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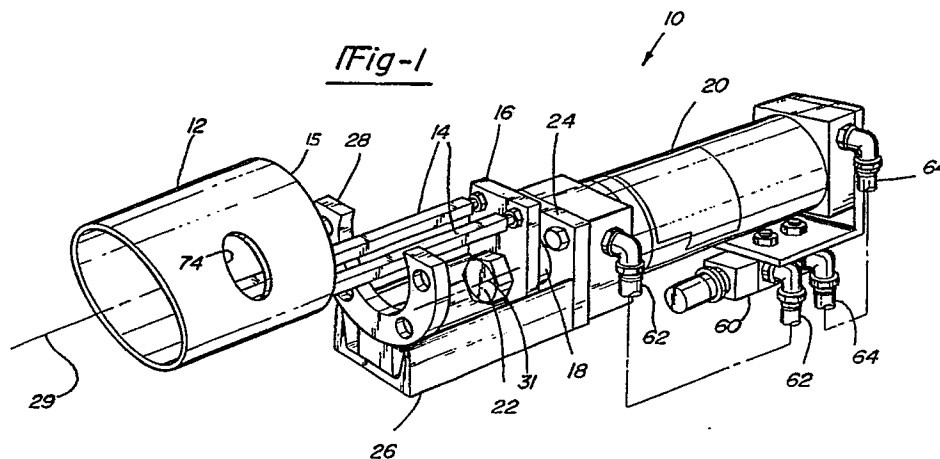
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(54) Auxiliary port cleaner for boiler wall sensing port.

(57) A cleaner for a boiler wall port used by various instruments, including light or sound wave receiving or emitting devices in which the device is mounted to a wallbox surrounding the port and extending from the boiler wall. The wallbox terminates in a mounting flange spaced from the boiler and to which the device is attached. The device includes a wave guide terminating in a flange attached to the wallbox mounting flange. The cleaner includes a weldment

attached to the wallbox mounting flange and an actuator mounted to the weldment. The actuator is coupled to a cutting sleeve disposed within the wallbox and moveable into and out of the boiler wall port. The cutting sleeve is coupled to the actuator by a pair of connecting rods passing through the wallbox mounting flange to insure precise alignment of the cutting sleeve.



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BACKGROUND AND SUMMARY OF THE INVENTION

The present invention relates to a cleaner for a port in the sidewall of a recovery boiler and more particularly to a cleaner for a sensing port used by sonic or video measuring devices or other similar instruments.

In a boiler it is necessary to monitor various parameters including internal gas temperature. In difficult to measure areas of the boiler, such as high temperature, high abrasion or high corrosion areas, conventional measuring devices have relatively short lives. A sonic sensor or a video monitor can be used in these locations to measure temperature or monitor internal functioning.

A sonic temperature measuring device projects sound waves across the boiler. Time in flight and amplitude of the sound waves across the boiler are measured to provide an average temperature across the width of the boiler. Sonic as well as video devices must have a clear path through the boiler wall to function properly.

A sonic sensing device includes a sonic transducer coupled to the boiler wall through a wallbox mounted to the boiler wall. A port through the boiler wall provides access to the interior of the boiler through which the transducer transmits and receives sound waves. One such device is known as the PYROSONIC-2000. PYROSONIC-2000 is a Registered Trademark of the Babcock & Wilcox company. The sensing port cleaner of this invention will be described in conjunction with the PYROSONIC-2000. It is to be understood that the sensing port cleaner of this invention can be used with various instruments with appropriate adaptation.

In operation, the boiler wall port will become clogged by matter contained in combustion gasses and also by slag products running down the furnace wall. The term "slag" will be used throughout the remainder of the specification to refer to the matter accumulating on the boiler wall. The accumulation of slag in the port interferes with the transmission and reception of the acoustic wave from the sonic device.

It is an object of the present invention to provide a cleaner for the boiler wall port to periodically remove the slag accumulation blocking the port.

The wallbox used to mount sound and light sensing devices is a generally tubular shaped member mounted at one end to the boiler wall surrounding the port. The opposite end of the wallbox includes a mounting flange to which the port cleaner and sonic device are mounted. The sonic device includes a wave guide through which the sound waves are emitted and received. The wave guide forms a passage diverging from the sound

wave source and terminates in a flange for attaching the device to the wallbox mounting flange. A funnel or cylindrical shaped wave guide extension may also be included within the wallbox and forms an extension of the wave guide from the mounting flange to the boiler wall port.

The port cleaner according to this invention comprises a cutting sleeve disposed in the wallbox surrounding the wave guide extension. An air cylinder is coupled to the cutting sleeve to move the sleeve longitudinally from a retracted position in the wallbox to an extended position in which the end of the cutting sleeve extends through the boiler wall port. In so doing, the cutting sleeve removes slag from the port to clean the port. The cutting end of the sleeve defines a plane which is at an angle relative to the plane of the port such that the sleeve end forms an advancing shearing line as the sleeve moves through the port. In operation, a portion of the slag will accumulate on the inner periphery of the cutting sleeve. The terminal end of the wave guide extension has an outside diameter closely fitting the inner diameter of the cutting sleeve such that as the sleeve is retracted, the terminal end of the wave guide extension removes accumulated slag from the inside of the sleeve. The end of the wave guide extension defines a plane at an angle to the plane of the port with the top portion of the wave guide extension projecting further than the lower portion in a manner that is complementary to sonic transmission. As the top of the wave guide extension removes slag from the cleaning sleeve, the falling slag will clear the lower end of the extension to avoid slag accumulation in the extension.

The cutting sleeve is coupled to the piston rod of an air cylinder by two parallel connecting rods. The connecting rod move the sleeve between the retracted and extended positions as the cylinder is actuated. Two connecting rods are used to insure parallel alignment of the sleeve in the wallbox and about the wave guide extension to prevent jamming of the sleeve.

An adjustable electrically operated timer energizes a solenoid at preset intervals to provide air pressure to the cylinder via a valve. A purge air coupling in the wallbox enables air to be introduced into the wallbox at a slight positive pressure to remove airborne fumes and loose particles from the wallbox. Purge air may also be used to condition the slag to provide positive shearing characteristics.

Further objects, features and advantages of the invention will become apparent from a consideration of the following description and the appended claims when taken in connection with the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

Figure 1 is a perspective view of the port cleaner of this invention; and

Figure 2 is a cross-sectional view of the port cleaner mounted to the side wall of the boiler and showing the wallbox and the sonic PYROSONIC-2000 transducer and wave guide.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

The sensing port cleaner of the present invention for cleaning a boiler port used by a sonic temperature sensor is designated generally at 10 in Figure 1. The port cleaner 10 includes a cutting sleeve 12 which, as will be described in greater detail below, is moved longitudinally in and out of the boiler wall port to clean the port. Cutting sleeve 12 is supported by two parallel connecting rods 14 connected at one end to the rear face 15 of the sleeve 12 at the lower portion of sleeve 12. Rear face 15 is normal to the longitudinal centerline of the sleeve. The opposite ends of rods 14 are attached to offset plate 16 which is in turn secured to piston rod 18 of actuating cylinder 20 by bolt 22. Offset plate 16 extends radially from piston rod 18. Actuating cylinder 20 is mounted to the cylinder mounting flange 24 of weldment 26. The longitudinal axis 29 of sleeve 12 is thus offset from the parallel longitudinal axis 31 of the piston rod 18. The end of weldment 26, opposite from the cylinder 20, includes a wallbox mounting flange 28 through which the port cleaner 10 is mounted to a boiler wallbox.

Figure 2 shows the port cleaner 10 in assembly relationship with a boiler and the PYROSONIC-2000 device 44. The wall of the boiler is formed by a number of water cooled tubes 32 which may be welded together by means of fins 34 in such a manner to form an opening, or port, 36. The desired port for the PYROSONIC-2000 device is obtained by bending one or more tubes to form the port or by removing stud plates between the tubes. A cylindrical wallbox 38 is mounted to the exterior side of the boiler wall and reinforced by a mounting bracket 40. Wallbox 38 forms a cylindrical housing surrounding the port 36. The terminal end of the wallbox opposite from the boiler wall forms a mounting flange 42 through which the port cleaner 10 and sonic device are mounted to the boiler wall.

The PYROSONIC-2000 device 44 includes a wave guide 46 which terminates in a mounting flange 48. Wave guide 46 forms a diverging passage 50 through which the device 44 emits and receives sound waves. Passage 50 diverges in the direction away from the device 44, toward the boiler.

A wave guide extension 52 is mounted in the wallbox 38 and forms an internal passage which serves as a continuation of the passage 50 of wave guide 46. The outward end of the extension 52 includes a flange 56 which is positioned between the mounting flange 42 of the wallbox and mounting flange 48 of the device 44 to mount the extension within wallbox 38.

The actuating cylinder 20 is operated by a solenoid controlled valve 60 which regulates the flow of a fluid, typically air, through tubes 62 and 64 connecting the valve 60 with both ends of the cylinder 20. An adjustable electrically operated timer (not shown) energizes the solenoid at preset intervals to actuate the cylinder. When the cylinder is actuated to extend piston rod 20, the sleeve is moved longitudinally through the wallbox so that the cutting edge 66 of sleeve 12 extends through port 36 as shown by the phantom lines in Figure 2. By moving through port 36, the cutting sleeve cuts away or shears the slag that has accumulated in port 36 which could otherwise interfere with the travel of the sound or light waves. When the cylinder is operated to retract the piston rod 20 into the cylinder, the cutting sleeve 12 is retracted into the wallbox as shown in the solid line position in Figure 2. Cutting end 66 may be hardened to resist wear in an abrasive environment.

The cutting end 66 of sleeve 12 is angled relative to the plane of the port 36 so as to present a progressive cut as it advances through the port 36. The diverged end 68 of the wave guide extension 52 is also inclined relative to the plane of port 36 in a manner that is complementary to sonic transmission. The wave guide extension upper end terminates closer to port 36 than does the bottom of the wave guide extension. The inner periphery of cutting sleeve 12 is closely fitting with the outer periphery of the wave guide extension so that as the cutting sleeve 12 is retracted into the wallbox, any slag 70 which may accumulate on the inner surface of sleeve 12 can be removed by the end of the wave guide extension. The wave guide extension end is inclined so that as slag is removed from the top portion of the sleeve 12, the falling slag will clear the lower end of the wave guide extension rather than accumulate within the extension.

Wallbox 38 includes a purge air connection 72 through which air is continuously supplied at a pressure of approximately 1 to 5 inches water. The cutting sleeve 12 has a large diameter aperture 74 which allows for circulation of the purge air between the cutting sleeve and the wave guide extension. The purge air provides continuous removal of fumes and airborne particulates in the wallbox and port 36 which may interfere with the devices. In some cases the purge air may be used to condition

the slag to improve cutting characteristics.

The cutting sleeve 12 is mounted by two connecting rods 14 to insure parallel operation of the cutting sleeve to prevent jamming of the sleeve on the extension or the wallbox. The wallbox mounting flange 28 is configured to match the wallbox mounting flange to which it is connected. Two apertures are bored through the wallbox mounting flange 48 of the device to allow the two connecting rods 14 to pass through.

It is to be understood that the invention is not limited to the exact construction illustrated and described above, but that various changes and modifications may be made without departing from the spirit and scope of the invention as defined in the following claims. In particular, when used with a video monitoring device, it may not be necessary for the wave guide or wave guide extension to form a diverging channel but rather a cylindrical channel.

Claims

1. Cleaner for a boiler wall port used by a wave emitting or receiving device wherein the device is mounted to a wallbox extending from the boiler wall and surrounding the port, the device having a wave guide member forming a channel through which said waves are emitted or received and a wave guide extension disposed within said wallbox forming a passageway for the waves through said wallbox, said cleaner comprising:

a cutting member disposed within said wallbox, said cutting member being longitudinally moveable between a retracted position in said wallbox and an extended position in which one end of said cutting member extends through said port and into said boiler to remove slag in said boiler blocking said port, said cutting member being hollow and surrounding said wave guide extension;

means disposed exteriorly of said wallbox for supporting said cutting member and for moving said cutting member between said retracted and extended positions; and

said wallbox including means forming a purge air inlet into said wallbox and said cutting member including an aperture to enable purge air to enter into said cutting member and surround said wave guide extension.

2. The cleaner of Claim 1 wherein said cutting member is a cylindrical sleeve, one end of said sleeve forming a cutting end which passes through said port as said sleeve is moved from the retracted to the extended positions.

3. The cleaner of Claim 2 wherein said cutting end lies in a plane at an angle to the plane of said port so as to perform a progressive cut as said cutting edge moves through said port, said angle being complementary to wave form transmission.

4. The cleaner of Claim 2 wherein the outer diameter of said wave guide extension is closely fitting the inner diameter of said cutting sleeve to enable the end of said extension to remove slag accumulating on the inner periphery of said cutting sleeve as said sleeve is moved to the retracted position.

5. The cleaner of Claim 4 wherein the terminal end of said wave guide extension lies in a plane at an angle to the plane of the port with the upper portion of said extension being closer to said port than the bottom of said extension.

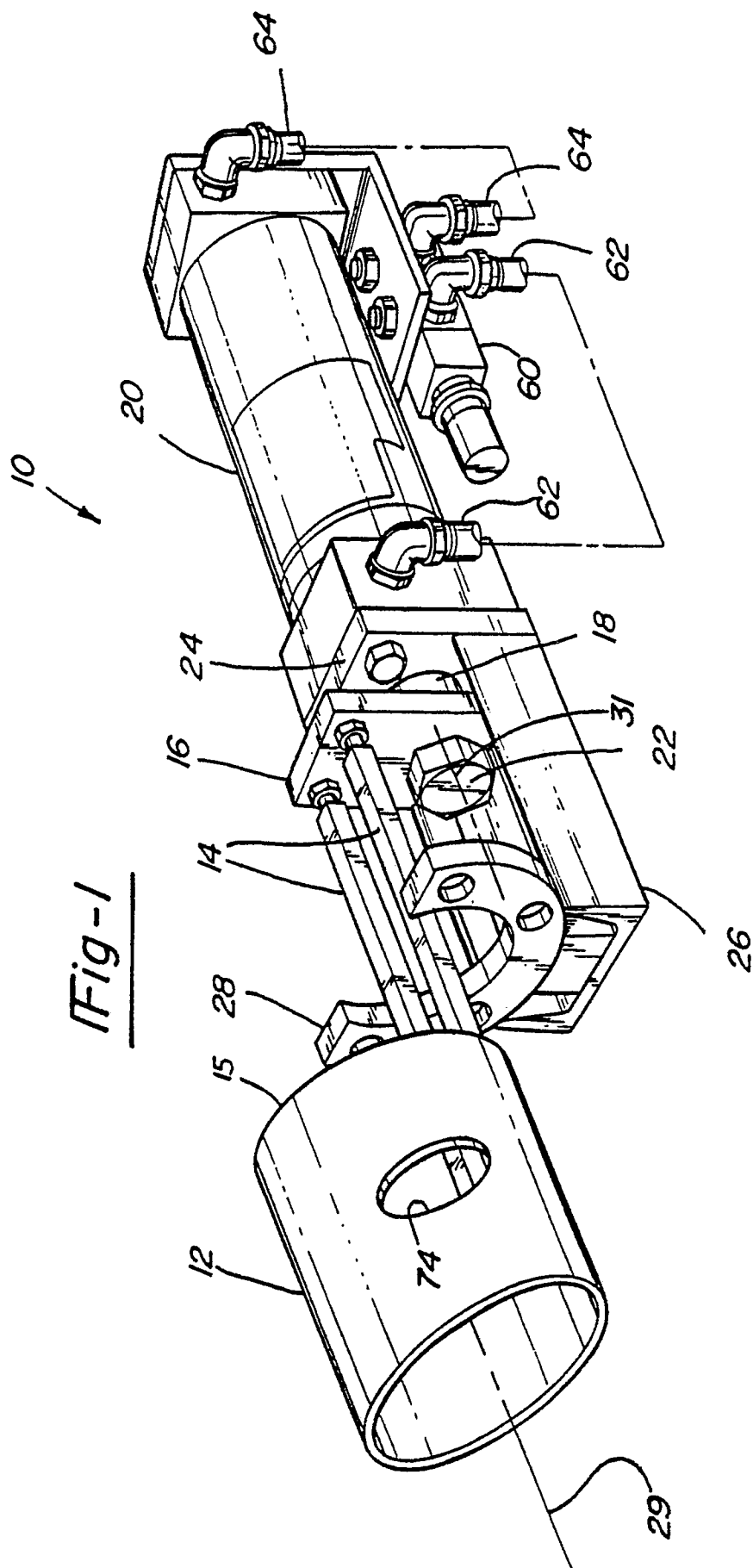
6. The cleaner of Claim 4 wherein said wave guide extension passage is diverging in a direction toward said boiler wall.

7. The cleaner of Claim 1 wherein said means for supporting and moving said cutting member includes;

an actuating cylinder having a piston rod moveable between retracted and extended positions corresponding to the retracted and extended positions of said cutting member; and

a plurality of parallel connecting rods connecting said cutting member to said piston rod to maintain alignment of said cutting member.

8. The cleaner of Claim 7 wherein said actuating cylinder and said wave emitting and receiving device are carried by a weldment mounted to said wallbox with the plurality of parallel connecting rods extending from the exterior of said wallbox, through said wallbox into the interior thereof to support said cutting member within said wallbox.



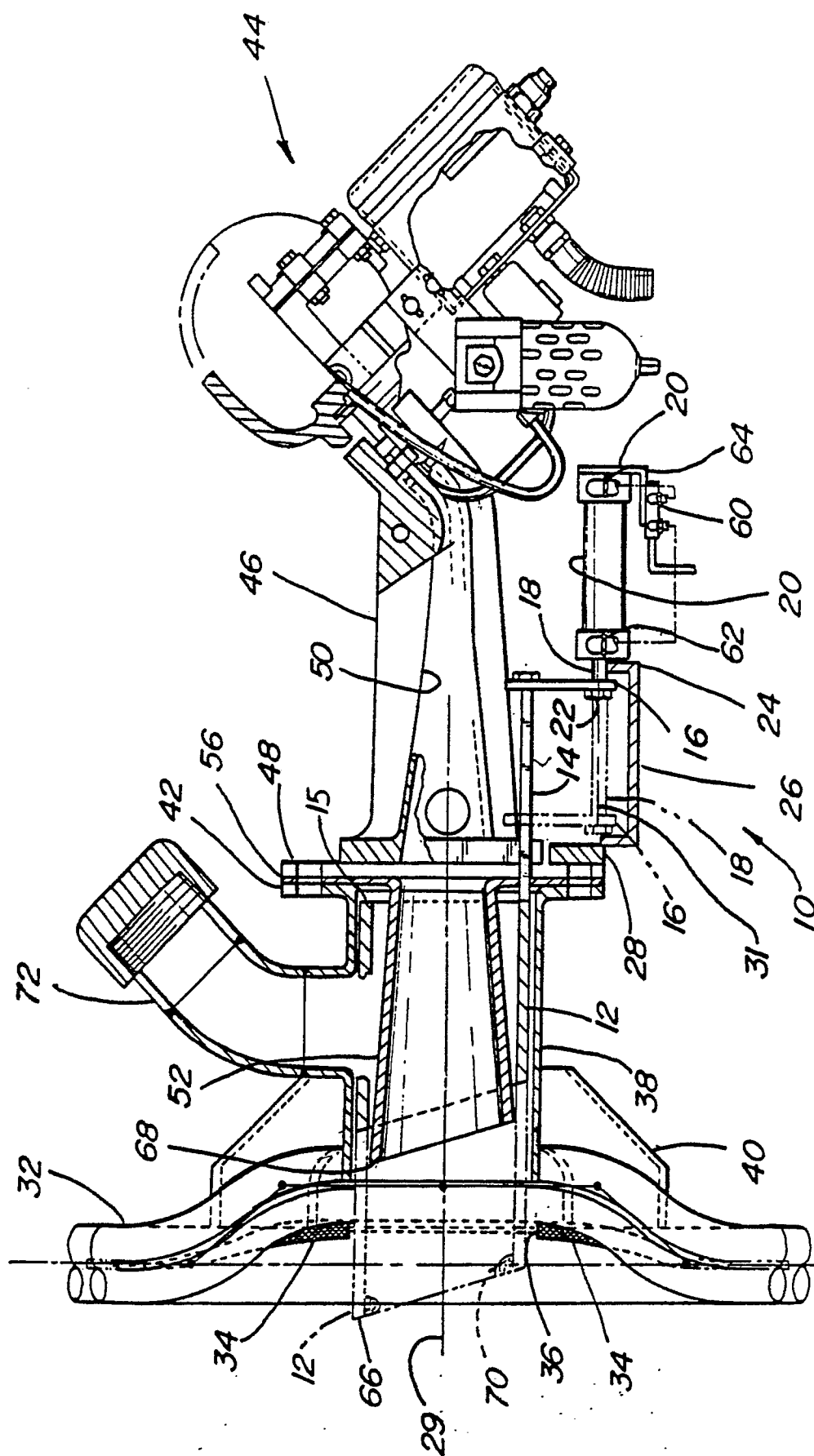


Fig-2