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(54) **COOLING SYSTEM AND METHOD FOR A TURBOMACHINE**

(75) Inventors: **Aaron M. Smith**, Smyrna, GA (US); **Rahul J. Chillar**, Marietta, GA (US); **Patrick M. Molumby**, Scotia, NY (US)

Correspondence Address:
GE ENERGY GENERAL ELECTRIC
C/O ERNEST G. CUSICK
ONE RIVER ROAD, BLD. 43, ROOM 225
SCHENECTADY, NY 12345 (US)

(73) Assignee: **General Electric Company**

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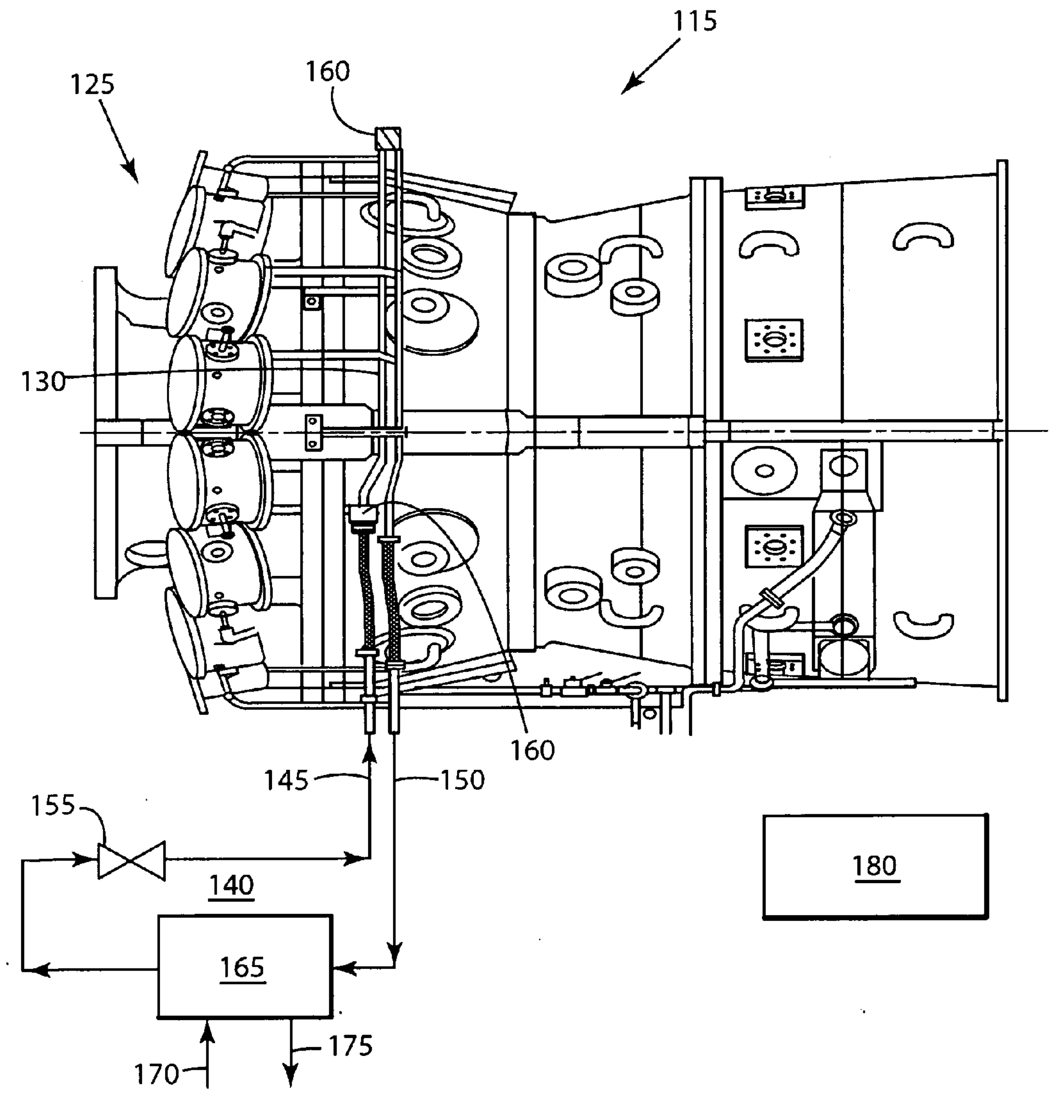
(57) **ABSTRACT**

An embodiment of the present invention provides a cooling system for a flame detection system of a turbomachine. An embodiment of the present invention may provide a control system for the operation of the cooling system. The control system may be configured to automatically and/or continuously monitor the cooling system to determine whether the position of the at least one valve should be changed.

An embodiment of the present invention may provide a method for monitoring the cooling system. The method of an embodiment of the present invention may provide a correction action if the cooling system is not operating within a parameter.



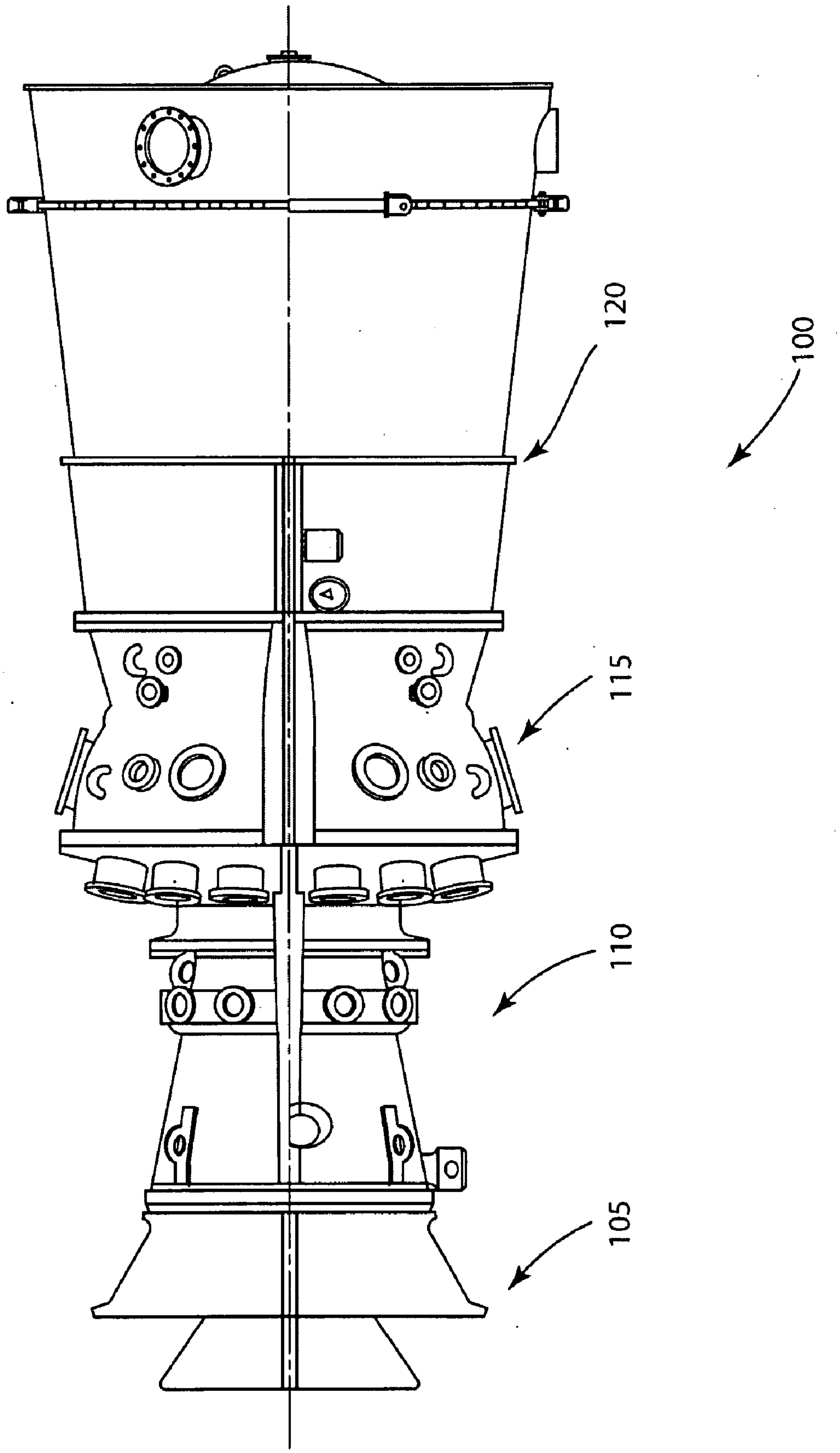


FIG. 1

FIG. 2

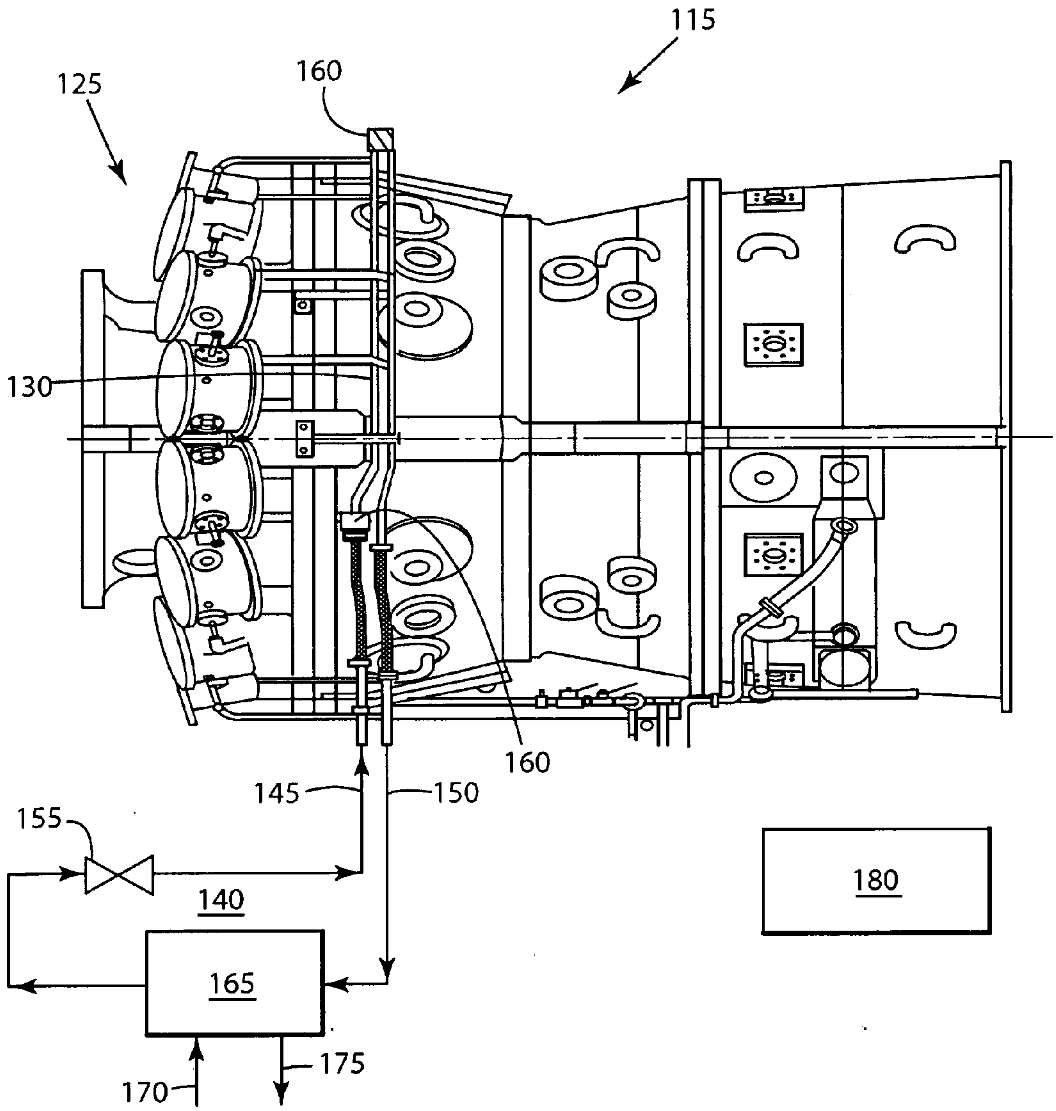


FIG. 3

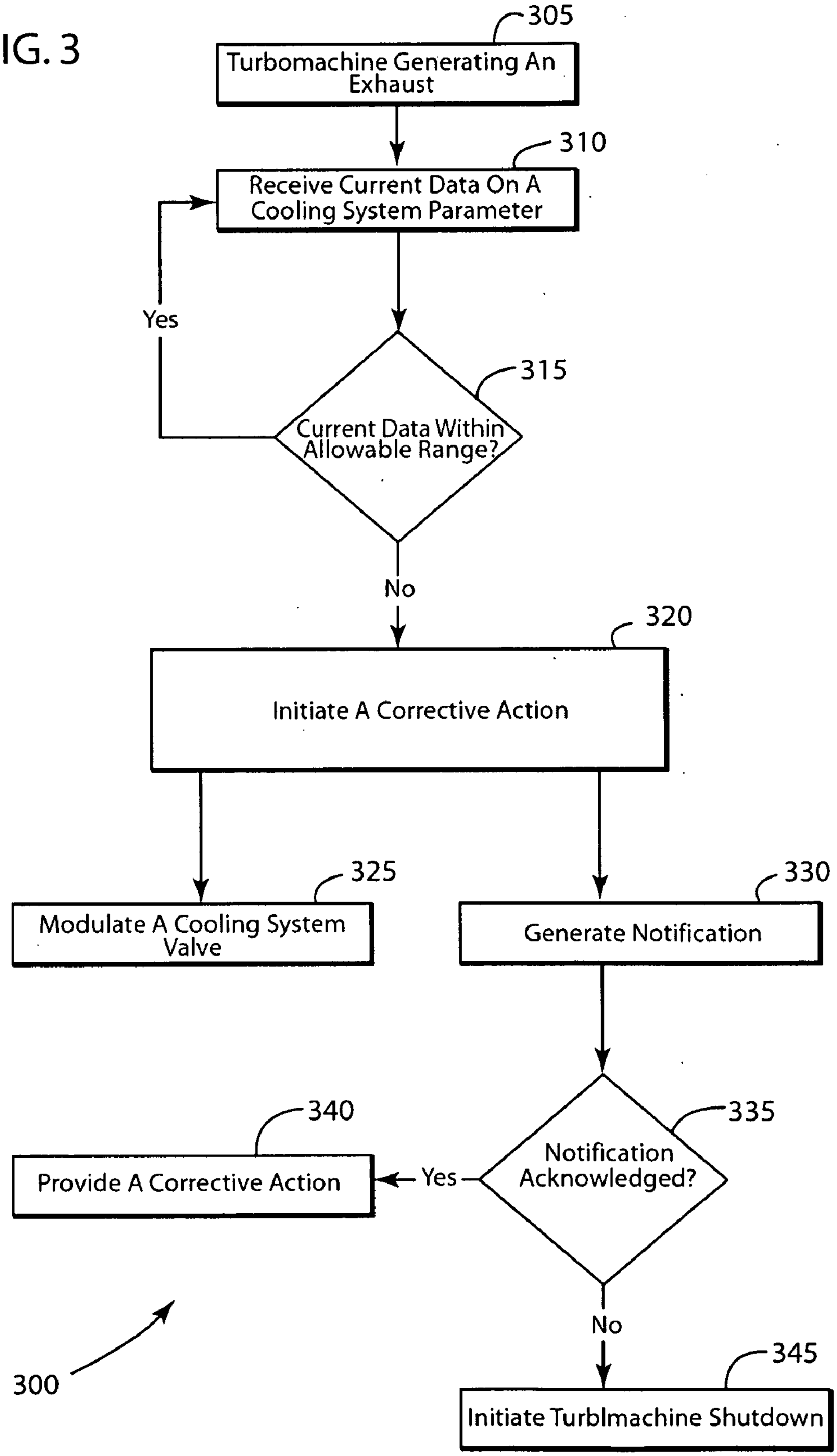
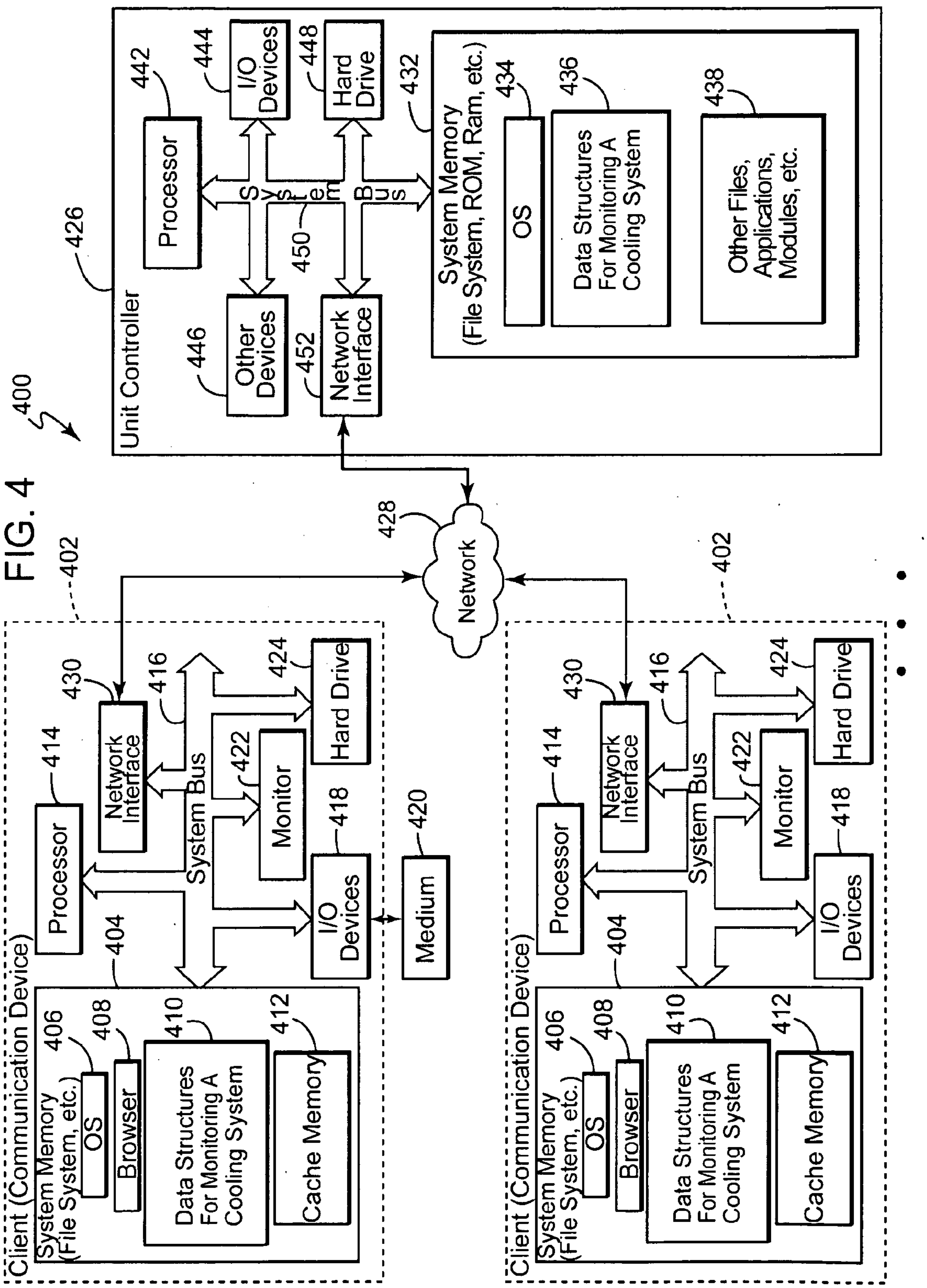

305
Turbomachine Generating An Exhaust
310
Receive Current Data On A Cooling System Parameter
Yes
315
Current Data Within Allowable Range?
No
320
Initiate A Corrective Action
325
Modulate A Cooling System Valve
330
Generate Notification
340
Provide A Corrective Action
Yes
335
Notification Acknowledged?
No
345
Initiate Turblmachine Shutdown
300

FIG. 4


400
Unit Controller
426
Processor
442
I/O Devices
444
Hard Drive
448
System Bus
450
Other Devices
446
Network Interface
452
System Memory (File System, ROM, Ram, etc.)
432
OS
434
Data Structures For Monitoring A Cooling System
436
Other Files, Applications, Modules, etc.
438
Network
428
Client (Communication Device)
402
System Memory (File System, etc.)
404
OS
406
Browser
408
Data Structures For Monitoring A Cooling System
410
Cache Memory
412
Processor
414
Network Interface
430
System Bus
416
Monitor
422
Hard Drive
424
I/O Devices
418
Medium
420
Client (Communication Device)
402
System Memory (File System, etc.)
404
OS
406
Browser
408
Data Structures For Monitoring A Cooling System
410
Cache Memory
412
Processor
414
Network Interface
430
System Bus
416
Monitor
422
Hard Drive
424
I/O Devices
418

COOLING SYSTEM AND METHOD FOR A TURBOMACHINE

BACKGROUND OF THE INVENTION

[0001] The present invention relates to the operation of a turbomachine, and more particularly to a cooling system and method for a turbomachine.

[0002] Some turbomachines, such as gas turbines, aero-derivatives, or the like, burn a fuel and an air mixture during a combustion process to generate energy. FIG. **1** illustrates an example of a turbomachine **100**. Generally, the turbomachine **100** comprises an inlet plenum **105** that directs an airstream towards a compressor housed in a compressor casing **110**. The airstream is compressed and then discharged to a combustion system **115**, where a fuel, such as natural gas, is burned to provide high-energy combustion gases, which drives the turbine section **120**. In the turbine section **120**, the energy of the hot gases is converted into work, some of which is used to drive the compressor, with the remainder available for useful work to drive a load such as the generator, mechanical drive, or the like (none of which are illustrated).

[0003] The flame created during the combustion process is monitored during the operation of the turbomachine **100**. Various forms of flame detection systems are used for the monitoring. Flame detection systems may be located in close proximity to the combustion system **115** of the turbomachine **100**. This leads to heating of the flame detection system, which leads to faulty flame detection. A cooling system should be used to remove the heat received by the flame detection system.

[0004] For the foregoing reasons, there is a need for a system and method to cool a flame detection system during the operation of the turbomachine **100**. The method and system should allow for real time monitoring and control of the cooling system.

BRIEF DESCRIPTION OF THE INVENTION

[0005] In accordance with an embodiment of the present invention, a cooling system for a turbomachine, the system comprising: a cooling circuit configured for delivering a coolant to at least one flame detection system, wherein a portion of the flame detection system is installed on a turbomachine: at least one device for determining a physical property of the coolant; and a control system for operating the cooling system; wherein, the control system receives data from the at least one device.

[0006] In accordance with an alternate embodiment of the present invention, a method of operating a cooling system for a turbomachine, the method comprising: providing a cooling system which comprises: a cooling circuit configured to deliver a coolant to at least one flame detection system, wherein a portion of the flame detection system is installed on a turbomachine; receiving data on a cooling system parameter; wherein the cooling system parameter comprises a physical property of the coolant; determining whether the data is within an allowable range; and initiating a corrective action if the data is outside of the allowable range.

BRIEF DESCRIPTION OF THE DRAWINGS

[0007] FIG. **1** is a schematic illustrating a turbomachine in accordance with an embodiment of the present invention.

[0008] FIG. **2** is a schematic illustrating an example of a cooling system in accordance with an embodiment of the present invention.

[0009] FIG. **3** is a flowchart illustrating a method of controlling an air preheating system in accordance with an embodiment of the present invention.

[0010] FIG. **4** is a block diagram of an exemplary system of controlling an air preheating system in accordance with an embodiment of the present invention.

DETAILED DESCRIPTION OF THE INVENTION

[0011] The following detailed description of preferred embodiments refers to the accompanying drawings, which illustrate specific embodiments of the invention. Other embodiments having different structures and operations do not depart from the scope of the present invention.

[0012] Generally, the cooling system may be employed to remove some of the heat experienced by the flame detection system, as described. An embodiment of the present invention may provide a method of monitoring and/or cooling the cooling system of the present invention.

[0013] Referring again to the Figures, where the various numbers represent like elements throughout the several views. FIG. **2** is a schematic illustrating an example of a cooling system **140** in accordance with an embodiment of the present invention. An embodiment of the combustion system **115** may comprise at least one combustion can **125**. Some turbomachines **100** may comprises a plurality of combustion cans **125**. Generally, within each of combustion can **125** the aforementioned combustion process occurs. A flame detection system **130** monitors the flame burning in some of the combustion cans **125**. The flame detection system **130** may be in the form of a flame scanner, a portion of which may be inserted within the combustion can **125**. For example, but not limiting of, the flame scanner may utilize an infra red technology, optical technology, or the like, to detect the flame.

[0014] An embodiment of the cooling system **140** may comprise a cooling system circuit. The cooling system circuit may comprise: a cooling system (CS) supply line **145**, a cooling system (CS) return line **150**, at least one valve **155**, at least one feedback device **160**, at least one heat exchanging device **165**, a heat exchanger (HX) supply line **170** and a heat exchanger (HX) return line **175**. A control system **180** may control the operation of the cooling system **140**. As illustrated in FIG. **2**, portions of the cooling circuit may be installed over a casing of the turbomachine **100**, such as, but not limiting of, the compressor casing **110**.

[0015] The CS supply line **145** generally serves to supply a coolant to the flame detection system **130**. The coolant may flow through a portion of the flame detection system **130** to remove the heat received from the combustion system **115**. In an embodiment of the present invention, the CS supply line **145** may comprise at least one valve **155** and at least one feedback device **160**. The at least one valve **155** may serve to control the supply of the coolant to the cooling system **140**. The at least one valve **155** may be located upstream of each feedback device **160**. An embodiment of the at least one valve **155**, may have the form of a solenoid valve, a motor-operated valve, or the like.

[0016] The at least one feedback device **160** generally serves to determine a physical property of the coolant. For example, but not limiting of, the at least one feedback device **160** may determine, a pressure or a flowrate of the coolant within the cooling system **140**. The at least one feedback device **160** may comprise the form of: pressure switch, a pressure transmitter, a pressure transducer, a flow meter, or the like.

[0017] In an embodiment of the present invention, a first feedback device may be located at upstream of each flame detection system **130** and a second feedback device may be located downstream of each flame detection system **130**. In an embodiment of the present invention, the at least one feedback device **160** may provide data on the physical property of the coolant to the control system **180**.

[0018] The CS return line **150** serves to move the heated coolant, from the flame detection system **130**. In an embodiment of the present invention, the CS return line **150** may be connected to a portion of the flame detection system **130**. The coolant may exit the flame detection at a temperature, reflecting the removal of heat from the flame detection system **130**.

[0019] In an embodiment of the present invention, the cooling system **140** may comprises a heat exchanging device **165** for adjusting the temperature of the coolant. The form of the heat exchanging device **165** may include: a heat exchanger, a chiller, or the like. The heat exchanging device **165** may comprise a HX supply line **170** and a HX return line **175**. The heat exchanging device **165** may form a closed or partially closed loop system, when connected with the CS supply line **145** and the CS return line **150**. As illustrated in FIG. **2**, the CS supply line **145** may be connected to a discharge end of the heat exchanging device **165**; and the CS return line **150** may be connected to an intake end of the heat exchanging device **165**.

[0020] The control system **180** may implement an algorithm, or the like, to control the operation of the cooling system **140**. The control system **180** may receive data from the at least one feedback device **160**. The control system **180** may utilize the data to determine the position of the at least one valve **155**. For example, but not limiting of, the algorithm may include an operating range of the pressure of the coolant within the CS supply line **145**. This may be used to determine if the coolant in the CS supply line **145** is received by the flame detection system **130**. For example, but not limiting of, a low-pressure value may indicate a coolant leak. Here, a leak may indicate that coolant is engaging a casing of the turbomachine **100**.

[0021] As will be appreciated, the present invention may be embodied as a method, system, or computer program product. Accordingly, the present invention may take the form of an entirely hardware embodiment, an entirely software embodiment (including firmware, resident software, micro-code, etc.) or an embodiment combining software and hardware aspects all generally referred to herein as a “circuit”, “module,” or “system”. Furthermore, the present invention may take the form of a computer program product on a computer-usable storage medium having computer-usable program code embodied in the medium.

[0022] Any suitable computer readable medium may be utilized. The computer-usable or computer-readable medium may be, for example but not limited to, an electronic, magnetic, optical, electromagnetic, infrared, or semiconductor system, apparatus, device, or propagation medium. More specific examples (a non exhaustive list) of the computer-readable medium would include the following: an electrical connection having one or more wires, a portable computer diskette, a hard disk, a random access memory (RAM), a read-only memory (ROM), an erasable programmable read-only memory (EPROM or Flash memory), an optical fiber, a portable compact disc read-only memory (CD-ROM), an optical storage device, a transmission media such as those supporting the Internet or an intranet, or a magnetic storage device. Note that the computer-usable or computer-readable medium could even be paper or another suitable medium upon which the program is printed, as the program can be electronically captured, via, for instance, optical scanning of the paper or other medium, then compiled, interpreted, or otherwise processed in a suitable manner, if necessary, and then stored in a computer memory. In the context of this document, a computer-usable or computer-readable medium may be any medium that can contain, store, communicate, propagate, or transport the program for use by or in connection with the instruction execution system, apparatus, or device.

[0023] Computer program code for carrying out operations of the present invention may be written in an object oriented programming language such as Java7, Smalltalk or C++, or the like. However, the computer program code for carrying out operations of the present invention may also be written in conventional procedural programming languages, such as the “C” programming language, or a similar language. The program code may execute entirely on the user’s computer, partly on the user’s computer, as a stand-alone software package, partly on the user’s computer and partly on a remote computer or entirely on the remote computer. In the latter scenario, the remote computer may be connected to the user’s computer through a local area network (LAN) or a wide area network (WAN), or the connection may be made to an external computer (for example, through the Internet using an Internet Service Provider).

[0024] The present invention is described below with reference to flowchart illustrations and/or block diagrams of methods, apparatuses (systems) and computer program products according to embodiments of the invention. It will be understood that each block of the flowchart illustrations and/or block diagrams, and combinations of blocks in the flowchart illustrations and/or block diagrams, can be implemented by computer program instructions. These computer program instructions may be provided to a processor of a public purpose computer, special purpose computer, or other programmable data processing apparatus to produce a machine, such that the instructions, which execute via the processor of the computer or other programmable data processing apparatus, create means for implementing the functions/acts specified in the flowchart and/or block diagram block or blocks.

[0025] These computer program instructions may also be stored in a computer-readable memory that can direct a computer or other programmable data processing apparatus to function in a particular manner, such that the instructions stored in the computer-readable memory produce an article of manufacture including instruction means which implement the function/act specified in the flowchart and/or block diagram block or blocks. The computer program instructions may also be loaded onto a computer or other programmable data processing apparatus to cause a series of operational steps to be performed on the computer or other programmable apparatus to produce a computer implemented process such that the instructions which execute on the computer or other programmable apparatus provide steps for implementing the functions/acts specified in the flowchart and/or block diagram blocks.

[0026] An embodiment of the control system **180** has the technical effect of controlling the operation of the cooling system **140**. The control system **180** of an embodiment of the present invention may be configured to automatically and/or continuously monitor the cooling system **140** to determine whether the position of the at least one valve **155** should be changed.

[0027] Alternatively, the control system **180** may be configured to require a user action to the initiate operation of the cooling system **140**. An embodiment of the control system **180** of the present invention may function as a stand-alone system. Alternatively, the control system **180** may be integrated as a module, or the like, within a broader system, such as a turbine control which or a plant control system which may governing the operation of the turbomachine **100**.

[0028] FIG. **3** is a flowchart illustrating a method **300** of controlling a cooling system **140** in accordance with an embodiment of the present invention. In an embodiment of the present invention the control system **180** that implements the method **300** may be integrated with a graphical user interface (GUI), or the like. The GUI may allow the operator to navigate through the method **300** described below. The GUI may also provide at least one notification of the status of the cooling system **140**. The method **300** may be adapted to control the operation of a variety of configurations of a cooling system **140**, include the embodiment that was described.

[0029] In step **305**, of the method **300**, the turbomachine **100** generates an exhaust. Depending on either the type and/or operation of the turbomachine **100**, the generated exhaust typically indicates that a flame exists within the combustion system **115**. Here, the flame detection system **130** may be detecting the presence of a flame within the combustion system **115**.

[0030] In step **310**, the method **300** may receive data on a cooling system parameter. An algorithm of the control system **180**, to monitor the operation of the cooling system **140**, may use the cooling system parameter. This algorithm may also use the cooling system parameter to control the operation of the cooling system. The cooling system parameter may comprise a physical property of the coolant. The physical property may include, but is not limited to, a pressure and/or a flowrate of the coolant. In an embodiment of the present invention, the user may define the cooling system parameter. In an alternate embodiment of the present invention, the algorithm may utilize multiple cooling system parameters.

[0031] In step **315**, the method **300** may determine whether the current data of the cooling system parameter is within an allowable range. An embodiment of the present invention may allow the user to set the allowable range. For example, but not limiting of, a user may select the pressure of the coolant in the CS supply line **145** as the cooling system parameter. After the method **300** receives data on the pressure value in step **310**, the pressure value may be compared to an allowable pressure range. If the current data is within the allowable range, the method **300** may revert to step **310**; otherwise the method **300** may proceed to step **320**.

[0032] In step **320**, the method **300** may initiate a corrective action. An embodiment of the method **300** may automatically initiate multiple corrective actions simultaneously. As illustrated in FIG. **3**, the method **300**, in step **325** may modulate a position of the at least one valve **155**. This may occurred automatically as a measure to reduce the uncertainty of where the coolant may be flowing. For example, but not limiting of, a low pressure value may indicate a coolant leak in the cooling system **140**. To avoid the waste associated with a coolant leak, the method **300** may automatically closed the at least one valve **155** to stop the flow of coolant flowing in the CS supply line **145**. Here, the corrective action may comprise isolating the cooling system **140**.

[0033] Concurrently, in an embodiment of the present invention, the method **320**, in step **330**, may automatically generate a notification. The notification may serve to inform the user that the cooling system parameter may not be within the allowable range. In an embodiment of the present invention, the GUI may provide the notification as a pop-up window, alarm, or other similar methods.

[0034] In step **335**, the method **300** may determine whether the notification is acknowledged. Due to the importance of the cooling system **140**, a prompt acknowledgment of the notification issued in step **330** may be required. If the notification is acknowledged, then the method **300** may proceed to step **340**, otherwise the method **300** may proceed to step **345**.

[0035] In step **340**, the method **300** may provide a corrective action to the user. For example, but not limiting of, the method **300** may provide the user with areas on the turbomachine **100** to inspect. Alternatively, the method **300** may suggest that the user verify the operation of the components of the cooling system **140**.

[0036] In step **345**, the method **300**, may initiate a turbomachine shutdown if the notification is not acknowledged. For example, but not limiting of, the method **300** may include a timer, or the like, used to monitor when the notification is acknowledged. Here, if notification is not acknowledged within a designated time, then the method may initiate the shutdown of the turbomachine **100** to reduce the possibility of a coolant leak engage a casing of the turbomachine **100**.

[0037] FIG. **4** is a block diagram of an exemplary system **400** for controlling a cooling system **140** in accordance with an embodiment of the present invention. The elements of the method **310** may be embodied in and performed by the system **400**. The system **400** may include one or more user or client communication devices **402** or similar systems or devices (two are illustrated in FIG. **4**). Each communication device **402** may be for example, but not limited to, a computer system, a personal digital assistant, a cellular phone, or any device capable of sending and receiving an electronic message.

[0038] The communication device **402** may include a system memory **404** or local file system. The system memory **404** may include for example, but is not limited to, a read only memory (ROM) and a random access memory (RAM). The ROM may include a basic input/output system (BIOS). The BIOS may contain basic routines that help to transfer information between elements or components of the communication device **402**. The system memory **404** may contain an operating system **406** to control overall operation of the communication device **402**. The system memory **404** may also include a browser **408** or web browser. The system memory **404** may also include data structures **410** or computer-executable code for controlling a cooling system **140** that may be similar or include elements of the method **300** in FIG. **3**.

[0039] The system memory **404** may further include a template cache memory **412**, which may be used in conjunction with the method **300** in FIG. **3** for controlling a cooling system **140** in accordance with an embodiment of the present invention.

[0040] The communication device **402** may also include a processor or processing unit **414** to control operations of the other components of the communication device **402**. The operating system **406**, browser **408**, and data structures **410** may be operable on the processing unit **414**. The processing unit **414** may be coupled to the memory system **404** and other components of the communication device **402** by a system bus **416**.

[0041] The communication device **402** may also include multiple input devices (I/O), output devices or combination input/output devices **418**. Each input/output device **418** may be coupled to the system bus **416** by an input/output interface (not shown in FIG. **4**). The input and output devices or combination I/O devices **418** permit a user to operate and interface with the communication device **402** and to control operation of the browser **408** and data structures **410** to access, operate and control the software to control a cooling system **140** in accordance with an embodiment of the present invention. The **110** devices **418** may include a keyboard and computer pointing device or the like to perform the operations discussed herein.

[0042] The I/O devices **418** may also include for example, but are not limited to, disk drives, optical, mechanical, magnetic, or infrared input/output devices, modems or the like. The I/O devices **418** may be used to access a storage medium **420**. The medium **420** may contain, store, communicate, or transport computer-readable or computer-executable instructions or other information for use by or in connection with a system, such as the communication devices **402**.

[0043] The communication device **402** may also include or be connected to other devices, such as a display or monitor **422**. The monitor **422** may permit the user to interface with the communication device **402**.

[0044] The communication device **402** may also include a hard drive **424**. The hard drive **424** may be coupled to the system bus **416** by a hard drive interface (not shown in FIG. **4**). The hard drive **424** may also form part of the local file system or system memory **404**. Programs, software, and data may be transferred and exchanged between the system memory **404** and the hard drive **424** for operation of the communication device **402**.

[0045] The communication device **402** may communicate with at least one unit controller **426** and may access other servers or other communication devices similar to communication device **402** via a network **428**. The system bus **416** may be coupled to the network **428** by a network interface **430**. The network interface **430** may be a modem, Ethernet card, router, gateway, or the like for coupling to the network **428**. The coupling may be a wired or wireless connection. The network **428** may be the Internet, private network, an intranet, or the like.

[0046] The at least one unit controller **426** may also include a system memory **432** that may include a file system. ROM, RAM, and the like. The system memory **432** may include an operating system **434** similar to operating system **406** in communication devices **402**. The system memory **432** may also include data structures **436** for controlling a cooling system **140** in accordance with an embodiment of the present invention. The data structures **436** may include operations similar to those described with respect to the method **400** for controlling a cooling system **140** in accordance with an embodiment of the present invention. The server system memory **432** may also include other files **438**, applications, modules, and the like.

[0047] The at least one unit controller **426** may also include a processor **442** or a processing unit to control operation of other devices in the at least one unit controller **426**. The at least one unit controller **426** may also include I/O device **444**. The I/O devices **444** may be similar to I/O devices **418** of communication devices **402**. The at least one unit controller **426** may further include other devices **446**, such as a monitor or the like to provide an interface alone with the I/O devices **444** to the at least one unit controller **426**. The at least one unit controller **426** may also include a hard disk drive **448**. A system bus **450** may connect the different components of the at least one unit controller **426**. A network interface **452** may couple the at least one unit controller **426** to the network **428** via the system bus **450**.

[0048] The flowcharts and step diagrams in the figures illustrate the architecture, functionality, and operation of possible implementations of systems, methods, and computer program products according to various embodiments of the present invention. In this regard, each step in the flowchart or step diagrams may represent a module, segment, or portion of code, which comprises one or more executable instructions for implementing the specified logical function(s). It should also be noted that, in some alternative implementations, the functions noted in the step may occur out of the order noted in the figures. For example, two steps shown in succession may, in fact, be executed substantially concurrently, or the steps may sometimes be executed in the reverse order, depending upon the functionality involved. It will also be noted that each step of the step diagrams and/or flowchart illustration, and combinations of steps in the step diagrams and/or flowchart illustration, can be implemented by special purpose hardware-based systems which perform the specified functions or acts, or combinations of special purpose hardware and computer instructions.

[0049] The terminology used herein is for the purpose of describing particular embodiments only and is not intended to be limiting of the invention. As used herein, the singular forms “a”, “an” and “the” are intended to include the plural forms as well, unless the context clearly indicates otherwise. It will be further understood that the terms “comprises” and/or “comprising,” when used in this specification, specify the presence of stated features, integers, steps, operations, elements, and/or components, but do not preclude the presence or addition of one or more other features, integers, steps, operations, elements, components, and/or groups thereof.

[0050] Although specific embodiments have been illustrated and described herein, it should be appreciated that any arrangement, which is calculated to achieve the same purpose, may be substituted for the specific embodiments shown and that the invention has other applications in other environments. This application is intended to cover any adaptations or variations of the present invention. The following claims are in no way intended to limit the scope of the invention to the specific embodiments described herein.

What is claimed is:

1. A cooling system for a turbomachine, the system comprising:

a cooling circuit configured for delivering a coolant to at least one flame detection system, wherein a portion of the flame detection system is installed on a turbomachine;

at least one device for determining a physical property of the coolant; and

a control system for operating the cooling system; wherein, the control system receives data from the at least one device.

2. The system of claim **1**, further comprising at least one valve configured for allowing the coolant to flow to the at least one flame detection system.

3. The system of claim **2**, wherein the control system determines the position of the at least one valve.

4. The system of claim **1**, further comprising a turbomachine, wherein the turbomachine comprises a casing, and wherein a portion of the cooling circuit extends over the casing.

5. The system of claim **4**, wherein the casing comprises at least one combustion can and wherein the at least one flame detection system is integrated with the at least one combustion can.

6. The system of claim **1**, wherein the physical property comprises at least one of: a pressure, a flowrate, or combinations thereof.

7. The system of claim **1**, further comprising at least one heat exchanging device for regulating a temperature of the at least one flame detection system.

8. The system of claim **1**, wherein the at least one device comprises at least one of: a pressure switch, a pressure transmitter, a pressure transducer, a flow meter, or combinations thereof.

9. The system of claim **2**, wherein the at least one valve comprises at least one of: a solenoid valve, a motor operated valve, or combinations thereof.

10. A method of operating a cooling system for a turbomachine, the method comprising:

providing a cooling system which comprises: a cooling circuit configured to deliver a coolant to at least one flame detection system, wherein a portion of the flame detection system is installed on a turbomachine;

receiving data on a cooling system parameter; wherein the cooling system parameter comprises a physical property of the coolant;

determining whether the data is within an allowable range; and

initiating a corrective action if the data is outside of the allowable range.

11. The method of claim **10**, wherein the step of providing the corrective action comprises modulating at least one cooling system valve.

12. The method of claim **10**, wherein the step of providing the corrective action comprises:

isolating the cooling system;

generating a notification;

determining whether the notification is acknowledged;

providing a corrective action if the corrective action is acknowledged; or

initiating a shutdown sequence of the turbomachine.

13. The method of claim **11**, wherein the cooling system valve is configured for allowing the coolant to flow to the at least one flame detection system.

14. The system of claim **11**, further comprising determining an operation position of the cooling system valve.

15. The method of claim **10**, wherein the turbomachine comprises a casing, and a portion of the cooling circuit extends over the casing.

16. The method of claim **15**, wherein the casing comprises at least one combustion can and integrating the at least one flame detection system with the at least one combustion can.

17. The method of claim **10**, wherein the physical property comprises at least one of a pressure, a flowrate, or combinations thereof.

18. The method of claim **10**, further comprising utilizing at least one heat exchanging device for regulating a temperature of the coolant.

19. The method of claim **11**, further comprising utilizing at least one device to provide data on the cooling system parameter, wherein the at least one device comprises at least one of: a pressure switch, a pressure transmitter, a pressure transducer, a flow meter, or combinations thereof.

20. The method of claim **11**, wherein the cooling system valve comprises at least one of: a solenoid valve, a motor operated valve, or combinations thereof.

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