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TO: Esys PMJ Users

FROM: F.M. Russoniello  
Engineering Manager - Esys

DATE: April 1, 1991

SUBJECT: Esys PMJ Installation

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The PMJ has proven to be very effective as a device to allow direct insertion of O<sub>2</sub> Analyzers into environments where the temperatures exceed the normal limits of the probes. Proper installation of the PMJ is critical to the successful operation of the probe.

The PMJ must be insulated when installed as shown in Figure 3 of the PMJ Brochure. This must be done in order to protect the PMJ and probe from direct radiant heat effects from the flame. The recommended thickness of the insulation is 3". Anchors must be used to secure the insulation to the PMJ. A variety of castible refractory materials may be used to insulate the PMJ. A.P. Green Platic Mix 318 is suitable for steam generator applications.

Please feel free to contact Esys at (661) 833-1902 should you have any questions.

ESYS PMJ



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INSTALLATION INSTRUCTION FOR ESYS PROBE MOUNTING  
JACKET IN A VERTICAL STACK APPLICATION

1. Remove the PMJ from its shipping container and check for shipping damage.
2. The Esys Probe Mounting Jacket (PMJ) is designed for many different probes, confirm that the PMJ received is compatible with the gas analyzer that will be installed into it. This can be accomplished by sliding the gas analyzer into the PMJ and checking alignment of the mounting flanges and insertion depth of the gas analyzer.

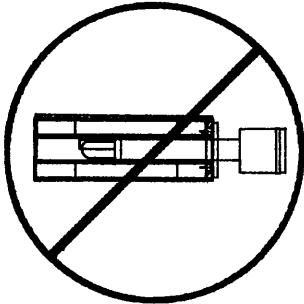


Figure 1

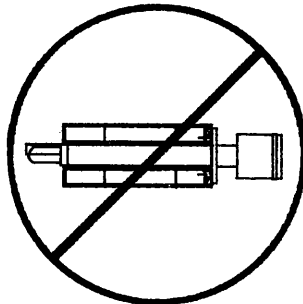


Figure 2

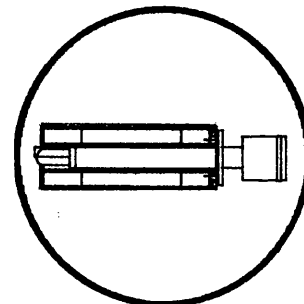


Figure 3

The probe in Figure 3 is shown with the proper insertion depth. The probe in Figure 2 is shown with an insertion depth that is too long, and Figure 1 is shown with an insertion depth which is too short.

The gap between the probe and the inner tube of the PMJ should not exceed 1/8".

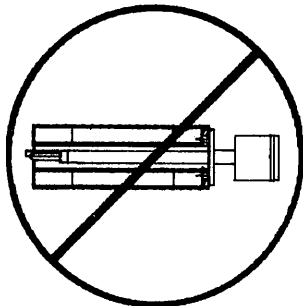


Figure 4

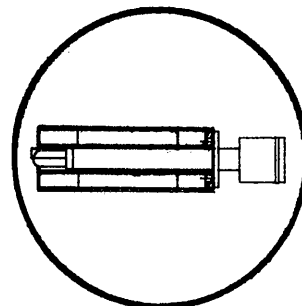


Figure 5

The probe in Figure 5 is shown with the proper gap, the probe in Figure 4 is shown with a gap which is too large.

3. Select the location on the stack to install the PMJ. Verify that the area is clear of internal and external obstructions that will interfere with the installation. The PMJ must be positioned so that the gas stream it is inserted into is representative of the process. Best results are normally obtained if the PMJ is positioned on the center line of the stack with 20% insertion into the gas stream. In addition, the sensing point should be selected so that the process temperature does not exceed 2000° F (1093° C). Figure 3-A provides mechanical installation references. Installation of the PMJ must include insulation as indicated in Figure 3-A. This insulation is usually castable refractory which is applied to stainless steel "V" anchors. The anchors are attached to the PMJ after insertion into the duct, or the skin of the vessel.

Some oxygen measurements dictate that the PMJ be installed in locations other than the stack. Consideration to the following must be given when installing the PMJ in these locations:

- A. The PMJ must be installed in such a way as to avoid radiated heat from the flame impacting the tip of the Probe. This can be done by mounting the PMJ with the process end angled away from the flame. (See Fig. 3-B).
- B. The PMJ must always be installed with the process end pointing downward so as to prevent condensate from building up in the gap between the PMJ inner wall and the Probe.
- C. The rear section of the outer tube of the PMJ is made of carbon steel. Carbon steel is used for the rear section so as to facilitate ease of welding to the existing vessel wall, which is usually made of carbon steel. The length of the carbon steel varies with the model number of the PMJ selected. The proper model PMJ must be selected and installed into the process in such a way so as NOT to allow the carbon steel portion on the PMJ to protrude past the surface of the existing refractory wall, into the process gas flow. Only the stainless steel portion of the PMJ should extend past the existing refractory surface once installed. The interface between the carbon steel section and the stainless steel section of the PMJ may be identified by the welded seam. The stainless steel section should then be insulated as described in these instructions.
- D. Depending on the model PMJ selected the combined weight of the Probe, PMJ, and insulation can exceed 100 pounds. Care must be taken to provide proper structural support for the PMJ in cases where the duct thickness cannot support the additional weight.

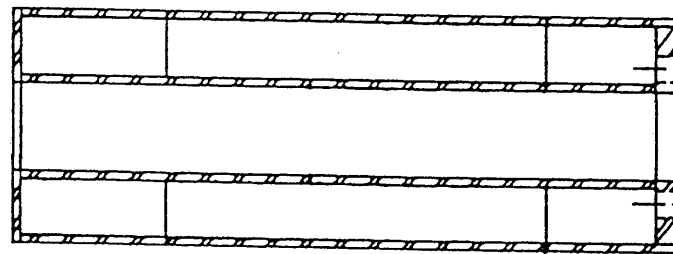
4. Once the location for installation has been determined, ensure that all materials are available for installation of the PMJ. The following is a list of the materials and tools required to install the PMJ.

- (a) Grefpatch 85 Refractory (or equivalent)
- (b) 304 SS Vee Hangers 3" x 5" x 1/8"
- (c) Cutting Torch
- (d) Welder with 1/8" 6011 welding rod  
(Includes welding hood and gloves)
- (e) Torpedo Level
- (f) Angle Finder
- (g) Chipping Hammer
- (h) Wire Brush
- (i) Drill or Saw (Adequate for removing the existing refractory in the stack)
- (j) Hand held Grinder
- (k) 2.5 LBS Sledge Hammer
- (l) Tape Measure
- (m) Soap Stone

5. The first step in the installation process is to cut a hole of sufficient size in the stack to allow the PMJ to be inserted into the gas stream at an angle of 15° (stack mounting). Figure 6 shows a typical cut-out pattern for a PMJ installed in a vertical stack. This pattern is for installation of the PMJ at a 15° downward angle into the stack. The circular pattern should be marked on the side of the stack where the PMJ is to be installed using the paper pattern shown in Figure 6 and the soap stone. Then, a hole matching the pattern should be cut out using an acetylene cutting torch. After the pattern has been cut, remove any excess steel left behind with a chipping or prying tool.
6. After the proper opening has been cut into the skin of the stack, the refractory will need to be removed. The opening in the refractory needs to be at a 15° downward angle into the stack. The opening in the refractory will need to have the same dimensions as shown in Figure 6.

7. With the skin of the stack and the refractory removed, install the PMJ and check for proper angle and depth. Figure 3-A provides mechanical installation references. When removing the refractory, care should be taken not to remove more refractory than required to install the PMJ.
8. Once the insertion depth and angle are correct, the PMJ can be welded into place. The PMJ is designed with a two piece outer tube. The rear section (Reference Figure 7) of the outer tube is made of mild carbon steel. This section allows for standard AC or DC ARC welding methods to be used when installing the PMJ into a stack with a mild carbon steel outer skin. The weld used to attach the PMJ to the stack should be a 1/4" fillet weld, using 1/8" 6011 welding rod. The weld around the PMJ should be capable of sealing the outer tube of the PMJ to the stack and provide enough strength to support the PMJ with the analyzer installed.
9. The first step in the welding process would be to insert the PMJ into the opening in the stack to achieve desired angle and depth, position the PMJ in the stack so that the bolt holes in the mounting flange are square and tack weld the PMJ to the outer skin of the stack using a minimum of four 1/2" tack welds that are equally spaced around the outer tube of the PMJ. Check the installation again to confirm that all requirements of positioning have been achieved. Once the PMJ has been tack welded to the stack and is positioned properly the fillet weld can be applied to secure the PMJ into place. After the welding is complete, a coat of rust inhibiting primer should be applied to the surface of the fillet weld. This will complete the welding process.
10. The second step in the welding process would be to attach the stainless steel "V" anchors to the PMJ as shown in Figure 3-A.
11. With the PMJ securely attached to the stack and the welding process completed, the next step is to install the insulating refractory material around the process end of the PMJ. Figure 3-A indicates how the insulating refractory material should be installed around the PMJ. Care should be taken to ensure that the end cap of the PMJ is completely covered with refractory without obstructing the opening of the inner tube (Figure 3-A). The minimum insulation depth is 3" at any point covering the PMJ.

FRONT END



REAR END

MILD CARBON STEEL  
SECTION OF OUTER  
TUBE

FIGURE 7

PATTERN FOR ESYS PMJ 132 AND 3000 ONLY,  
IN A VERTICAL WALL STACK



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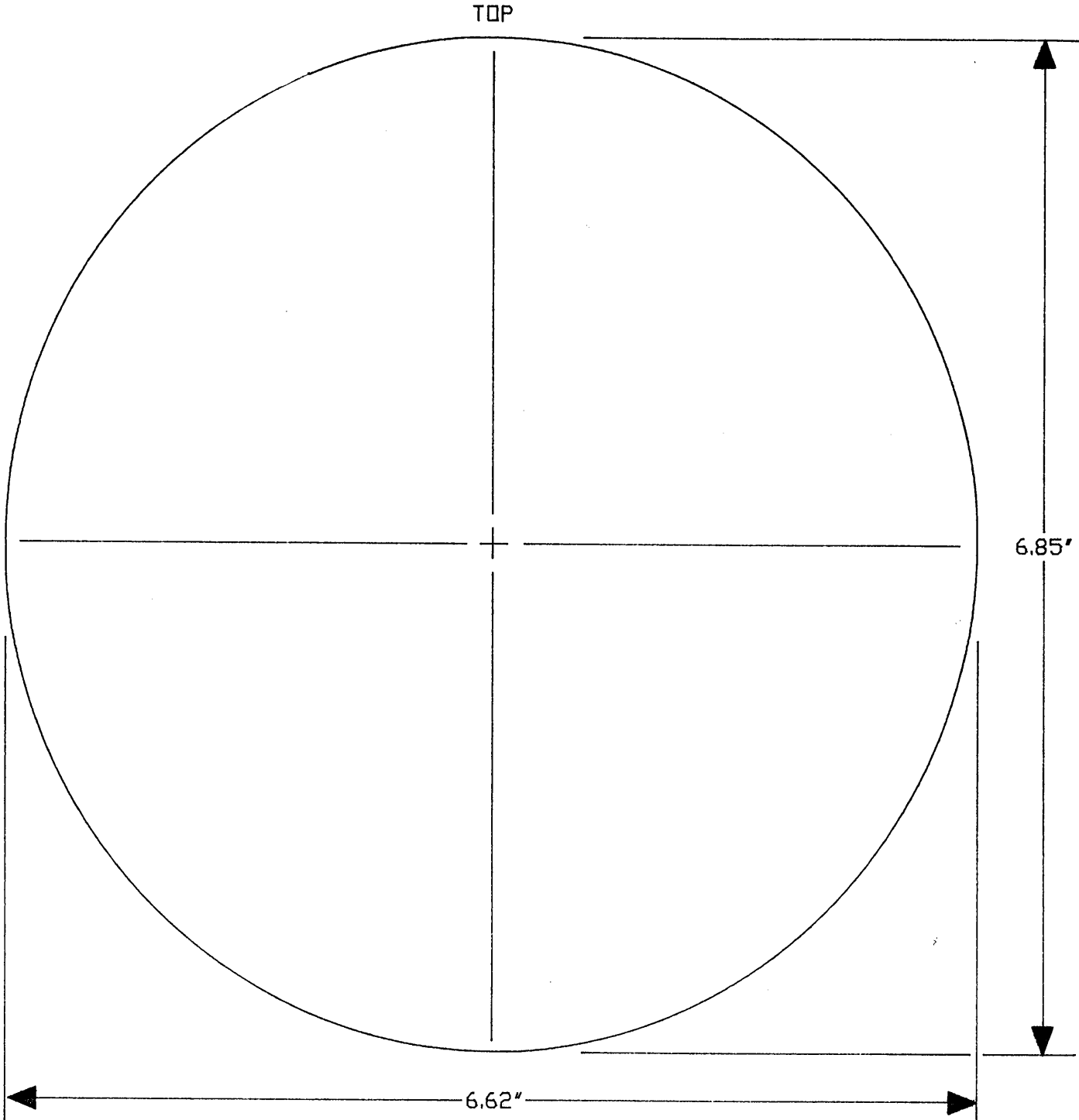


FIGURE 6



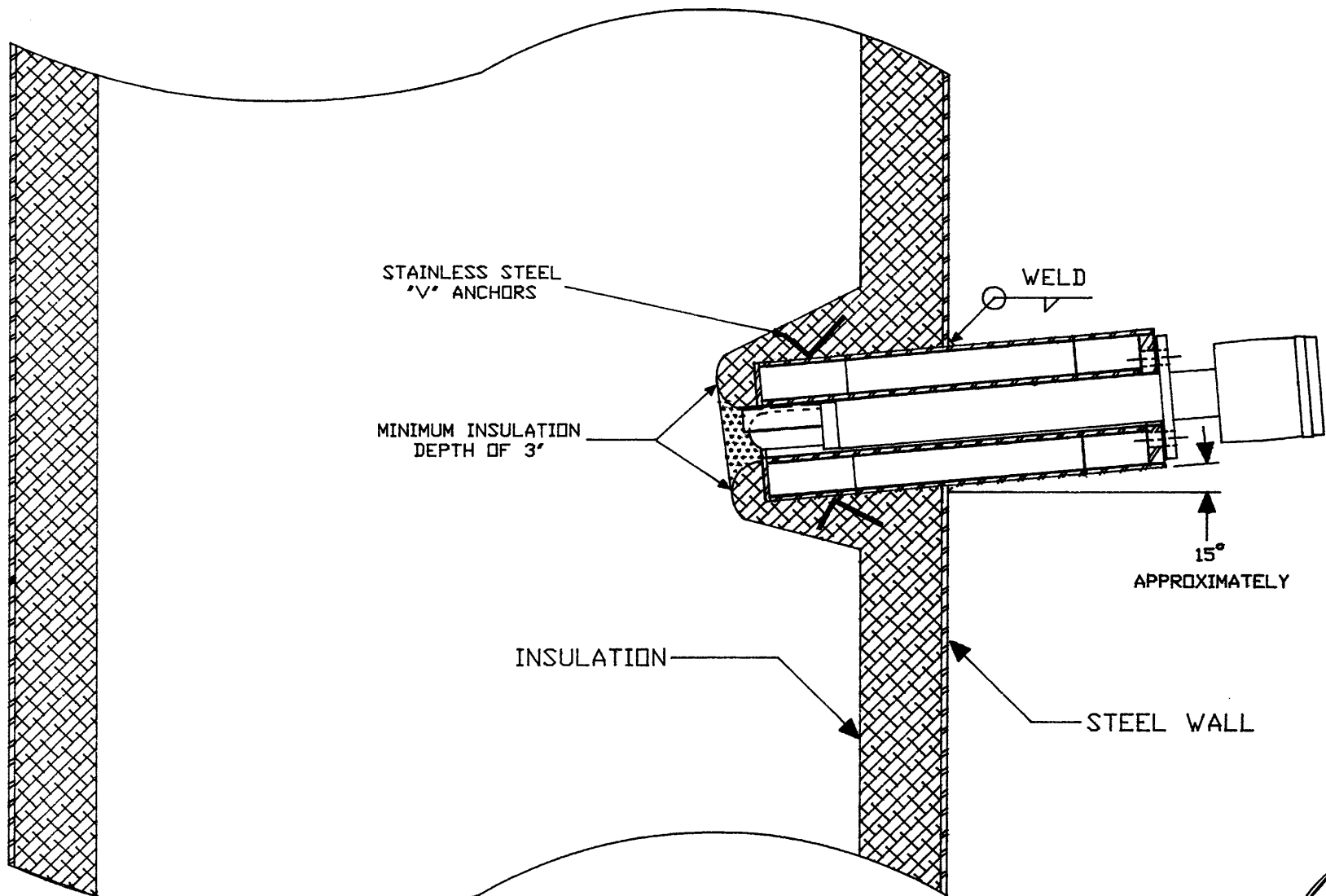


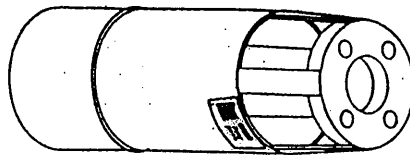
FIGURE 3-A



ESYS PROBE MOUNTING JACKET PATENT # 4,860,603		APPROVED BY <i>[Signature]</i>
TYPICAL VERTICAL STACK INSTALLATION		DRAWN BY D. BOPP
4520 STINE ROAD, #7 BAKERSFIELD, CA 93313		JOB#
TELEPHONE (805) 833-1982		FILE: JACTDOC
		DATE: 1/22/92
		PAGE 1 OF 1

The "patented" Esys Probe Mounting Jacket (PMJ), is a device designed to allow the direct insertion of gas analyzers into high temperature processes. The Esys PMJ is rated to operate in process temperatures as high as 2,000° F. The PMJ provides protection for probe type gas analyzers which are rated to operate at lower process temperatures. Consult your Esys representative for your specific application and performance requirements.

## ESYS PROBE MOUNTING JACKET



Since 1988, the PMJ has proven itself in the challenging environment of oil field steam generator applications. These steam generators use natural gas, sour gas, and high sulfur oils as fuels.

In steam generator applications, the PMJ eliminates the need for a probe bypass or sample system. The Esys Probe Mounting Jacket will effectively reduce the overall operating cost of a bypass mounted probe type gas analyzer for the following reasons:

1. By eliminating the maintenance cost associated with cleaning and repairing a probe bypass or sample system.
2. By eliminating the bypass systems, or sample systems, the need for cleaning these systems is also eliminated, thereby avoiding the formation of toxic wastes which result from these cleaning operations.
3. By dramatically reducing the heat loss associated with a bypass system, which directs hot gases through piping around the convection section.
4. By eliminating the possibility of flue gas condensation on the probe, and the resulting formation of corrosive compounds, the probe life is extended.
5. By reducing the installation cost compared to a typical probe bypass system.

The Esys PMJ is safer than conventional probe bypass mounting systems, as it does not create the potential for the exposure of personnel to high process temperatures.

The Esys Probe Mounting Jacket is available in a variety of sizes. For more information on price and delivery, contact Esys at (661) 833-1902.

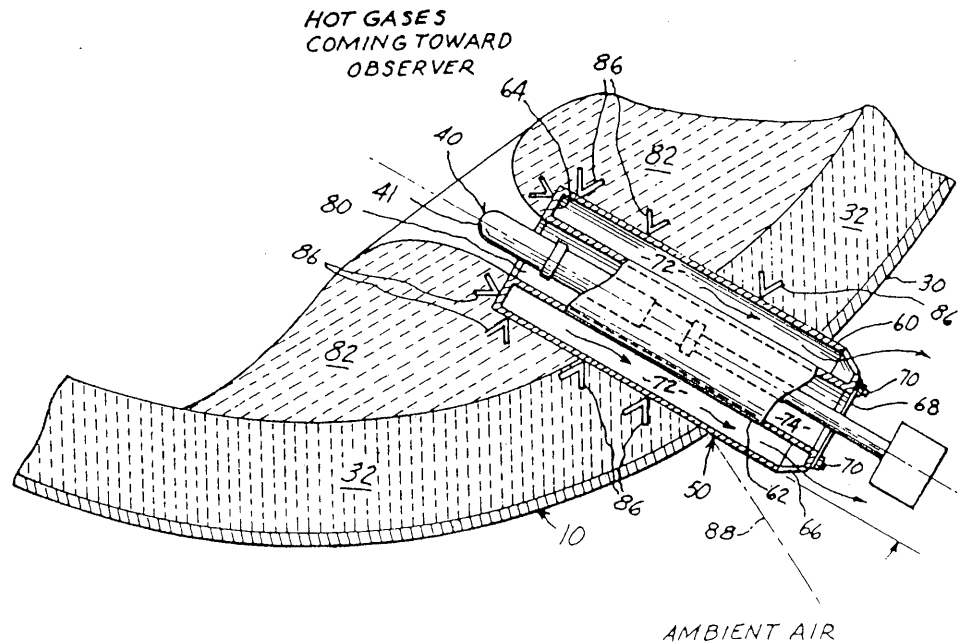
[11] Patent Number: 4,860,603  
[45] Date of Patent: Aug. 29, 1989

Primary Examiner—John Chapman  
Assistant Examiner—Michele Simons  
Attorney, Agent, or Firm—Jerry N. Lulejian

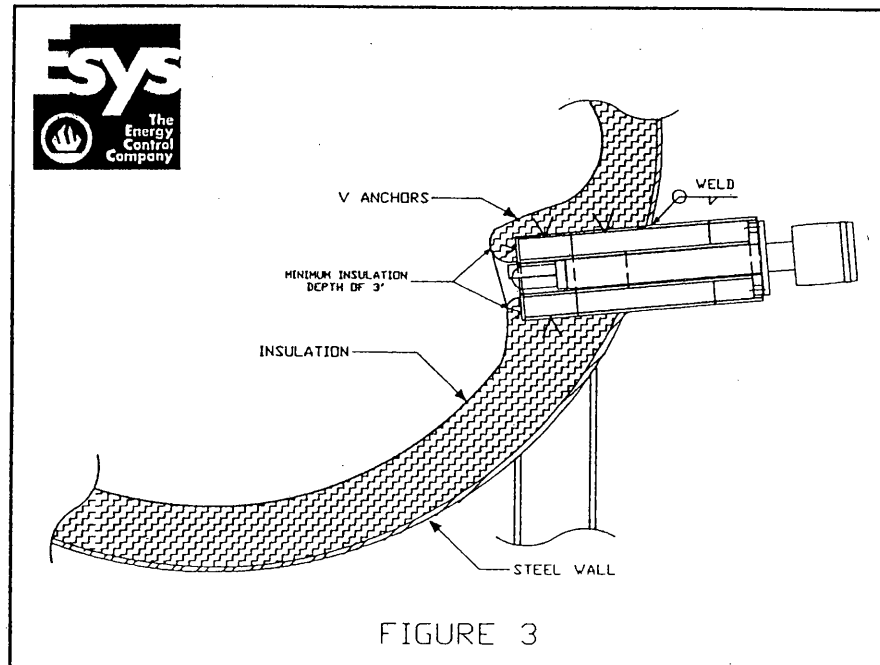
[57] ABSTRACT

In a hot environment such as the exhaust system of a steam generator an apparatus for protecting a measuring device such as an oxygen concentration probe from heat damage by offering a probe housing within the hot environment for housing the probe and a surrounding convection housing which defines a convection space therebetween substantially closed to the subject environment and open to the ambient environment. The higher temperature of the hot environment relative to the ambient environment causes gas convection currents to flow from the defined convection space to the ambient environment, protecting the probe from heat damage.

16 Claims, 4 Drawing Sheets



The Esys Probe Mounting Jacket (PMJ) may be installed in a wide variety of combustion processes including steam generators, boilers, process heaters, and incinerators. Installation is accomplished by welding the rear section of the PMJ to the skin of the vessel, or ducting, as shown in Figure 3.



This portion of the PMJ is made of carbon steel for ease of welding. The inner tube, end plate, and the outer hot end tube are made of high temperature, stainless steel alloys selected to withstand high process temperatures.

Installation of the PMJ includes the insulation indicated in Figure 3. This insulation is usually castable refractory which is applied to stainless steel "V" anchors which are attached to the PMJ after insertion into the duct, or skin of the vessel.

The PMJ installed as shown in Figure 3, becomes a permanent part of the plant equipment and should last the life of the vessel or duct. No maintenance is required, provided the insulation remains intact. The mounting flange on the rear section of the PMJ can be custom designed to meet customer specifications. The PMJ is also available in a variety of lengths and diameters to fit specific applications.

Consult Esys The Energy Control Company for further technical data.



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