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NOTICE

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Navy Case No. 77,531 PATENTS

SHIELDED BEARING LUBRICATION

The present invention relates in general to enhanced lubrication of bearings for maintenance-free operation of machinery with which such bearings are associated.

BACKGROUND OF THE INVENTION

Automatic lubrication systems are generally known in the art for controlled supply of lubricant to critical locations in machinery in an effort to provide maintenance-free operation thereof. U.S. Patent No. 3,381,776 to Gruber et al., for example, discloses a time-actuated pneumatic injection system through which control and sensing of manifolds and pistons is designed to ensure that critical locations are properly lubricated. U.S. Patent No. 4,621,931 to Jensen features regulation of flow of lubricant oil to hydrostatic bearings. As to the lubrication of a rolling element bearing under control of a condition sensing pneumatic system, U.S. Patent No. 5,020,636 to Daeges discloses the introduction of lubricant into a propellant gas stream in accordance with a pressure gradient across the bearing. U.S. Patent No. 5,217,662 to Yamsmura et al. relates to the detection and measurement of motor loading parameters for timely supply of lubricating grease. Automatic time control for lubricating critical areas of machinery is also disclosed in U.S. Patent No. 5,381,874 to Hadank et al. However, none of the foregoing U.S. patents addresses the problems of insuring immediate delivery of precise quantities of the lubricant to intended bearing locations while also ensuring that such delivery is made without ingress of contamination into the lubricant.

Accordingly, it is an important object of the present invention to provide for improved automatic delivery of precise quantities of clean lubricant to critical locations in a rolling element type of bearing.

SUMMARY OF THE INVENTION

In accordance with the present invention, automatic lubrication of rolling element bearings is enhanced by direct delivery of lubricant through separate feed lines connected by fixed fittings to the bearing seals or shields. Critical surfaces of the rolling element bearing are thereby wetted with precise quantities of lubricant which is timely delivered without exposure to sources of contamination.

BRIEF DESCRIPTION OF THE DRAWING FIGURES

A more complete appreciation of the invention and many of its attendant advantages will be readily appreciated as the same becomes better understood by reference to the following detailed description when considered in connection with the accompanying drawing wherein:

FIG. 1 is a partial side elevation view of a pair of bearing assemblies in some machinery arrangement, in association with an automatic lubricating system depicted in a block diagram; and

FIG. 2 is an enlarged side section view through one of the bearing assemblies shown in FIG. 1.

DETAILED DESCRIPTION OF PREFERRED EMBODIMENT

Referring now to the drawing in detail, FIG. 1 depicts a portion of typical machinery equipment, generally referred to by reference numeral 10, having bearing assemblies 12 serviced by a lubrication system generally referred to by reference numeral 14. As depicted in FIG. 1, at

least two of the bearing assemblies 12 journal a power shaft 16 for rotation during operation of the machinery 10. Condition monitoring means for the machinery is associated with each of the bearing assemblies 12, including for example a temperature sensor 18 and a vibration sensor 20 according to the illustrated embodiment. Condition sensing signals from the sensors 18 and 20 at each bearing assembly 12 are fed to an analyzer 22 of the lubrication system 14 from which an output is fed to a pressure dispenser 24 in parallel with timing control signals from a timer 26. A source of compressed air 28 is connected to the dispenser 24 from which pressurized air is intermittently supplied on demand through an air manifold 30 to a pair of grease reservoirs 32 under control of analyzer 22 and/or timer 26.

It will be apparent from the foregoing description that grease as a lubricant is intermittently pressurized within each of the reservoirs 32 of the lubrication system 14 for supply to the bearing assemblies 12 in accordance with one or more condition factors designed to automatically provide time-controlled lubrication for maintenance-free operation of the machinery 10. In accordance with the present invention, such maintenance-free operation is maximized by supply of the grease under pressure from the respective reservoirs 32 separately to the bearing assemblies 12 through single feed line conduits 34, in cooperation with contamination preventing features of the bearing assemblies as hereinafter disclosed.

Referring now to FIG. 2, each of the bearing assemblies 12 to which a feed line conduit 34 is connected, has an inner ring 36 fixed to the power shaft 16, an outer ring 38 and circumferentially spaced rolling elements 40 in rolling contact with the radially confronting raceway surfaces of the inner and outer rings. The outer ring 38 of such rolling element type bearing is fixedly mounted by a housing 42. An annular shield 44 is fixed to the outer ring 38 in

spaced relation to the rolling elements 40 to enclose a lubricant receiving space 46 on one axial side of the rolling elements opposite the space 48 on the other axial side within which excessive and degraded lubricating grease is accumulated. The grease under pressure is supplied to the receiving space 46 from one of the feed line conduits 34 through a fitting 50 extending into the housing 42 closed by a cover 52. A delivery end portion 54 of each feed line conduit 34 within the housing 42 is threadedly connected to the shield 44 for supply of a requisite quantity of lubricant to space 46 as shown in FIG. 2.

Precise quantities of lubricant grease are automatically fed under pressure at proper times by the lubrication system 14 directly to each bearing assembly 12 through the separate feed line conduits 34 to insure timely delivery. The grease is so delivered to each receiving space 46 within the chamber of each bearing assembly so as to insure that there is no ingress of contamination during lubricant delivery. The chamber of each bearing assembly also has the accumulating space 48 to receive excess and degraded lubricant grease from the rolling element bearing surfaces being lubricated so as to insure maintenance-free operation of the machinery 10 being serviced.

Obviously, other modifications and variations of the present invention may be possible in light of the foregoing teachings. It is therefore to be understood that

the invention may be practiced otherwise than as specifically described.

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SHIELDED BEARING LUBRICATION

ABSTRACT OF THE DISCLOSURE

Precise quantities of lubricant under automatic control are injected through chambers of housings into shielded rolling element bearings. Separate feed line conduits directly deliver the lubricant to the shielded critical surfaces of such bearings and insure maintenance-free operation of machinery with which the bearings are associated.

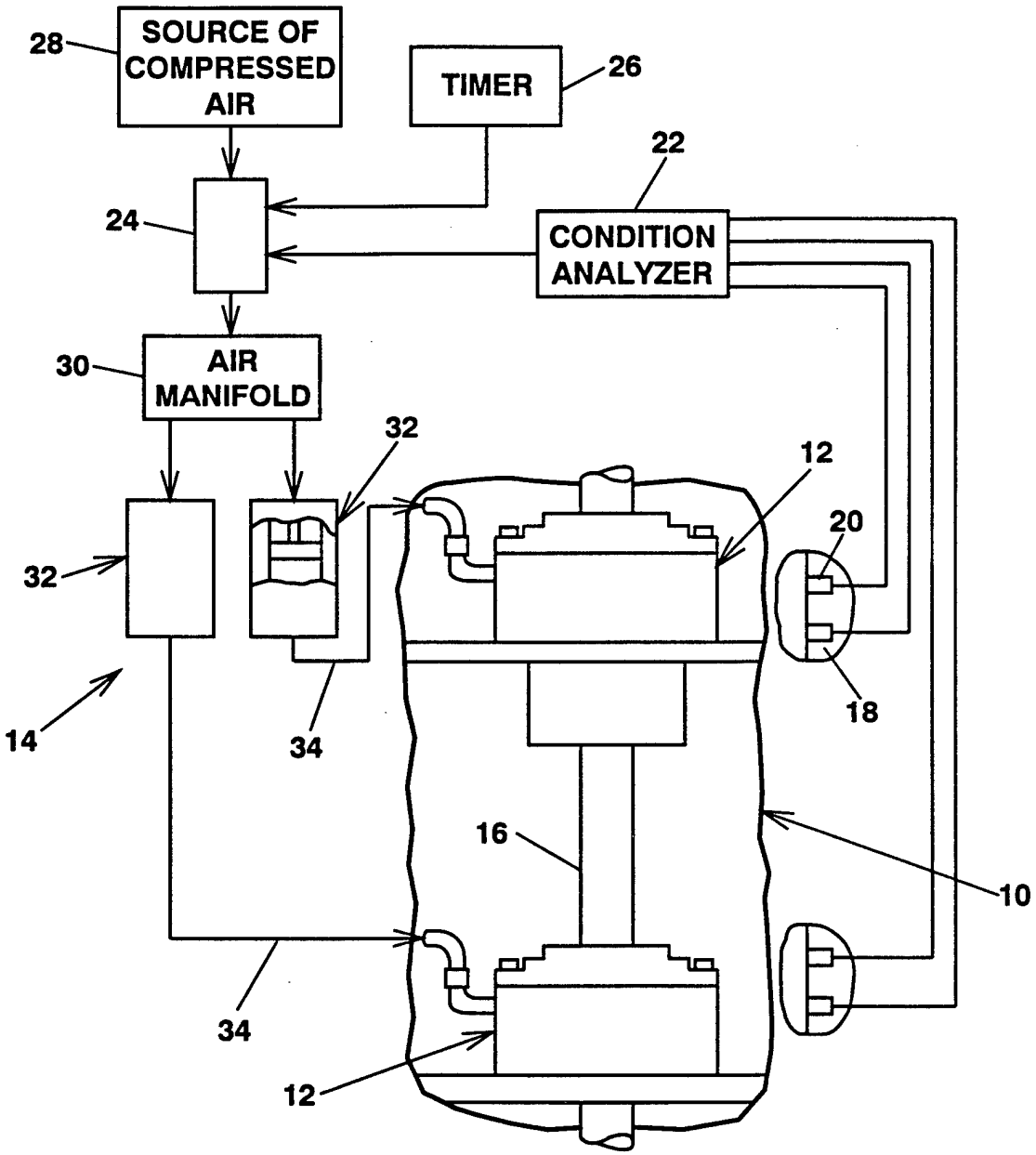
28
SOURCE OF COMPRESSED AIR
TIMER
26
22
24
CONDITION ANALYZER
30
AIR MANIFOLD
32
12
20
32
18
14
34
16
10
34
12

FIG. 1

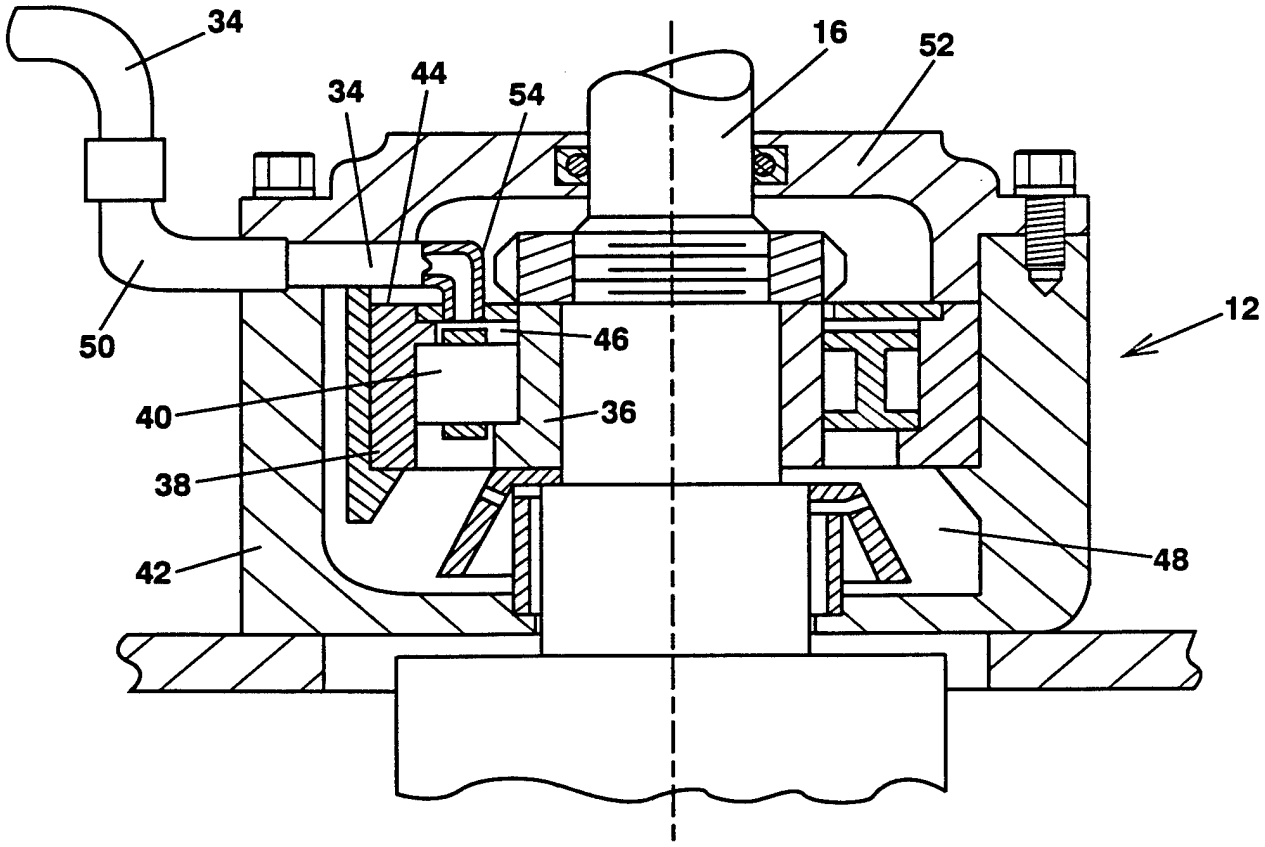

FIG. 2