Feb. 14, 1933. K. DAHMEN 1,897,722

SOUND RECORDING AND REPRODUCING MEANS

Filed April 29, 1931

Fig. 1.

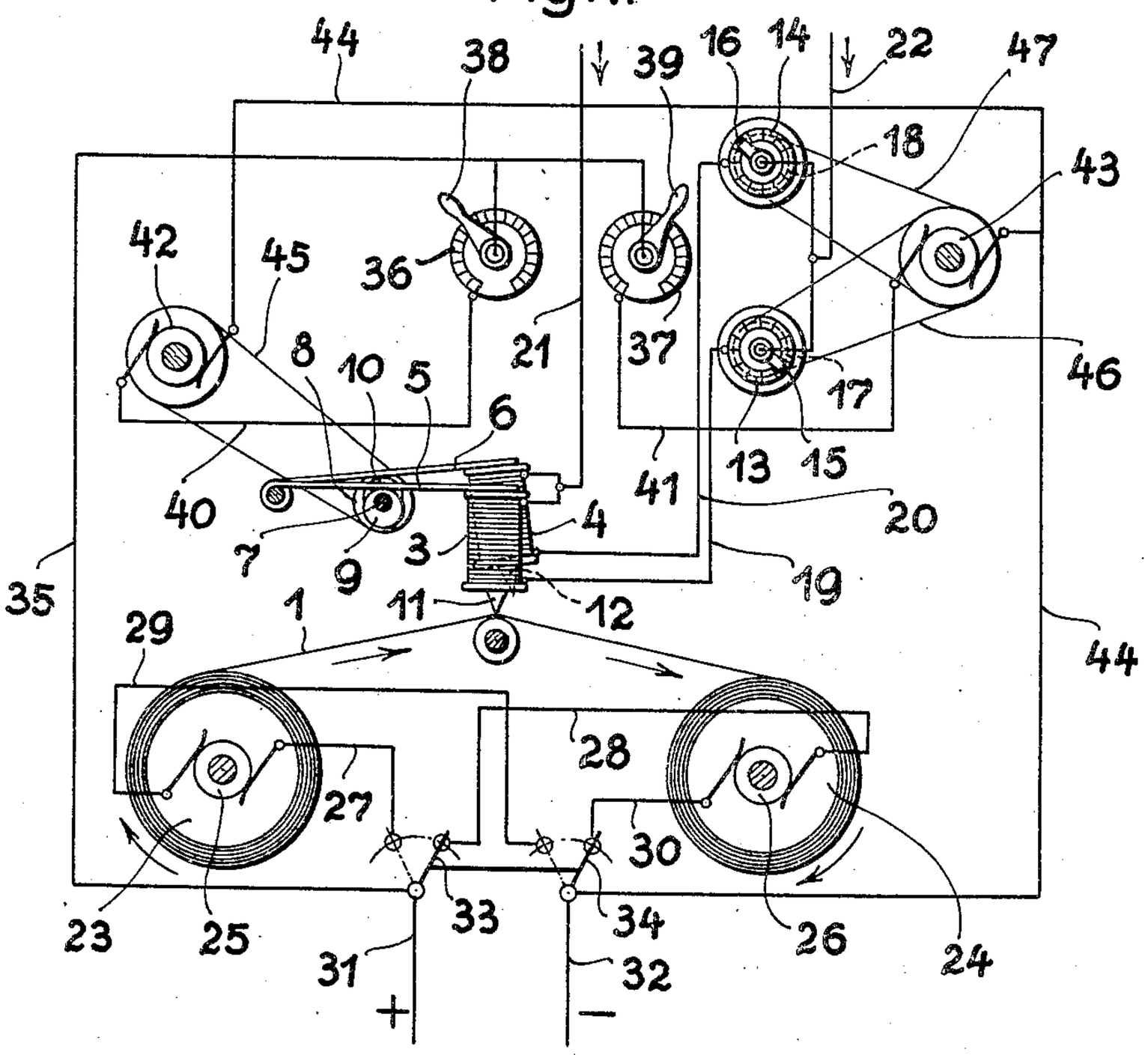
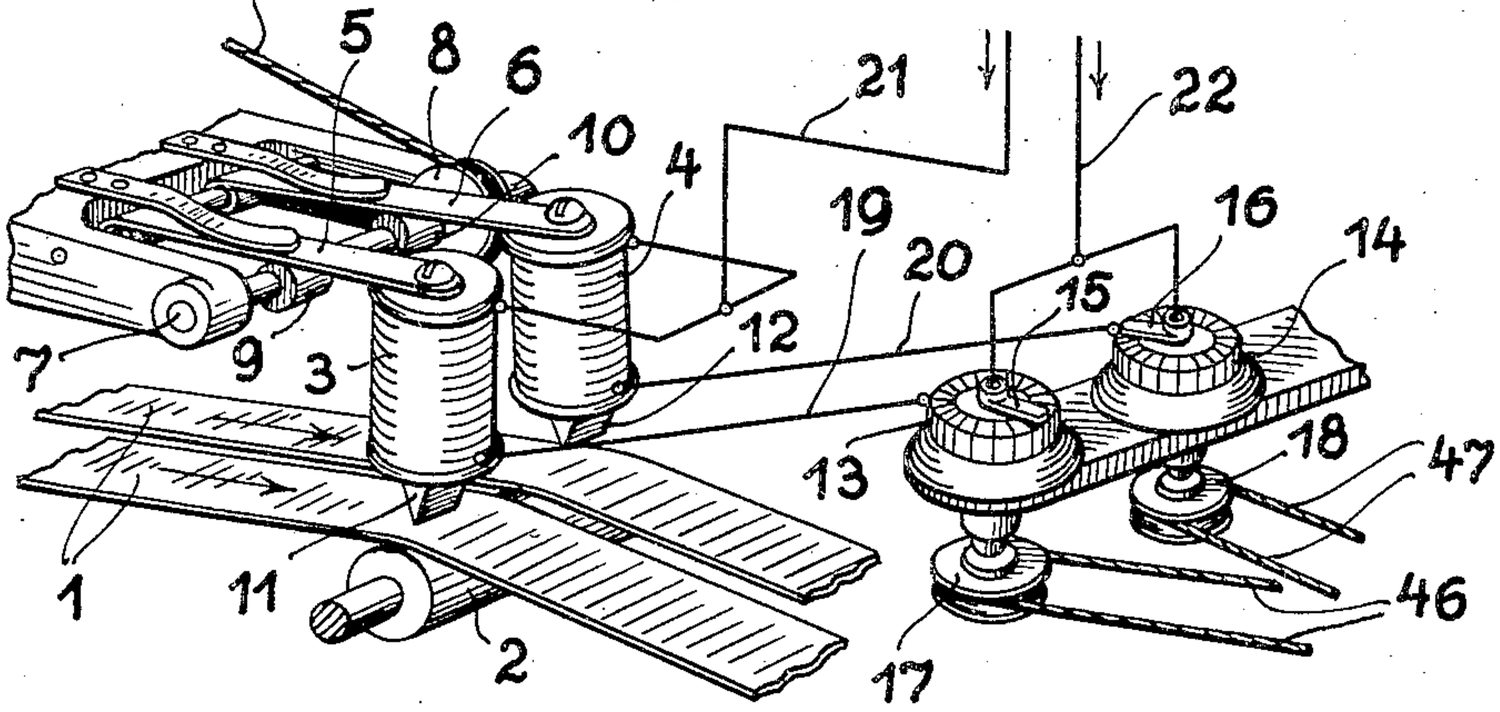


Fig. 2.



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SOUND RECORDING AND REPRODUCING MEANS

Application filed April 29, 1931, Serial No. 533,711, and in Germany March 30, 1929.

This invention has reference to a method of recording acoustic signals by electro-magnetic means, and it is one of the important objects of the invention to produce a comparatively large or extensive record in a very simple manner upon a comparatively small carrier, a plurality of such records being superimposed upon each other in the well known manner. With the methods heretofore in use for the production of acoustic records there was the inconvenience that the carrying capacity of the carrier for the acoustic signals was rather limited, and in view of increasing this capacity of the carrier it has been suggested heretofore to arrange and operate the reproduction magnets exactly as the signal-receiving magnets for the different superimposed records at different distances relatively to each other and in different electric connections, that is to say either serially arranged or opposite to each other. Thus, with this previous system it became necessary to select a special manner of electric connection or of spacing the coils for each record, so that the number of the records to be superimposed had to be restricted from constructional reasons.

Now with the method of the invention to be described it becomes possible however to arrange an almost unlimited number of records in a comparatively small space. Broadly considered, this object is accomplished by producing two records of each acoustic signal simultaneously the intensity of which varies however in accordance with a certain frequency. Furthermore, the intensity curves of the two records are displaced with relation to each other by a differentiated positioning of their periods, so that for each phase the sum of each two recording intensities of equal time-periods remains the same, that is to say, that the resulting intensity is constant. For each of the superimposed records a different frequency of the fluctuations of intensity is to be selected, while the velocity of the recording carrier relatively to the record producing member remains constant.

The invention will be more fully described by reference to the accompanying drawing showing an exemplification embodying the principles of this invention in perspective view, all the details of the supporting frame and of the means which do not constitute a part of the invention, and are unnecessary for the understanding thereof not having been shown in the drawing.

In the drawing:

Fig. 1 shows diagrammatically a sound recording and reproducing device.

Fig. 2 is a perspective view of a part of the device. The modification shown in the drawing comprises two previously magnetized steel bands 1 situated side by side and wound on rollers 23, one of which is shown in Fig. 1. The bands 1 pass over a guide roller 2 and are wound on rollers 24. The rollers 23 and 24 are rotated by means of electrical motors 25 and 26 which are connected with a main 31 by conduits 27 and 28, while the wirings 29 and 30 connect said motors with a return line 32. A switch 33, 34 is used to connect either the motor 25 or the motor 26 with a source of electrical energy not shown in the drawing, one of the motors being cut off from the supply of electrical current while the other motor is in operation. In the position shown in Fig. 1 the main lines 31 and 32 are connected with the motor 26 driving the rollers 24 so that the bands 1 will be moved in the direction of the arrows shown in Figs 1 and 2, and will be wound on said rollers 24. By switching the switch 33, 34 to its other position, shown by dotted lines in Fig. 1, it is possible to wind the bands 1 back on the rollers 23. A wire 35 connects the main line 31 with resistances 36 and 37, which can be regulated by levers 38 and 39. Conduits 40 and 41 connect the resistances 36 and 37 with electrical motors 42 and 43, which are connected with the return line 32 by means of the conduit 44. The electrical motor 42 drives a shaft 7 by means of a cord 45 passing around a grooved wheel 8 rigidly connected with said shaft. Two cords 46 and 47 connect the electrical motor 43 with grooved wheels 17 and 18 and drive the adjustable resistances 13 and 14 connected with said wheels. Two coils 3 and 4 are situated over the bands 1 at the place where these bands pass over the roller 2, said coils being con-

nected with movable arms 5 and 6 actuated by cams 9 and 10 whi h are displaced with respect to each other. The cams 9 and 10 are rotated together with the shaft 7 and they actuate the arms 5 and 6, so that the magnets 11 and 12 connected with the arms 5 and 6, and situated within the coils 3 and 4, alternately approach and recede from the bands 1. It is to be noted that the magnets 11 and 12 should have a polarity different from that of the bands 1. A sliding contact 15 is situated over the adjustable resistance 13 driven by a wheel 17 and forms an angle of 180° with a sliding contact 16 situated over the adjustable resistance 14, which is driven by the wheel 18. The resistances 13 and 14 are connected with the lower ends of the coils 3 and 4 by means of wires 19 and 20, while the upper ends of the coils 3 and 4 are connected with one of the leads 21 of the talking circuit. The other lead 22 is connected with the sliding contacts 15 and 16.

During the reception of the acoustic signals the sliding contacts 15, 16 are uniformly rotated, so that due to the resistances 13 and 14, a weaker or a stronger current impulse will be produced in the coil 3 and then in the coil 4, so that either one or the other of the bands 1 will be submitted to a stronger or a weaker action of the magnets, while the total intensity of the magnetic influence remains always the same. At the same time, however, said magnets 3 and 4 are alternatingly moved by the cams 9, 10, so that they will come closer or less close to their corresponding steel bands 1. The bands 1 are provided with records of sounds along their entire length while being wound on the rollers 24. Then the position of the switch 33, 34 is changed and the bands 1 are again wound on the rollers 23. The recording which takes place during this second winding is superimposed on the previous records, so that said subsequent recording must take place with a frequency different from that of the previous records. This is easily obtained by changing the position of the levers 38 and 39 of the resistances 36 and 37, since it will correspondingly change the velocity of rotation of the sliding contacts 15 and 16 and of the cams 9 and 18. By a suitable selection of the rotating speed of the sliding contacts 15, 16 and of the cams 9, 10 there is the possibility for the production of a large number of different frequencies, and consequently of a larger number of records to be superimposed. The reproduction of such records should, of course, take place under the same operating conditions.

It should be understood that the invention is not limited to the embodiment herein shown and described merely by way of exemplification, and other means may be used for the production of the modulating frequencies, as long as the essential features of the invention remain unchanged which are constituted by the fact that several records may be obtained by different frequencies upon the same carrier, which are then reproduced under the same conditions.

I claim:—

1. A method of recording acoustic signals, comprising the steps of producing two records for each acoustic signal, each of said records having a time period and intensity different from that of the other record produced by the same signal, the sum of the intensities of two records produced by the same signal having a constant value, and superimposing records having a different frequency of fluctuations of intensity.

2. A method of recording acoustic signals, comprising the steps of producing by electro-magnetic means two records for each acoustic signal on a recording element, passing phase-displaced electrical currents through said electro-magnetic means during the recording of said acoustic signal, and then superimposing records having a different frequency from that of the first-mentioned records on said recording element.

3. A device for recording acoustic signals, comprising a pair of magnetized bands, means for synchronously moving said bands, a pair of electro-magnets situated near said bands, means for alternately reciprocating said magnets, a talking circuit connected with said magnets, resistances connected with said magnets, and means for producing a phase difference in one of said resistances.

4. A device for recording acoustic signals, comprising a pair of magnetized bands, means for synchronously moving said bands, a pair of electro-magnets situated near said bands, means for connecting said magnets in parallel, means for alternately reciprocating said magnets, a talking circuit connected with said magnets, a pair of resistances, means for connecting said resistances in parallel with said talking circuit, one of said resistances having a phase displacement of 180 degrees with respect to the other resistance, and means for operating such resistances.

In testimony whereof I affix my signature.

KARL DAHMEN.