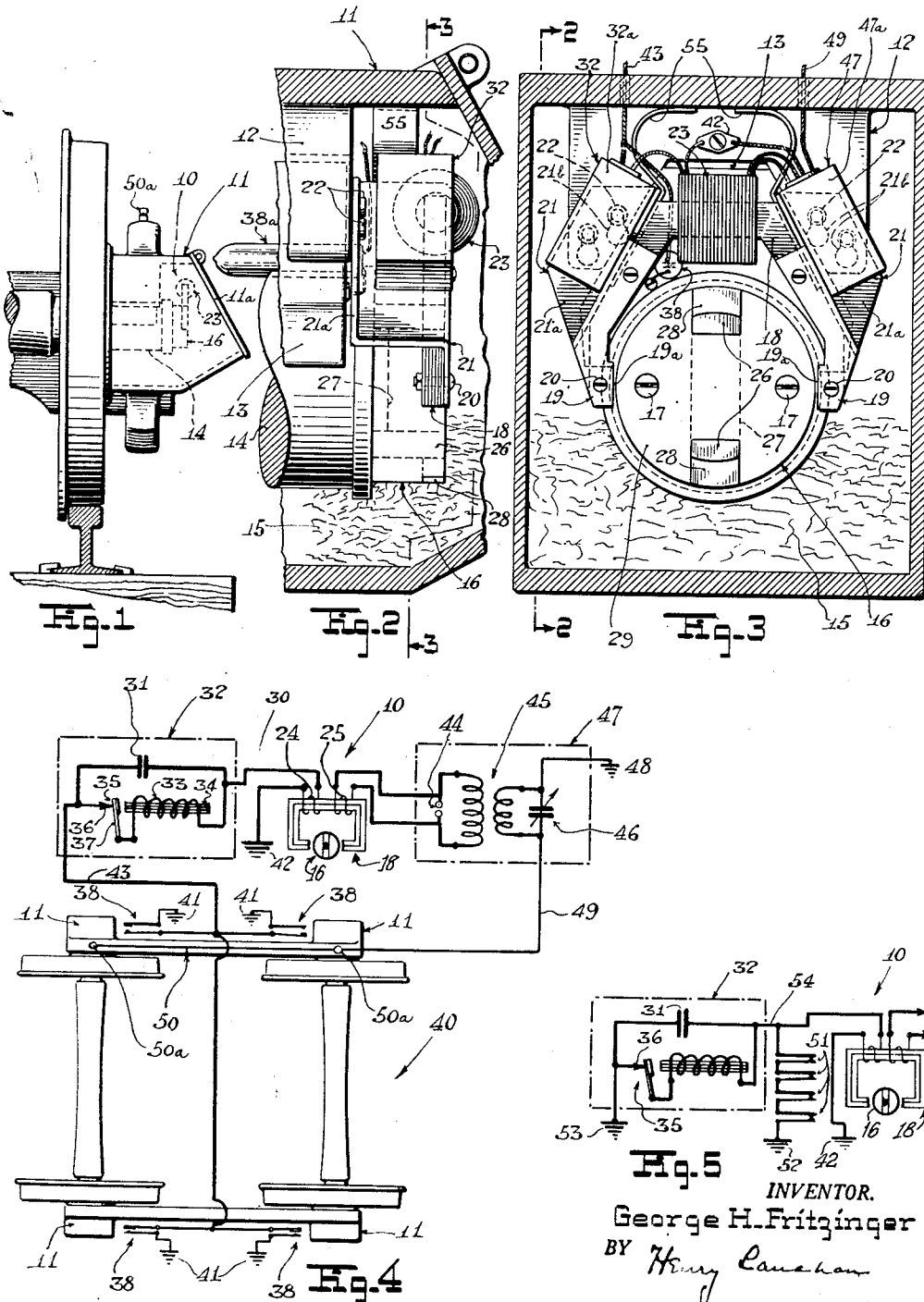


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 APPARATUS RESPONSIVE TO ABNORMALLY
 HOT CONDITIONS IN MACHINES
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APPARATUS RESPONSIVE TO ABNORMALLY
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This invention relates especially to alarm systems for detecting overheated journal bearings of railway cars, and is particularly concerned with a novel signal-generating apparatus for such systems.

My invention provides an improved alarm system for detecting overheated bearings of railway cars, which is without any wires or physical connections between the car trucks and the cars or between the cars of a train, and which is especially adapted to fulfill the need for practical and dependable bearing alarm systems for freight trains. In this instance, the alarm must usually be given at a point remote from the car having the overheated bearing—for example, ahead in the locomotive or back in the caboose. This is accomplished in the present instance by a novel apparatus for giving an alarm by radio signaling.

The present control system includes a generator mounted within the journal housing of a railway car, but the mechanical features of this generator are not claimed herein since the same are described and claimed in my pending continuation-in-part application Serial No. 759,089, filed July 5, 1947, now Patent No. 2,476,719, dated July 19, 1949.

The objects of my invention are to provide a unitary signal-generating apparatus for bearing alarm systems which is adapted to be mounted on the truck of a railway car, which requires no batteries or other sources of potential, which operates to convert mechanical power taken from the moving car into electrical signal energy, which has however no mechanical coupling with the rotary portion of the car truck nor any parts which undergo wear when the alarm system is not in operation, which is adapted to be readily mounted in the journal housing of present-day railway cars wherein it is protected by the housing from the elements of the weather, dirt, cinders, etc., which is adapted to occupy only unused space within the journal housing, and which is of simple and economical construction.

These and other objects and features of my invention will more fully appear from the following description and the appended claims.

In the description of my invention, reference is had to the accompanying drawings, of which:

Figure 1 is a view of a railway car wheel and journal housing showing a signal-generating apparatus incorporated within the housing according to my invention;

Figure 2 is a partial vertical sectional view, to larger scale, taken through the journal hous-

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ing on the line 2—2 of Figure 3 and showing the signal-generating apparatus in side elevation;

Figure 3 is a sectional view taken on the line 3—3 of Figure 2, and showing the signal-generating apparatus in front elevation;

Figure 4 is a schematic drawing of circuits and mechanism according to my invention; and

Figure 5 is a schematic view illustrating an alternative arrangement of the circuit system of Figure 4.

In the accompanying drawings I show a preferred embodiment of my invention comprising a magneto 10 mounted within a standard on-board journal housing 11 of a railway car. This magneto is normally in a condition incapable of generating high-tension current but is rendered operative to generate such current whenever a journal bearing of the car becomes overheated. This high-tension current is converted into a radio frequency signal wave and transmitted from the car truck having the overheated journal bearing. This wave is received at any desired point on the train, and is there amplified and fed into a suitable mechanism to give an audible and/or visible alarm. Such receiver and alarm mechanism may be standard equipment and need not be herein shown.

In the standard construction of journal boxes of railway cars there is the journal housing 11 having within the top portion thereof a journal wedge 12 for supporting a bearing or brass 13 into which journals an axle 14 of the car. The space below the axle is filled with an oil-soaked waste 15 which is inserted into and removed from the housing by way of a front opening having a cover or lid 11a. The space to the front of the axle and thereabove is however unused. It is in this unused space that I mount the magneto 10. Thus, the magneto is closed in by the housing 11 and is protected from the elements of the weather and from dirt and cinders. Moreover, it will be observed that the magneto does not interfere with the waste 15 or obstruct the insertion and removal of the waste into and out of the housing.

A further important feature of my invention is that I utilize the journal of the railway car as the journal also for the magneto 10 and that I require no mechanical coupling of the magneto with any rotary portion of the car truck. Also, I require no batteries or other sources of potential. To these ends, the magneto is provided with a permanent magnet rotor, referred to as 16, which is mounted onto the end face of the axle 14 and held fixedly thereto by screws 17 as hereinafter explained. Cooperating with this rotor

is a U-shaped field core 18. This field core is mounted, preferably detachably, in the upper front part of the housing 11 and has a pair of field poles 19. Preferably, these field poles are spaced from the end of the axle 14 and positioned so that their common medial plane passes substantially through the center of the axle 14 and in substantially parallel relation with the horizontal. The faces 19a of these poles are made flat and positioned parallel with the vertical, this being done in order that the rotor may not come into contact with the field poles as the bearing 13 wears. The field core is made of laminated material held together by screws 20. These screws also serve to retain mounting brackets 21 to the opposite legs of the core. These brackets have turned-up flanges 21a provided with slots 21b for detachable connection with screw heads 22 which are carried by the wedge 12. On the central part of the field core there is an induction coil 23 having primary and secondary windings 24 and 25 as schematically shown in Figure 4.

The rotor 16 comprises one or more permanent magnets 26—two being herein shown—which are preferably made of one of the efficient permanent magnet materials known as "Alnico." These magnets are positioned intermediately between the center of the axle 14 and the outer periphery thereof, and are so disposed that their magnetic axes are normal to the end face of the axle, this being done so that the magnetic material of the axle will not provide any substantial shunt for the flux of the magnets. Bridging the ends of the magnets which are adjacent to the axle is a non-permanent magnetic member 27, and fitted to the outer end portions of the magnets are radially-extending pole shoes 28. These pole shoes terminate on an arc about the center of the axle 14. For holding the magnets and members 27 and 28 in the assembled relation just described, the same are housed, preferably cast, in a body 29 of non-magnetic material. In order that this rotor structure will not pick up any of the waste 15 and carry it around within the housing 11, the body 29 is made cylindrical and provided with a smooth continuous exterior surface, the peripheral surface of the body being flush with the faces of the pole shoes 28 and the end face of the body being flush with the exposed sides of the shoes 28 and ends of the magnets 26. It is through this body 29 that the aforementioned screws 17 extend to hold the rotor to the axle 14.

Typically, the rotor 16 may have an axial (with respect to the axle 14) length of an inch or more, and may have a radial dimension equal to that of the end face of the axle 14. If a rotor of longer axial dimension is employed—which may be desired to permit the use of more efficient shapes of permanent magnets—then its radial dimension is preferably reduced so that the rotor will not occupy any of the space through which the waste 15 is to pass as it is inserted into and removed from the housing 11.

The magneto 10 has a primary circuit 30 which includes the primary winding 24 and a circuit breaker or interrupter 32 as shown in Figure 4. This interrupter is of the electrically-operable type comprising a field coil 33, preferably of low resistance, which is wound on a magnetic core 34, and a switch 35 including a stationary contact 36 and a movable contact or armature 37 which is actuated electromagnetically to break the switch contacts upon energization of the field coil 33. The field coil 33 and switch 35 are con-

nected in series and have a condenser 31 connected in shunt therewith to reduce arcing at the switch contacts. The interrupter is connected serially in the primary circuit 30 so that when current is supplied to the interrupter by the primary winding 24 the primary circuit will be broken recurrently to cause high voltages to be induced in the secondary winding 25 of the induction coil. However, the interrupter is operatively disassociated from the primary circuit and left in an idle condition except when a journal bearing of the car becomes overheated as is herein next explained.

Associated with each journal bearing 13 is a thermostat 38. This thermostat comprises a pair of contacts (see Figure 4) either in a normally-open or normally-closed condition, one of which contacts is thermally responsive—for example, made of a bimetal—so that the thermostat is operated when it is heated to a predetermined temperature. Typically, the thermostat is enclosed in an evacuated cylindrical casing 38a, and this casing is inserted in a well provided in the journal bearing 13 at a point adjacent to the axle 14 as indicated in Figure 3. By way of illustrative example, there may be provided one magneto 10 for each car truck 40 as indicated in Figure 4. There is however a thermostat 38 associated with each of the four journal bearings of the car truck as diagrammatically indicated, and all thermostats are connected in the primary circuit 30. In the present instance, each thermostat 38 is considered as being normally open, in which case each is connected in series with the interrupter 32 and primary winding 24 but in parallel relation with each other. This is done, for example, by grounding a contact of each thermostat 38 to the truck, as at 41, likewise grounding one side of the primary winding 24 at 42, connecting the other contact of each thermostat by a lead 43 to the interrupter, and connecting the other side of the interrupter to the primary winding. Thus, the primary circuit is maintained normally open and the interrupter is normally unenergized and idle. As a result, there are no high voltages induced in the secondary winding—it being understood that the voltages induced directly by rotation of the rotor 16 are very small—and accordingly the magneto is in a normally-inoperative condition. When however any one of the journal bearings of the car truck becomes overheated, the respective associated thermostat 38 is operated to close the primary circuit, the interrupter is then put into operation and high voltages are induced in the secondary winding 25.

The secondary winding is connected to a pair of electrodes forming a spark gap 44 and also to the primary of a radio frequency transformer 45, the secondary of this transformer being tuned to a predetermined frequency by a condenser 46. The spark electrodes and tuned radio frequency transformer, referred to generally as 47, form with the magneto 10 a radio frequency generator. One side of the transformer 45 is grounded at 48 and the other is connected by a lead 49 to an antenna 50. The operation of the radio frequency generator is as follows: When the primary circuit 30 is broken by the interrupter 32 the field of the primary current collapses and a train of high-voltage impulses is impressed across the spark gap 44. The gap is broken down by these voltage impulses and in response thereto radio frequency oscillations are induced

in the tuned secondary of the transformer 45. These oscillations are fed to and transmitted by the antenna 50. This antenna may be mounted in any desired position, but is preferably located on the car truck 40. By way of example, it may be mounted at a side of the car truck, being supported thereon at the ends by insulators 50a as indicated in Figure 4.

In Figure 5, I show a circuit system for normally-closed thermostats 51, it being understood that there is one such thermostat for each journal bearing as hereinbefore explained. Now, however, the thermostats are connected in series with each other, and the group thereof is connected in shunt with both the primary winding 24 and the interrupter 32. This is done, for example, by grounding one side of the primary winding again at 42, one side of the group of thermostats at 52, one side of the interrupter at 53, and then connecting the other sides of the primary winding, thermostat group and interrupter together by a lead wire 54. When the bearings are in normal condition, the thermostats 51 provide a direct short across the interrupter and the interrupter is effectively disassociated from the primary winding. If, however, one of the bearings becomes overheated, the short on the interrupter is removed, with the result that the current from the primary winding 24 is fed through the interrupter. The primary circuit is accordingly broken and high-voltage impulses are induced in the secondary winding.

The components 32 and 47 of the radio frequency generator are mounted as units on the core 18 in hermetically sealed containers referred to in Figure 3 by the numerals 32a and 47a respectively, the sealing being done so that oil spray and fumes may not get into contact with the switch contacts or the electrodes of these units. Thus the whole radio frequency generating system is contained within the journal housing and only two leads need be brought out of the housing, which are the lead 43 from the interrupter to the thermostats 38 or 51 and the lead 49 from the component 47 to the antenna 50. Additionally, the stator structure of the generating apparatus, and the interrupter 32 and source 47, may be removed as a unit upon detaching the brackets 21 from the screw heads 22, which is done simply by lifting the apparatus upwardly and then outwardly from the housing. Such detachable mounting of the apparatus is advantageous in facilitating the replacement of worn-out bearings. In order however that the apparatus will be firmly mounted within the housing there is a pair of springs 55, secured to the brackets 21, which engage the top wall of the housing and urge the apparatus downwardly to maintain engagement of the brackets 21 with the screw heads 22.

While I have herein particularly shown and described my invention in terms of a preferred embodiment, it will be understood that this embodiment is subject to changes and modifications without departure from the scope of my invention which I endeavor to express according to the following claims.

I claim:

1. In a system responsive to overheating of a journal bearing of a railway car: the combination of a normally-inoperative magneto having primary and secondary circuits comprising intercoupled low-voltage and high-voltage windings; a thermostat thermally associated

with said journal bearing and a device responsive to said thermostat upon overheating of said bearing of said truck for recurrently interrupting said primary circuit whereby high-tension currents are induced in said secondary circuit.

2. In a system responsive to overheating of a journal bearing of a railway car: the combination of a normally-inoperative magneto-electric generator including a rotor mounted on a rotary portion of a truck of said car and a cooperating stator mounted on a relatively fixed portion of said truck, said stator including an induction coil having a normally open primary circuit; an electrically-energizable circuit interrupter adapted when supplied with electric power to break recurrently its own circuit; and means responsive to overheating of a bearing of said truck for closing said primary circuit through said circuit interrupter.

3. In a system responsive to overheating of a journal bearing of a railway car: the combination of a magneto-electric generator mounted on a truck of said car and driven by a rotary portion thereof, said generator including an induction coil having primary and secondary windings; an electrically-energizable circuit interrupter adaptable when supplied with current to break recurrently its own circuit; and a normally-open thermostat associated with said journal bearing and connected serially with said interrupter and the primary winding of said induction coil for closing the primary winding of said generator through said interrupter when said bearing is overheated.

4. In a system responsive to overheating of a journal bearing of a railway car: the combination of a magneto-electric generator mounted on a truck of said car and driven by a rotary portion thereof, said generator including an induction coil having primary and secondary circuits; an electrically-energizable circuit interrupter of the type which when supplied with power breaks recurrently its own circuit; means associated with said journal bearing and responsive to overheating thereof for connecting said interrupter in said primary circuit; a pair of spark electrodes connected in said secondary circuit; and a tuned circuit for transmitting radio frequency oscillations from said spark electrodes.

5. An apparatus responsive to overheating of a journal bearing comprising a radio frequency signal generator including a magneto operable by the shaft associated with said bearing; means for abling and disabling said magneto to render said generator operative and inoperative to produce radio frequency oscillations; and thermally-responsive means associated with said bearing and controlling said last-stated means to put said generator into operation upon overheating of said bearing.

6. A radio signalling apparatus for detecting overheated bearings on a railway car, said apparatus being adapted to be mounted within a journal housing of said car, comprising a magneto-electric generator including a permanent magnet rotor mounted on a portion of the car axle within said housing; a field core cooperating with said rotor; an induction coil on said field core having primary and secondary windings; an electrically-energizable circuit interrupter for said primary winding said interrupter being of a type which when supplied with power breaks recurrently its own circuit; a thermostat associated with said journal bearing for operatively connecting said interrupter with said pri-

mary winding; a source of radio frequency oscillations energized by said secondary winding; and hermetically-sealed means enclosing said interrupter and oscillation source.

7. In a system for a machine having a normally-rotating member, said system being adapted to operate in response to the development of an abnormally hot condition in said machine: the combination of a magneto having primary and secondary circuits comprising intercoupled low-voltage and high-voltage windings, and a rotor coupled to said rotating member and driven thereby; an electrically-energizable interrupter for breaking recurrently said primary circuit to cause high-tension current to be produced in said secondary circuit; and a switch device normally positioned to maintain said interrupter in an idle condition, said switch device including means operated in response to the development of said abnormally hot condition in said machine to put said interrupter into operation.

8. In a system for a machine having a normally-rotating member, said system being adapted to operate in response to the development of an abnormally hot condition in said machine: the combination of a magneto having primary and secondary circuits comprising intercoupled low-voltage and high-voltage windings, and a rotor coupled to said rotating member and driven thereby; an electrically-energizable interrupter adapted upon supply of current thereto to interrupt recurrently said primary circuit; a switch device controlling supply of current to said interrupter and having a normal position wherein it causes the interrupter to remain normally in an idle condition, said switch device being responsive to the development of said abnormally hot condition for causing current to be supplied to said interrupter whereby the interrupter is energized to break recurrently

the circuit of the primary winding and cause intermittent high-tension currents to be produced in said secondary winding.

9. In a system responsive to overheating of a journal bearing of a railway car: the combination of a magneto-electric generator mounted on a truck of said car and driven by a rotary portion thereof, said generator including an induction coil having primary and secondary windings; an electrically-energizable circuit interrupter connected in a closed circuit with said primary winding, said interrupter being of the type which when supplied with power breaks recurrently its own circuit; and a normally-closed thermostat associated with said journal bearing and opened when said bearing becomes overheated, said thermostat being connected in parallel relation with both said interrupter and said primary winding.

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