

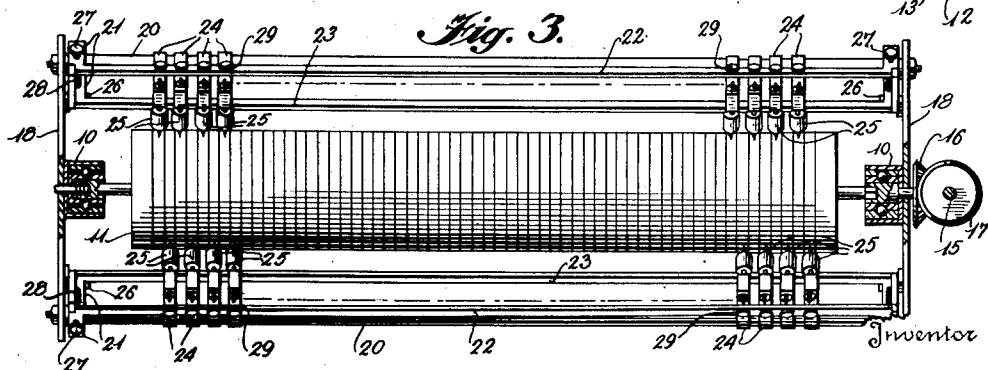
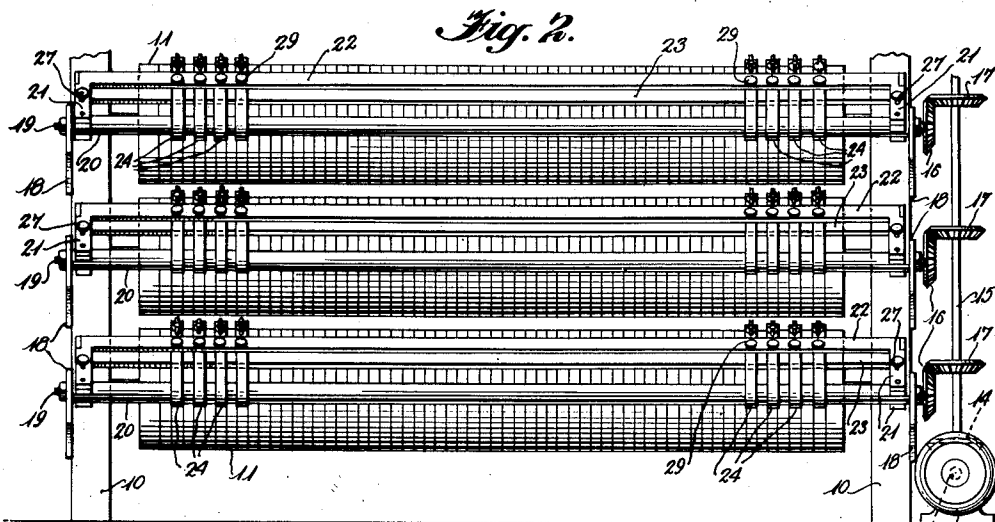
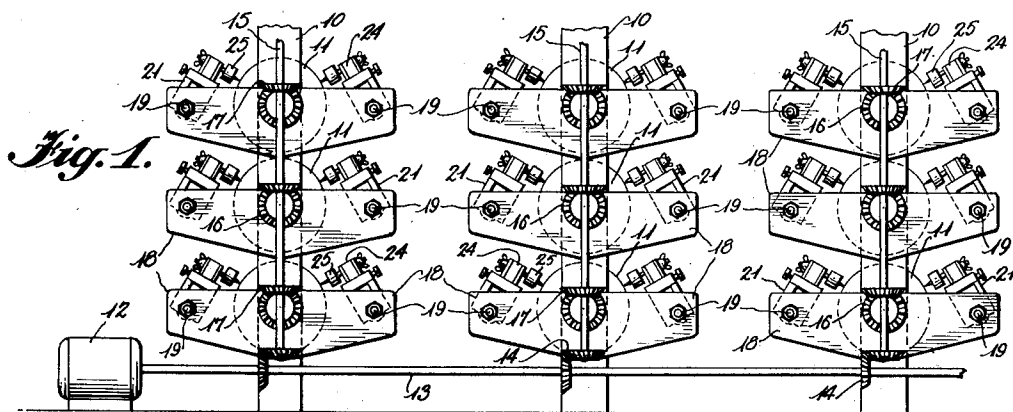
March 21, 1950

N. J. JEWETT  
RECORDED TONE MUSICAL INSTRUMENT AND METHOD  
OF PRODUCING RECORDS THEREFOR

2,500,947

Filed Sept. 16, 1947

3 Sheets-Sheet 1



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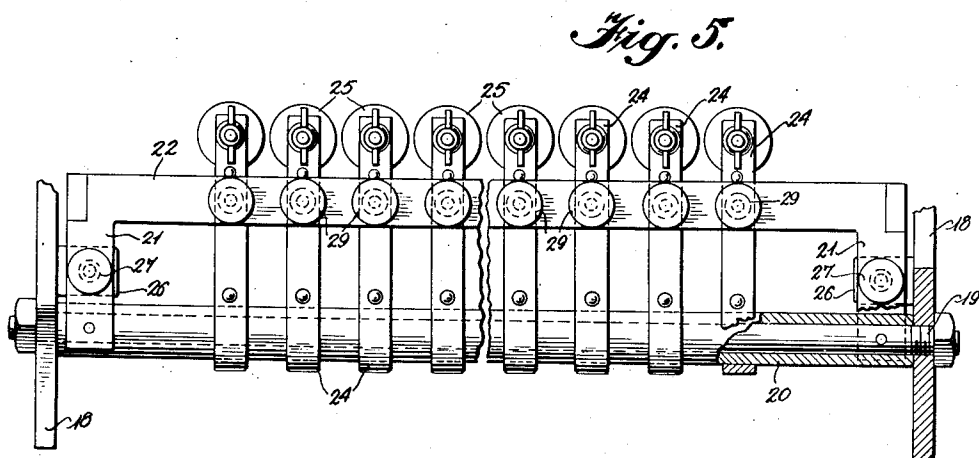
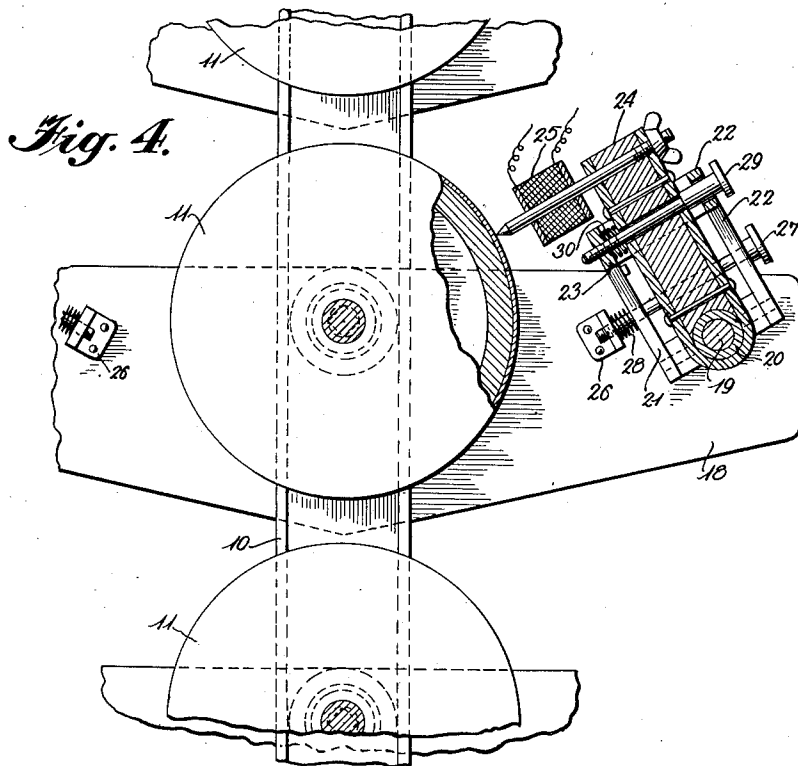
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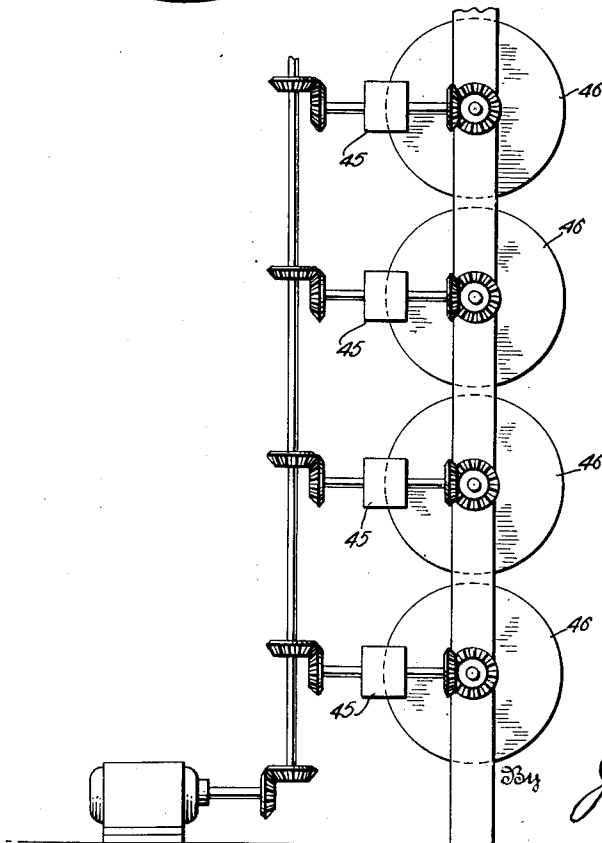
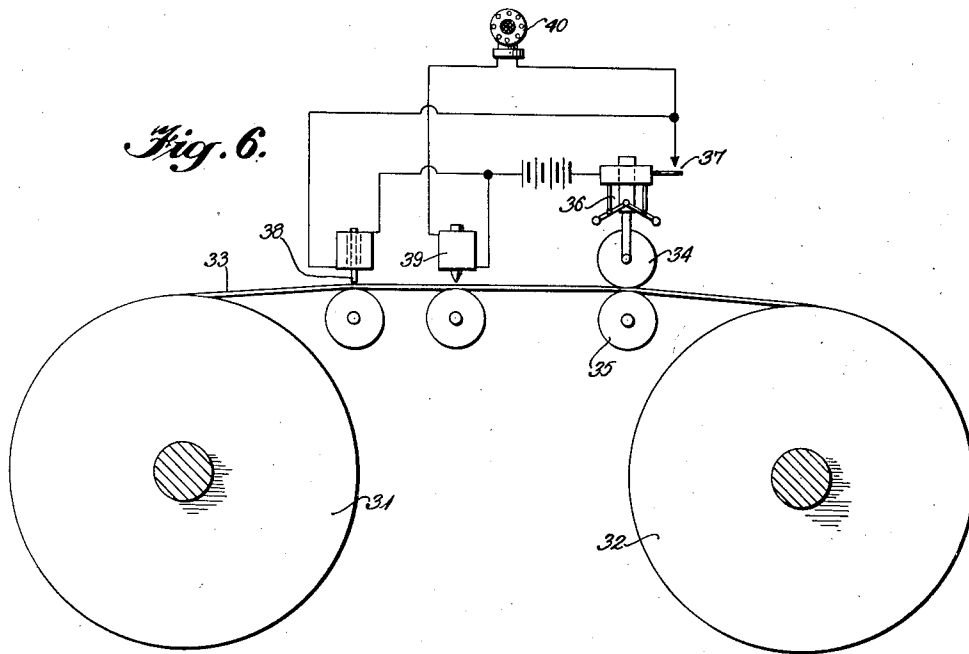


*Fig. 7.*

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## UNITED STATES PATENT OFFICE

2,500,947

RECORDED TONE MUSICAL INSTRUMENT  
AND METHOD OF PRODUCING RECORDS  
THEREFORNelson J. Jewett, Arlington, Va., assignor of  
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Application September 16, 1947, Serial No. 774,329

11 Claims. (Cl. 84—1.28)

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The invention relates to recorded tone organs and has as an object to provide apparatus to support and drive cylinders bearing tone records and to adjust pickups relative to the records on such cylinders to secure an acceptable reproduction of the tone records.

It is a further object of the invention to provide apparatus to make the removal and interchanging of such records convenient.

It is a further object of the invention to provide a method of preparing the records and of application of the records to the cylinders.

It is a further object to provide apparatus for supporting and driving recorded tone records by which provision a large number of such records may be assembled and operated in a limited space.

It is a further object of the invention to provide a recorded tone organ which is versatile in capabilities, in that it is made up of a plurality of instrumentalities which may be embodied in a self-contained console, or which instrumentalities may be located in spaced locations, by means of which the separate instrumentalities may be located where convenient, either in a home or a public hall.

It is a further object of the invention to provide recorded tone apparatus of such a nature that it may be used as a complete instrument or may be used to supplement the tonal resources of small pipe organs.

Further objects will appear from the following description when read in connection with the accompanying drawings showing an illustrative embodiment of the invention and wherein

Figure 1 is a view diagrammatic in character showing cylinder supporting and driving apparatus;

Figure 2 is a detail side elevation;

Figure 3 is a horizontal section with a record cylinder shown in plan, showing bearings for the cylinder from which and into which a cylinder may readily be placed and removed for interchange;

Figure 4 is a detail elevation of a pickup supporting frame arranged for both group and individual adjustment of the pickups of a group relative to the surface of a record cylinder;

Figure 5 is a side elevation partly in section showing one pickup carrying frame;

Figure 6 is a diagrammatic illustration of a recording device; and

Figure 7 is a diagrammatic side elevation of record reproducing apparatus.

As shown, a plurality of frames are provided

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comprising spaced pairs of spaced uprights 10. Between the pairs of uprights of the frames, record cylinders 11 are shown. To drive the cylinders, a motor 12 is shown driving a shaft 13 extending past the frames. Driven by the shaft 13 through medium of bevel gears 14, there are shown vertical shafts 15 journaled in bearings, not shown, mounted one on each of the uprights of each frame. The cylinders 11 are driven by bevel gears 16 on shafts projecting from bearings for each, in mesh with bevel gears 17 fixed on the shafts 15 (see Figure 2).

It is obvious that the frames 10 may be horizontally disposed and vertically spaced, or arranged in other positions to permit the drive of groups of cylinders from a single motor wherein the axes of each group are parallel. The function of the arrangement is to insure that all cylinders shall be driven in synchronism to preserve the relative pitches of the various recorded tones. It follows that the pitch of the entire instrument may be raised or lowered by speeding up or slowing down of the drive motor.

An equivalent of the bevel gear drive is the use of worm drives, which use may be preferred for some installations where silence is important. Instead of a gear drive, synchronous motors may be utilized to drive the various groups of cylinders with satisfactory results.

Where the tone producing cylinders are to be separated and placed in locations distant from each other, separate synchronized motors may be provided for the respective groups.

To support pickups, one for each record of a cylinder, there are shown bracket members 18 secured upon the uprights 15. Upon a rod 19 fixed in openings in the brackets 18 a pipe 20 is shown as mounted to carry a frame including pickup arms. The frame is shown as comprising end arms 21 secured to the pipe 20, with spaced bars 22, 23 between which the individual pickup arms 24, are pivotally mounted on the pipe 20, the ends of the arms 24, remote from the pickups 25 being pivoted on the pipe 20.

To adjust the frames, carrying with them the groups of pickup arms, there are shown lugs 26 standing adjacent one of the arms 21 at each end of the frame and a screw adjustment bolt 27 passing freely through the arms 21 and having screw threaded engagement in holes in the lugs, a compression spring 28 acting to hold the frame arms pressed against shoulders on the bolts 27.

To adjust the individual pickup arms 24, screw bolts 29 are shown, each passing freely through an opening in the bar 22 and formed with a

shoulder abutting the pickup arm, the bolt having screw threaded engagement with an opening in the bar 23 to compress a spring 30.

To swing the frames and the groups of pickups as a whole away from the cylinder for removal of the latter, the screw bolts 27 may be removed and the frames may then be swung about the rods 19.

Adjustment of the individual pickups is important to secure an even response from the respective records, and adjustment of the groups is important to secure uniform response of each as compared with another.

The amplification of the current modulated by the pickups and the reproduction of sounds by loud speakers will follow usual practice.

The embodiment of the recorded tone cylinders involves a cylinder carrying 60 recorded semitones (for a five manual organ) for each quality of tone or "stop." For each cylinder there is a stop relay (not shown) with 60 circuit closers as is usual in pipe organs.

The circuit through each pickup has two breaks, one controlled by the stop relay and the other by the key circuit closer at the console. The key circuit closers may act through intermediate relays in the manner well known with pipe organs.

The entire apparatus may be housed in the console for a self-contained and readily movable instrument or the record cylinders may be in a sound insulated room, the amplifier in a separate place and the speakers may be located wherever desired.

In the production of the record cylinders, the records cannot well be made in situ on the cylinder, for the reason that it is difficult or impossible to cause the end of the act of recording to coincide with the point of beginning. In other words, it is difficult to avoid a double record on at least a portion of the circumference of the cylinder.

In accordance with the present invention, this difficulty is avoided by producing a record of indefinite length on a tape, film or wire (determined by the process chosen, be it magnetic, photographic or a groove in plastic material). A piece of the thus produced record is then cut and secured about the cylinder so that the ends meet accurately, after which revolution of the cylinder in coaction with sound reproducing means may produce a continuous tone so long as the sound reproducing means is active.

The requirements are accuracy of pitch of the tone producing instrument and of speed of the record receiving material.

To these ends, and as shown in Figure 6, a supply reel 31 of record material is provided and a take up reel 32 to receive the record. To drive the record receiving band 33 at the required speed, independently of the amount of material on reel 32, drums 34, 35 are shown between which the band passes, one of which drums is to be driven by a motor, not shown, at known speed.

To avoid waste of material, the band is run only while making a record. In use the tone emitting instrument, if not of a fixed tone variety, is sounded and the pitch of the instrument is adjusted by any known form of pitch meter, as for instance, that shown in Patent 844,838, or in 2,191,203 or 2,290,754. The drive of the band is then started but of course will not be at correct speed instantly. A speed indicator, as for instance a centrifugal device as indicated at 36 is provided to close a circuit as at 37 when the drive is up to speed. The circuit closer 37 closes paral-

lel circuits. In one circuit there is shown a single stroke magnet actuating a stamp 38 to mark the beginning of the record and a sound recorder 39 in circuit with a microphone 40 are included in another circuit. The tone production will be continued adjacent the microphone for a sufficient time after circuit closer 37 has acted, to produce an excess of record.

When the requisite number of tones and semitones for a cylinder have been recorded, the band from reel 32 is cut at each stamped location. A length of each record, from a point adjacent the stamped end is then cut just sufficient to encircle the cylinder and is secured in its order on the cylinder.

In production of a string quality of cylinder, it is necessary to produce the lower tones by use of a double bass and perhaps to utilize half speed of the first records to get the lowest tones on the records for use on the instrument cylinders. Higher tones would be had in turn from a cello, viola and violin including harmonics of the latter. This procedure will be followed in the case of brass, woodwind, wind reed and other qualities including the human voice.

It is to be understood that the first produced records will be mounted on master cylinders and they in turn will be sounded before a microphone with amplification and loud speaker apparatus, and utilized to produce records to be mounted on cylinders to be supplied to users. The records for use may be a simple duplication of the tones on the master cylinders or may be a combination of two or any number of the simple tones on the separate master cylinders. This kind of a registration cylinder will be controlled by a single draw knob on a console and will therefore secure the effect of a piston, usual with pipe organ consoles.

The records for use must be as accurate to pitch as at all possible. It is very difficult to produce and hold a tone absolutely true while testing the pitch and making the original record, with the human voice or with any instrument, as with the violin, where the pitch is controlled by the player.

To the end of correcting inaccuracies of pitch of the master record, the apparatus diagrammatically shown in Fig. 7 may be employed. As there shown, a speed adjuster 45 of any known form is introduced into the drive of each of the master cylinders 46. With the apparatus of Figure 7, the record producer of Figure 6 may be utilized to produce records for cylinders for use. If only the simple tones of one master cylinder are to be recorded for use, only one of the cylinders will be placed in the frame. The master cylinder or cylinders under reproduction may be sounded for any length of time necessary to accurately measure the pitch of the tones and to adjust the speed to produce the required length of tape record required for the cylinder for use. The bearings for the master cylinders, with the provision for easy exchange, shown in Figure 3 may be utilized with the structure of Figure 7.

To secure the choir effect referred to by Benjamin F. Meissner in the "Proceedings of the Institute of Radio Engineers," November 1936, page 1439, in the final record for use, separate master records may be made of each semitone as sounded by different tone producers or of the same tone producer at different times, and master cylinders may be made up of each such tone production. These cylinders may be mounted in the apparatus of Figure 7.

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In the production of the choir effect record for use as above described, the pitches of the respective semitones to be so combined may be justified with each other by adjustment of the speed of the various respective master records by adjustment of the variable speed drives 45.

It is to be understood that conventional amplification and loud speaker apparatus will be used. Particularly with the apparatus of Figure 7, the highest possible fidelity of reproduction should be provided since the results produced by musical instruments utilizing the records prepared by this factory apparatus will depend on the said factory apparatus.

While in the production of the first master records the modulation will ordinarily be produced by sound waves acting on a microphone, an actual reproduction of sound in making records for use from the master records is not necessary. Instead the modulated current that emanates from the amplification apparatus may be caused to directly affect the recording magnet.

In the making of the original master record by microphonic pick up of the vibration produced by a tone producer, extraneous sound must be rigidly excluded. However, if the modulated current from the amplifier is applied directly to the recording magnet, in making the final records, extraneous sounds will have no effect and this may be done in an open factory space.

Minor changes may be made in the physical embodiment of the invention within the scope of the appended claims, without departing from the spirit of the invention.

I claim:

1. A recorded tone musical instrument comprising, in combination: a plurality of sound record carriers; a plurality of records on each of said carriers; said records being of sounds each differing a semitone from another thereof to provide a dichromatic scale; means for causing sound reproduction movement of said carriers in synchronism.

2. A recorded tone musical instrument comprising, in combination: a sound record carrier; a plurality of sound records mounted on said carrier; a group of pick-up devices, individuals thereof to coact with respective sound records and standing normally in sound reproducing relation thereto; and means to adjust the individual pick-ups relative each to its record for uniformity of response.

3. The combination of claim 2 with means to adjust all of said pick-ups as a group relative to the carrier.

4. The combination of claim 2 with means whereby said group of pick-ups may be moved bodily away from the carrier.

5. In recorded tone musical instrument apparatus; a frame comprising spaced members; a plurality of pairs of bearings, one of each pair mounted in the respective frame members; record carrying cylinders each mounted at its ends in and readily removable from the bearings of the respective pairs; cylinder drive means acting through one of each pair of bearings; and means to cause continuous synchronous revolution of said cylinders.

6. Apparatus for producing sound records com-

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prising, in combination: supply and take-up reels for record materials; means to produce a sound record on said material as it passes between said reels; and means to mark said material at the beginning of each separate record.

7. The method of producing recorded tone sound record cylinders which comprises producing a record on flexible material of each tone desired, and of indefinite length in excess of the circumference of the cylinder to be produced; cutting a length from each such record closely approximating the developed length of said circumference; and mounting said cut lengths in axial juxtaposition in cylindrical form with the two ends of each length meeting on said cylindrical form to provide for continual repetition of the tone from each record as the completed cylinder is revolved and as each record is scanned while the cylinder is being continuously revolved.

8. The process of producing recorded tone records which comprises; producing master records of sustained tones as accurately to pitch as feasible; mounting said master records for reproducing movement; producing records for use by reproduction of the recorded vibrations of the master records; and adjusting the pitch of said reproduced vibrations by varying the speed of movement of said master records during the reproduction thereof.

9. The process of producing recorded tone records which comprises modulating an electric current by microphonic pick-up of sound vibrations from a sound producer of a sustained tone; producing a master record of said vibrations; modulating an electric current in accordance with the said master record; amplifying said second named modulated current; and producing a record for use by direct effect of the output of said amplified current upon a recording device.

10. A multitone record cylinder comprising, in combination: a cylinder; means axially carried by said cylinder for revoluble mounting thereof; a plurality of sustained tone sound records carried by said cylinder; the center line of each of said records lying in a plane perpendicular with the axis of the cylinder; said records substantially continuous about the periphery of the cylinder; and means for ready removal of the cylinder from its drive means.

11. The cylinder of claim 10 wherein the pitch of the tones recorded on said records are similar in timbre and each differs in pitch from that on adjacent records by a semitone; the records upon the cylinder comprising a record of each semitone of at least one octave of musical semitones.

NELSON J. JEWETT.

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