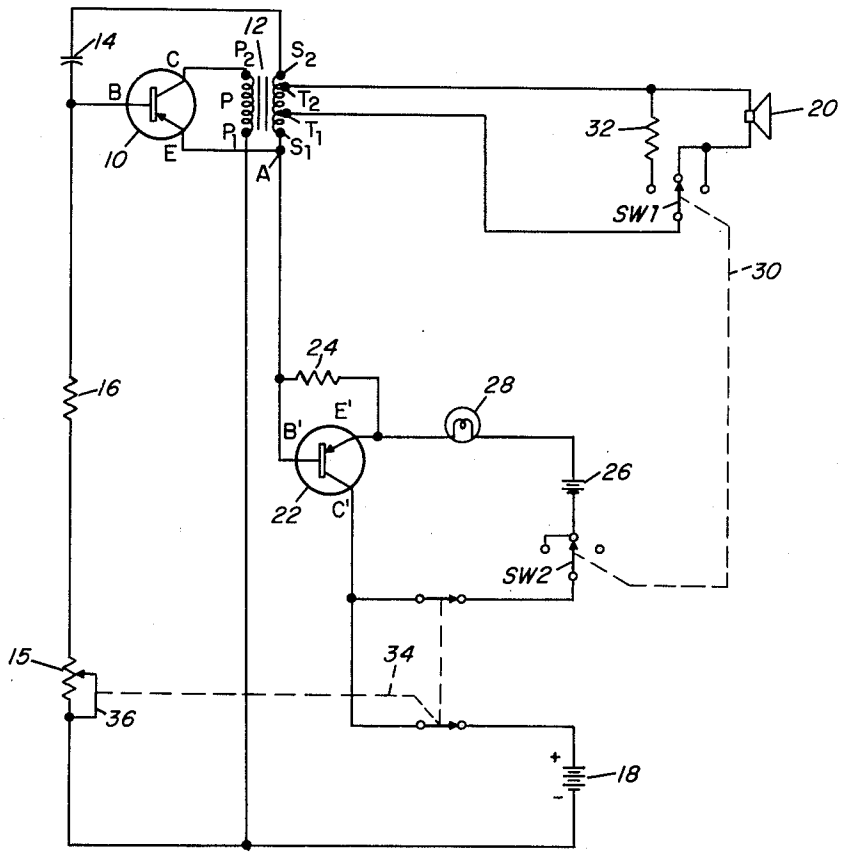
June 5, 1962 M. E. BERNSTEIN ET AL 3,038,120

ELECTRONIC TRANSISTORIZED METRONOME

Filed Aug. 19, 1959



Malcolm E. Bernstein
Harold L. Rodman
INVENTORS

BY *Walter G. Finch*
ATTORNEY

United States Patent Office 3,038,120
Patented June 5, 1962

3,038,120

ELECTRONIC TRANSISTORIZED METRONOME

Malcolm E. Bernstein, 822 Milford Mill Road, and Harold L. Rodman, 7018 Deerfield Road, both of Baltimore 8, Md.

Filed Aug. 19, 1959, Ser. No. 834,853
4 Claims. (Cl. 324—68)

This invention relates generally to educational apparatus, and more particularly it pertains to an electronic transitorized metronome device which can be utilized in the training of speakers.

In order to present a talk or idea-implanting speech with force and conviction, it is well-known that proper delivery of the speech by a speaker is of the essence. Only spoken lines having rhythmic flow, intonation or inflection in proper timing can be interest-rousing to an audience. The projection of the personality of the speaker and his idea or product is mainly through his speech and therewith his ability to gain or lose the attention of the listening audience. A speaker may have the problem of too rapid speech, which results in anxiety or lack of comprehension on the part of the listening audience. On the other hand, a slow, bland delivery results in loss of interest by the listening audience. In addition, the speaker may have the problem of not being able to speak continuously over a period of time.

The present invention is, therefore, an improvement on the apparatus shown in a co-pending U.S. patent application of Malcolm E. Bernstein entitled "Metronome-Audiometer," Serial Number 799,601, filed March 16, 1959, and now abandoned, in which there is disclosed an educational instrument for training a speaker in voice inflection and intensity, and in which regulation of speech cadence as well as speech intensity is accomplished by the speaker comparing his delivery in a visual and audible manner with an adjustable metronome and sound intensity arrangement.

It is most important for anyone delivering a talk or speech to phonate immediately without any additional control of the breath, discomfort, or warm-up. Most untrained speakers are nervous and very apprehensive because they cannot control or beautifully deliver lines in a speech at all times and under all circumstances. The apparatus of the present invention can be used to achieve full phonation of a speaker.

It is well-known that humming by a performer immediately causes the vocal chords to be put into action and emit sound. However, once the performer has gotten to the focal point through the hum, immediate speech is a natural follow-up. In brief, humming, speaking, and singing, all must have instant sound, without pausing for additional breath, because once the performer has arrived at a point to deliver sound, he is immediately ready to carry through the motion of speech without any additional physical or mental gymnastics.

It is also to be pointed out that through the hum, immediate speech of the performer is more sonorous and controlled. The performer from that point can increase intensities volume-wise and without moving a muscle, decrease volume to a whisper and still retain the intensities. As a voice builder and a breath builder which without question is the key to understanding delivery of the spoken word, thoughts can be measured and weighed to communicate the real meaning.

A performer, delivering lines based on his own innate lung power, has abilities which vary from five (5) to ten (10) seconds to as much as ten (10) to fifteen (15) seconds. Thus, without full realization of just how long fifteen seconds is in speaking, the performer often throws himself into panic when he realizes that he is gasping for breath, and as a result breaks continuity of speech.

In the electronic transitorized metronome of the present invention, the sound of the beat of the metronome gives the sensation of pulse and consequently acquaints the student with the rapidity or slowness of his speech. Through this, the student senses the proper speed for effective speaking or communication of the thought he wishes to convey to the listening audience.

It is, therefore, a principal object of this invention to provide an electronic transistorized metronome which can be utilized to give audible or visual indications of beat or both simultaneously.

Another object of this invention is to provide an electronic transistorized metronome circuit arrangement which can be utilized for training speakers in continuous voice inflection and maintaining continuity for the spoken phrase.

Another object of this invention is to provide an electronic transistorized metronome which is economical to manufacture, easy to maintain, and which is an effective and efficient educational instrument for use in training persons in speech delivery.

Other objects and advantages of this invention will become more apparent from the following specification and accompanying drawing which is a schematic diagram of an electronic transistorized metronome incorporating features of this invention.

Referring now to the drawing, there is schematically depicted a transistorized metronome circuit which can be used to give audible or visual indications or both simultaneously. This circuit includes a first transistor **10**, together with an associated transformer, capacitor, resistor, and battery components comprising a blocking oscillator arrangement.

To understand this first transistor portion of the metronome circuit, let there temporarily be considered a common point A as the electrical return of the positive side of a battery **18**. This common point A is also the connection to the emitter E of the transistor **10**, and the terminal S_1 of the secondary coil S of a transformer **12**.

The negative side of the battery **18** is connected to a terminal P_1 of the primary coil P of the transformer **12**. The other terminal P_2 of primary coil P is connected to the collector C of the transistor **10**. The other terminal S_2 of the secondary coil S is connected through a capacitor **14** to the base B of the transistor **10** which additionally connects to a resistor **16**.

The resistor **16** is serially connected to a variable resistor **15** in the circuit to form a bias path from the base B of the transistor **10** to the negative side of the battery **18**. Current from the battery flows through the primary coil P of the transformer **12** to the collector C of transistor **10**. This current induces a voltage in the secondary coil S of the transformer **12** which causes the capacitor **14** to charge rapidly through the base-emitter circuit B—E.

As capacitor **14** starts to charge, the base current change in the transistor **10** causes the collector current to increase, thereby cumulatively increasing the secondary voltage. Both base and collector currents of the transistor **10** are brought to a peak when capacitor **14** is fully charged. As the voltage thereacross approaches a maximum, the charging current starts to decrease. This causes the base and collector currents of the transistor **10** to drop. The drop in collector current reverses the polarity of the voltage induced in the secondary coil S of transformer **12**.

Since the conductivity of base-emitter circuit B—E is unidirectional, the capacitor **14** can only discharge through resistors **15** and **16**. The resulting waveform is an abrupt pulse of current somewhat flat-topped, followed by a relatively long period of practically no current flow with the repetition time determined by the resistance-

capacitance product of resistors **15** and **16**, totalized, and capacitor **14**. This wave form is suitable for driving a loud speaker **20** in metronome service. The loud speaker **20** is shown connected to taps T_1 and T_2 of the secondary coil S of the transformer **12** for this purpose.

In the current path from point A to the positive side of battery **18**, there is now to be considered the base-collector circuit B^1—C^1 of an emitter-follower connected second transistor **22**. A bias resistor **24** from emitter E^1 to base B^1 of the second transistor **22** limits the current in its emitter-collector circuit E^1—C^1 to a low value. Under these conditions a battery **26** will not light a serially connected incandescent lamp **28** when connected to the emitter E^1 and collector C^1 of transistor **22** as shown.

With each pulse of the blocking-oscillator connected first transistor **10**, a pulse of current flows as related between its collector C and emitter E. This current returns through battery **18** and the collector-base circuit C^1—B^1 of the second transistor **22** to common point A and causes a large increase in the emitter-to-collector current from battery **26**. Consequently, the lamp **28** flashes in unison with the pulsing of the first transistor **10** and with the pulse clicks emanating from the speaker **20**.

If it is desired to operate the metronome circuit visually indicated only or audibly indicated only, a two-pole three-position switch **30** may be connected so that one pole SW1 thereof, is in circuit with the loudspeaker **20** and the other pole SW2 is in circuit with the lamp **28**. In the center position, as shown, for the switch poles SW1 and SW2 of switch **30** both the speaker **20** and lamp **28** are in circuit.

In the right throw position of the switch **30**, the circuit to lamp **28** is opened but the speaker remains connected. In the left throw position from center, the switch **30** disconnects the speaker **20** but completes the lamp circuiting.

To avoid an impedance charge in the discharge circuit of capacitor **14** and a resulting undesirable repetition rate change of the pulsing when the speaker **20** is switched out, a compensatory resistor **32** in place thereof is switched in, if desired.

The metronome may be turned on or off by opening the circuits for the batteries **18** and **26** with a double pole switch **34**. Switch **36** is preferably linked to a variable arm **36** which by changing the resistance value of resistor **15** alters the discharge rate of capacitor **14**. Thus, the same control knob can alter the metronome beat time as desired.

Obviously, many modifications and variations of the present invention are possible in light of the above teachings. It is, therefore, to be understood that within the scope of the appended claims, the invention may be practiced otherwise than as specifically described.

What is claimed is:

1. A transistorized metronome device for producing observations audible or visual or both simultaneously, comprising, a circuit including a transistorized blocking oscillator having a transformer for producing periodic pulses, a first power supply connected thereto, an emitter-follower connected transistor coupled to said transistorized blocking oscillator, a second power supply connected to said emitter-follower connected transistor, a loudspeaker connected to the output of said transformer for audible observations of said periodic impulses, a signal type incandescent lamp connected to the output of said emitter-follower connected transistor for visual observation of said periodic impulses, and means for electrically switching said outputs from said transistorized blocking oscillator and said emitter-follower connected transistor for audible observations alone, or visual observations alone, or both together simultaneously.

2. A transistorized metronome device as recited in claim 1, wherein said power supplies are of the low voltage type.

3. A transistorized metronome device as recited in claim 1, and means for adjusting the period of said periodic impulses.

4. A transistorized metronome device as recited in claim 1, and means for compensating for change in the period of said periodic impulses upon switching from audible observations to visual observations alone.

References Cited in the file of this patent

UNITED STATES PATENTS

2,522,492 Andersen ---------- Sept. 19, 1950