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ABSTRACT OF THE DISCLOSURE

A novel temperature probe (20, 120) provides a visual indicator to an operator of when an assembly, such as a vehicle axle (22), having with a semi-fluid synthetic grease (54) for lubricating the bearings (48) therein has reached an unsafe temperature during operation. In one embodiment, the temperature probe (20) is provided in a specially drilled bore (78) through one of the components (42). In another embodiment, the temperature probe (120) is provided in a bore (182) drilled into a fastener member (72) which is normally used in the assembly. The temperature probe (20, 120) includes an indicator pin (82, 188) which is mounted in a housing (80, 186). When the components reach an unsafe temperature during operation, the indicator pin (82, 188) pops outwardly from the housing (80, 186) to alert a user that an unsafe temperature has been reached.
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COMPLETE SPECIFICATION

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Invention Title: TEMPERATURE INDICATOR FOR A SEMI-FLUID SYNTHETIC GREASE FILLED AXLE

The following statement is a full description of this invention, including the best method of performing it known to me:-

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TEMPERATURE INDICATOR FOR A SEMI-FLUID SYNTHETIC GREASE FILLED AXLE

BACKGROUND OF THE INVENTION

This invention is generally directed to a novel temperature indicator for providing a visual indication to an operator of when a vehicle axle, such as a trailer axle, filled with a semi-fluid synthetic grease for lubricating the wheel bearings therein has achieved an unsafe temperature. More particularly, one form of the present invention is directed to a novel temperature indicator that can be retrofit into existing vehicle axles without modification of the design of the axle.

Current trailer hub/bearing designs have moved towards using a semi-fluid synthetic grease lubricant for lubricating the wheel bearings instead of gear oil as had commonly been used in prior trailer hub/bearing designs. Semi-fluid synthetic grease is more advantageous because it is not as sensitive to a less than perfect wheel seal
and therefore, leakage is less likely that with an oil filled axle hub.

When leakage occurs with an oil filled axle hub, the oil spreads or sprays around the axle, saturating everything in the area. This can result in a fire from hot brake shoes and drums that become coated with oil if a seals fails.

When leakage occurs with a semi-fluid synthetic grease filled axle hub, because the semi-fluid synthetic grease is more solid than oil, the semi-fluid synthetic grease does not spread or spray around the axle like oil. The semi-fluid synthetic grease merely pushes out past the seal and either falls away cleanly, or just stays present around the immediate area, thereby preventing fires.

An advantage of using an oil filled axle hub is that such hubs were easy to monitor with a window in the hub cap that had a fill line. If the user found that the oil was low (i.e., below the fill line), a plug was simply pulled on the hub cap and oil was added until the level reached the fill line.

With a semi-fluid synthetic grease filled axle hub, however, the semi-fluid synthetic grease does not flow through the bearings, but tends to stay in the grease chamber in the hub even when the wheel stops. This occurs especially in cool weather since the semi-fluid synthetic grease is used. At low temperatures, the viscosity of the semi-fluid synthetic grease is heavy like a grease, but at higher temperatures, the semi-fluid
synthetic grease starts to flow more like a heavy liquid. Because of this characteristic of the semi-fluid synthetic grease, a hub cap without a window is used to prevent the mechanic from mistakenly thinking that the hub was low on oil since the oil level would not show up in the window. Because the window used with oil does not work with a semi-fluid synthetic grease filled hub, usually a simple metal or solid plastic cap is employed. The problem that results is that the mechanic cannot monitor the axle to determine whether an adequate amount of lubrication is present. It is well known that if a wheel bearing is operated for a long time without adequate lubrication, the bearing will heat up significantly and cause the hub to also heat up since the bearings press into the wheel/hub. This can result in a catastrophic bearing failure if this condition is left undetected.

The present invention presents a novel temperature indicator for providing a visual indication to an operator of when a vehicle axle, such as a trailer axle, filled with a semi-fluid synthetic grease for lubricating the wheel bearings therein has achieved an unsafe temperature. One form of the temperature indicator of the present invention can be easily retrofit into existing trailers, without modification of the trailer. Other features and advantages of the present invention will become apparent upon a reading of the attached specification, in combination with a study of the drawings.
OBJECTS AND SUMMARY OF THE INVENTION

A general object of the present invention is to provide a novel temperature indicator for providing a visual indication to an operator of when a vehicle axle, such as a trailer axle, filled with a semi-fluid synthetic grease for lubricating the wheel bearings therein has reached an unsafe temperature.

An object of the present invention is to provide a novel temperature indicator which can be retrofit into existing vehicle axles without modification of the design of the axle.

Another object of the present invention is to provide a novel temperature probe which can be used in combination with a fill hole in a vehicle axle.

Briefly, and in accordance with the foregoing, the present invention discloses a novel temperature indicator for providing a visual indication to an operator of when a vehicle axle, such as a trailer axle, filled with a semi-fluid synthetic grease for lubricating the wheel bearings therein has achieved an unsafe temperature.

In one embodiment, the temperature probe is provided through a metal wheel hub of a conventional wheel mounting apparatus. The wheel mounting apparatus includes an axle, the wheel hub which is rotatably mounted on the axle by a plurality of wheel bearings, and a chamber provided between the wheel hub and the axle for housing the semi-fluid synthetic grease for lubricating the wheel bearings. The temperature probe is formed from
an indicator pin which is mounted in a housing. When the bearings reach an unsafe temperature, the indicator pin pops outwardly from the housing and the wheel hub to alert a user that an unsafe temperature has been reached by the bearings.

In another embodiment, and in the preferred embodiment, a temperature probe is provided in one of the hub cap bolts or fastener members of a conventional wheel mounting apparatus which is used to mount a hub cap to the wheel hub. The temperature probe is formed from an indicator pin which is mounted in a housing. When the axle reaches an unsafe temperature, the indicator pin pops outwardly from the housing and the hub cap to alert a user that an unsafe temperature has been reached by the axle.

BRIEF DESCRIPTION OF THE DRAWINGS

The organization and manner of the structure and operation of the invention, together with further objects and advantages thereof, may best be understood by reference to the following description, taken in connection with the accompanying drawings, wherein like reference numerals identify like elements in which:

FIGURE 1 is a cross-sectional view of a wheel mounting apparatus and an axle having a novel temperature probe attached thereto which incorporates the features of a first embodiment of the invention, such temperature
probe being in a first position indicating to the user that the axle is at a safe temperature;

FIGURE 2 is an enlarged view of FIGURE 1 showing a portion thereof;

FIGURE 3 is an enlarged, cross-sectional view of a portion of the wheel mounting apparatus of FIGURE 1 having the temperature probe attached thereto, such temperature probe being in a second position indicating to the user that the bearings have reached an unsafe temperature;

FIGURE 4 is a cross-sectional view of a wheel mounting apparatus and an axle having a novel temperature indicator attached thereto which incorporates the features of a second embodiment of the invention, such temperature indicator being in a first position indicating to the user that the axle is at a safe temperature;

FIGURE 5 is an exploded view of the temperature indicator of FIGURE 4 which is formed from a temperature probe and a hub cap bolt or fastener member which is shown in cross-section;

FIGURE 6 is an enlarged view of FIGURE 4 showing a portion thereof; and

FIGURE 7 is an enlarged, cross-sectional view of a portion of the wheel mounting apparatus of FIGURE 4 having the temperature probe attached thereto, such temperature probe being in a second position indicating to the user that the axle is at an unsafe temperature.
DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

While the invention may be susceptible to embodiment in different forms, there is shown in the drawings, and herein will be described in detail, a specific embodiment with the understanding that the present disclosure is to be considered an exemplification of the principles of the invention, and is not intended to limit the invention to that as illustrated and described herein.

The present invention provides a novel temperature indicator 20, 120 for an assembly which uses synthetic grease lubricated bearings 48, such as a conveyor belt assembly or a vehicle, for example a trailer, for visually indicating to a user when an unsafe temperature has been reached by the bearings 48 during operation. As shown in the drawings, the temperature indicator 20, 120 is provided on a wheel mounting apparatus 24 of a trailer. It is to be understood that the present invention can be used in a variety of mechanical assemblies, so long as the assembly includes bearings between two moving components to allow the one component to rotate relative to the other component.

A first embodiment of the invention is shown in FIGURES 1-3. A second embodiment of the invention is shown in FIGURES 4-7. Each is shown in a wheel mounting apparatus 24.

The wheel mounting apparatus 24 is used for mounting a wheel (not shown) on the vehicle. The wheel mounting apparatus 24 generally includes the axle 22, a wheel hub
assembly 26 and a brake assembly 28.

The axle 22 is fixedly mounted on the vehicle body by suitable means and is formed from a hollow tube 30 having ends (only one of which is shown) having a hollow spindle 32 attached thereto by, for example, a weld 34. The spindle 32 is a hollow, tapered member having a threaded end 36. The hollow tube 30 and spindle 32 of the axle 22 define a volume therein. The axle 22 is formed from a suitable strong rigid material.

The brake assembly 28 is of known construction and as such is not described in detail herein. The brake assembly 28 is mounted on the axle 22 and generally includes a brake drum 38 and a brake shoe 40.

The wheel hub assembly 26 is mounted on the end of the axle 22 and generally surrounds the spindle 32. The wheel hub assembly 26 includes a metal wheel hub 42 having a wall 44 which defines a space, cavity or chamber 46 between the wheel hub 42 and the spindle 32, a plurality of wheel bearings 48 and a hub cap 50. The wheel hub 42 is attached to the brake drum 38 by suitable known means, such as bolts 52.

A bath of semi-fluid synthetic grease 54 is contained within the wheel hub chamber 46. The semi-fluid synthetic grease 54 lubricates the wheel bearings 48 and the axle 22 during operation of the vehicle. A slip ring type seal 56 is provided between the wheel hub 42 and the axle 22 to prevent the semi-fluid synthetic grease 54 from leaking out from the chamber 46 at the intersection of the wheel hub 42 and the axle 22.
The wheel bearings 48 are mounted between the wheel hub 42 and the spindle 32 by a bearing cup 58 and a bearing cone 60. An inner adjusting nut 62 is threaded onto the threaded end 36 of the spindle 32 and bears against the bearing cone 68 and a shoulder 64 formed in the spindle 32 to position the wheel bearings 48. The adjusting nut 62 is locked onto the spindle 32 by threading a lockwasher 66 and an outer jam nut 68 on the threaded end 36. The wheel bearings 48 allow the wheel hub assembly 26 and the brake drum 38 to rotate relative to the fixed axle 22. The bearings 48 are mounted on both sides of the chamber 46 and are lubricated by the bath of semi-fluid synthetic grease 54 contained within the chamber 46.

The hub cap 50 includes a first, solid cap member 70 attached to the end of the wheel hub 42 by a plurality of metal bolts or fastener members 72, which are discussed in more detail herein, a second, solid cap member 74 attached to the outer face of the first cap member 70 by suitable means, and a sintered metal plug 76 attached to the center of the second cap member 74 by suitable means for preventing the build-up of pressure formed under heating conditions of operations within the wheel hub 42 which might force the semi-fluid synthetic grease 54 through the slip ring seal 56. The hub cap 50 seals the outer end of the hub chamber 46 and prevents the semi-fluid synthetic grease 54 from leaking out of the end of the wheel hub assembly 26.

The bolts 72, which preferably number six, are
evenly spaced at a position radially outward of a centerline of the axle 22. Each bolt 72 includes a threaded shank 178 which is five-sixteenths of an inch in diameter and which depends from a head 180. A plurality of threaded holes are formed in the cap member 70 at positions which are approximately one-eighth of an inch outward of the bearing cups 58. Likewise, a plurality of threaded blind holes are formed in the wheel hub 42 at positions which are approximately one-eighth of an inch outward of the bearing cups 58. The holes and the blind holes are aligned with each other and the threaded shank 178 of respective bolts 72 are respectively threaded therethrough to clamp the hub cap 50 onto the wheel hub 42. The head 180 of each bolt 72 sits against the exterior of the cap member 70. The bolts 72 only clamp the cap member 70 to the end of the wheel hub 42. There is no shear load placed on the bolts 72.

During operation of the vehicle, as the wheel, wheel hub 42, hub cap 50 and brake drum 38 rotate, heat is generated. This causes the semi-fluid synthetic grease 54 within the chamber 46 to increase in temperature. Also during operation, some semi-fluid synthetic grease 54 may leak into the hub cap 50 through the space between the bearing cup 58 and the bearing cone 60 where the wheel bearings 48 are located and may leak through the slip ring seal 56.

With regard to the first embodiment of the invention as shown in FIGURES 1-3, in order to visually alert an operator of when an unsafe temperature has been reached
by the bearings 48 and the axle 22, the novel visual indicating means of the present invention is provided. The bearings 48 and axle 22 can reach an unsafe temperature as a result of a variety of conditions, for example, the bath of semi-fluid synthetic grease 54 in the chamber 46 becoming overheated as a result of heating conditions of operation within the wheel mounting apparatus 24, because of a loss of grease 54 in the chamber 46, because of contamination of the grease 54 or because of race failure of the bearing cup 58 and/or bearing cone 60. As shown in FIGURES 1-3, the temperature probe 20 which forms the visual indicating means is removably mounted in a port 78 provided through the wall 44 of the wheel hub 42. The port 78 is threaded and is in communication with the chamber 46. When the temperature probe 20 is removed from engagement with the port 78, the port 78 is used as a fill hole for filling the chamber 48 with semi-fluid synthetic grease 54.

As best shown in FIGURES 2 and 3, the temperature probe 20 includes a cup-like housing 80, an indicator pin 82, a spring 84 and a quantity of solder 86 mounted within the housing 80. The housing 80 has a closed end and an open end at the opposite end thereof. A shoulder 88 is provided along the length of the interior wall of the housing. The indicator pin 82 has a head 90 and a shank 92 extending therefrom. The shank 92 is within the housing 80 and has a barbed end 94 which is embedded in the solder 86 which is provided at the closed end of the housing 80. The barbs on the end 94 of the shank 92
ensure that the indicator pin 82 does not prematurely dislodge from the solder 86. An end of the spring 84 is seated against the shoulder 88 and the opposite end of the spring 84 is seated against the head 90 of the indicator pin 82.

The temperature probe 20 is securely mounted in a recess of a brass plug 98. The temperature probe 20 is suitably held within the brass plug 98, such as by a friction fit or by adhesive. The brass plug 98 is threadedly mounted in the port 78. The brass plug 98, and thus the temperature probe 20, can be removed from engagement with the wall 44 of the wheel hub 42 by unthreading the plug 98 therefrom. When the plug 98 and the temperature probe 20 are removed from the wheel hub 42, semi-fluid synthetic grease 54 can be added to the chamber 46 through the open port 78.

As the wheel, wheel hub assembly 26 and brake drum 38 turn relative to the axle 22, heat is generated. If the bearings 48 are properly lubricated during operation (a sufficient quantity and quality of semi-fluid synthetic grease 54 is present in the chamber 46) or if race failure has not occurred, the head 90 of the indicator pin 82 will remain against the open end of the housing 80 as shown in FIGURES 1 and 2. If an insufficient quantity or quality of the semi-fluid synthetic grease 54 is present in the chamber 46 during operation to properly lubricate the bearings 48, or if race failure has occurred, a rise in temperature results within the chamber 48. When the temperature reaches a
predefined level (for example, normal operating temperature of the axle 22 is 180°F and 250°F solder 86 is used), sufficient heat is transmitted to the solder 86 through the brass plug 98 to melt the solder 86. Once the solder 86 melts, the barbed end 94 of the indicator pin 82 is released therefrom and the spring 84 biases the indicator pin 82 outwardly from the housing 80 until the barbed end 94 contacts the shoulder 88 within the housing 80. Once the operator sees that the head 90 of the indicator pin 82 has moved away from or “popped out” of the housing 80 as shown in FIGURE 3, he or she will know that an investigation is in order. The operator will then remove the plug 98 and thus the temperature probe 82 by unthreading the plug 98 from the wheel hub 42 to perform a check as described herein, and add semi-fluid synthetic grease 54 if necessary to prevent a catastrophic bearing failure which would result if this condition was left undetected.

As one of ordinary skill in the art would realize, the temperature probe 20 may take of variety of forms so long as a visual indication is provided to the user that an unsafe temperature has been reached by the axle 22. For example, the indicator pin 82 could be biased inwardly. The plug 98 can be welded through a port in the wheel hub 42 and a second fill hole can be provided (which would have closing member associated therewith) for filling the chamber 46 with semi-fluid synthetic grease 54. Additionally, the plug 98 and the temperature probe 20 can be designed as an integral member.
With regard to the second embodiment of the invention as shown in FIGURES 4-7, in order to visually alert an operator of when an unsafe temperature has been reached by the bearings 48 and the axle 22, the novel visual indicating means of the present invention is provided. Again, the axle 22 can reach an unsafe temperature as a result of a variety of conditions, for example, the bath of semi-fluid synthetic grease 54 in the chamber 46 becoming overheated as a result of heating conditions of operation within the wheel mounting apparatus 24, because of a loss of grease 54 in the chamber 46, because of contamination of the grease 54 or because of race failure of the bearing cup 58 and/or bearing cone 60. As shown in the drawings, the temperature indicator 120 includes a temperature probe 181 which is mounted in one of the bolts 72, which is preferably a grade 8 hub cap bolt. In this embodiment, the port 78 of FIGURES 1-3 is replaced by a standard fill port (not shown).

As shown in FIGURE 5, a three-sixteenths of an inch smooth, blind bore 182 is drilled in one of the bolts 72. The blind bore 182 is aligned with the centerline of the bolt 72. The temperature probe 181 is secured by adhesive 184 within the blind bore 182. Preferably, the adhesive 184 is applied as a one-sixteenth of inch diameter bead of urethane and the temperature probe 181 is twisted as it is inserted into the blind bore 182 in the bolt 72.

As best shown in FIGURES 6 and 7, the temperature
probe 181 includes a cup-like housing 186, an indicator pin 188, a spring 190 and a quantity of solder 192 mounted within the housing 186. The housing 186 has a closed end and an open end at the opposite end thereof. A shoulder 194 is provided along the length of the interior wall of the housing 186. The indicator pin 188 has a head 196 and a shank 198 extending therefrom. The shank 198 is within the housing 186 and has a barbed end 200 which is embedded in the solder 192 which is provided at the closed end of the housing 186. The barbs on the end 200 on the shank 198 ensure that the indicator pin 188 does not prematurely dislodge from the solder 192. An end of the spring 190 is seated against the shoulder 194 and the opposite end of the spring 190 is seated against the head 196 of the indicator pin 188.

As the wheel, wheel hub assembly 26 and brake drum 38 turn relative to the axle 22, heat is generated. If the bearings 48 are properly lubricated during operation (a sufficient quantity and quality of the semi-fluid synthetic grease 54 is present in the chamber 46), or if race failure of the bearing cup 58 and/or bearing cone 60 has not occurred, the head 196 of the indicator pin 188 will remain against the open end of the housing 186 as shown in FIGURES 4 and 6. If an insufficient quantity or quality of the semi-fluid synthetic grease 54 is present in the chamber 46 during operation to properly lubricate the bearings 48, or race failure has occurred, a rise in temperature results within the chamber 46. When the temperature reaches a predefined level (for example,
normal operating temperature of the axle 22 is 180°F and 250°F solder 92 is used), sufficient heat is transmitted to the solder 192 through the metal wheel hub 42 and the metal bolt 72 to melt the solder 192. Once the solder 192 melts, the barbed end 200 of the indicator pin 188 is released therefrom and the spring 190 biases the indicator pin 188 outwardly from the housing 186 until the barbed end 200 contacts the shoulder 194 within the housing 186. Once the operator sees that the head 196 of the indicator pin 188 has moved away from or "popped out" of the housing 186 as shown in FIGURE 7, he or she will know that an investigation is in order. The operator can perform a check as described herein, and add semi-fluid synthetic grease 54 through a port in the wheel hub 42 if necessary to prevent a catastrophic bearing failure which would result if this condition was left undetected.

As one of ordinary skill in the art would realize, the temperature probe 181 may take of variety of forms so long as a visual indication is provided to the user that an unsafe temperature has been reached by the axle 22. For example, the indicator pin 188 could be biased inwardly. The bolt 72 and the temperature probe 181 can be designed as an integral member. Also, if desired, the temperature probe 181 could be provided in more than one bolt 72.

A benefit of providing the temperature probe 181 in one of the bolts 72 is that this invention can be easily retrofit into existing apparatuses, such as wheel mounting apparatus 24, without requiring a change in the
existing structure.

While a preferred embodiment of the present invention is shown and described, it is envisioned that those skilled in the art may devise various modifications of the present invention without departing from the spirit and scope of the appended claims. The invention is not intended to be limited by the foregoing disclosure.

Where the terms "comprise", "comprises", "comprised" or "comprising" are used in this specification, they are to be interpreted as specifying the presence of the stated features, integers, steps or components referred to, but not to preclude the presence or addition of one or more other feature, integer, step, component or group thereof.
The claims defining the invention are as follows:-

1. An assembly being characterized by:
   a first component (22);
   a second component (42) rotatably mounted on said first component (22) by at least one bearing (48);
   a chamber (46) provided between said first component (20) and said second component (42);
   a semi-fluid synthetic grease (54) within said chamber (46) for lubricating said at least one bearing (48); and
   visual indicating means (20, 120) associated with said chamber (46) for providing a visual indication to a user of the temperature of said at least one bearing (48).

2. An assembly as defined in claim 1, being characterized in that said visual indicating means (20, 120) comprises a biasing component (84, 190) which biases a member (82, 188) relative to said chamber (46) when a predetermined temperature is reached by said at least one bearing (48).

3. An assembly as defined in claim 2, being characterized in that said member (82, 188) is biased outwardly relative to said chamber (46) when said predetermined temperature is reached by said at least one bearing (48).
4. An assembly as defined in claim 2, being characterized in that said visual indicating means (20) is provided through a wall (44) of one of said components (42).

5. An assembly as defined in claim 4, being characterized in that said member (82) is biased outwardly from said one component (42).

6. An assembly as defined in claim 4, being characterized in that a port (78) is provided through said wall (44) of said one component (42) in which said visual indicating means (20) is provided, said visual indicating means (20) being removable from said port (78).

7. An assembly as defined in claim 4, being characterized in that a port (78) is provided through said wall (44) of said one component (42), said visual indicating means (20) being threaded into engagement with said port (78) and being removable from said port (78).

8. An assembly as defined in claim 2, being characterized in that said biasing component (84) is a spring.

9. An assembly as defined in claim 2, being characterized in that said member (82) is provided in a housing (80), said housing (80) including a portion of
solder (86) therein which melts and permits said member (82) to be biased relative to said housing (80) when said predetermined temperature is reached by said at least one bearing (48).

10. An assembly as defined in claim 9, being characterized in that said housing (80) is disposed in a brass plug (98).

11. An assembly as defined in claim 1, being characterized in that said visual indicating means (20) is provided through a wall (44) of said one component (42).

12. An assembly as defined in claim 11, being characterized in that a port (78) is provided through said wall (44) of said one component (42) in which said visual indicating means (20) is provided, said visual indicating means (20) being removable from said port (78).

13. An assembly as defined in claim 11, being characterized in that a port (78) is provided through said wall (44) of said one component (42), said visual indicating means (20) being threaded into engagement with said port (78) and being removable from said port (78).

14. An assembly as defined in claim 1, being characterized in that said first component (22) is an
axle of a vehicle and said second component (42) is a wheel hub mounted on said axle.

15. An assembly as defined in claim 1, being further characterized by a third component (50) mounted on one of said first and second components (42) by at least one bolt (72), said visual indicating means (120) being disposed on said bolt (72).

16. An assembly as defined in claim 15, being characterized in that said bolt (72) includes a threaded shank (178) having a bore (182) therein, and said visual indicating means (120) is disposed in said bore (182).

17. An assembly as defined in claim 16, being characterized in that said visual indicating means (120) comprises a biasing component (190) which biases a member (188) relative to said threaded shank (178) when a predetermined temperature of said at least one bearing (48) is detected.

18. An assembly as defined in claim 17, being characterized in that said member (188) is biased outwardly relative to said threaded shank (178) when said predetermined temperature of said at least one bearing (48) is detected.

19. An assembly as defined in claim 18, being characterized in that said biasing component (190) is a
spring.

20. An assembly as defined in claim 17, being characterized in that said member (188) is provided in a housing (186) disposed in said bore (182), said housing (186) including a portion of solder (192) therein which melts and permits said member (188) to be biased relative to said housing (186) when said predetermined temperature of said at least one bearing (48) is detected.

21. An assembly as defined in claim 16, being characterized in that said visual indicating means (120) is secured in said bore (182) by adhesive (184).

22. An assembly as defined in claim 15, being characterized in that said a first component (22) is an axle of a vehicle, said second component (42) is a wheel hub mounted on said axle, and said third component (50) is a hub cap of the vehicle.

23. A temperature indicator (120) capable of being used in an assembly, said assembly including at least one bearing (48) which is lubricated by semi-fluid synthetic grease (54), said temperature indicator (120) being characterized by: a bolt (72) having a threaded shank (178), said bolt (72) being capable of being mounted to a component (42) of the assembly, and visual indicating means (181) carried by said bolt (72) for providing a visual indication to a user of temperature of the at
least one bearing (48).

24. A temperature indicator (120) as defined in claim 23, being characterized in that said threaded shank (178) has a bore (182) therein and said visual indicating means (181) is disposed in said bore (182).

25. A temperature indicator (120) as defined in claim 24, being characterized in that said visual indicating means (181) comprises a biasing component (190) which biases a member (188) relative to said threaded shank (178) when a predetermined temperature is detected.

26. A temperature indicator (120) as defined in claim 25, being characterized in that said member (188) is biased outwardly relative to said threaded shank (178) when said predetermined temperature is detected.

27. A temperature indicator (120) as defined in claim 26, being characterized in that said biasing component (190) is a spring.

28. A temperature indicator (120) as defined in claim 25, being characterized in that said member (188) is provided in a housing (186) disposed in said bore (182), said housing (186) including a portion of solder (192) therein which melts and permits said member (188) to be biased relative to said housing (186) when said predetermined temperature is detected.
29. A temperature indicator (120) as defined in claim 24, being characterized in that said visual indicating means (181) is secured in said bore (182) by adhesive (184).

30. An assembly as claimed in claim 1, substantially as described herein with reference to the accompanying drawings.

31. A temperature indicator as described in claim 22, substantially as described herein with reference to the accompanying drawings.

DATED this 27th day of January, 2000.

WABASH NATIONAL CORPORATION
By their Patent Attorneys:
CALLINAN LAWRIE