(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property Organization
International Bureau

(43) International Publication Date
23 July 2015 (23.07.2015)

WIPO | PCT

(10) International Publication Number
WO 2015/107446 A1

(51) International Patent Classification:
F23D 14/06 (2006.01) *F23D 14/26* (2006.01)

(21) International Application Number:
PCT/IB2015/050222

(22) International Filing Date:
12 January 2015 (12.01.2015)

(25) Filing Language: Italian

(26) Publication Language: English

(30) Priority Data:
VE2014A000002 14 January 2014 (14.01.2014) IT

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(81) Designated States *(unless otherwise indicated, for every kind of national protection available)*: AE, AG, AL, AM, AO, AT, AU, AZ, BA, BB, BG, BH, BN, BR, BW, BY, BZ, CA, CH, CL, CN, CO, CR, CU, CZ, DE, DK, DM, DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID, IL, IN, IR, IS, JP, KE, KG, KN, KP, KR, KZ, LA, LC, LK, LR, LS, LU, LY, MA, MD, ME, MG, MK, MN, MW, MX, MY, MZ, NA, NG, NI, NO, NZ, OM, PA, PE, PG, PH, PL, PT, QA, RO, RS, RU, RW, SA, SC, SD, SE, SG, SK, SL, SM, ST, SV, SY, TH, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, ZA, ZM, ZW.

(84) Designated States *(unless otherwise indicated, for every kind of regional protection available)*: ARIPO (BW, GH, GM, KE, LR, LS, MW, MZ, NA, RW, SD, SL, ST, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, RU, TJ, TM), European (AL, AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HR, HU, IE, IS, IT, LT, LU, LV, MC, MK, MT, NL, NO, PL, PT, RO, RS, SE, SI, SK, SM, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, KM, ML, MR, NE, SN, TD, TG).

Published:

— *with international search report (Art. 21(3))*

— *before the expiration of the time limit for amending the claims and to be republished in the event of receipt of amendments (Rule 48.2(h))*

(54) Title: COOKING HOB GAS BURNER

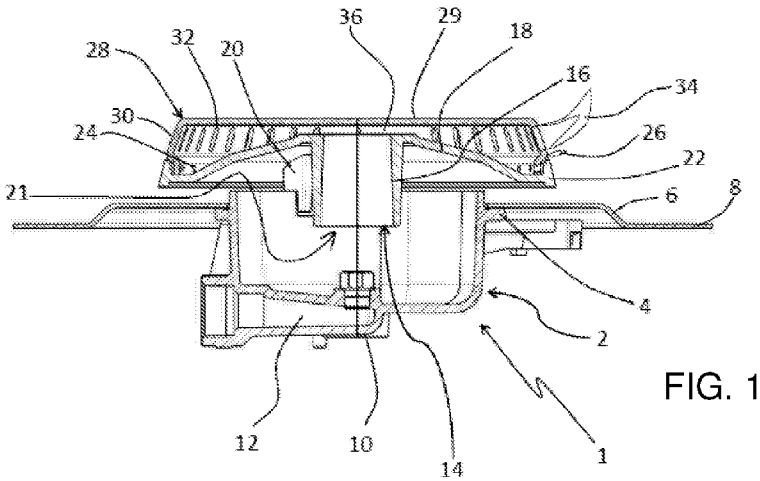

FIG. 1

(57) Abstract: An improved gas burner, comprising: - an injector holder (2) fixable to the sheet metal (8) of a cooking hob and provided on its base with an injector (10), - a burner body (14) associated with the injector holder (2) and adapted to define with the sheet metal (8) a circumferential passage for the entry of primary air intended to form the combustion mixture with the gas leaving the injector (10), - at least one cover (28), -- formed from a single piece of drawn sheet metal, -- positioned on the burner body (14) and defining therewith at least one radial venturi effect chamber (36), -- comprising a circumferential flange (30) provided with a plurality of elongated apertures (32, 40) of essentially vertical extension, for passage of the combustion mixture to generate a ring of main flames (34).

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COOKING HOB GAS BURNER

The present invention relates to an improved gas burner.

Gas burners are known intended to be installed in particular in cooking hobs. They comprise an injector holder cup, a burner body positioned on the injector holder cup and a cover positioned on the burner body and defining therewith a chamber for mixing the gas with the primary air and distributing the hence formed mixture, to feed a flame ring.

The injector holder cup is made of die-cast aluminium and is provided on its circumference with means for its fixing to the sheet metal of the cooking hob and on its base with an injector of vertical axis connected to the gas intake conduit.

The burner body is also made of die-cast aluminium and is provided with a conduit of vertical axis coaxial with the injector, which faces this latter at its lower end and opens at its upper end into the distribution chamber, bounded upperly by the cover. In its outer edge there is provided a plurality of primary and secondary apertures, which generate the ring of main flames and the stabilization flame.

The cover can be of two types: the first type has its outer surface virtually flat and is of more pleasant appearance and easier to clean; the second type has its upper surface provided centrally with a depression or projection, which makes it of less pleasant appearance and less easy to clean; at the same time it can be made of sheet metal of lesser thickness and is hence less costly than the first type.

A compromise tending to reconcile both these requirements is widely available for example in Brazil, where cost represents the most important

factor; in this case the closure cover is made from a single piece of sheet metal and includes the holes for forming the ring of main flames, in this manner forming a true flame divider. In contrast, in such known flame dividers the apertures for generating the ring of main flames consist of more or less large holes which, besides being of unpleasant appearance, present technical limitations. In particular, because of the thin sheet metal with which the flame divider is made, when liquefied gas is used, passage from the maximum flow position to the minimum flow or closed position can cause a small detonation. This means that the burner minimum flow rate has necessarily to be increased, with consequent reduction of its operating range.

The object of the invention is to eliminate the aforesaid drawbacks by providing a gas burner for cooking hobs with a sheet metal cover which is able to generate an upwardly generated flame ring.

This and other objects which will be apparent from the ensuing description are attained according to the invention by an improved gas burner presenting the characteristics described in claim 1.

The present invention is further clarified hereinafter in the form of three preferred embodiments, with reference to the accompanying drawings, in which:

Figure 1 is a diametrical section through a first embodiment of a gas burner according to the invention,

Figure 2 is a lateral view of a second embodiment thereof shown partly sectioned at the cup-shaped support, and

Figure 3 is a partly sectioned lateral view of a third embodiment thereof.

In the embodiment of Figure 1, the burner according to the invention comprises a cup-shaped support 2, provided with a circumferential flange 4 by which the support can be fixed in traditional manner to an annular projection 6, formed in the upper sheet metal 8 of a cooking hob.

On the base of the cup-shaped support 2 a seat is provided for an injector 10 of vertical axis, fed with the gas via a conduit 12 provided in the support.

A burner body 14 rests on the cup-shaped support 2. It comprises a substantially cylindrical tubular portion 16, coaxial with the injector 10 and having its lower end facing it and its upper end opening at the centre of a circular portion 18 with downwardly-facing slight concavity.

From the lower surface of this circular portion 18, three shoulders 20 extend downwards disposed at 120° apart and forming elements for supporting the burner body 14 at the circumferential edge of the cup-shaped support 2.

The dimensioning of the various parts is such that when the burner body 14 rests on the cup-shaped support 2, the circumferential edge of the circular portion 18 defines with the cooking hob 8 an annular passage through which the primary air 21 required for forming the combustible mixture with the gas, can enter the interior of the cup-shaped support 2.

The circumferential edge of the circular portion 18 faces upwards and forms an annular band 22.

The burner according to the invention also comprises a cover 28 which is rested on the burner body 14. In particular, the cover 28 can rest with its lower edge on the inner zone (defined externally by the annular band 22) of

the upper surface of said circular portion 18 (see Figure 1) and/or can rest on the upper edge of the annular band 22 (see Figure 2).

The cover 28 is made of blanked and drawn sheet metal, preferably of steel, but also of aluminium, brass, stainless steel, sintered steel or other suitable metal alloys.

The cover 28 has an essentially flat upper surface 29, with the edge bent downwards to form externally a circumferential band 30 provided with a plurality of apertures 32 of essentially elongated vertical extension, for passage of the combustion mixture which generates the ring of main flames 34.

The cover 28 has a radial extension less than that of the annular band 22 of the body 14. Preferably, the annular band 22 of the burner body 14 is exposed (i.e. is not covered/hidden by the cover 28) and is inclined by an angle corresponding to the inclination of the circumferential flange 30 of the cover 28, such as to define line continuity between said cover and the exposed portion of the burner body 14. However, it should be noted that said annular band 22 of the burner body 14 can also present an inclination which is different from that of the circumferential flange 30 of the cover 28.

The substantially flat portion 29 of the cover 28 defines with the concave portion 18 of the burner body 14 a radial venturi effect chamber 36, which facilitates the mixing of the gas with the primary air and the formation of the combustion mixture.

In a position underlying the elongated apertures, the circumferential flange 30 of the cover 28 is provided with a plurality of small apertures 24 for passage of the combustion mixture intended to feed an annular stabilization

flame 26 for the ring of main flames 34. In particular, the small apertures 24 of the circumferential flange 30 of the cover 28 are covered and hidden by the annular band 22 of the burner body; hence the mixture which leaves the apertures 24 of the cover 28 generates the annular stabilization flame 26 at holes (not shown) provided in the annular band 22 of the burner body 14, or in that annular space left between the lower edge of the cover 28 and the upper edge of the annular band 22 of the body 14 (see Figure 1).

In greater detail, the sheet metal which forms the cover 28 has a thickness preferably between 1.0 and 1.7 mm, while the elongated apertures 32 provided in the circumferential band 30 have a height between 3.0 and 7.0 mm and a width between 1.0 and 1.7 mm.

The elongate shape of these apertures 32 has proved considerably advantageous, in that:

- it enables the main flames 34 to be given a direction with a strong vertical component, ensuring burner efficiency while enabling a low minimum power thereof and hence a wide range of burner operation,
- it enables this advantage to be achieved while using a cover 28 of small thickness,
- it substantially reduces the risk of returning flame,
- it eliminates small explosion phenomena when the gas feed is shut off, particularly of liquefied gas.

In a second embodiment shown in Figure 2, both the elongated apertures 32 for the ring of main flames 34, and the small apertures 38 for the ring of stabilization flames 26 are provided in the inclined circumferential band 30 of the cover 28, very close together. In particular, in this second

embodiment, the small apertures 38 are not covered by the annular band 22 of the body 14, hence the stabilization flames 26 are generated at these apertures.

In a third embodiment shown in Figure 3, in contrast to the burners of the two previous embodiments which have the axes of the elongated apertures 32 lying in a radial vertical plane, this embodiment provides elongated apertures 40 with their axis inclined to said radial vertical planes.

A cover/flame divider 28 with apertures 32 or 40 of elongated vertical extension (and with one or more of the aforedescribed characteristics) can also be used with multi-ring burners, i.e. with burners presenting a central body, from which a central flame ring originates, and an annular body, which is separated from said central body by an annular cavity and in which one or more annular flame rings originate, concentric to said central ring.

CLAIMS

1. An improved gas burner, comprising:

- an injector holder (2) fixable to the sheet metal (8) of a cooking hob and provided on its base with an injector (10),
- a burner body (14) associated with said injector holder (2) and defining with said sheet metal (8) a circumferential passage for the entry of primary air intended to form the combustion mixture with the gas leaving said injector (10),
- at least one cover (28), formed from a single piece of drawn sheet metal, positioned on said burner body (14) and defining therewith at least one radial venturi effect chamber (36),

characterised in that said cover comprises a circumferential flange (30) provided with a plurality of elongated apertures (32, 40) of essentially vertical extension, for passage of the combustion mixture which generates a ring of main flames (34).

2. A burner as claimed in claim 1, characterised in that the sheet metal which forms the cover has a thickness between 1.0 and 1.7 mm.

3. A burner as claimed in one or more of the preceding claims, characterised in that said elongated apertures (32, 40) have a height between 3.0 and 7.0 mm and a width between 1.0 and 1.7 mm.

4. A burner as claimed in one or more of the preceding claims, characterised in that said circumferential flange (30) is inclined to the vertical.

5. A burner as claimed in one or more of the preceding claims, characterised in that said burner body (14) comprises an annular band (22) at its circumferential edge.

6. A burner as claimed in one or more of the preceding claims, characterised in that said annular band (22) of the burner body (14) is exposed and is inclined by an angle corresponding to the inclination of the circumferential flange (30) of said cover (28), such as to define line continuity between said cover (28) and the exposed portion of said body (14).

7. A burner as claimed in one or more of the preceding claims, characterised in that said cover (28) has a radial length less than that of the annular band (22) of the body (14).

8. A burner as claimed in one or more of the preceding claims, characterised in that said elongated apertures (32) have their axis lying in radial vertical planes of the burner.

9. A burner as claimed in one or more of the preceding claims, characterised in that said elongated apertures (40) have their axis inclined to radial vertical planes of the burner.

10. A burner as claimed in one or more of the preceding claims, characterised in that said circumferential flange (30) of said cover (28) is provided, in a position underlying said elongated apertures (32), with a plurality of small apertures (24) for passage of the combustion mixture intended to feed an annular stabilization flame (26) for the ring of main flames (34).

11. A burner as claimed in one or more of the preceding claims, characterised in that said annular stabilization flame (26) is generated at holes defined in the annular band (22) of the body (14).

12. A burner as claimed in one or more of the preceding claims, characterised in that said annular stabilization flame (26) is generated at the

annular space defined between the lower edge of the cover (28) and the upper edge of the annular band (22) of the body (14).

13. A burner as claimed in one or more of the preceding claims, characterised in that said circumferential flange (30) of the cover (28) is also provided with a plurality of small apertures (38) for passage of the combustion mixture which generates a ring of stabilization flames for the ring of main flames (34).

14. A burner as claimed in one or more of the preceding claims, characterised in that said small apertures (38) are disposed in said circumferential flange (30) of the cover (28), below said elongated apertures (32, 40).

15. A burner as claimed in one or more of the preceding claims, characterised in that said cover (28) comprises an essentially flat upper surface (29) with the edge bent downwards to form said circumferential flange (30).

16. A burner as claimed in one or more of the preceding claims, characterised in that:

- said burner body (14) comprises a central portion and an annular portion which is concentric to the central portion and is separated therefrom by an annular cavity,
- said at least one cover (28) defines with said central portion of the body (14) a central chamber from which a first ring of main flames emerges through said elongated apertures (32, 40) of essentially vertical extension of said at least one cover (28),

- said at least one cover (28) defines with said annular portion of said body (14) an annular chamber from which at least one second ring of main flames emerges through said elongated apertures (32, 40) of essentially vertical extension of said at least one cover (28).

17. A burner as claimed in the preceding claim, characterised in that said at least one cover (28) comprises:

- a first cover of circular shape which with said central portion of said body (14) defines said central chamber,
- a second cover of annular shape which with said annular portion of said body (14) defines said annular chamber.

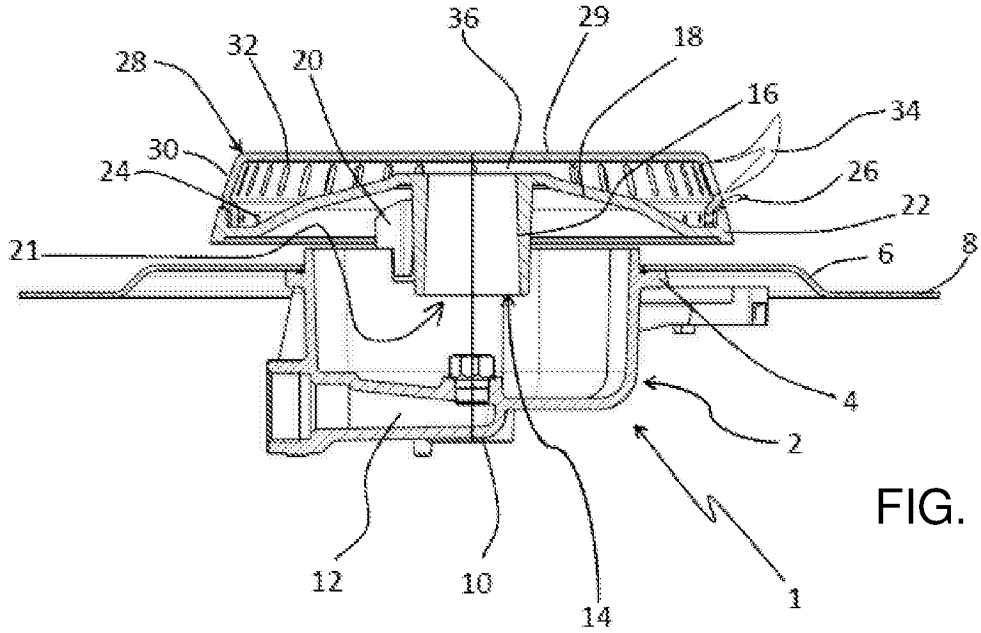

FIG. 1

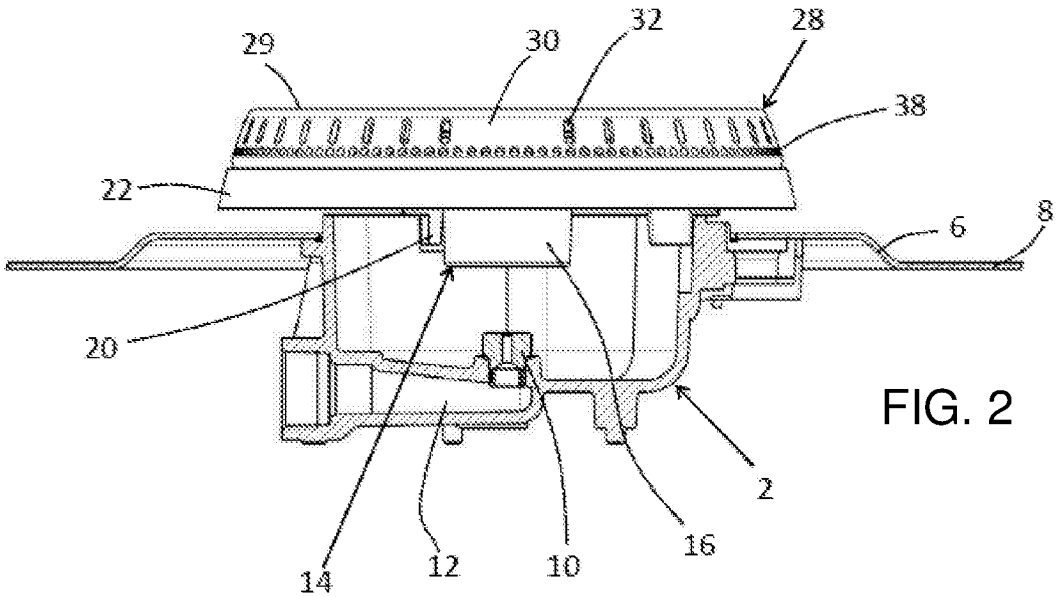

FIG. 2

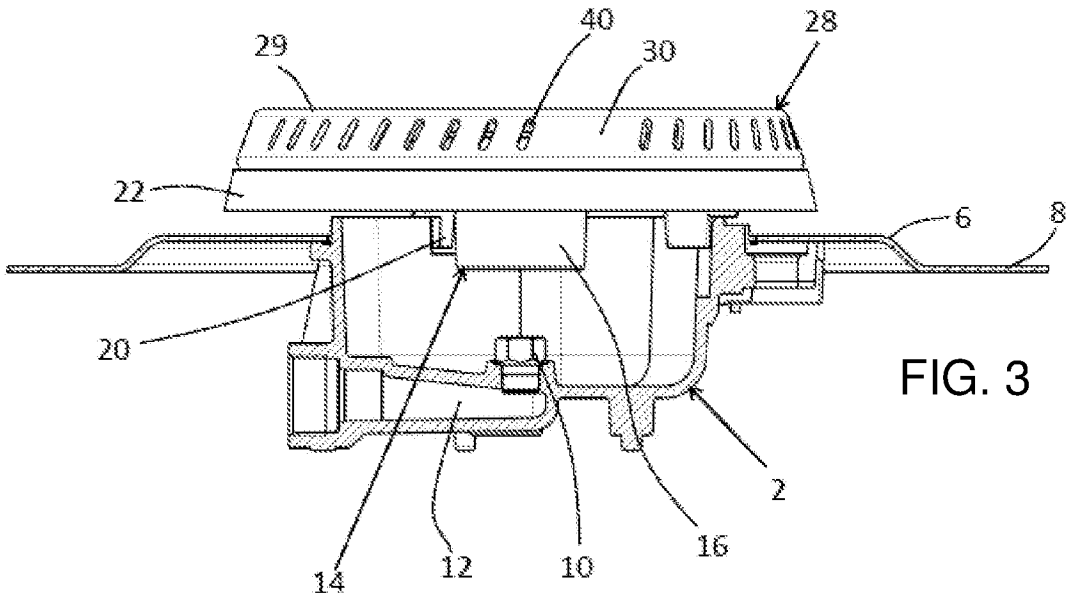

FIG. 3

INTERNATIONAL SEARCH REPORT

International application No
PCT/IB2015/050222

A. CLASSIFICATION OF SUBJECT MATTER
INV. F23D14/06 F23D14/26
ADD.

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
F23D

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)
EPO-Internal, WPI Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	GB 2 272 283 A (FAGOR S COOP LTDA [ES]) 11 May 1994 (1994-05-11) figures 5, 7, 9 page 1, lines 4-10 page 8, line 9 - page 10, line 2	1,4,5,8, 10,12-15
Y	JP 2008 202866 A (RINNAI KK) 4 September 2008 (2008-09-04) the whole document	1,4-8, 10,12-15
Y	GB 2 100 411 A (SABAF SPA) 22 December 1982 (1982-12-22)	1,4-7
A	the whole document	15

☐ Further documents are listed in the continuation of Box C.

☒ See patent family annex.

* Special categories of cited documents :

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier application or patent but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
3 June 2015	19/06/2015

Name and mailing address of the ISA/	Authorized officer
European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Fax: (+31-70) 340-3016	Vogl, Paul

INTERNATIONAL SEARCH REPORT

International application No.
PCT/IB2015/050222

Box No. II Observations where certain claims were found unsearchable (Continuation of item 2 of first sheet)

This international search report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. ☐ Claims Nos.:
because they relate to subject matter not required to be searched by this Authority, namely:

2. ☒ Claims Nos.: 16, 17
because they relate to parts of the international application that do not comply with the prescribed requirements to such an extent that no meaningful international search can be carried out, specifically:

see FURTHER INFORMATION sheet PCT/ISA/210

3. ☐ Claims Nos.:
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

Box No. III Observations where unity of invention is lacking (Continuation of item 3 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:

1. ☐ As all required additional search fees were timely paid by the applicant, this international search report covers all searchable claims.

2. ☐ As all searchable claims could be searched without effort justifying an additional fees, this Authority did not invite payment of additional fees.

3. ☐ As only some of the required additional search fees were timely paid by the applicant, this international search report covers only those claims for which fees were paid, specifically claims Nos.:

4. ☐ No required additional search fees were timely paid by the applicant. Consequently, this international search report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:

Remark on Protest

☐ The additional search fees were accompanied by the applicant's protest and, where applicable, the payment of a protest fee.

☐ The additional search fees were accompanied by the applicant's protest but the applicable protest fee was not paid within the time limit specified in the invitation.

☐ No protest accompanied the payment of additional search fees.

FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210

Continuation of Box II.2

Claims Nos.: 16, 17

The invention to be defined by the subject-matter of claim 16 is not disclosed in a manner sufficiently clear and complete to be carried out by a person skilled in the art for the following reasons:

- The basic features of a multiple ring burner as specified in the last paragraph of the description are well defined.
  The central portion of the multiple ring burner can easily be understood as being constructed as specified in claim 16.
- The description does not specify in any manner, how the annular portion works, particularly how the gas-air mixture it uses is prepared. If it were via the central portion venturi, an indication how this could be performed, should have been provided. If it were via a second venturi construction, details about such a construction should have been provided. Due to its constructional details, the venturi construction of the central portion cannot be used separately as a second venturi construction for the annular portion.

The applicant's attention is drawn to the fact that claims relating to inventions in respect of which no international search report has been established need not be the subject of an international preliminary examination (Rule 66.1(e) PCT). The applicant is advised that the EPO policy when acting as an International Preliminary Examining Authority is normally not to carry out a preliminary examination on matter which has not been searched. This is the case irrespective of whether or not the claims are amended following receipt of the search report or during any Chapter II procedure. If the application proceeds into the regional phase before the EPO, the applicant is reminded that a search may be carried out during examination before the EPO (see EPO Guidelines C-IV, 7.2), should the problems which led to the Article 17(2) declaration be overcome.

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No
PCT/IB2015/050222

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
GB 2272283 A	11-05-1994	ES 2109119 A1	01-01-1998
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