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Warren et al.

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[54] **SENSING SYSTEM AND DEVICE**

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[52] **U.S. Cl.** .....**246/169 A**, 116/114.5

[51] **Int. Cl.** **B60q 9/00**

[58] **Field of Search**.....340/280, 231; 116/105, 114.5; 246/169 A; 102/46, 37.6

[56] **References Cited**

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[57] **ABSTRACT**

A novel device and system are provided for the detection of overheated journals and bearings on a moving vehicle. In one embodiment retroreflective material is propelled to the roadway beneath the vehicle, e.g., a train, to form a target. The target is then exclusively detected by an optical scanner located on a rearward portion of the vehicle.

8 Claims, 3 Drawing Figures

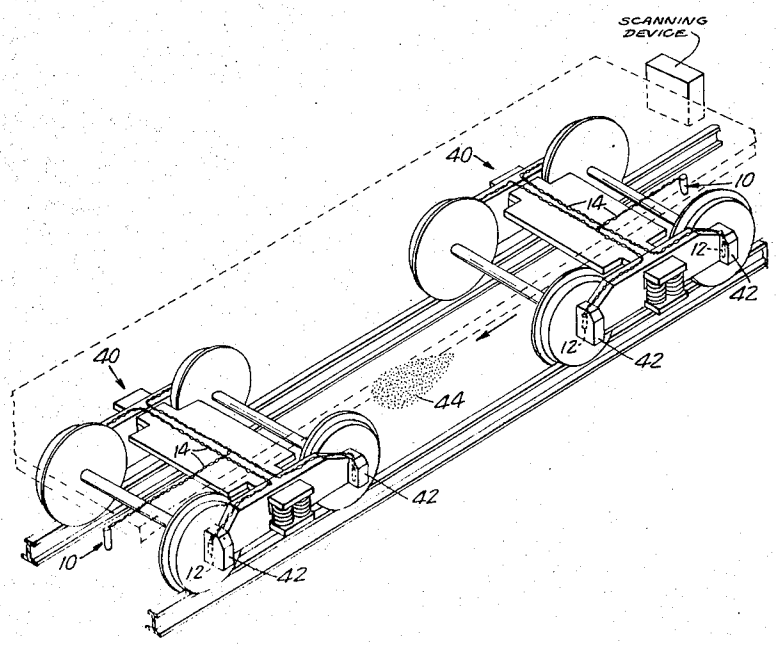


FIG. 1

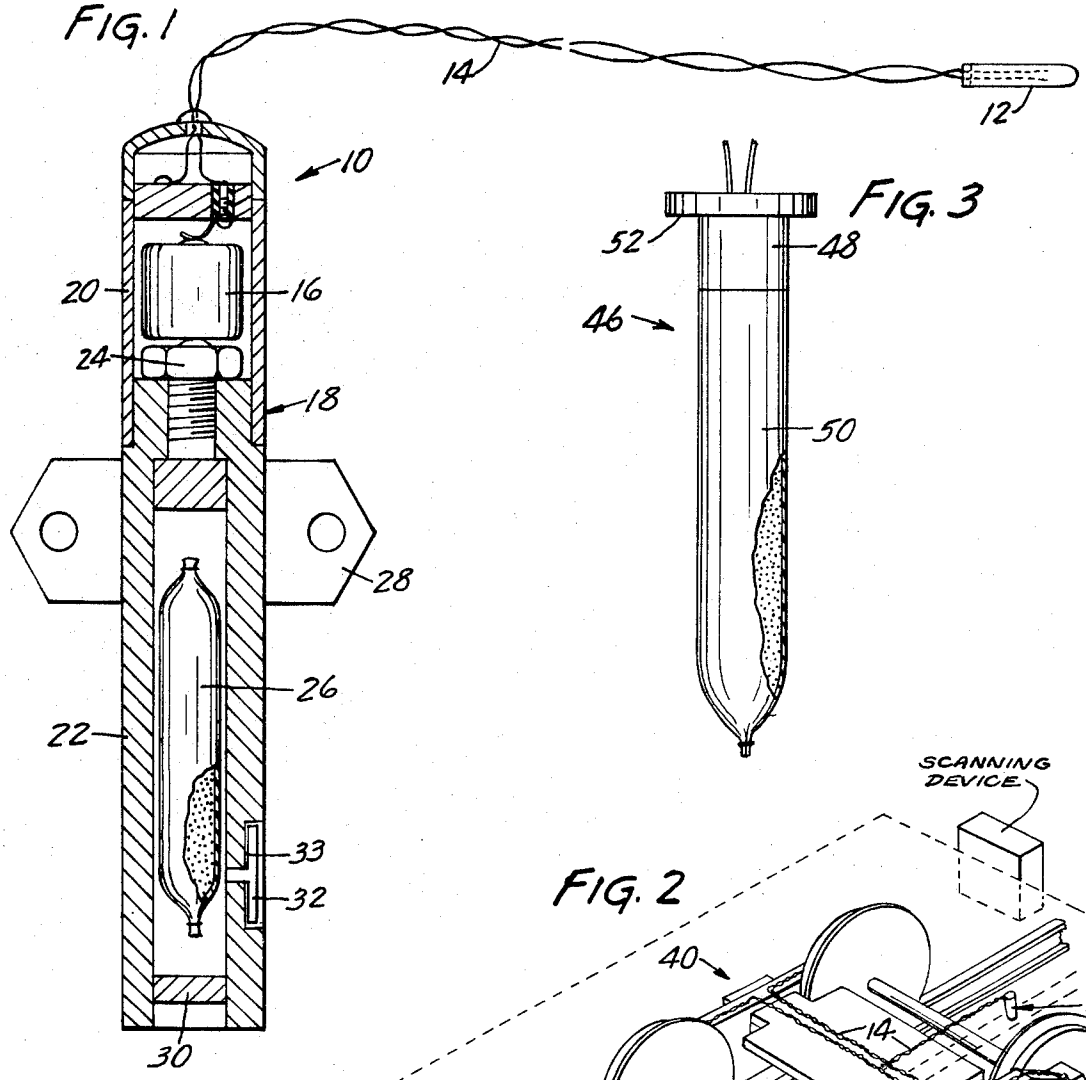
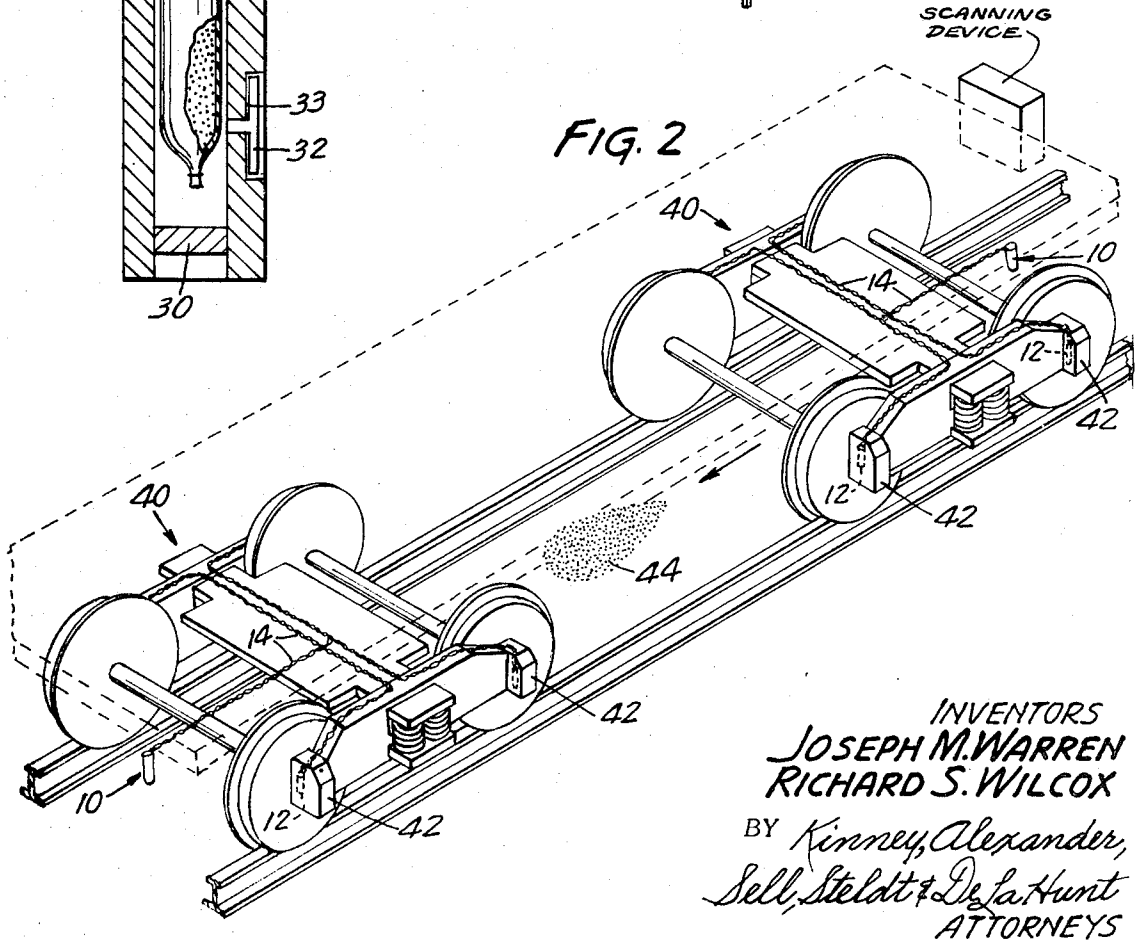


FIG. 3

FIG. 2



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SENSING SYSTEM AND DEVICE

BACKGROUND OF THE INVENTION

1. Field of the Invention

This invention relates to the detection of overheated journals and bearings on a moving vehicle and, more specifically, to the detection of hot boxes on a train.

2. Description of the Prior Art

Overheated journals or bearings on a moving vehicle may result in a serious accident if the problem remains undetected. This problem is most apparent, and most serious, in the operation of trains because an overheated journal or bearing may result in a derailment.

Journals which have been packed with rags and oil or grease emit clouds of smoke when the journal becomes overheated. For many years the emission of smoke from a journal box was relied upon as the sole means of detecting overheated journals in railroad operations. However, smoke from an overheated journal may not always be detected. For example, at night the smoke may not be visible to one on the train, and tight fitting journal box lids tend to retain the smoke and other vapors within the journal box very efficiently. Furthermore, newer railroad cars have roller bearings instead of journal boxes and these bearings emit much less smoke and order when they fail than does an overheated journal box.

Thus, some method other than visible detection of smoke has been seriously needed in order to detect an overheated journal or bearing before a derailment results. In accordance with this need, various proposals have been made in attempts to alleviate this problem. For example, light generating sources (i.e., flares) have been proposed which would burn to produce a bright light when a journal is overheated. However, these sources would not be particularly effective during daylight hours, and an intense light could be supplied for only a short time. Moreover, such sources are very expensive.

Another system which has been proposed utilizes infrared bolometer detectors. These systems are ordinarily used for a short section of track, e.g., just before entering a large city. This system is tremendously expensive and it does not continuously monitor the journals because the system is only located at the entrance to large freight yards or cities.

Thus, there are many disadvantages with the various systems which have been proposed. For example, some of the systems are very expensive, some do not provide continuous monitoring of the journals, and others are dependent upon ambient light conditions.

THE PRESENT INVENTION

The present invention provides a novel detection system and device for the continuous monitoring of journals and bearings on a moving vehicle. The detection system operates independently of ambient lighting conditions and is relatively inexpensive when compared to some of the prior art systems. In accordance with the invention there is provided a device for detecting overheated journals or bearings comprising

a. heat sensing means which is adapted to actuate when a journal or bearing reaches a predetermined temperature, and

b. a target-producing means comprising

1. a housing, and

2. a marker within said housing which is adapted to be displaced from said housing to the roadway to form a visibly detectable target upon the actuation of said heat sensing means.

In another embodiment there is provided a device which comprises

a. at least one heat sensing device adapted to actuate above a predetermined temperature, the heat sensing device being adapted to be located within a journal or bearing;

b. a target-producing means comprising

1. a source of electrical current which is connected to said heat sensing device,

2. a housing,

3. propellant means which is adapted to actuate upon receipt of an electric current from said source when said heat sensing device is actuated,

4. a marker within said housing which is adapted to be displaced from said housing to the roadway upon the actuation of said propellant means.

There is also provided a novel system for the detection of overheated journals or bearings which, in one embodiment, comprises the novel device described above and an optical projection and scanning device located on a rearward portion of the vehicle. A heat sensing device is located within at least one journal or bearing on the moving vehicle. When the journal or bearing becomes overheated, the heat sensing device actuates and allows electrical current to actuate the propellant means whereby the marker is displaced from the housing to the roadway to form a target. The optical projection and scanning device on the rearward portion of the vehicle scans the roadway beneath the vehicle and exclusively or selectively detects the target and thereafter produces a warning signal.

The invention will be described in more detail hereinafter with reference to the accompanying drawings wherein like reference characters refer to the same parts throughout the several views and in which:

FIG. 1 is a cross sectional view of one embodiment of a detection device made in accordance with the invention;

FIG. 2 shows railroad car trucks equipped with detection devices of the invention; and

FIG. 3 shows a replacement loading for the detection device.

Referring first to FIG. 1 there is shown generally a device **10** for detecting overheated journals or bearings. The device comprises at least one heat sensing device **12** which is connected by wires **14** to the target-producing means of the device. Heat sensing device **12** preferably is a bimetallic switch. The target-producing means comprises a source of electrical energy **16** (which is shown here as a small battery), a housing **18**, propellant means **24**, and marker **26**. Housing **18** may have a main portion **22** and a detachable portion or cover **20** so as to provide easy access to the propellant means **24**. A mounting bracket **28** may be affixed to the housing **18** so that the device **10** may be mounted on the vehicle. A plug or stopper **30** may be inserted in the open end of the housing to prevent marker **26** from being prematurely dropped to the roadway.

A blow plug **32** may be provided on housing portion **22** in such a manner that plug **32** is displaced from the

housing when the marker **26** is propelled out the open end of the housing portion **22**. The portion **33** of the housing which lies behind plug **32** may be painted with a very conspicuous color, e.g., bright red or orange. Thus, the brightly colored portion **33** of the housing is easily noticed after the propellant means has displaced marker **26** and plug **32** from the housing.

Although the source of electrical energy **16** is shown as a small D C battery (1.5 volts), the electrical current may also be provided by an external source, e.g., from an electrical system on the moving vehicle itself. When a battery is used as the electrical current source, it is preferred to mount the battery within the housing (as shown in the drawing) so that it will not be affected by dirt, moisture, grease, etc.

Propellant means **24** is preferably an explosive charge which is adapted to detonate upon the receipt of an electrical current. For example, the propellant means may comprise a commercial explosive charge such as Ignition Cartridge Model 1375 (sold by Holex, Inc.). The propellant means may also comprise a source of compressed air or gas or it may even be a mechanical spring. The function of the propellant means is merely to displace the marker from the housing when the heat sensing device is actuated.

Marker **26** forms a visibly detectable target when it is dropped or propelled to the roadway. Thus, marker **26** may comprise paint or any other visibly detectable substance. Preferably marker **26** comprises light-reflecting means such as fluorescent materials or retroreflective materials. For example, a fluorescent marker or target be detected by a scanner which is sensitive to ultraviolet light. When the detection device contains means to propell the marker onto the roadway, it is possible to package the marker in a plastic bag which will burst upon hitting the roadway. When the marker is to be simply dropped to the roadway, the packaging, if any, should be capable of bursting immediately to allow the marker to form a visibly detectable target.

If desired, one may use various ordoriferous materials in conjunction with visibly detectable materials for the marker. In such a case two scanners would be used in conjunction with each other to detect the target made by the marker. Thus, the possibility of producing a false alarm signal would be greatly reduced by requiring both types of scanners to detect the target.

The most preferred markers or targets are the retroreflective materials. These include reflective elements such as transparent glass microspheroids with a thin metallic reflector coating, e.g., aluminum, over approximately half of their area, as described in U.S. Pat. No. 2,963,378. Reflective granules described in U.S. Pat. No. 3,043,196 are also very useful.

Another retroreflective material which is very useful is a paste composition comprising retroreflective elements dispersed and suspended in a vehicle, the vehicle comprising a volatile solvent and a gellating agent which causes the vehicle to gel. The retroreflective elements are preferably transparent glass beads that have been hemispherically coated with a light-reflective material, e.g., aluminum. Uncoated glass beads are also useful if a reflective pigment such as metal flake or powder is included in the vehicle. Another composition which is very useful comprises retroreflective elements in an adhesive binder, the retroreflective elements having been hemispherically coated with a light-reflective material such as aluminum.

The retroreflective target produced by marker **26** may be made self-destructable by including with the marker. in a separate package, a strong base which would decompose the thin metallic coating on the glass beads after a short period of time. For example, strong bases such as sodium hydroxide may be useful for this purpose.

Referring next to FIG. **2** there are shown two railroad trucks **40** with which have been equipped with detection devices **10**. Wires **14** connect the target-producing means with the heat sensing devices **12**, which are mounted within journals or bearings **42**. In this fashion, only one target-producing means is required to service one truck, with a heat sensing device **12** being located in each of the four journal or bearings on the truck. When a journal becomes overheated, the heat sensing device actuates and allows an electrical current to actuate the target-producing means, causing a marker to be displaced from the target-producing means to the roadway beneath the train or vehicle to form a target **44**. A scanner located on a rearward portion of the train or vehicle will then detect the target which is laying on the roadway beneath and thereafter produce a warning signal.

Various scanning devices may be used in the detection system. For example, when the target is a retroreflective material, an optical projection and scanning device may be used to detect the target. For example, such photoscanning devices are commercially available from Machinery Electrification, Inc. as Model 5330, from Photoswitch as Model 42RE1, from General Electric as Model SC501A6 or from Loepfe. These photoscanners include a light source which sends out one or more beams of light and a photoelectric cell adjacent each beam of light that develops an electric signal whose magnitude depends on the amount of light that strikes the cell. A very useful photoscanner which projects a curtain of light rather than a beam is available from Erwin Sick Co. in their LV series. The photoscanner is adapted to produce a warning signal, e.g., a buzzer or flashing light, to alarm someone in the caboose or passenger car of the train. The photoscanner may even be connected with an electromechanical device to trigger the braking system of the vehicle or train.

In order to prevent the target from giving a false alarm to a following train, the photoscanner may be adapted to trigger a target-covering means, e.g., a loading of dark paint which is propelled to the roadway to cover the light-reflecting target.

In FIG. **3** there is shown a unitary replacement loading **46** for the detection device **10**. The loading **46** comprises a propellant means **48** and a marker **50**. Such a replacement loading is designed for very fast and efficient recharging of the detection device. For example, the replacement loading may be simply inserted into the top portion of the housing with the marker **50** aiming or pointing toward the bottom portion of the housing. Lip **52** on the top of the replacement loading prevents the explosive charge from falling down into the main portion of the housing.

Another embodiment of the replacement loading comprises a propellant means and a marker contained

within a barrell housing similar to that of housing portion **22** shown in FIG. **1**. In this embodiment the housing is adapted to be detachably mounted or connected to a second housing (similar to housing portion **20** in FIG. **1**) which is fixedly mounted on the vehicle. The second housing contains the source of electrical current and the lead wires to the heat sensing device. Thus, the detection device may be simply recharged or reloaded by detaching the barrell housing and replacing it with a barrell housing which contains a marker of light-reflecting material and a live explosive charge.

What is claimed is:

1. A system for detecting overheated journals or bearings on a moving vehicle comprising

a. heat sensing means which is adapted to actuate when a journal or bearing reaches a predetermined temperature,

b. target-producing means comprising

1. a housing, and

2. a marker within said housing which is adapted to be displaced from said housing to the roadway to form a visibly detectable target upon the actuation of said heat sensing means, and

c. an optical scanning device located on a rearward portion of said vehicle which is adapted to scan the roadway beneath said vehicle and which is further adapted to exclusively detect said target and thereafter produce a warming signal.

2. A system for detecting overheated journals or bearings on a moving vehicle comprising

a. at least one heat sensing device adapted to actuate when a journal or bearing on said vehicle reaches a predetermined temperature;

b. a target-producing means comprising

1. a source of electrical current which is connected to said heat sensing device,

2. a housing,

3. propellant means which is adapted to actuate upon receipt of an electrical current from said source when said heat sensing device is actuated,

4. a marker within said housing which is adapted to be displaced from said housing to the roadway to form a visibly detectable target upon the actuation of said propellant means, and

c. an optical scanning device located on a rearward portion of said vehicle which is adapted to scan the roadway beneath said vehicle and which is further adapted to exclusively detect said target and thereafter produce a warning signal.

3. The system of claim **2**, wherein said source of electrical energy is a battery.

4. The system of claim **2**, wherein said propellant means comprises an explosive charge which is adapted to detonate upon receipt of said electrical current.

5. The system of claim **2**, wherein said marker comprises light-reflecting means.

6. The system of claim **5**, wherein said marker comprises fluorescent material.

7. The system of claim **5**, wherein said marker comprises retroreflective material.

8. The system of claim **5**, wherein said battery is located within said housing and is electrically connected in series between said heat sensing device and said explosive charge.

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