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(54) A LOW NOX BURNER

(57) This present invention relates to an efficient environmentally friendly burner: a low NO_x (nitrogen oxide) burner that uses premixed air and gas as fuel and water as medium of heat transfer. Premixed air and gas in this device provides heat for boiler through stabilized combustion.

The device consists of burner ports, flame stabilizers, upper and lower water chambers, and a mixing chamber. The burner ports are formed by a number of rectangular tubes with gaps in between that function as passageway for air and gas. The premixed air and gas are equally delivered from the mixing chamber to those gaps and combust as they flow through. Circulation channels for cooling water are designed inside the burner ports and the flame stabilizer to effectively prevent the flashback of flame as well as lower the combustion temperature. A minimized formation of NO_x is therefore achieved.

The low NO_x burner according to the present invention is simple in structure and convenient to use. Compared with traditional premix combustion systems, this device guarantees combustions that are more stable, and it is much less likely to cause flashback of flame or blockage.

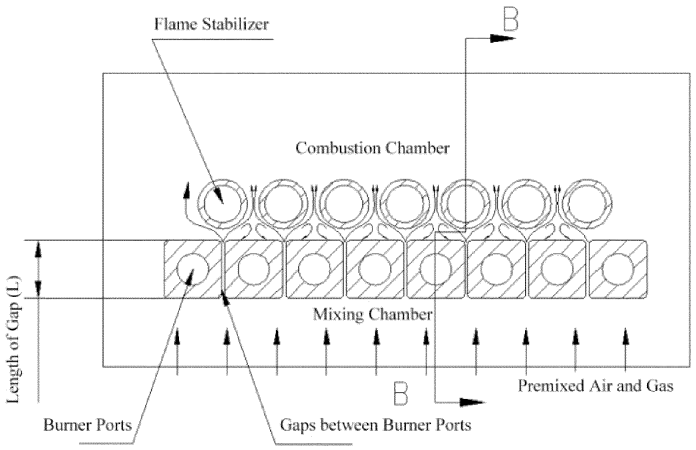

FIG.2 A–A

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Description

TECHNICAL FIELD

[0001] This present invention relates to an efficient environmentally friendly burner: a low NO_x burner that uses premixed air and gas as fuel and water as medium of heat transfer. Through combustion of premixed air and gas in a specially designed burner head where cooling water is infused, the temperature of flame is lowered, a safer and more efficient combustion is achieved, thereby reducing the formation and emission of NO_x.

BACKGROUND

[0002] At present, gas boilers are applied more and more universally worldwide. Burners matched with most of boilers adopt a diffusion-type combustion manner. The burners have the main advantages of stability in combustion and maturity in technology; however, the burners have the shortcomings of being incomplete in combustion and high in NO_x emission and the like. Therefore, people begin to research and develop a full-premixed combustion technology, that is, air and gas are premixed and sent into a specially designed burner to be burned; the burner is usually cylindrical, the surface of the burner is wrapped with a layer of high temperature resistant metal fiber fabric, and flames burn on the surface of the fabric. In the full-premixed combustion technology, gas burns more fully, and the thermal efficiency is higher. However, the burner has several problems:

1. The flames are poor in stability, and flashback of flame occurs easily;

2. Since meshes of the fabric are dense, blockage is a very common problem;

3. Much NO_x is emitted under the conditions of a low air excess coefficient, and since the NO_x emission is an important reason for forming atmospheric haze, a low NO_x emission combustion technology is demanded globally.

SUMMARY

[0003] Against technical problems to be solved, the present invention overcomes the aforementioned shortcomings in the prior art and provides a combustion device which is simple and reliable in structure, can fully mix air and gas, enables the gas to burn stably, solves the problems of backfire detonation, blockage, etc. and can reduce NO_x emission.

[0004] The technical solution adopted to solve the aforementioned problems by the present invention is as follows:

a low-NO_x burner consists of burner ports, flame stabilizers, upper and lower water chambers, and a mixing chamber. Premixed air and gas flow evenly through the gaps between the burner ports, which causes a pressure drop that divides the combustion chamber and mixing chamber into two units of different pressures. The size and depth of the gaps are adjusted according to the quenching conditions.

[0005] Two water chambers are designed with the burner, one above and the other below the burner ports and flame stabilizers. As cooling water is infused in the burner ports, flashback of flame from the combustion chamber to the mixing chamber is avoided. Meanwhile, the lowered temperature of flame restrains the formation of NO_x.

[0006] A row of flame stabilizers, composed of a number of cylinder pipes, is arranged in front of the burner ports. These pipes perform the role of a bluff body of airflow. When the burning gas passes them, a negative pressured is formed in the back, which facilitates the combustion of unburned gas. In this way, a continuous and stable process of combustion is achieved. The cooling water in the pipes lowers the temperature of the flame, thus the formation of NO_x is reduced. Infusing cooling water into the bluff of airflow inside a combustion device is the most significant characteristic of this device, and the method of controlling combustion temperature of flame through the adjustment of the quantity of heat of each unit area is also a key point of this invention.

BRIEF DESCRIPTION OF DRAWINGS

[0007]

FIG. 1 is a schematic structural diagram of the present invention; and

FIG. 2 is a schematic diagram of structural connection of the combustion head.

DESCRIPTION OF EMBODIMENTS

[0008] The present invention is introduced in detail below with reference to accompanying drawings. As shown in FIG. 1, it is a combustion device consists of burner ports, flame stabilizers, upper and lower water chambers, and a mixing chamber.

[0009] As shown in FIG. 2, two water chambers are designed with the burner, one above and the other below the burner ports and flame stabilizers. Both the burner ports and the flame stabilizers are infused with cooling water.

[0010] As shown in FIG. 2, the burner ports are formed by a number of rectangular tubes with gaps in between that function as passageway for air and gas. The burner ports are infused with cooling water to effectively prevent the flashback of flame as well as lower the combustion temperature. A minimized formation of NO_x is therefore

achieved.

[0011] As shown in FIG. 2, a row of flame stabilizers, composed of a number of cylinder pipes, is arranged in front of the burner ports. These pipes perform the role of a bluff body of airflow. When the burning gas passes them, a negative pressured is formed in the back, which facilitates the combustion of unburned gas. In this way, a continuous and stable process of combustion is achieved. The cooling water in the pipes lowers the temperature of the flame, thus the formation of NO_x is reduced.

[0012] Premixed air and gas flow evenly through the gaps between the burner ports, which causes a pressure drop that divides the combustion chamber and mixing chamber into two units of different pressures. The ignition and combustion of gas then take place in the combustion chamber. Different combustion power can be reached through adjusting the amount of premixed air and gas into the mixing chamber.

[0013] Gaps between burner ports and cooling water infused in both burner ports and flame stabilizers are the innovative features of this invention. It solves the problem of flashback of flame and blockage in traditional burners and lowers the temperature of combustion flame. A minimized formation of NO_x is therefore achieved.

[0014] Through the aforementioned embodiments, the objective of the present invention has been achieved completely and effectively. Those skilled in the art should understand that the present invention includes but is not limited to contents described in the aforementioned embodiments and accompanying drawings. Any modification without departing from functions and structure principle of the present invention should be included in the range of claims.

Claims

1. A low NO_x burner **characterized by** infusing cooling water into burner ports, which prevents flashback of flame from the combustion chamber to the mixing chamber and lowers temperature of combustion, thereby achieving a minimized formation of NO_x.

2. The low NO_x burner according to claim 1, is **characterized in that** a row of cylinder pipes in front of the burner ports are infused with cooling water to serve as a bluff body of airflow, which stabilizes the flame and cools down the temperature of combustion. Thus, the formation of NO_x is reduced.

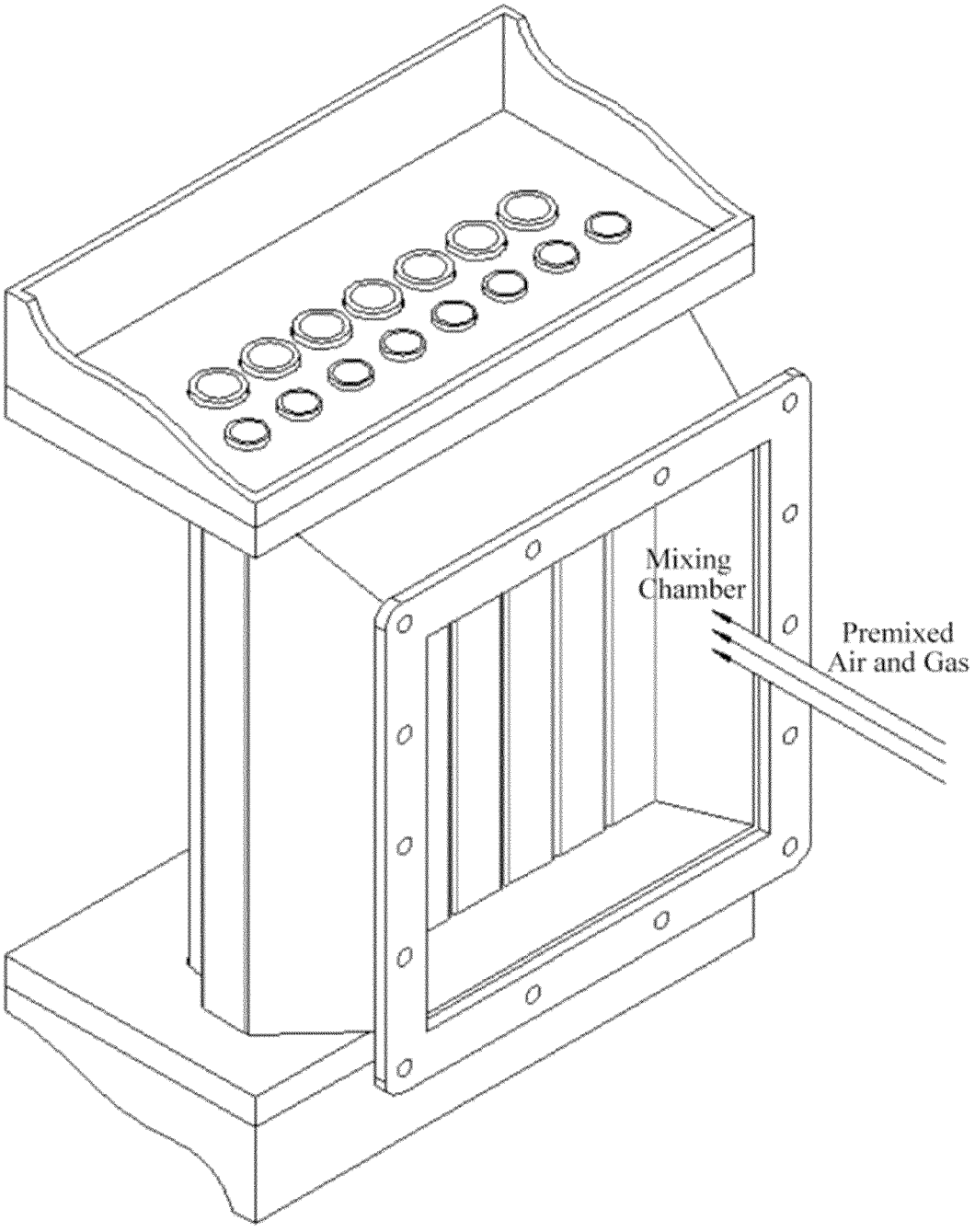

FIG. 1

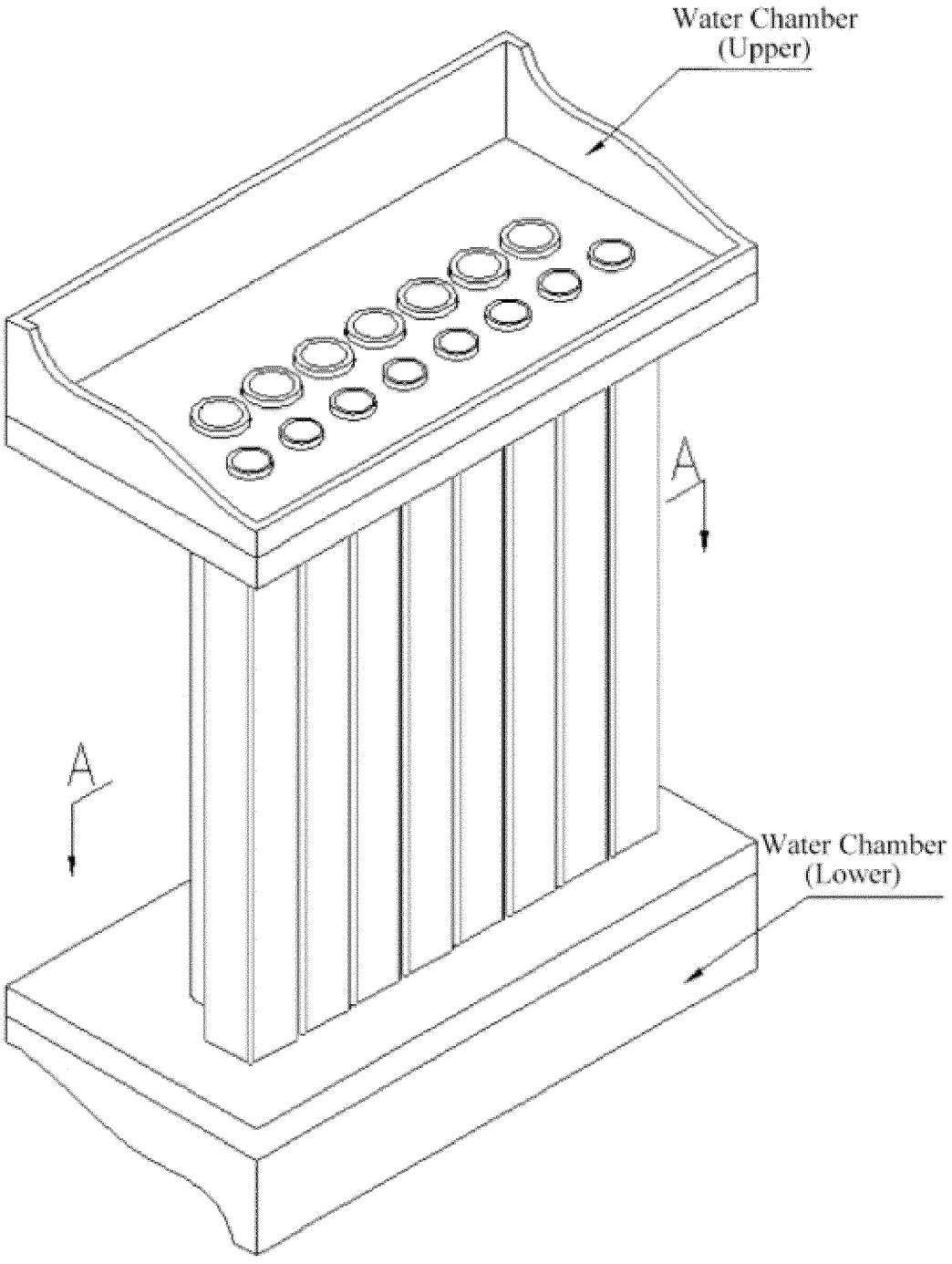

FIG.2

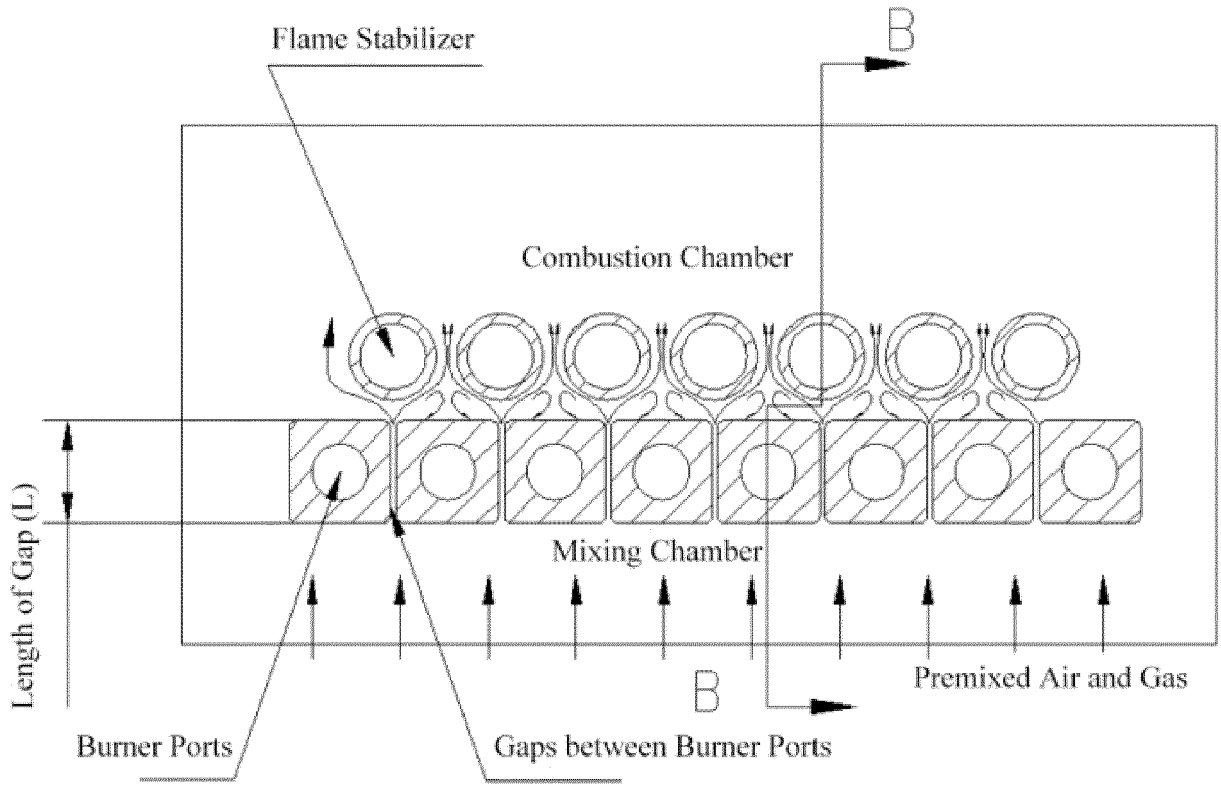
Flame Stabilizer
B
Combustion Chamber
Length of Gap (L)
Mixing Chamber
B
Premixed Air and Gas
Burner Ports
Gaps between Burner Ports

FIG.2 A–A

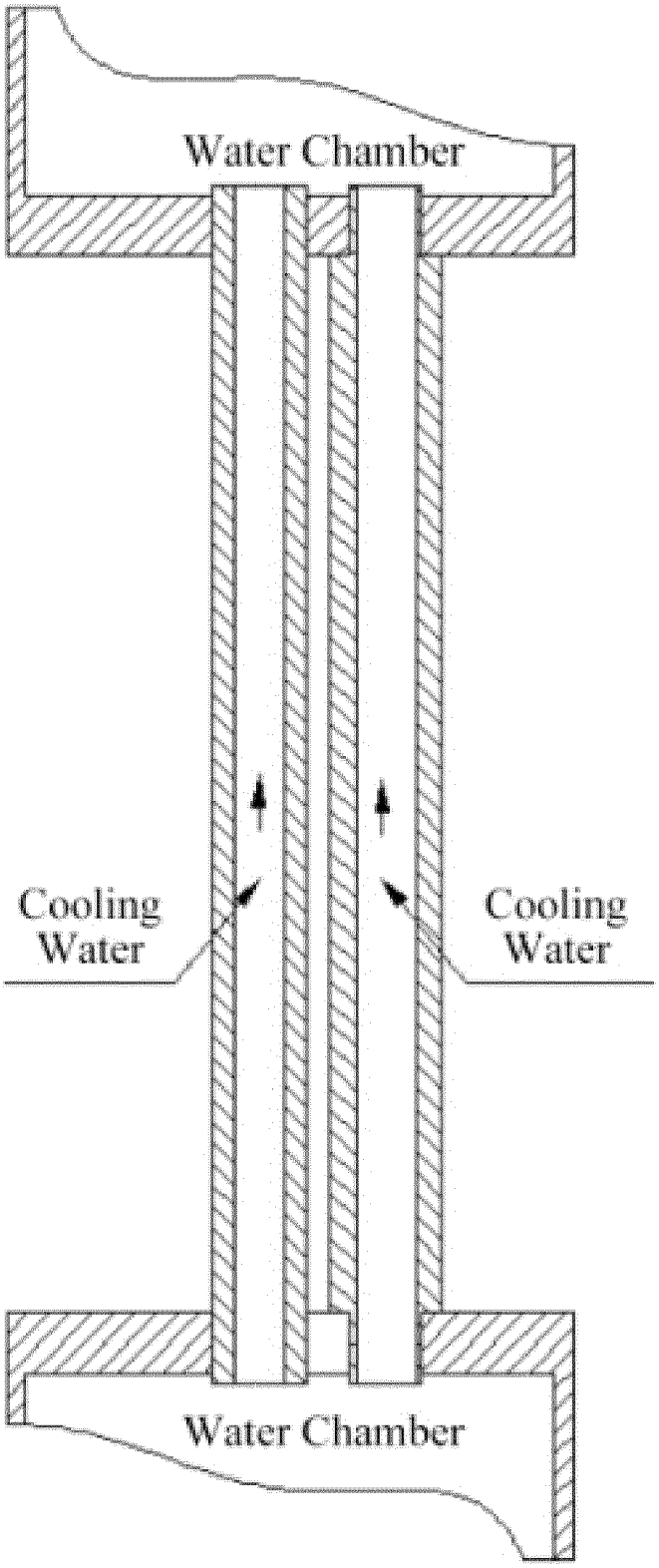

FIG.2 B-B

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EUROPEAN SEARCH REPORT

Application Number
EP 17 16 5975

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
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X	US 4 915 620 A (BITTMANN BERND [DE] ET AL) 10 April 1990 (1990-04-10) * column 1, line 6 - column 2, line 54 * * column 10, line 23 - column 11, line 26; figures 7-10 *	1,2	
X	US 5 711 661 A (KUSHCH ALEKSANDR S [US] ET AL) 27 January 1998 (1998-01-27) * column 1, line 4 - column 8, line 67; figures 3,4 *	1,2	

TECHNICAL FIELDS SEARCHED (IPC)

F24H
F23D

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	10 August 2017	Theis, Gilbert

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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EPO FORM 1503 03.82 (P04C01)

ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO. EP 17 16 5975

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report. The members are as contained in the European Patent Office EDP file on
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10-08-2017

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EPO FORM P0459

For more details about this annex : see Official Journal of the European Patent Office, No. 12/82