



(12)

EUROPEAN PATENT APPLICATION

- (43)

Date of publication:

20.02.2008 Bulletin 2008/08

(51)

Int Cl.:

F23K 3/00 (2006.01)
F16K 3/00 (2006.01)
F16K 1/16 (2006.01)

F23K 3/02 (2006.01)
F16L 55/00 (2006.01)
- (21)

Application number:

07113411.8
- (22)

Date of filing:

30.07.2007

(84) Designated Contracting States: AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HU IE IS IT LI LT LU LV MC MT NL PL PT RO SE SI SK TR Designated Extension States: AL BA HR MK YU	(72) Inventors: - Waltz, Robert Canton, OH 44708 (US) - Widmer, Neil San Clemente, CA 92672 (US)
(30) Priority: 15.08.2006 US 504462	(74) Representative: Bedford, Grant Richard London Patent Operation GE International Inc 15 John Adam Street London WC2N 6LU (GB)
(71) Applicant: General Electric Company Schenectady, NY 12345 (US) Designated Contracting States: DE FR GB	

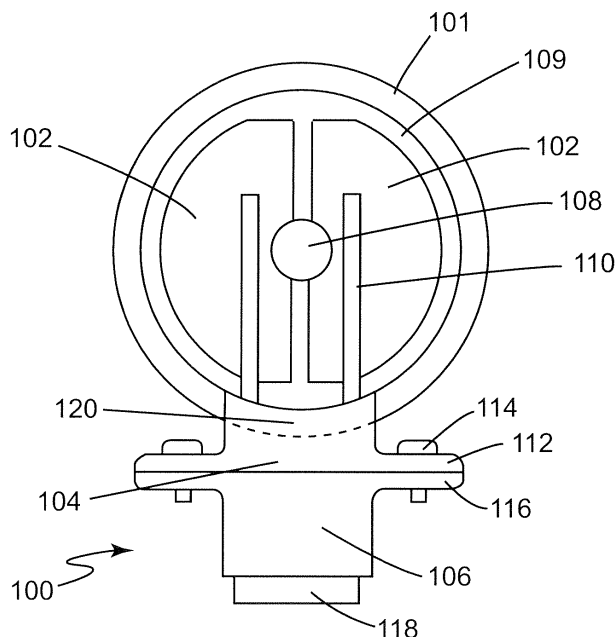
(54)

Port-installed damper

(57)

A port-installed damper (100) for trimming a flow of a substance through a pipe (101), the pipe (101) having a port formed therein, that includes a fitting (104) that attaches to the pipe (101) about the port, a port assembly (106) that attaches to the fitting (104) and includes an actuator (118), and means for trimming the flow of a substance through the pipe (101). The actuator (118) may be connected to the means for trimming by one or more connectors. The port may have a predetermined size such that, during installation of the port-installed damper (100) and the means for trimming may pass through the port. In some embodiments, the port may not extend beyond half of the circumference of the pipe (101).

FIG. 1



Description

[0001] This present application relates generally to systems for trimming, i.e., controlling, the flow of a material through a pipe. More specifically, but not by way of limitation, the present application relates to systems for trimming, i.e., controlling, the flow of air and pulverized coal through a pipe to the burners of a coal-fired boiler.

[0002] Coal-fired boilers typically are fed by multiple coal pulverizing mills. Each mill supplies a mixture of coal and air through multiple pipes to multiple burners within the boiler. Each coal supply path typically originates at a respective pulverizer mill and terminates at the individual burner mounted in the boiler. Each coal pipe has its own characteristic mechanical system performance/resistance properties for a two phase flow of air flow and coal flow. These properties vary for each coal pipe at any given time and boiler load based upon a number of system factors relating to both equipment and process variables.

[0003] For example, equipment such as a forced draft fan, air heater, primary air fan, coal feeder, coal pulverizer, coal classifier, riffle box/fixed orifice, piping system, elevation, air flow and coal flow monitor, burner isolation valve, burner, and boiler and process parameters such as elevation, air temperature, air pressure, air flow, coal flow, coal density, coal moisture, coal composition and coal particle size all impact the performance/resistance characteristics of the system. In other words, as the boiler load changes and as the individual mechanical factors vary for each coal pipe, the air/coal system performance and resistance changes for the total coal piping system and each individual coal pipe within that system.

[0004] It is known that the balance of coal flow to the burners in a coal-fired power plant can have a significant impact on combustion efficiency, residual carbon in fly ash, and NO_x emissions. Even a small burner-to-burner imbalance can significantly impact boiler performance. However, coal flow balancing of multiple burner boilers is a difficult problem for engineers and operators to solve because of all the variables discussed above.

[0005] As a result, the pipes may be fitted with dampers so that the flow of air and pulverized coal may be trimmed, i.e., controlled, such that the proper burner balance is achieved. Generally, the installation of such dampers is expensive and time consuming. This is due to the fact that installation usually requires cutting and removing a complete section of the pipe, supporting the resulting ends of the pipes, welding flanges to the pipe ends, and installing and bolting the damper device between the pipe flanges. In addition, the appropriate locations for installing dampers are typically at locations in which the piping is elevated or otherwise difficult to reach. This may require scaffolding and lifting equipment to support the pipe ends and to lift the new pipe section into place, which adds more difficulty and cost to the operation. Thus, there is a need for a more efficient and less costly system and/or method for this operation to be completed, and still yield an effective damper.

[0006] According to a first aspect of the invention there is described a port-installed damper for trimming a flow of a substance through a pipe, the pipe having a port formed therein, that includes a fitting that attaches to the pipe about the port, a port assembly that attaches to the fitting and includes an actuator, and means for trimming the flow of a substance through the pipe. The actuator may be connected to the means for trimming by one or more connectors. The port may have a predetermined size such that, during installation of the port-installed damper, the means for trimming may pass through the port. In some embodiments, the port may not extend beyond half of the circumference of the pipe.

[0007] The actuator adjusts the means for trimming via the one or more connectors to control the flow of the substance through the pipe. The means for trimming may be a pair of butterfly damper blades, and the one or more connectors may be two stems that connect each butterfly damper blade to the actuator. The stems, upon assembly, may travel from the actuator to the butterfly damper blades through the port and an opening in the fitting. The opening in the fitting may have a predetermined size such that, during installation of the port-installed damper, the butterfly damper blades may pass through the opening in the fitting.

[0008] The butterfly damper blades may include an open setting, wherein a majority of the cross-sectional area of the pipe may be open to flow, a closed setting, wherein a majority of the cross-sectional area of the pipe may be closed to flow, and one or more intermediary settings between the open setting and the closed setting. In some embodiments, a width of the opening may be just greater than the distance between an outer edge of each of the stems when the stems are preassembled into a unit that comprises the butterfly damper blades, the stems, the port assembly, and the actuator. A length of the opening may be just greater than the width of one of the butterfly damper blades.

[0009] In some embodiments, the port may have approximately the same size as the opening in the fitting. The fitting may include a port insert that surrounds the opening in the fitting and inserts into the port. In such embodiments, the port may have a size such that the port fits snugly about the port insert. An end of the port insert is curved so that it matches a curvature of the pipe. The fitting further may include a first flange and the port assembly may include a second flange such that a bolt may attach the port assembly to the fitting via the second flange to the first flange.

[0010] In some embodiments, the butterfly damper blades, the stems, the port assembly, and the actuator may be preassembled into a preassembled unit such that, when the first flange is attached to the pipe and the second flange of the preassembled unit is attached to the first flange, the damper blades are positioned within the pipe in a desired location. In addition, the port assembly may have a shape such that when the port assembly is attached to the fitting, the opening in the fitting

is substantially filled and closed by a section of the port assembly that inserts into the opening such that the inner surface of the pipe remains substantially smooth.

[0011] The present application further describes an apparatus for trimming the flow of a substance through a pipe, the pipe having a port formed therein, that includes a port assembly, one or more damper blades supported by the port assembly and operable between at least two positions, and a flange portion of the port assembly connectable with the pipe to seal the port and support the damper blade in the pipe to permit flow of the substance at a first rate when the damper blade is in a first position and permit flow of the substance at a second rate when the damper is in a second position. The port may have a predetermined size such that, during installation of the apparatus, the one or more damper blades may pass through the port. In some embodiments, the port does not extend beyond half of the circumference of the pipe.

[0012] The one or more damper blades may be two butterfly damper blades that are each supported by the port assembly by a stem. In some embodiments, a width of the port may be just greater than the distance between an outer edge of each of the stems when the stems are preassembled into a unit that comprises the butterfly damper blades, the stems, and the port assembly. A length of the opening may be just greater than the width of one of the butterfly damper blades.

[0013] In some embodiments, the apparatus further may include a fitting that attaches to the pipe about the port. The fitting may include a first flange and the port assembly may include a second flange such that a bolt may attach the port assembly to the fitting by bolting the second flange to the first flange.

[0014] Various features of the present application will become apparent to one of ordinary skill in the art upon review of the following detailed description of the preferred embodiments when taken in conjunction with the drawings, in which:

FIG. 1 is a section view of a pipe demonstrating an installed exemplary embodiment of the present application, with damper blades in the "closed" position.

FIG. 2 is a section view of a pipe demonstrating an installed exemplary embodiment of the present application, with damper blades in the "open" position.

FIG. 3 is a side view of a pipe demonstrating an exemplary port and a side view of a flanged pipe fitting that may be used with certain embodiments of the present application.

[0015] As described, coal-fired boilers typically are fed by multiple coal pulverizing mills. Each mill supplies a mixture of coal and air through several pipes to multiple burners within the boiler. Each coal supply path typically originates at a respective pulverizer mill and terminates at the individual burner mounted in the boiler. Referring

now to the figures, where the various numbers represent like parts throughout the several views, Figs. 1 and 2 demonstrate an exemplary embodiment of a port-installed damper 100 with a pipe 101 (which may constitute a pulverized coal/air supply pipe) of the present application. The pipe 101 may have a circular cross-sectional shape. Those of ordinary skill in the art will appreciate that other cross-sectional shapes for pipe 101 also are possible. The port-installed damper 100 may include damper blades 102, a flanged pipe fitting 104, and a housing or port assembly 106. As used herein, a port is defined to be a cut-out opening in the pipe 101 that, generally, is contained within a single side of the pipe 101, i.e., does not extend beyond half of the pipe's 101 circumference. This definition of a port excludes complete section cuts of pipe 101.

[0016] The damper blades 102 may comprise a means for trimming the flow of material through the pipe 101. As known in the art, damper blades may be used to block an area of the pipe so that flow therethrough may be trimmed or controlled as desired. The damper blades 102 may be a pair of butterfly blades as disclosed in U.S. Patent 6,799,525, which is hereby incorporated herein by reference in its entirety. As such, the damper blades 102 may have a profile of an approximate half-circle (as shown in Fig. 1) and a relatively thin depth (as shown in Fig. 2). The damper blades 102 may be made from carbon steel, stainless steel or other similar alloys or materials. Those of ordinary skill will recognize that damper blades of different type, material, shape and size may be used with the present application, and that the use of butterfly shaped damper blades is exemplary only. For example, in some embodiments, knife blades, which are known in the art, may be used.

[0017] The damper blades 102 may be oriented within the pipe 101 so that they form a valve that trims or controls flow through the pipe 101. Accordingly, the damper blades 102 may be oriented such that in a "closed" position or setting (as shown in Fig. 1) the damper blades 102 block a majority of the cross-sectional area of the pipe 101. In this position, the damper blades 102 may be said to "line-up" with each other so that they occupy approximately the same plane. The amount of flow blockage that the damper blades 102 provide to the cross-sectional area of the pipe 101 in the closed position may be manipulated as desired by changing the size of the damper blades 102. For example, a center hole cutout 108 may be included to decrease the blockage of the pipe 101 by the damper blades 102 when they are in the closed position. Further, an outer clearance 109 between the outer-edge of the damper blades and the inner-surface of the pipe 101 may be increased or decreased to alter the blockage characteristics of the damper blades 102.

[0018] As shown in Fig. 2, each damper blade 102 may be rotated approximately 90° about its damper blade stem 100 from the closed position to expose a relatively thin profile so that the damper blades 102 are essentially par-

allel to each other. In this position, the damper blades 102 may be said to be in a "full open" setting. In the full open setting, a majority of cross-sectional area of the pipe 101 may be open (i.e., not blocked by the damper blades 102) to permit maximum flow. The damper blades 102 also may occupy intermediary settings (i.e., settings between the open and closed settings) so that a desired intermediate flow rate for the material passing through the pipe 101 may be achieved.

[0019] The damper blades 102 may be mounted to damper blade stems 110 as known in the art. The damper blade stems 108 may be made from the same material as the damper blades 102 or other similar materials. The damper blade stems 110 may position and orient the damper blades 102 within the pipe 101 and may cause the damper blades 102 to rotate between the open, intermediary and closed settings. The damper blade stems 110 also may provide support to the damper blades 102 such that the damper blades 102 remain fixed in a desired position or setting and perform the desired trimming function to the flow of pulverized coal.

[0020] The flanged pipe fitting 104 may be a fitting that attaches to the pipe 101 per methods known in the art, such as welding or similar means. The flanged pipe fitting 104 may be positioned so that it is centered over a port 202, as shown in Figure 3. As stated, a port is defined to be a cut-out opening in the pipe 101 that, generally, is contained within a single side of the pipe 101, i.e., does not extend beyond half of the pipe's 101 circumference, which excludes complete section cuts of pipe 101. As shown in Fig. 2, the port 202 may be rectangular in nature, though other shapes also may be used.

[0021] The flanged pipe fitting 104 may include a flange 112, which may be used to attach the port assembly 106 to the flanged pipe fitting 104. The port assembly 106 may include a port assembly flange 116 that may attach to the flange 112 of the flanged pipe fitting 104 per a number of bolts 114. The bolts 114 may pass through the flange 112 into a port assembly flange 116. Those of ordinary skill will recognize that other means of attaching the port assembly 106 to the flanged pipe fitting 104 may be used.

[0022] The flanged pipe fitting 104 may have an opening or openings through which, when being installed, the damper blade stem 110 for each damper blade 102 may pass so that the damper blade stem 110 may engage an actuator 118 that is located within or connected to the port assembly 106. The opening(s) within the flanged pipe fitting 104 may be various sizes as long as it allows the damper blade stems 110 to pass through to the port assembly 106. However, as discussed in more detail below, it may be beneficial during installation for the flanged pipe fitting 104 to have a single opening 203 (as shown in Fig. 2). Further, it may be beneficial for the single opening 203 to be sized such that the damper blades 102 may pass through the opening 203. In such cases, during installation, the damper blades 102 may efficiently pass through the opening 203 into the pipe 101 as the port

assembly 106 is positioned so that it may be attached to the flanged pipe fitting 104.

[0023] In addition, the port assembly 106 may be shaped such that when the port assembly 106 is attached to the flanged pipe fitting 104, the opening 203 within the flanged pipe fitting 104 is filled and closed by a section of the port assembly 106 that inserts into the opening 203. The section of the port assembly 106 may fill the opening such that the generally contour of the inner wall of the pipe 101 is matched. In this manner, the inner surface of the pipe 101 may remain a substantially smooth surface. Thusly, the flow of pulverized coal or other material may be disturbed as little as possible.

[0024] The actuator 118 may be located within or connected to the port assembly 118 and may include means for controlling the rotation of the damper blade stems 110 so that the desired setting of the damper blades 102 is achieved. The actuator 118 may include any means known in the art for achieving this result, including the linear actuator as disclosed in U.S. Patent 6,799,525. The setting of the actuator 118 (and, in turn, the settings of the damper blades 102) may be controlled manually via systems known in the art, such as switches, dials, knobs, levers, etc., that may be located on the port assembly 102. In alternative embodiments, the setting of the actuator 118 (and, in turn, the settings of the damper blades 102) may be controlled by electro-mechanical and/or computerized control systems, such as those disclosed in U.S. Patent 6,799,525.

[0025] By way of example, installation of the port-installed damper 100 may be accomplished as follows. First, as shown in Fig. 2, a port 202 may be cut out of a side wall of the pipe 101. As one skilled in the art will appreciate, the port 202 may include several shapes and sizes. In certain embodiments and as shown, the port 202 may be rectangular in shape. The flanged pipe fitting 104 then may be attached to the port 202. This may be accomplished by welding the flanged pipe fitting 104 to the area of the pipe 101 around the port 202. Those skilled in the art will appreciate that other means of attachment may be used.

[0026] As stated, the flanged pipe fitting 104 may have an opening 203 through which the damper blade stem 110 for each damper blade 102 may pass so that the damper blade stem 110 may engage an actuator 118. In some embodiments, it may be beneficial during installation to have a single opening 203 in the flanged pipe fitting 104 that is sized such that the damper blades 102 (when assembled as part of the "damper blades 102/damper blade stems 110/port assembly 106/actuator 118 unit" and when positioned in what would be the "open" setting, i.e., where the damper blades 102 are parallel to each other) may pass through the opening 203. That way, during installation, the damper blades 102 may efficiently pass through the opening 203 into the pipe 101 as part of a pre-assembled unit as the port assembly 106 is positioned so that it may be attached to the flanged pipe fitting 104.

[0027] In such an embodiment, the single opening 203 may be rectangular and, as discussed in more detail below, it may be beneficial for the opening 203 in the flanged pipe fitting to be minimized. As such, the opening 203 may be sized such that it is just large enough for the damper blades 102 to pass through (i.e., sized such that the damper blades 102 may pass through relatively comfortably, but no larger). Accordingly, the width of the opening may be sized such that it is just greater than the distance between the outer edges of the damper blade stems 110. The length of the opening 203 may be sized such that it is just greater than the width of the damper blades 102. Thus, for example, if the diameter of the pipe 101 is about 43 cm, the distance between the outer edges of the damper blade stems 110 may be approximately 2.5 to 15 cm. Accordingly, the width of the opening 203 may be just greater than this measurement. For example, in the case where the distance between the outer edges of the damper blade stems 110 is 6 cm, the width of the opening 203 may be approximately 7 cm. The width of each of the damper blades 102 may be slightly less than the radius of the pipe 101, such that the width of the each of the damper blades 102 may be approximately 15 to 20 cm. Accordingly, the length 206 of the opening 203 may be sized such that it is just greater than this measurement. For example, in the case where the width of each of the damper blades is 18 cm, the length of the opening may be approximately 19 cm. In this manner, as stated, the size of the opening 203 may be minimized so that it is just large enough to allow the damper blades 102 (when assembled as part of the damper blades 102/damper blade stems 110/port assembly 106/actuator 118 unit and when positioned in what would be the "open" setting, i.e., where the damper blades 102 are parallel to each other) to pass through it during installation.

[0028] Minimizing the opening 203 in such a manner may be beneficial because it allows the port 202 also to be minimized. Such minimization of the port 202 may allow the strength characteristics of the pipe 101 to remain essentially intact so that no bracing or support members are needed during the removal of the port 202 and the installation of the port-installed damper 100. Minimization of the port 202 also may allow the strength characteristics of the pipe 101 to remain essentially intact so that no bracing or support members are needed after installation of the port-installed damper 100 when the pipe 101 is again used to carry the flow of pulverized coal. Further, in some embodiments, the flanged pipe fitting 104 may be sized, made of certain rigid materials (such as steel, carbon steel, stainless steel or other alloys), and attached to the pipe 101 such that the strength characteristics of the pipe 101 are not even minimally compromised.

[0029] The size of the port 202, thus, may be minimized by sizing it such that it generally corresponds to the length and width measurements of the minimized opening 203. In some embodiments, such as that shown in Fig. 1, a

part of the flanged pipe fitting 104 may constitute a port insert 120 (see dashed line and shaded area on Figs. 1 and 2). The port insert 120 may surround the opening 203 of the flanged pipe fitting 104 and may be inserted into the port 202 so that its outer surface abuts the inner surface of the port 202. In other words, the port 202 may be sized such that it snugly accepts the port insert 120 of the flanged pipe fitting 104. This arrangement may aid in attaching the flanged pipe fitting 104 to the pipe 101. Further, it may allow the flanged pipe fitting 104 to add structural support to the pipe 101. Thus, in such embodiments, the size of the port 202 will have to be slightly larger than the size of the opening 203 so that it may accommodate the port insert 120. Though, if the size of the opening 203 and the thickness of the port insert 120 are minimized, the size of the port 202 also will be minimized if the port 202 is sized so that it fits snugly around the port insert 120. As stated above, minimization of the port 202 may allow for the strength characteristics of the pipe to be essentially unaffected, which may allow the installation and continued use of the port-installed damper to proceed more efficiently.

[0030] With the port 202 sized as described above, the flanged pipe fitting 104 may be attached to the pipe 101 by welding or other means known in the art. As stated, the flanged pipe fitting 104 may include a port insert 120. The port insert 120 may be constructed so that its approximate length corresponds to the thickness of the section of the pipe 101 that was removed to form the port 202. Further, the end of the port insert 120 may be curved so that it matches the curvature of the pipe 101. In this manner, the surface of the inner wall of the pipe 101 may remain relatively smooth after the flanged pipe fitting 104 is attached to the pipe 101.

[0031] With the flanged pipe fitting 104 attached to the pipe 101, the other components of the port-installed damper 100, i.e., the damper blades 102, the damper blade stems 110, the port assembly 106, and the actuator 118, may be assembled separately and then installed. The damper blades 102 may attach to the damper blade stems 110 per methods known in the art; the actuator 118 may attach to the port assembly 106 per methods known in the art; and the damper blade stems 110 may engage the actuator 118 per methods known in the art. Once assembled, this unit, i.e., the "damper blades 102/damper blade stems 110/port assembly 106/actuator 118 unit," may be fixed into place by attaching the port assembly flange 116 to the flange 112 of the flanged pipe fitting 104 via pipe flange bolts 114 (or other means known in the art). In doing this, the damper blades 102 may be positioned in the open setting so that the damper blades 102 may be passed through the opening 203 and into the pipe 101. The component parts of the damper blades 102/damper blade stems 110/port assembly 106/actuator 118 unit may be constructed such that when the port assembly flange 116 is attached to the flange 112 of the flanged pipe fitting 104, the damper blades 102 are positioned within the pipe 101 in a desired loca-

tion.

[0032] Once installation is complete, the damper blades 102 may operate to provide flow trimming to control the flow of air and pulverized coal supplied to the burners of a coal-fired boiler. (Note that although the apparatus described in this application has been described primarily in its function as a pulverized coal trimming valve, the port-installed damper 100 also may be installed and used in other applications that include the flow of similar materials through a pipe.) Once installed, use of port-installed damper 100 may be consistent with the description found in U.S. Patent 6,799,525 concerning the control, function and usage of damper blades to control the flow of air and pulverized coal to the burners in a coal-fired boiler. Generally, such usage may include controlling the settings of the damper blades 102 (via the damper blade stems 110 interaction with the actuator 118) such that a desired flow of air and pulverized coal to each of the burners is achieved. In such a manner, the system may be "balanced" so it operates more efficiently.

[0033] It should be apparent that the foregoing relates only to the preferred embodiments of the present application and that numerous changes and modifications may be made herein without departing from the spirit and scope of the application as defined by the following claims and the equivalents thereof.

Claims

1. A port-installed damper (100) for trimming a flow of a substance through a pipe (101), the pipe (101) having a port (202) formed therein, comprising:
 - a fitting (104) that attaches to the pipe (101) about the port (202);
 - a port assembly (106) that attaches to the fitting (104) and includes an actuator (118); and
 - means for trimming the flow of a substance through the pipe (101);

wherein the actuator (118) is connected to the means for trimming by one or more connectors, and the port (202) comprises a predetermined size such that, during installation of the port-installed damper (100), the means for trimming may pass through the port (202).
2. The port-installed damper (100) of claim 1, wherein the port (202) does not extend beyond half of the circumference of the pipe.
3. The port-installed damper of any preceding claim, wherein the actuator (118) adjusts the means for trimming via the one or more connectors to control the flow of the substance through the pipe (101).
4. The port-installed damper of claim 3, wherein the means for trimming comprises a pair of butterfly damper blades (102) and the one or more connectors comprises two stems (110) that connect each butterfly damper blade (102) to the actuator (118); and the stems (110), upon assembly, travel from the actuator (119) to the butterfly damper blades (102) through the port (202) and an opening (203) in the fitting (104).
5. The port-installed damper of claim 4, wherein the opening (203) in the fitting (104) comprises a predetermined size such that, during installation of the port-installed damper (100), the butterfly damper blades (102) may pass through the opening (203) in the fitting.
6. The damper of claim 4 or claim 5, wherein the butterfly damper blades (102) comprise an open setting, wherein a majority of the cross-sectional area of the pipe (101) may be open to flow, a closed setting, wherein a majority of the cross-sectional area of the pipe (101) may be closed to flow, and one or more intermediary settings between the open setting and the closed setting.
7. The port-installed damper of any one of claims 4 to 6, wherein a width of the opening (203) is just greater than the distance between an outer edge of each of the stems (110) when the stems (110) are preassembled into a unit that comprises the butterfly damper blades (102), the stems (110), the port assembly (106), and the actuator (118); and a length of the opening (203) is just greater than the width of one of the butterfly damper blades (102).
8. The port-installed damper of claim 7, wherein the port (202) comprises approximately the same size as the opening (203) in the fitting (104).
9. The port-installed damper of claim 7 or claim 8, wherein the fitting (104) includes a port insert (120) that surrounds the opening (203) in the fitting (104) and inserts into the port (202).
10. The port-installed damper of claim 9, wherein the port (202) comprises a size such that the port (202) fits snugly about the port insert (120).

FIG. 1

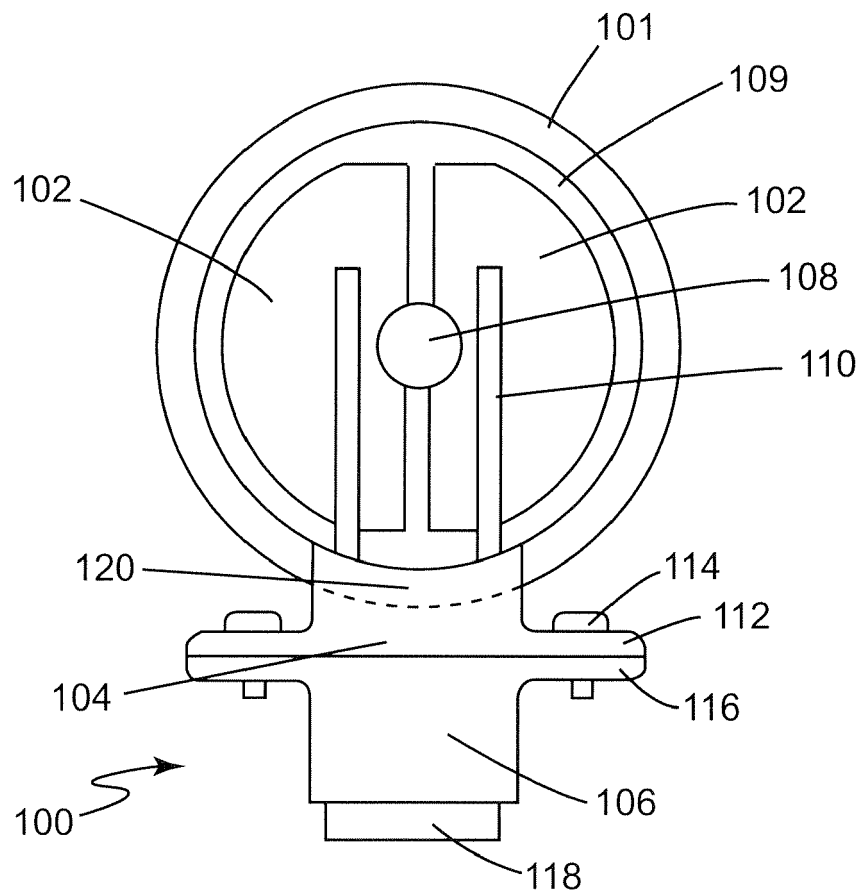


FIG. 2

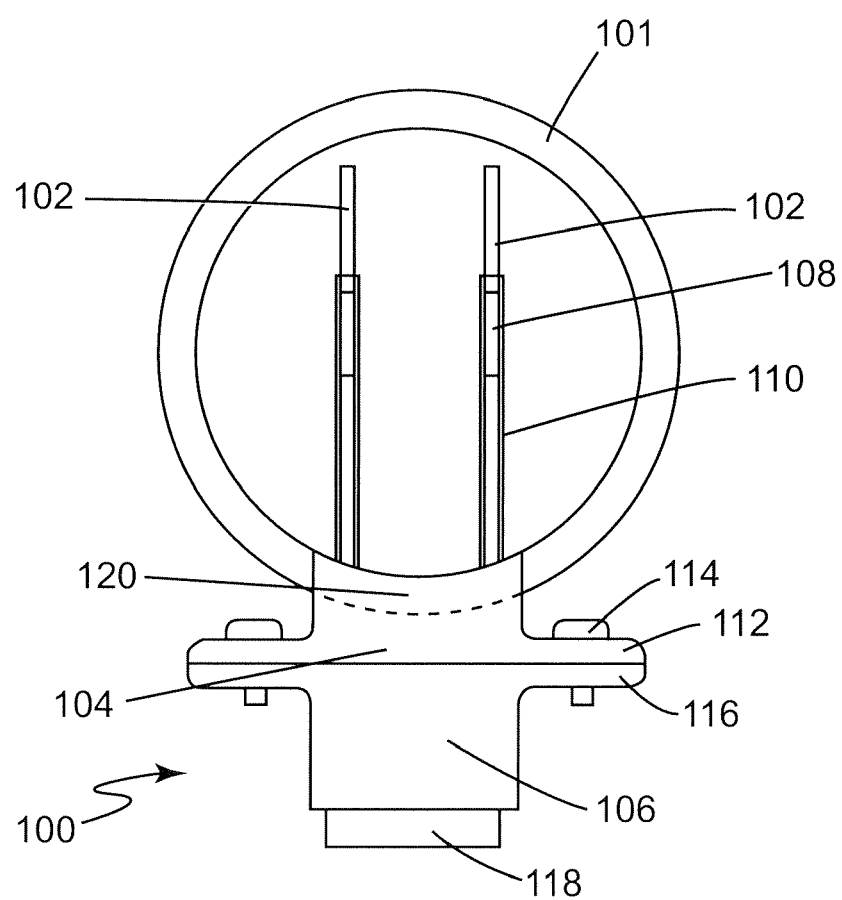
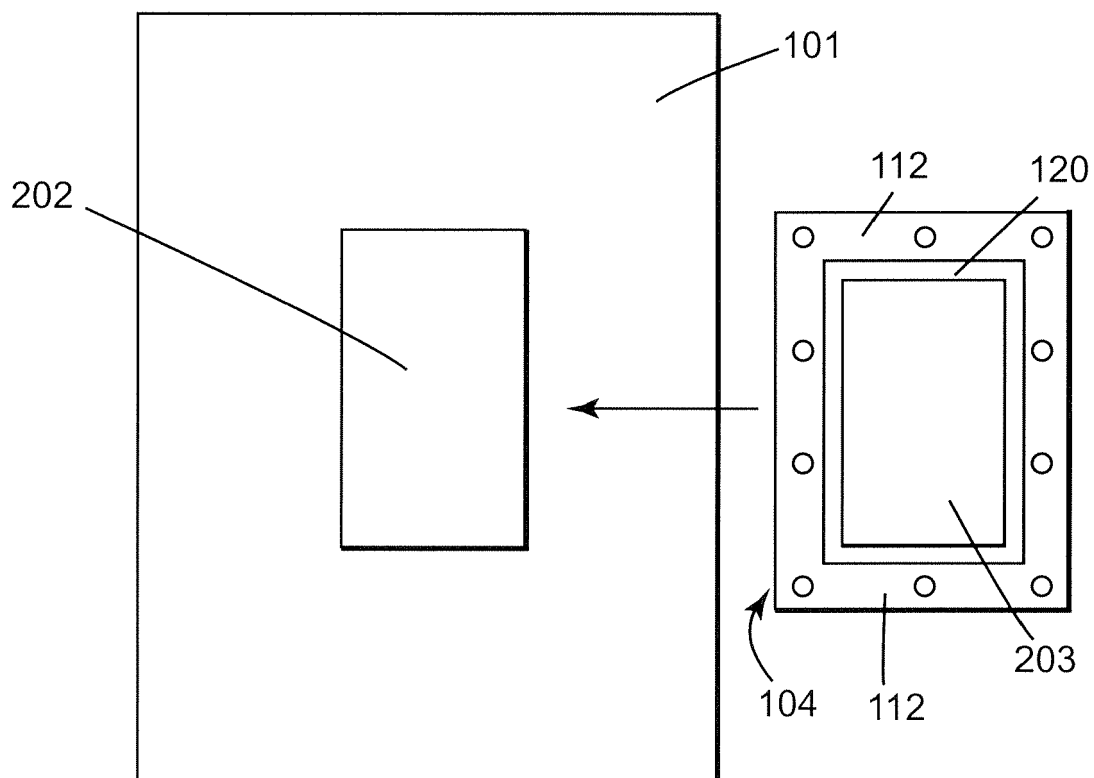


FIG. 3



REFERENCES CITED IN THE DESCRIPTION

This list of references cited by the applicant is for the reader's convenience only. It does not form part of the European patent document. Even though great care has been taken in compiling the references, errors or omissions cannot be excluded and the EPO disclaims all liability in this regard.

Patent documents cited in the description

- US 6799525 B [0016] [0024] [0024] [0032]