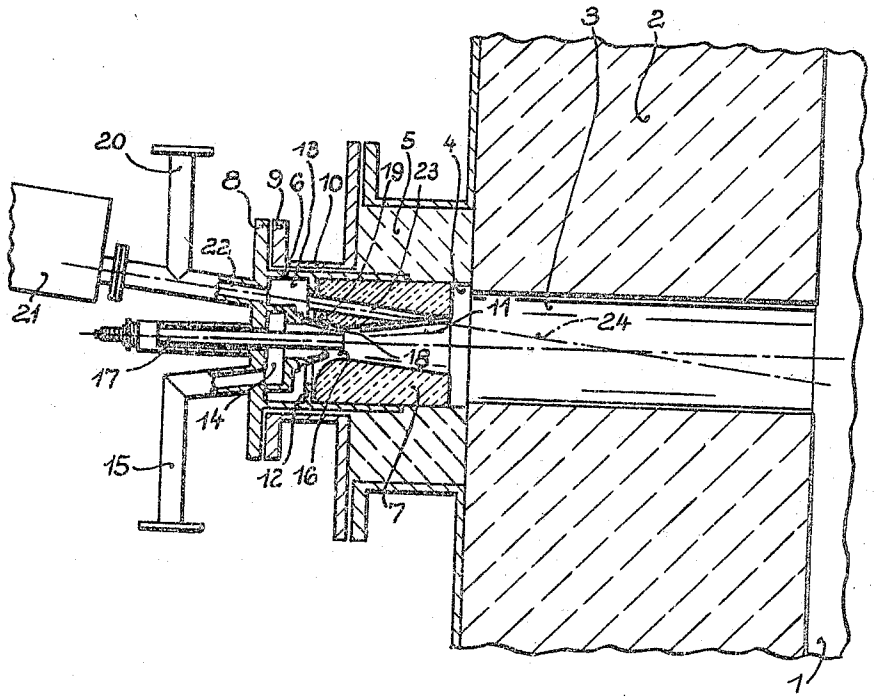
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DEVICE FOR IGNITING AND CHECKING THE FLAME OF A BURNER

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DEVICE FOR IGNITING AND CHECKING THE FLAME OF A BURNER

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The present invention relates to a device for igniting and checking the flame of a burner, especially a burner of a blast heating apparatus.

Arrangements are known in which a pilot flame ignited by a spark plug serves to ignite a burner and in which a flame detector which may include photoelectric cells is provided to check and control the burner.

A known arrangement of this kind includes gas and air passages arranged parallel to each other and a spark plug extending through the gas passage and into a wall opening of the burner. The spark plug is cooled in this arrangement by the stream of cold gas as long as the pilot flame is burning, however, when the gas supplied to the pilot flame is shut off, the spark plug is subjected to the radiant heat of the burner. Even if during the heating as well as the blast period of the blast heating apparatus air is continuously fed through the air passage arranged parallel to the gas passage and serving at the same time to observe the flame of the burner, it is not possible to obtain a perfect cooling of the sensitive spark plug.

The known arrangement has also the disadvantage that due to the laminar guidance of gas and air toward each other a proper guiding and checking of the pilot flame can not be assured.

It is an object of the present invention to overcome the disadvantages of known arrangements of this type.

It is an additional object of the present invention to provide for an arrangement of this type in which overheating of the spark plug is positively prevented.

It is a further object of the present invention to provide an arrangement of this type in which the flame detector is arranged in such a manner so that the pilot flame, as well as the flame of the burner, especially the flame of a blast heating apparatus ignited by the pilot flame can be properly checked.

With these objects in view, the device according to the present invention for igniting and checking the flame of a burner mainly comprises a burner body formed with an elongated bore therethrough tapering from opposite ends to a cross section of smallest diameter intermediate the opposite ends of the bore, air chamber means arranged adjacent one end of the burner body and communicating with one end of the aforementioned bore therethrough, a gas nozzle extending through the air chamber means into said one end of the bore toward but short of the smallest diameter thereof and defining with an inner surface portion of the bore between said one end and the smallest diameter thereof an annular passage through which air can flow from the air chamber means towards the other end of the bore. The device includes further a spark plug extending through and slightly beyond the gas nozzle spaced from the inner surface thereof so that gas may flow through the annular space defined between the outer surface of the plug and the inner surface of the nozzle and be ignited by the spark plug so that a flame will form downstream of the smallest bore diameter, substantially straight passage means communicating with the air chamber means and with the bore downstream of the smallest diameter thereof, and flame detector means arranged along the axis of the straight passage means for checking the flame.

In this device a combustible mixture of gas and air will form and the flame produced by igniting this mixture by means of the spark plug will be driven out from the region of the spark plug by the stream of the gas air mixture. The root of the flame will be located a short distance downstream of the spark plug and the latter will thereby be subjected to the cooling action of the gas stream and be prevented from overheating.

The flame forming downstream of the smallest bore diameter in the bore through the burner body may be used as pilot flame for igniting a burner, especially a burner of a blast heating apparatus. In such an arrangement the burner body is preferably formed from heat resisting and heat insulating material. In addition, after the pilot flame is extinguished, air is continuously fed through the air chamber means and the bore of the burner body so that the spark plug as well as the flame detector is protected by this constant air stream against overheating by the heat developed by the burner of the blast heating apparatus.

According to a further development of the present invention the straight passage means along the axis of which the flame detector means is located is arranged in such a manner so as to permit checking of the pilot flame, as well as of the flame of the burner of the blast heating apparatus by the flame detector means.

The novel features which are considered as characteristic for the invention are set forth in particular in the appended claims. The invention itself, however, both as to its construction and its method of operation, together with additional objects and advantages thereof, will be best understood from the following description of specific embodiments when read in connection with the accompanying drawings in which:

The drawing is a partially sectioned side view of the device according to the present invention connected to a wall of a blast heating apparatus.

Referring now to the drawing, it will be seen that the device according to the present invention mainly comprises a burner body **7** formed from heat resistant and heat insulating material, for instance stone, through which an elongated bore **11** extends which tapers from opposite ends to a cross section **16** of smallest diameter intermediate the opposite ends of the bore **11**. Air chamber means **13** are arranged at one end of the burner body **7** and communicate with one end of the bore **11** therethrough. A gas chamber means **14** is located within the air chamber means **13** and combined to a unit with the latter and the gas chamber means **14** has a gas nozzle which extends through the interior of the air chamber means **13** into the left end, as viewed in the drawing, of the bore **11** but short of the smallest diameter thereof. The outer surface of the gas nozzle defines with an inner surface portion of the bore **11** between the left end and the smallest diameter thereof an annnular passage **19** through which air can flow from the air chamber means **13** toward the right end of the bore. A spark plug **17** extends with a portion thereof through the gas chamber means **14** and through the gas nozzle, spaced from the inner surface of the latter, and slightly beyond the free end thereof into the bore **11** so that gas may flow through the annular space **18** defined by the outer surface of the plug **17** and the inner surface of the nozzle and be ignited by the spark plugs **17** so that a flame will form downstream of the smallest diameter **16** of the bore **11** through the burner body **7**.

The burner body **7** is partly located in a housing **6** abutting with its left end, as viewed in the drawing, against an annular wall **12** of the housing provided intermediate the ends of the latter and the left end of the housing is closed by an end wall **8** spaced from the annular wall **12** and defining with the latter and the portion of the hous-

ing 6 between the annular wall 12 and the end wall 8 the aforementioned air chamber. In addition to the bore 11, a substantially straight passage 23 is formed through the burner body 7 and the straight passage 23 has an axis inclined at an acute angle to the axis of the bore 11 and communicates at opposite ends thereof with the interior of the air chamber 13 and the bore 11 downstream of the smallest diameter thereof. A conduit 22 coaxial with the axis of the straight passage 23 extends rearwardly from the end wall 8 of the housing and communicates at one end thereof with the interior of the air chamber and flame detector means 21, only schematically indicated in the drawing, are connected to the other or the left end, as viewed in the drawing, of the conduit 22. The flame detector means 21, of known construction, may include for instance photocells so that the presence or absence of a flame sending light rays through passage 23 and conduit 22 may be checked by the flame detector means. The specific construction of the flame detector means does not form part of the present invention and therefore the specific construction is not illustrated in the drawing. A conduit 20 branches off to one side of the conduit 22 intermediate the end wall 8 and the flame detector means 21 and the outer end of the conduit 20 is adapted to be connected to an air supply for feeding fresh air into the air chamber 13. A gas conduit 15 communicates with one end thereof with the interior of the gas chamber 14 and the outer end of the conduit 15 is adapted to be connected to a supply of cumbustible gas.

The above described device is preferably used in connection with the burner of a blast heating apparatus so that the pilot flame developed in the above described device may be used for igniting this burner. The drawing illustrates the shaft 1 of a blast heating apparatus of known construction, not illustrated in the drawing and a burner of this blast heating apparatus is located at a portion of the shaft 1 not shown in the drawing so that the burner of the blast heating apparatus may be ignited by the pilot flame developed by the above described device. For this purpose, the wall 2 partly defining the shaft 1 is formed with a passage 3 therethrough which is preferably arranged coaxial with the axis of the bore 11 through the burner body 7, and which communicates at opposite ends thereof, respecttively, with the shaft 1 and an opening 4 of an annular member 5 projecting fixed to the wall 2 about the passage 3. The right end of the housing 6, as viewed in the drawing, extends into the opening 4 of the annular member 5 and the portion of the burner body 7 extending towards the right, beyond the right end of the housing 6 is snugly received in the opening 4 of the annular member 5. An annular portion of the end wall 8 of the housing is connected in any convenient manner to a flange 9 of an outer housing 10 partly surrounding the housing 6 and an annular end wall of the outer housing 10 is connected in any convenient manner to the flange of a metal sleeve surrounding the annular member 5, which sleeve may be integrally formed with a metal sheeting on the outer surface of the wall 2.

The axis 24 of the straight passage 23 along which also the conduit 22 and the flame detector means 21 are located includes with a common axis of the bore 11 through the burner body 7 and the opening 3 through the wall portion 2 a small acute angle so that the axis 24 will not only intersect a pilot flame extending from the bore 11 int othe opening 3, but so that the axis may also extend through the opening 3 without being intersected by any portion of the wall 2. Due to this arrangement it is possible to check with the flame detector 21 not only a pilot flame, but also, after the pilot flame is extinguished by interrupting feed of gas through the conduit 15, any flame on the burner located at the bottom end of the shaft 1 which has been ignited by the pilot flame and which extends upwardly in the shaft 1 past the opening 3.

During operation of the above described arrangement air is constantly fed into the air chamber 13, not only

when the pilot flame is burning, but also after the latter has been extinguished while the blast heating apparatus is in operation so that the spark plug as well as the flame detector means are protected from being overheated by the heat developed by the blast heating apparatus. The flame detector means 21 cooperates in known manner to temporary shutoff feeding of gas through the conduit 15 to the device if the combustible air mixture forming in the bore 11 is not ignited by the spark plug and to control subsequently thereto renewed feeding of gas through the conduit 15 into the device while the spark plug is again energized until the combustible mixture is ignited and the pilot flame formed.

It will be understood that each of the elements described above or two or more together, may also find a useful application in other types of devices for igniting and checking a flame of a burner differing from the types described above.

While the invention has been illustrated and described as embodied in a device for igniting and checking a pilot flame which in turn is used to ignite a burner, especially a burner of a blast heating apparatus, it is not intended to be limited to the details shown, since various modifications and structural changes may be made without departing in any way from the spirit of the present invention.

Without further analysis, the foregoing will so fully reveal the gist of the present invention that others can by applying current knowledge readily adapt it for various applications without omitting features that, from the standpoint of prior art, fairly constitute essential characteristics of the generic or specific aspects of this invention and, therefore, such adaptations should and are intended to be comprehended within the meaning and range of equivalence of the following claims.

What is claimed as new and desired to be secured by Letters Patent is:

1. A device for igniting and checking the flame of a burner, comprising, in combination, a burner body formed with an elongated bore therethrough tapering from opposite ends to a cross-section of smallest diameter intermediate the opposite ends of said bore; air chamber means arranged adjacent one end of said burner body and communicating with one end of said bore; a gas nozzle extending through said air chamber means into said one end of said bore toward but short of said smallest diameter thereof and defining with an inner surface portion of said bore between said one end and said smallest diameter thereof an annular passage through which air can flow from said air chamber means towards the other end of said bore; a spark plug extending through and slightly beyond said gas nozzle spaced from the inner surface thereof so that gas may flow through the annular space defined by the outer surface of said plug and the inner surface of said nozzle and be ignited by said spark plug so that a flame will form downstream of said smallest bore diameter; substantially straight passage means communicating with said air chamber means and with said bore downstream of said smallest diameter thereof; and flame detector means arranged along the axis of said straight passage means upstream of said air chamber means for checking the flame.

2. A device as set forth in claim 1, wherein said burner body is formed from heat resisting and heat insulating material.

3. A device as set forth in claim 1, wherein said bore, said gas nozzle, and said spark plug are arranged along a common axis.

4. A device as set forth in claim 3, wherein the axis of straight passage means includes a small acute angle with said common axis.

5. A device as set forth in claim 4 and including conduit means for feeding air into said air chamber means, said conduit means having a portion located along the axis of said straight passage means and said flame detector

means being connected to said portion of said conduit means.

6. A device as set forth in claim 4, wherein the flame forming downstream of said smallest bore diameter is used as pilot flame for igniting a burner, especially a burner of a blast heating apparatus, and including shaft means of said blast heating apparatus, and an additional passage means providing communication between the other end of said bore and said shaft means, and wherein said axis of said straight passage means includes with the axis of said bore and that of said additional passage means an angle so as to intersect said flame forming downstream of said smallest bore diameter and so as to be directed toward a flame formed in said shaft means of said blast heating apparatus, whereby said flame detecter may be used to check the flame in said bore as well as the flame formed in the shaft means of the blast heating apparatus.

7. A device as set forth in claim 6, wherein said additional passage means is arranged along said common axis.

8. A device as set forth in claim 3, and including gas chamber means located within and combined to one unit with said air chamber means, said gas nozzle communicating at one end thereof with said gas chamber means and

extending with the other end thereof into said bore of said burner body, and conduit means communicating with said gas chamber means for feeding a combustible gas into the latter.

9. A device as set forth in claim 6, wherein said additional passage means extends through a wall portion partly defining said shaft means and including an annular member projecting outwardly of said wall portion fixed thereto about said additional passage means, and said burner body being located at least in part in the interior of said annular member snugly engaging the inner surface thereof.

10. A device as set forth in claim 9, and including means for holding said air chamber means to said one end of said burner body and the latter in the interior of said annular member.

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