ABSTRACT OF THE DISCLOSURE

A retractable soot blower for use with a heating chamber. The inner end of the soot blower lance traverses a generally straight line across the heating chamber as the lance is moved to and from its retracted and extended positions. The soot blower lance and operating mechanism are such that the lance does not extend outwardly from the wall of the heating chamber along the line traversed by the inner end of the lance and requires a distance outwardly from the wall of the heating chamber substantially less than the traverse of the inner end of the soot blower into the heating chamber.

BACKGROUND OF THE INVENTION

It is conventional in the soot blower art, particular soot blowers associated with large heating chambers such as those provided in utility type boilers, to provide long soot blower lances which are, in effect, straight pieces of pipe that move from a retracted position outwardly of the heating chamber to an extended position into and perhaps substantially across the heating chamber. This extended position may be as much as 50 feet into the heating chamber. These long lances are permanently mounted on the side of the heating chamber and thus in their retracted position extend this relatively long distance laterally outward from the chamber.

This arrangement can cause a space problem in power plants where there are large steam generators placed in side-by-side relation. It may require the power plant building to be enlarged and the steam generating units to be placed further apart than otherwise would be necessary merely to accommodate these long soot blower lances.

With the organization of the invention the space required to accommodate the soot blower lance laterally of the heating chamber is considerably decreased.

SUMMARY OF THE INVENTION

This decrease in space requirement is achieved by constructing the soot blower lance and the drive and support mechanism for the lance in such a manner that when the lance is in its retracted position, it does not extend outwardly from the wall of the heating chamber along the line that the inner end of the lance traverses in moving from its retracted to its extended position. In a preferred arrangement of the invention the lance is curved, for example, forming an arc of a circle. With this configuration the drive for the lance may be pivotally connected to the distal or outer end of the lance, and the lance may ride upon or in a bearing or guide adjacent the opening in the wall of the heating chamber through which the lance is adapted to project and extend into and across the chamber. The lance may then be moved by suitable driving mechanism to and from its extended and retracted position, and in this preferred embodiment the distal end of the lance may traverse a straight line which extends diagonally outwardly from the plane of the furnace wall.

A suitable control is provided for the discharge of the pressurized cleansing medium (such as air) from the inner end of the lance, and the discharge and control arrangement is such as to provide for the formation of jets that are generally normal to the line of traverse of the inner end of the lance.

BRIEF DESCRIPTION OF THE DRAWINGS

FIGURE 1 is in the nature of a vertical sectional view through a portion of a heating chamber and showing the improved soot blower organization of the invention associated with this chamber;

FIGURE 2 is a fragmentary vertical section showing the disposition of the soot blower lance of the invention with relation to the tubular heat exchange members in the heating chamber;

FIGURE 3 is in the nature of a vertical section taken generally from line 3—3 of FIGURE 2;

FIGURES 4 and 5 are detailed views of one form of tip or end arrangement for the lance of the invention;

FIGURES 6, 7 and 8 are detailed views of a modified form of tip or end arrangement; and

FIGURES 9, 10 and 11 are detailed views of still another modified construction for the tip or end of the lance of the invention.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

Referring now to the drawings wherein like reference numerals are used throughout to designate like elements, the preferred and illustrative embodiments of the invention disclosed therein include a soot blower lance 10 mounted exteriorly of the wall 12 of heating chamber 14. This heating chamber may form part, such as the upper region, of the furnace or gas pass of a high capacity utility type boiler. Within this heating chamber there is disposed tubular heat exchange members 16 which are aligned in rows as best shown in FIGURE 2. These heat exchange members periodically become fouled, as with soot and slag, and the soot blower lance is provided for the purposes of removing this foreign material from these members.

The lance 10 is supported exteriorly of the heating chamber 14 with there being provided, in the illustrative organization, a support member 18 which may be part of the structural steel support for the heating chamber. In the illustrative arrangement the inner end or region of the lance 10 is supported upon the bearing or idler 20 when the lance is in its retracted position as shown in solid lines in FIGURE 1.

The lance 10 is of such a configuration and is supported and driven in such a manner to and from a retracted position and an extended position into the heating chamber that the inner end 22 of the lance traverses a straight line 24 across the heating chamber 14, while the lance when in its retracted position does not extend outwardly from the wall 12 along this line, but rather is diverted therefrom so that it requires substantially less distance outwardly from the wall than would otherwise be the case. To accomplish this result, in the preferred embodiment the lance is curved with this curve preferably being the arc of a circle. By forming the lance in this manner the outer or distal end 26 of the lance may be driven along a straight line 28 by the drive mechanism 30 while the lance is guided on the roller or bearing member 20.

The lance is supported and driven exteriorly of the heating chamber 14 and the drive mechanism includes a guide rail or tract 32 supported from the structural member 18 which may, in turn, form part of the supporting steel for the heating chamber 14. Structural members 35 are supported by and extend from the member 18 with these members, in turn, being secured to the guide rail 32. A motor drive 34 is mounted on the guide rail 32 and is pivotally connected to the distal end of the lance. This motor drive is effective to move this end of the lance
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parallel to the guide rail 32 and along the line 28. As the lance is moved through vertically elongated wall opening 33 from its retracted position, shown in dotted lines in FIGURE 1, the lance is guided by means of the bearing or roller member 26; and the inner end of the lance tracks along the line 24 across the heating chamber. It will be noted that the distance 36 which the lance extends from the wall 12, and which is required to accommodate the lance in its retracted position, is substantially less than the distance that the inner end of the lance extends into the heating chamber when the lance is in its extended position.

The high pressure cleansing medium, such as air or steam, is supplied to the lance through the flexible supply hose 38, and the inner end of the lance is provided with suitable passages for discharge of this high pressure fluid such that it will impinge upon the tubular member 16.

In the embodiment disclosed in FIGURE 4 there are provided a series of passages or openings 40 positioned about this end of the lance, as shown, and through which the high pressure fluid is discharged. In this embodiment all of the passages 40 are continuously open to the interior of the lance, and thus this high pressure fluid simultaneously passes through each of these passages.

In order to reduce the quantity of high pressure medium flowing from the lance there is provided, in the embodiment of FIGURES 6, 7 and 8, a control device in the form of cylindrical member 42 which has a pair of diametrically opposed slots or grooves 44 formed in its outer surface. This cylindrical member 44 is positioned adjacent to the shoulder 45 formed at the inner end of the lance 10 such that the slots 44 may communicate with the passages 40. Thus, as disclosed in FIGURE 8, the high pressure fluid may simultaneously be discharged only from one pair of diametrically opposed passages 40. This diametric arrangement balances the reaction forces created by the high pressure jets. Cylindrical member 42 is rotatable by means of the flexible shaft 48 which extends throughout the length of the arcuate lance 10 and is connected to a suitable motor 51. Thus by rotating the member 42, the opposed pair of passages 40 through which the high pressure fluid is discharged may be varied with this preferably being a continuous operation during activation of the soot blower.

As will be evident from FIGURE 1, as the lance 10 is moved from its retracted to its fully extended position, the attitude of the inner end of the lance will continuously change. Close to the retracted position this inner end will be generally horizontal and co-axial with the line of traverse 24 while close to the extreme extended position the end of the lance will have an attitude that has a substantial angle to this line 24 and generally corresponds to that disclosed in FIGURE 11. Accordingly if the high pressure fluid is discharged only radially from the axis of the inner end of the lance, the pattern of discharge will not be such as to provide the most desirable cleaning action of the tubular members 16 but would, in fact, miss a portion of this heat exchange surface. It is desirable that the lance have the high pressure medium discharge from the inner end of the lance generally in a plane normal to the line of traverse 24, or in other words, in the organization of FIGURE 1 in a generally vertical plane. While this result cannot easily be fully achieved, an approximation can be achieved by having two sets of discharge passages formed in the inner end of the lance. Such an arrangement is disclosed in FIGURES 9, 10 and 11. The first set of passages identified generally as 50 corresponds to and operates in accordance with the passages 40 of the FIGURES 6, 7 and 8 embodiment. The fluid discharges through these passages in a plane normal to the axis of the inner end of the lance 10. The second set of passages identified generally as 52 includes numerous individual passages 54 that are oriented such that when the lance occupies a position well within the heating chamber 14 and remote from its retracted position (such as ¾ of the way across the heating chamber 14), the fluid jets formed by discharge through these passages are generally in a plane normal to the line 24. This is best shown in FIGURE 11.

There is provided with this organization an arrangement for selectively determining which of the sets of passages (50, 54) the high pressure fluid will be discharged through, and there is further provided with this control device means for restricting the discharge of the fluid through a single pair of diametrically opposed passages in whichever set of passages is to be used. This control is in the form of an elongated cylindrical member 55 which is provided with a pair of elongated opposed grooves 56. Pressurized fluid is supplied to these grooves through bores 59.

Member 55 is movable longitudinally of lance 10 as well as rotateable within the lance by means of the flexible shaft 60 which extends through the lance and is connected to a suitable motor 51. In the innermost position of member 55 the end of the member is in engagement with the shoulder 46 and the grooves 56 then communicate with a pair of diametrically opposed openings in the set 50. The openings 54 in the set 52 are at this time blocked by the cylindrical surface of member 55. The member 55 is rotatable from its innermost position to a second position substantially to the rear of the inner end of the lance and where the grooves 56 communicate with diametrically opposed passages 54 in the set 52. When member 55 is in this second position, high pressure fluid medium is prevented from being supplied to the set of passages 50, and rotation of member 55 effects distribution of the pressurized fluid medium through diametrically opposed passages in each set.

In the operation of the soot blower it may be desirable to utilize the set of openings 59 during the first ¾ of the traverse of the soot blower. During the traverse of the soot blower across the heating chamber and then utilizing the set of openings 52 during the final ¼ of this traverse.

It will be appreciated that with the organization of the invention a soot blower arrangement is provided wherein the distance laterally outward from the heating chamber necessary to accommodate the soot blower in its retracted position is substantially less than that heretofore required and wherein the straight line traverse of the discharge region of the lance is maintained with a control of the pressurized discharge being provided.

What is claimed is:

1. A retractable soot blower for use with a heating chamber having heat exchange surface therein, said blower including an elongated lance of substantially uniform curvature throughout its length movable between a first position where it is substantially fully retracted from said chamber and a second position where it extends a predetermined distance into said chamber from a wall of said chamber, passage means adjacent the forward end of said curved lance for discharge of a high pressure fluid medium, the improvement comprising means for supporting said curved lance curvilinearly of said wall such that when it is in its retracted position it extends from the wall a distance substantially less than the distance that it traverses within said heating chamber when moved from its retracted to its extended position, means for driving said curved lance to and from its retracted and its extended position, said curved lance having a configuration and said last-named means being so constructed that the inner region of the curved lance traverses a generally straight line across said heating chamber.

2. The soot blower of claim 1 wherein said lance of substantially uniform curvature is in the form of an arc of a circle.

3. The soot blower of claim 1 including valve means at the front end of said lance to control the discharge of said high pressure fluid medium and means for manipulating this valve means.

4. The soot blower of claim 3 wherein said means for
manipulating said valve means is located at the end of said lance remote from said valve means.

5. The soot blower of claim 1 wherein the means at the inner region of the curved lance for directing a pressurized medium includes a first series of openings operative to direct said medium in a plane generally normal to the line of traverse of said end at the initial portion of the extension of the lance into the chamber and a second set of openings operative to direct said medium in a plane generally normal to said line of traverse at the location where said lance extends well into the chamber, and means remote from the inner region of said lance to selectively control the set of openings through which said medium is directed.

6. The soot blower organization of claim 5 wherein each of the set of openings includes pairs of diametrically opposed openings and wherein said control means includes means for simultaneously directing the pressurized medium through the opposed set of openings such that the reactive forces developed are generally equal and opposite.

7. The soot blower organization of claim 6 wherein the control means includes a spool device axially and rotatably movable in the lance and operative in response to rotation to vary the opposed openings through which the medium is discharged.

8. A soot blower for use with a vertically disposed heating chamber having tubular heat exchange surface disposed therewithin, said soot blower being retractable such that the forward end thereof is movable generally along a horizontal line from a retracted position where it is located adjacent a wall of the chamber and an extended position where it extends well into the chamber, means for mounting said soot blower exteriorly of the chamber including a support adjacent an opening in the wall of the chamber through which the soot blower is adapted to extend, said soot blower including an elongated lance connected adjacent its outer end to a driving device and curving downwardly from this location to its inner end when occupying its fully retracted position, said driving device being operative to drive said lance to and from its extended and its retracted position, and including a guide member extending outwardly and upwardly in generally a straight line from said wall, the curve of said lance being in the form of an arc of a circle so that incident to said driving means traversing said straight line the inner end of the lance traverses a generally horizontal line across said heating chamber, means at the outer end of said lance for supplying a pressurized medium to said lance and means at the inner end of the lance to discharge this medium from said lance.

9. The soot blower organization of claim 8 wherein said discharge means includes a first set of openings operative to direct said medium in a vertical plane when the lance is in the first portion of its traverse of the chamber, a second set of openings disposed to direct said medium in a vertical plane when the lance is in the last portion of its traverse of the chamber and means at the outer end of said lance to selectively control the discharge of said medium through said sets of openings.

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