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ELECTRICAL DUAL METRONOME

Filed Dec. 5, 1958

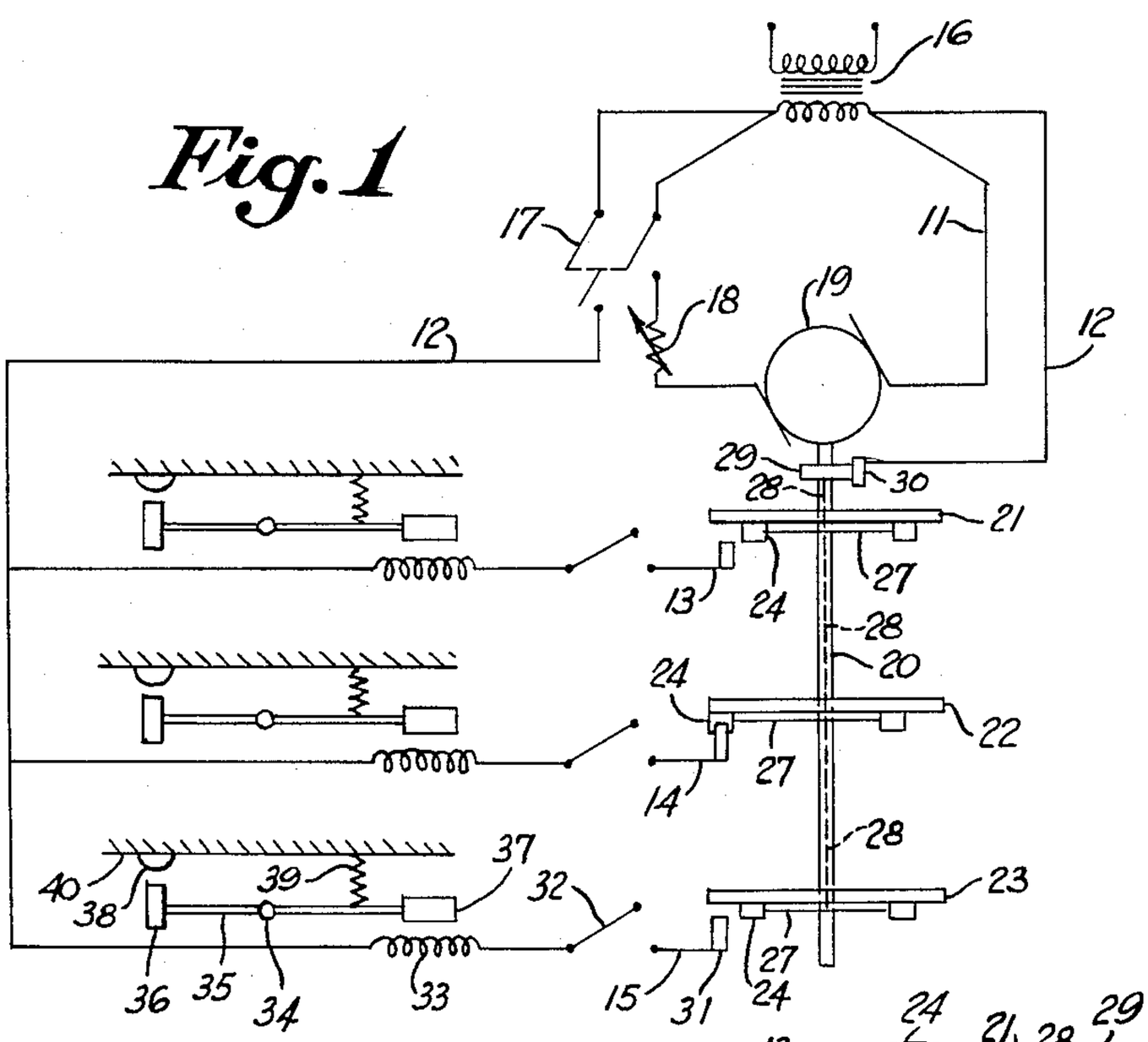

Fig. 1

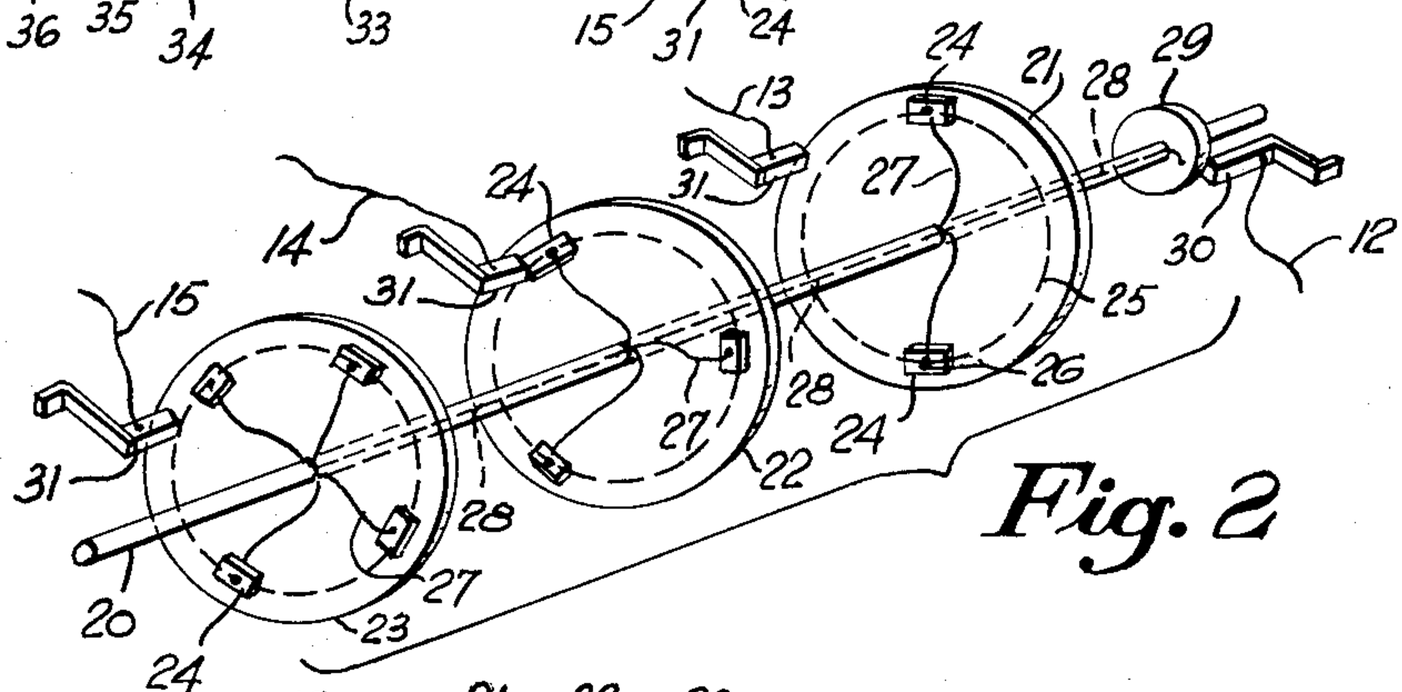

Fig. 2

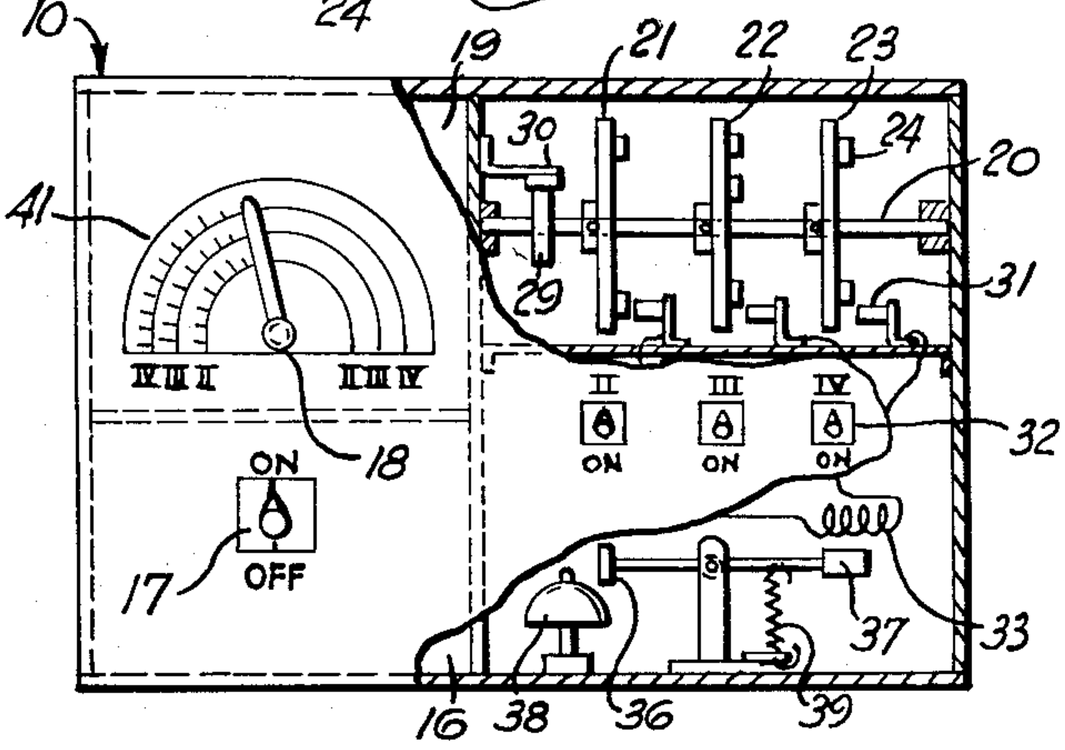

Fig. 3

INVENTOR.
PAUL BILLOTTI
BY Richards & Geier
ATTORNEYS

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ELECTRICAL DUAL METRONOME

Paul Billotti, 881 7th Ave., New York, N.Y.

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This invention relates to a metronome and refers more particularly to an electrical dual metronome.

Students of music need to acquire a facility for playing at particular ratios of beats because it is required that they play at one rate of beat with one hand and another rate of beat with the other hand. Practicing playing at different rates of beat simultaneously is arduous without the use of a metronome to set the desired ratio and to serve as a guide to the student. The ordinary metronomes of prior art are not capable of producing two different beats simultaneously.

Therefore, an object of the present invention is to provide an electrically operated dual metronome which is not subject to the disadvantages of the prior art.

Another object of the present invention is to reduce the time required for the learning of beat frequencies through the use of an electrical dual metronome.

An additional object is to provide a greater degree of accuracy in musical instruments by providing an electrically or electronically operable device capable of producing any number of fixed beat ratios.

Other objects will become apparent during the course of the following specification.

The objects of the present invention may be realized by the device of the present invention which provides two series of contrasting tones in various ratios and at various predetermined uniform rates. The device is electrically operated and easily controlled.

A rotatable shaft of controllable speed provides the means of achieving short duration current flows in each of several circuit branches, and the principle of electromagnetism is utilized to produce different identifiable tones at diffeernt uniform rates.

The invention will appear more clearly from the following description when taken in connection with the accompanying drawing showing, by way of example, a preferred embodiment of the inventive idea.

In the drawing:

FIGURE 1 is a diagram showing the electrical circuit and the mechanical members used in the metronome of the present invention.

FIGURE 2 is a diagrammatic perspective view of the rotating discs, the conductive strips, and the electric circuit contacts.

FIGURE 3 is a partial section through an electrical dual metronome with parts removed constructed in accordance with the present invention.

The electrical connections of the dual metronome of the present invention, shown in FIGURE 1, include the motor electric circuit **11**, the disc electric circuit **12**, and the parallel electric branch circuits **13**, **14** and **15**. A suitable device **16** which is included in the circuits **11** and **12** may be used to convert A.C. power to D.C. power, if necessary. A double pole switch **17** enables both circuits **11** and **12** to be opened with one operation. A variable resistance **18** in the circuit **11** controls the speed of an electric motor **19** provided with a motor shaft **20**. On the shaft **20** are mounted three discs **21**, **22** and **23** made of insulating material, and which have a series of slots **25** (FIG. 2). Electrically conducting strips **24** are fastened to the discs **21**, **22**, and **23** by means of bolts **26** extending through the slots **25**. The slots enable the strips **24** to be fastened to the discs in any number or configuration desired.

As shown in FIG. 2, strips **24** are electrically connected

with one side of electric circuit **12** by means of electric wires **27** mounted on the faces of the discs and connected with a wire **28** mounted on the shaft **20**. The wire **28** is connected with a conducting ring **29** fastened on the shaft **20**, which is in constant contact with a fixed brush **30** forming a part of the circuit **12**.

Each of the parallel branch circuits **13**, **14** and **15** is electrically connected to one side of circuit **12** and comprises electric contacts **31**, a switch **32**, and a solenoid **33**. FIGURE 1 further shows three separate tone producing devices cooperating with the three branch circuits. Each of these devices includes a pivot **34** and an arm **35** mounted intermediate its ends upon the pivot **34**. One end of the arm **35** carries a hammer **36**, while a magnet **37** is mounted on the opposite end of said arm. Tone material, such as a bell **38**, is carried by a support **40** close to the hammer **36**. A spring **39** is attached to the support **40** and to the arm **35**. The pivot **34** is so disposed that the magnet **37** is located adjacent to the solenoid **33**.

The tone materials or bells **38** of the various branch circuits may be so constructed as to emit differently sounding tones.

The number of strips **24** mounted on the discs **21**, **22**, and **23** determines the ratio of beats available on the dual metronome. By varying the number of symmetrically placed strips on the various discs various beat ratios are obtained. By way of example, in FIG. 2 disc **21** has two symmetrically placed strips, disc **22** has three, and disc **23** has four. The result is a beat ratio of 2:3:4 in respective order. Thus, if a beat ratio of 2:3 is desired, discs **21** and **22** would be made operative (in a manner to be described later), and similarly a beat ratio of 3:4 and 2:4 would be obtained by making discs **22** and **23**, and discs **21** and **23**, operative, respectively. The number of beats per minute is controlled by means of the variable resistance **18**, which controls the speed of rotation of the shaft **20**. An indicator panel **41** mounted upon the case **10** (FIGURE 3) can easily be correlated with the variable resistance **18** by any suitable known means. By co-axially mounting the pointer of the indicator and the contact arm of the variable resistance, the setting of the pointer of the indicator **41** to a desired rate of beat will automatically adjust the variable resistance **18** to the desired value.

The electrical dual metronome of the present invention is operated in the following manner:

To begin operation of the electrical dual metronome it is first determined what ratio of beats and what rate of beats is desired. The beat ratio desired is obtained by closing switches **32** in the two branch circuits corresponding to the discs having that ratio of conductive strips **24**. Thus, if a 3:4 ratio of beats (for example 60 and 80 beats per minute) is desired, switches **32** in branch circuits **14** and **15** (marked III and IV in FIG. 3) would be closed, since it was previously indicated (FIG. 2) that discs **22** and **23**, which correspond to circuits **14** and **15**, respectively, have conductive strips **24** in the ratio of 3:4. The variable resistance **18** can then be regulated to indicate 60 on the line of indicator panel **41** corresponding to circuit **14**, and since the dial is calibrated for all the circuits, the panel indicator would at the same time point to 80 on the indicator panel line corresponding to circuit **15** (FIG. 3). The double pole switch **17** is then closed, thereby causing motor circuit **11** to close, motor **19** to operate and shaft **20** to rotate. Since, as an example a ratio of 3:4 was desired, the switch **32** in branch circuit **13** is left open but switches **32** in circuits **14** and **15** are closed.

Shaft **20** has fastened to it an electrically conductive ring **29**, which rotates with shaft **20** and is in constant contact with brush **30** of circuit **12**. From ring **29** circuit **12** continues through wire **28** to wires **27** fastened on

the face of the discs 21, 22, and 23 (FIG. 2). Wires 27 continue circuit 12 up to the conductive strips 24.

Each of the circuits 13, 14 and 15 has an electric contact 31, so disposed with respect to the disc corresponding to that circuit, that it contacts each of the strips 24 on said corresponding disc once during each revolution of the shaft 20. If a switch 32 of a particular circuit is closed, the circuit 12 is closed through that branch circuit each time a strip 24 comes in contact with electric contact 31. FIGS. 1 and 2, for example, show one strip 24 of disc 22 in contact with contact 31, while there is shown no contact involving strips of discs 21 and 23. Thus, at this instant circuit 14 is closed and circuits 13 and 15 are open.

Using circuit 15, as an example, with switch 32 closed, during the time interval a strip 24 of disc 23 is in contact with contact 31 a current passes through the circuit. The current passing through solenoid 33 creates a temporary magnetic field in the vicinity of solenoid 33 for the duration of contact of members 24 and 31. This magnetic field attracts the magnet 37 which causes arm 35 to pivot about the pivot 34, whereby hammer 36 also rotates about pivot 34 and strikes the tone material 38, causing a distinct tone.

As the strip 24 continues to rotate with disc 23, its contact with contact 31 is broken, circuit 15 is opened, no current flows through solenoid 33, and the magnetic field collapses. The force attracting magnet 37 no longer being in existence, spring 39 rotates the arm 35 (and thus the hammer 36 and magnet 37) back into equilibrium position. When the circuit is again closed by the next strip 24 coming in contact with contact 31 the process is repeated.

Thus, when two branch circuits are operating simultaneously, as described above, a plurality of different tones at different pre-determined uniform rates is achieved.

Among the advantages of the present invention are ease and accuracy of control of both the rate and ratio of beats, the high rate of beats obtainable at a low shaft velocity by increasing the number of strips 24 per disc, and the fact that electrical operation makes for more uniform quality of tone. The metronome described herein is also compact and easily manufactured.

It is apparent that the example shown above has been given solely by way of illustration and not by way of limitation and that it is subject to many variations and

modifications within the scope of the present invention. All such variations and modifications are to be included within the scope of the present invention.

What is claimed is:

An electrical dual metronome, comprising, an electric motor, a source of electrical energy connected with said motor, a rotatable motor shaft driven by and being part of said motor, a variable resistance connected in series with said motor, whereby the speed of said motor shaft is varied by said variable resistance, a plurality of discs of insulating material mounted on said motor shaft and rotatable therewith, a variable number of strips of conducting material adjustably mounted on said discs and conductively connected with said source, a plurality of contacts of conductive material, each being adjacent to a separate one of said plurality of discs and disposed to engage each strip on said disc once during one rotation of said shaft, a plurality of electric switches each conductively connected in series with a separate contact, a plurality of solenoids each conductively connected in series with a separate switch, whereby a magnetic field is created adjacent to each of said solenoids during the interval when the contact engages the strips and the switch is closed; and a plurality of tone producing devices, each comprising, a pivot, an arm rotatably supported intermediate its length by said pivot, a hammer and a magnet mounted at opposite ends of said arm, tone material disposed adjacent to said hammer, a support, a spring connecting said support and said arm, said tone producing devices disposed so that each of said magnets is disposed in the magnetic field of one of said solenoids, said magnetic field attracting said magnet toward the solenoid, whereby said arm and said hammer rotate about said pivot, said hammer striking said tone material, whereby the plurality of tone producing devices produce a plurality of different tones at different predetermined uniform rates.

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