

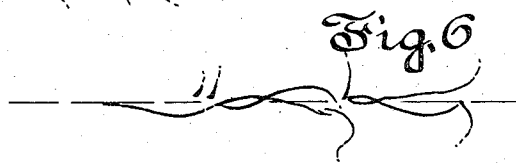
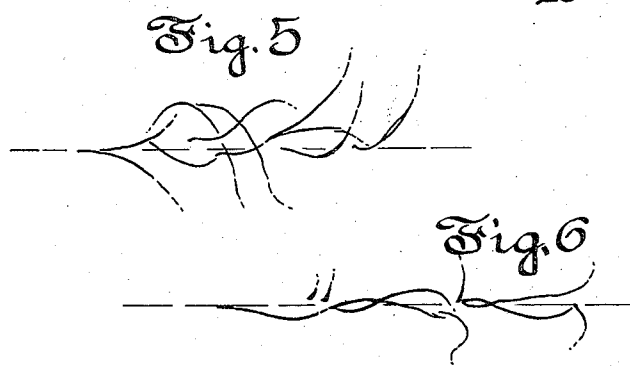
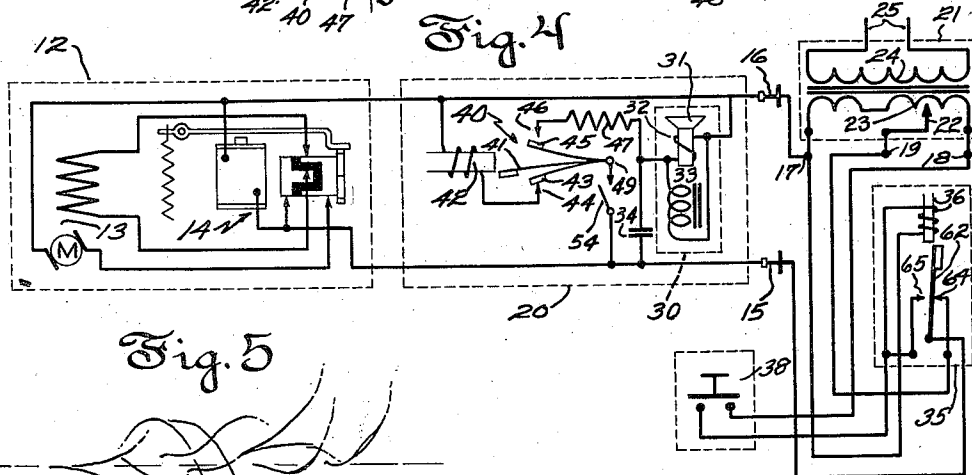
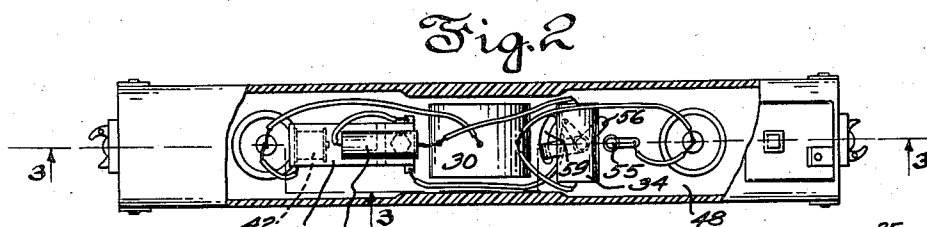
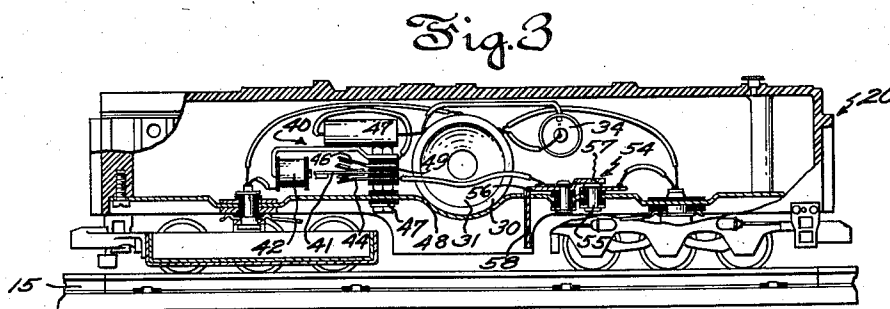
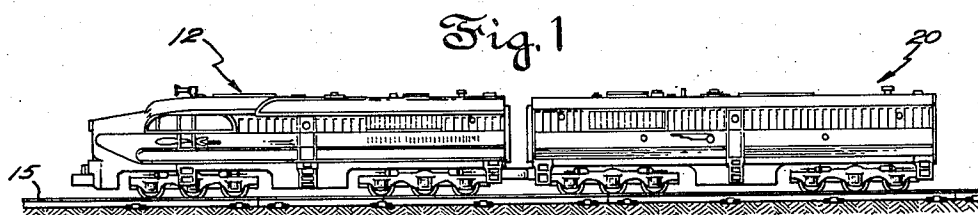
April 21, 1959

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2,882,834

TOY LOCOMOTIVE SOUND EFFECTS

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2,882,834

TOY LOCOMOTIVE SOUND EFFECTS

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Application May 3, 1956, Serial No. 582,584

4 Claims. (Cl. 104—150)

This invention relates to toy or model electric railroads particularly of miniature size whose rolling stock comprises a locomotive externally styled to resemble either a one-unit or two-unit diesel locomotive carrying sound producing means from which will emanate noises realistically simulating the pulsating roaring sound of a diesel engine and also familiar variations of such sound that accompany change of engine speed. The invention also relates to electrical systems which enable the same sound producing means on occasion to produce a signaling sound simulating that of a diesel horn.

An object of the invention is to produce the aforesaid characteristics of sound by the use of very small electrically energized apparatus susceptible of being contained by and concealed within the more miniature sizes of toy or model railroad rolling stock whether running on two-rail or three-rail track.

Another object is to subject the train-carried sound producer to the same increases and decreases of electrical potential that are impressed on the track rails for energizing the propulsion motor of the locomotive for controlling its speed of travel, so that the pulsating character of the aforesaid roaring sound will vary automatically in accordance with changes in the speed of running of the train, a familiar characteristic of diesel locomotives in real railroading.

Another object is to incorporate the propulsion motor in one piece of rolling stock and the sound producing devices in a separate piece of rolling stock coupled thereto, such rolling stock being externally fashioned to resemble a two-unit locomotive.

A still further aim is to accomplish all of the foregoing objectives by circuit systems incorporating balanced resistance and capacitance and requiring only a two-rail track capable of being energized by alternating or direct current at selected voltages varying say from 4 volts to 15 volts, in response to which variation of voltage the speed of the train and the rapidity of pulsation and strength of the diesel roaring will increase and decrease in unison. Moreover the diesel imitating sound will continue realistically in subdued form, with diminished loudness and slowed rate of pulsation, when the propulsion motor is actually stopped as when the train is standing at a way station.

A further object is to provide the sound producing circuit with an electrical cutout that can be set to silence the diesel roar and which when so set permits the propulsion motor still to operate without sound effect and also leaves the train carried sound producer still able to emit the signalling noise of a diesel horn whenever the current fed to the track from the power circuit is pulsed by means of an electromagnetic vibratory circuit interrupter as in the trackside electrical apparatus shown in my copending patent application Serial No. 362,082, now U.S. Patent No. 2,826,996, issued March 18, 1958, owned by the assignee of the present application.

An object contributory to the above aims is to supple-

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ment the signal sound producing system disclosed in the aforesaid patent application with an additional electromagnetic vibratory circuit interrupter carried on the rolling stock operating with relatively very low frequency and so connected in circuit as to affect only the current reaching the miniature sound producing loud speaker and not the current delivered to the locomotive propulsion engine, whereby the loud speaker may be impelled to emit a toneless, roar imitating noise and yet stand ready at any time to respond to the relatively high frequency circuit interruptions of the trackside vibrator for sounding its horn imitating tonal signal.

The foregoing and other aims and objectives of the invention will become apparent in fuller detail from the following description of a preferred embodiment of the improvements said description having reference to the appended drawings wherein:

Fig. 1 shows a two-unit diesel locomotive of a toy or model train standing on toy railway track and equipped to produce sound realistically imitative of the growling roar of a diesel engine as well as on occasion the signalling noise of a diesel horn.

Fig. 2 is a plan view of the trailing or "B-unit" of the locomotive with its car roof broken away to expose internal diminutive sound producing apparatus.

Fig. 3 is a view taken in section on the planes 3—3—3 in Fig. 2 looking in the direction of the arrows.

Fig. 4 is a diagram of wiring connections.

Figs. 5 and 6 are oscillograph curves showing typical wave characteristics of the current that energizes the sound producer to cause it to emit a pulsating roaring noise imitative of a diesel engine.

In Figs. 1 and 4 the A-unit of a miniature "diesel" locomotive is represented at 12. Its propulsion motor 13 may be universal for operation on alternating or direct current. If alternating current is employed, starting, stopping and reversal of the direction of train running may be governed by the stepping action of an electromagnetic motor reversing relay 14 as is conventional and explained for instance in U.S. Patent No. 2,196,319. If direct current is employed the stepping relay 14 can be emitted and the direction of trail travel reversed by merely reversing the polarity of the track rails 15 and 16. In either case it will be understood as indicated by electrical connections in Fig. 4 that the propulsion motor 13 derives its energizing current from the track rails 15, 16 through relatively insulated traction wheels on respectively opposite sides of the locomotive in conventional manner.

The sound producing apparatus in the B-unit 20 of the locomotive derives energizing current from the track rails 15, 16 in the same manner. As an illustrative source of current supply a train controller 21 is represented in Fig. 4 having a 7½ volt binding post 19 in constant electrical connection with a manually swung voltage varying take-off arm 22 that sweeps selective lengths of the train running section 23 of the higher voltage portion of the secondary winding of a toy transformer in the controller 21. The base or zero voltage binding post of the controller is represented at 17 and the full potential or 15 volt binding post at 18. The primary winding 24 of the transformer derives power from any suitable source of alternating current, preferably at 60 cycles, through an attachment cord 25 whereby the controller can be stationed in any desired position at the track side of the railway for manually governing the speed and direction of running of the train in the usual way through a circuit that includes normally closed contacts, one on reed 62 and one stationed at 64, in the high frequency electromagnetic vibratory circuit interrupter 35. When the reed 62 is idle, train running, normally uninterrupted alternating current reaches the track

rails 15 and 16 at voltages selective between 4 and 15 volts through a circuit traceable in Fig. 4 as 17, 16, 15, 62, 64, 19.

The sound producer 30 of the present improvements is mounted on the interior of the B-unit 20 of the locomotive and may take the form of a magnetic speaker either of the horn type or the cone type, but preferably shall be of the dynamic loud speaker type incorporating either a permanent type of field magnet or a solenoid energized field magnet 33 as indicated in Fig. 4. Structural details of the speaker or sound producer 30 are not herein shown because they may be similar to the corresponding unit shown in a copending application of Raymond E. Smith, Serial No. 251,426, filed October 15, 1951 now U.S. Patent No. 2,791,972 issued May 14, 1957. The basic elements of the speaker are an electromagnetically incited vibratory air wave inducing, dished diaphragm or cone 31 having a voice coil 32 and the electromagnet 33 whose core may be replaced by a permanent magnet as well understood in the art. For purposes hereinafter explained in fuller detail there is placed in series with the speaker 30 a resistor 47.

When, as is fully explained in my aforesaid U.S. Patent No. 2,826,996, it is desired to energize speaker 30 to produce a horn imitating signal sound, normally open momentary switch 38 will be manually closed to direct 15 volts from controller 21 through the magnet coil 36 of vibrator 35 which causes reed 62 to vibrate at the relatively high frequency of the alternating current derived from controller 21. The current delivered to track rails 15, 16 and hence to speaker 30 is thus intermittently broken and remade at least twice during each excursion of the reed through the breaking and making of contact by the reed not only with the aforesaid stationed contact 64 but also with an additional contact 65 stationed at the opposite side of the reed. This however does not interfere with the running of the train nor control of train speed because the vibrator interrupted current continues impressed upon the track through a circuit traceable in Fig. 4 as 17, 16, 15, 62, 64 or 65 and 19 or 18.

Figs. 2, 3 and 4 show interpositioned in only the speaker circuit a low frequency electromagnetic vibratory circuit interrupter 40 comprising a reed 41 normally displaced laterally from alignment with its driving solenoid 42 in its idle position so as normally to close a circuit between a contact 43 resiliently carried by the reed and a resiliently stationed contact 44 forming one electric terminal of the solenoid 42. At the same time another contact 45 resiliently carried on the opposite side of reed 41 is separated from another resiliently stationed contact 46 which connects to the aforesaid resistor 47. The general arrangement of the contacts may be as in my U.S. Patent No. 2,826,996. An overall hookup of the circuits is illustrated in Fig. 4 and their cooperative relationship hereinafter more fully described.

Fig. 3 shows that the mounted end of reed 41 and of the stationed spring leaf contacts 44 and 46 are held in insulated relation by a common base structure 49 that is secured to the sheet metal floor 48 of the B-unit 20 which floor of the rolling stock also supports the sound producer 30.

Further carried on car floor 48 there is a cutout switch 54 comprising an insulated circuit terminal 55 and a swingable switch arm 56 having a conductive circuit making and breaking end 57 and a handle end 58, the latter extending through an aperture 59 in the car floor to become accessible for setting the switch in ON or OFF position when the rolling stock is removed from the track and turned upside down.

The circuiting of the train carried components of the electrical system can be traced in Figs. 2, 3 and 4 as follows.

Alternating current fed to track rails 15, 16 from the controller binding posts 17 and 19 whether continuous

and uninterrupted while signal energizing switch 38 is open or whether interrupted by the signal causing vibration of reed 62 when switch 38 is closed, serves to energize the magnet coil 42 of the train carried low frequency vibrator 40 through the medium of normally closed, reed opened contacts 43 and 44. The coil energizing A.C. circuit can be traced in Fig. 4 as 16, 42, 44, 43, 49, 54 and 15. When silencing switch 54 is set in open position vibrator 40 remains idle and without effect on sound producer 30 which thereupon is left operatively responsive only to current derived from track 16, 15 through a capacitor 34 that is capable of building up a signal sounding energization of speaker 30 responsive to interruptions of track current by vibrator 35 as is fully described in my aforesaid U.S. Patent No. 2,826,996. Thus whether silencing switch 54 is open or closed speaker 30 can be made to emit a horn or whistle imitating tonal sound at any time by manually closing signaling switch 38.

When the silencing switch 54 is set in closed position there will constantly be emitted by speaker 30 the pulsating sound of a diesel engine that is new with this invention. To accomplish such effect upon speaker 30 the reed vibrated contacts 45, 46 open and close at relatively very low frequency to make and break a circuit through the resistor 47. This circuit can be traced in Fig. 4 as 16, 32, 47, 46, 45, 54 and 15.

Starting from its position in Fig. 4 reed 41 will be drawn toward alignment with its motivating solenoid 42. Owing to the springy nature of the driving contacts 43, 44, they will remain closed until by momentum reed 41 has lunged beyond a position of alignment with its solenoid thus causing circuit to be made between contacts 45 and 46. This imparts an impulse to the voice coil 32 of the air wave generating diaphragm or cone 31 in speaker 30. Contacts 43, 44 immediately separate and the natural spring bias in reed 41 returns to its starting position in Fig. 4 thus breaking the speaker circuit at contacts 45, 46 and reclosing the solenoid energizing contacts 43, 44. This cycle of reed excursion automatically repeats at a very low frequency opening and closing contacts 45, 46, say, three to sixty times per second. Factors determining the low frequency of circuit interruptions caused by reed 41 are the thickness, length and stiffness of reed 41, and the space setting of the reed driving contacts 43, 44, in other words a composite effect of the natural mechanical resonance of the reed and the positional setting of the reed driving contacts.

Regardless of the mechanical resonance of the reed, the frequency of its excursions will vary with the reed driving strength of the magnetic field of solenoid 42 which in turn varies in accordance with different voltages impressed on the track rails 15, 16 by the train speed controlling manipulation of take-off arm 22 in controller 21. Thus when the track voltage is raised from 4 volts toward 15 volts the reed will vibrate proportionally faster and this will increase correspondingly the rapidity of the pulsations of the diesel engine sound emitted by the speaker. At the same time, other characteristics of the sound will change because of accompanying change in the proportional periods of time during one reed excursion that the speaker affecting contacts 45, 46 remain open or closed. The springiness in each of the reed motivated contacts accommodates differing degrees of overthrow of reed 41 past its position of alignment with solenoid 42. This varies the said proportional periods of time and consequently the depth and intensity of noise emitted by speaker. The sound is found to rise to a crescendo and higher pitch as higher voltages are delivered to the track.

A further condition, namely that speaker 30 is fastened to the thin reverberative sheet metal floor 48 of the car, causes the inciting of speaker cone 31 by relatively slow circuit interruption to produce a sounding board

effect in the sheet metal 48 that augments the loudness and depth of the sound emitted by the speaker for simulating the pulsating exhaust roar of a diesel engine.

Without implying that the elements of the electrical system must possess definite electrical ratings the resistor 13 may to advantage be rated 10 ohms—1 watt when a permanent field magnet instead of the electromagnet 33 is used in the speaker 30. In such instance the resistor may be replaced by a condenser rated 25 mfd.—15 volts—of the electrolytic type. Either will serve to check excessive current supply to the speaker and will filter out frequencies derived through the track from the trackside current supply if vibrator 40 should be substituted for vibrator 35 as a way of causing the train carried speaker to fail to match the natural mechanical resonance of the cone or diaphragm in the speaker. In either case there results an erratically broken current wave as is shown by the oscillographs of Figs. 5 and 6 which is productive of the desired toneless pulsating noise emitted by the speaker imitative of the exhaust sound of a diesel engine. The capacitor 34 may be rated in the neighborhood of 100 mfd.—15 volts for protection of the voice coil of the speaker.

The propulsion motor 13 and its automatic direction reversing step switch 14 may be carried on the same locomotive chassis 20 with the sound producing apparatus in the event that a single unit diesel locomotive is to be simulated by the exterior fashioning of the toy rolling stock.

As various obvious departures from and substitutions can be made for the exact circuiting and composition of electrical elements proposed in the herein disclosed example of an embodiment of the invention, the appended claims are directed to and intended to cover all such departures and substitutions as come within a broad interpretation of the wording of the claims.

I claim:

1. An electrical system for operating a toy electric train and causing to emanate therefrom substantially toneless sounds simulating the pulsating exhaust noise of a diesel engine, comprising in combination, toy track rails, a source of electrical energy, means for varying the potential of said source of electrical energy, means to connect said variable source across said rails, toy rolling stock riding on said rails equipped with means to collect current therefrom derived from said source, conductors connected to said collector means carried by said rolling stock electrically associated to form a plurality of parallel load circuits, a train propulsion motor carried by said rolling stock in a first one of said parallel load circuits, sound producing apparatus carried by said rolling stock in a second one of said parallel load circuits including an electrodynamic loud speaker having

a voice coil, circuit making the breaking contacts in series with said voice coil, a resilient magnetically attractable reed mechanically connected with said contacts to open and close the same and normally biased toward a flexed position causing said contacts to be open, an electromagnet stationed relatively to said reed to exert magnetic attraction thereon in a direction away from said flexed position, said electromagnet having an electric winding connected across said rails for deriving current from said track rails at varying potential determined by said variable source of electrical energy, and auxiliary contacts electrically connected in series with said winding to make and break the supply of current to said winding mechanically connected with said reed to be opened and closed by the flexing thereof at a periodicity determined at least in part by the potential of current in said track rails.

2. An electrical system as defined in claim 1, in which the said speaker includes an airwave inducing diaphragm having a mechanical resonance discordant with the frequency of vibration of said reed, thereby to defeat evenness in the vibrations of said diaphragm and impart irregular fluctuation thereto resulting in the emission of a substantially toneless pulsating noise by said speaker.

3. An electrical system as defined in claim 1, together with a third circuit in branching relation to a portion of the said second circuit and containing the said speaker to the exclusion of the said electromagnetically powered means, a capacitor in said third circuit in series with said speaker, additional automatic circuit interrupting means electrically connected and manually operable at will to supply to the said track rails a current pulsating regularly at frequencies sufficiently higher than the circuit interrupting frequency of said electromagnetically powered means to cause said speaker to emit a tonal signalling sound.

4. An electrical system as defined in claim 3, together with a noise silencing switch in the said second circuit having a switch operating handle protruding outside the said rolling stock to be manually shiftable between open or closed positions.

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UNITED STATES PATENT OFFICE
CERTIFICATE OF CORRECTION

Patent No. 2,882,834

April 21, 1959

William R. Smith

It is hereby certified that error appears in the printed specification of the above numbered patent requiring correction and that the said Letters Patent should read as corrected below.

Column 6, line 1, claim 1, for "circuit making the breaking contacts" read -- circuit making and breaking contacts --; column 2, line 42, for "emitted" read -- omitted --.

Signed and sealed this 1st day of September 1959.

(SEAL)

Attest:

KARL H. AXLINE

Attesting Officer

ROBERT C. WATSON
Commissioner of Patents