invention, at least two such scanning devices each suited for the different frequency ranges wherein the scanning devices, together with the pole piece ends associated with them, are arranged on a common mounting means which is rotatably supported about its longitudinal axis in the sound pickup housing in such a manner that, by rotating the mounting means, the pole piece ends associated with the scanning devices can selectably be brought in contact with the pole piece parts that are fixed with respect to the housing.

Proper pickup of the audio-frequency voltages which, according to one known recording method are modulated onto an auxiliary carrier situated above the audio-frequency range, is not possible with a pickup which is suited for a matrix or stereo method. This is so because of the high frequencies which must be picked up in this method, the scanning device is too slow due to the large mass of the vibrating armature. For this known recording method, a sound pickup with an armature of a mass as small as possible is, therefore, required.

Although such a sound pickup would in principle be suited to scan quadrophonic recordings according to a matrix method or the presently popular stereo recordings, the disadvantage would be that with such a sound pickup interference frequencies lying above the useful frequencies to be scanned are also picked up and would, together with these desired frequencies, result in undesirable intermodulation.

It is well known that, in order to obtain sufficient output voltage with electromagnetic sound pickups, the largest possible number of turns on the induction coils is necessary. However, with an increasing number of turns, the inductance of the induction coils also increases. Together with the distributed capacity of the coil and the capacity of the wiring between the scanning system and the amplifier, this inductance produces an electric resonance and thereby a magnification of the amplitudes in the region of the resonance frequency. Eliminating this amplitude magnification by damping is not feasible because crosstalk is increased thereby. In known customary pickups presently in use, the inductance of the coil is, therefore, given such values that together with the values of the capacitances present, an electric resonance above 20 kHz results, that is, above the range of useful frequencies to be transmitted.

In the quadrophonic method with auxiliary carrier, in order that the resulting electric resonance point can also be placed above the usable frequency range, that is, above the audio-frequency voltages on the carrier, it is necessary that the induction coils have lower inductance values. In a practical embodiment of the present invention, therefore, each of the two induction coils have a tap to which an operator switches when going to the quadrophonic method with auxiliary carrier. The switch for switching from the one end of the coils to the taps (or vice versa) is coupled with the rotatably supported mounting means. In this manner assurance is always provided that the inductance matched to the frequency range to be scanned is switched into the circuit.

Other features which are considered as characteristics for the invention are set forth in the appended claims.

Although the invention is illustrated and described in relationship to a specific embodiment, it is nevertheless not intended to be limited to the details shown, since various modifications and structural changes may be made therein without departing from the spirit of the invention and within the scope and range of equivalents of the claims.

The construction and method of operation of the invention, however, together with additional objects and advantages thereof will be best understood from the following description of specific embodiments when read in connection with the accompanying drawings, in which:

FIG. 1 is longitudinal cross sectional view taken along the line A–B in FIG. 2 and showing an electromagnetic sound pickup system according to one embodiment of the invention.

FIG. 2 is a view of the sound pickup system looking along the line C–D in FIG. 1.

FIG. 3 is a view of the switching plate for switching the inductance values of the induction coils as used in the sound pickup system shown in FIGS. 1 and 2.

Referring to FIG. 1, there is shown one of two pole piece parts 2 which are fixed with respect to a pickup housing. FIG. 1 also shows the associated induction coil 3 which is also disposed inside the pickup housing 1 along with the pole piece part 2. The induction coil 3 is provided with a tap (not shown in FIG. 1) which, together with the one end of the coil winding, is led to contacts 13 and 14 which are arranged outside the housing 1. A mounting means 4 is supported for rota-

tion about its longitudinal axis on the housing 1. The mounting means 4 mounts scanning devices 5, 6, 7 (see also FIG. 2) suitable for scanning different frequency ranges with their associated pole piece ends 8, 9, 10 (see also FIG. 1). The scanning devices are displaced by 120° relative to each other. A shaft 11 for the mounting means 4 extends through the pickup housing 1 and carries a switch plate 12 on its backside.

This switch plate 12 is provided on both sides with conductor tracks, as can be seen in detail in FIG. 3, and is arranged so that the conductors on one side are contacted by the contacts 13 and 14 and the conductors on the other side by contact pins 17 and 18 of the pickup. The contact pins 17 and 18 of the pickup are arranged in a receptacle 16 which is rigidly connected to the pickup housing 1. A knob 20 is provided for rotating the mounting means 4.

The arrangement of the scanning devices 5, 6, 7 with their associated pole piece ends 8, 9, 10 is shown in FIG. 2. A detent spring 21 is provided which has one end fastened to the receptacle 16 (FIG. 1) and which carries at its free end a conical pin 22. When switching from one scanning device to another, the detent spring 21 snaps with this pin 22 into corresponding recesses 23, 24 25, which are provided in the mounting means 4.

Simultaneously with the switching of the scanning device suited for the frequency range to be scanned, which is accomplished by turning a knob 20 attached to the mounting means 4, the switch plate 12 is switched to the inductance values of the induction coils which correspond to this frequency range.

FIG. 3 shows conductor tracks 26 and 27 arranged on the switch plate 12 with their switch contacts 28, 29, 30 and 31, 32 33, respectively. Also shown in FIG. 3 is a second induction coil 34 having a tap leading to a contact 35 and also having one end which leads to a contact 36. The other end of the coil 34 is connected with the one end of the induction coil 3 via a wire 15, and the latter is connected to the pickup contact pin 19. The other end of the coil 3 leads to the contact 13 and its tap to the contact 14.

For switching to the appropriate inductance values of the induction coil 3, the conductor track 26, on the one hand, is associated with the pickup contact pin 17 which slides continuously on the conductor track 26 and, on the other hand, makes connection with the contacts 13 or 14 of the coil 3 via the switch contacts 28, 29 or 30, depending on the position of the switch plate 12.

For switching to the appropriate inductance values of the induction coil 34 which is associated with the conductor tract 27, on the one hand, the pickup contact pin 18 slides continuously on the conductor tract 27, and, on the other hand, makes connection with the contacts 35 or 36 of the coil 34 via the switch contacts 31, 32 or 33 depending on the position of the switch plate 12.

What I claim is:

1. An electromagnetic sound pickup for use in the production of quadrophonic sound recordings and the like comprising a housing, pole pieces each having two parts, one of said parts carrying an induction coil and being fixedly mounted on said housing, the other of said parts being detachably assembled to said one part which is fixed to said housing, a magnetic armature associated with each detachably assembled part of said pole pieces, a needle carrier connected to each said magnetic armature, said needle carrier being supported so that it can be elastically deflected, each said magnetic armature and connected needle carrier defining a structural unit forming a scanning device, at least two scanning devices, each suited for different frequency ranges, a common mounting means rotatably mounted on said housing, each of said scanning devices together with its associated part of said pole pieces being mounted on said mounting means, whereby rotation of said mounting means causes each said other part of said pole pieces to selectively be brought into contact with the one part of said pole piece that is fixed to said housing.

2. An electromagnetic sound pickup according to claim 1 including means for changing the inductance of said induction coils.

3. An electromagnetic sound pickup according to claim 2 wherein each of said induction coils is provided with at least one tap, each of said coils having an end, a switch means for switching between said tap and the respective coil end, said switch being coupled for rotation with said mounting means.

4. An electromagnetic sound pickup according to claim 3 wherein said switch means includes a switch plate having conductor tracks, and pickup contact means in continuous sliding contact with said conductor tracks.

5. An electromagnetic sound pickup according to claim 4 wherein said switch means includes a plurality of switch contacts on said switch plate, and further pickup contact means contacting said switch contacts depending on the rotary position of said switch plate.

6. An electromagnetic sound pickup according to claim 1 including means adapted to be grasped by an operator to rotate said mounting means.

7. An electromagnetic sound pickup according to claim 1 including detent means on said housing and operable to engage said mounting means to secure the latter in the desired rotatable position.

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