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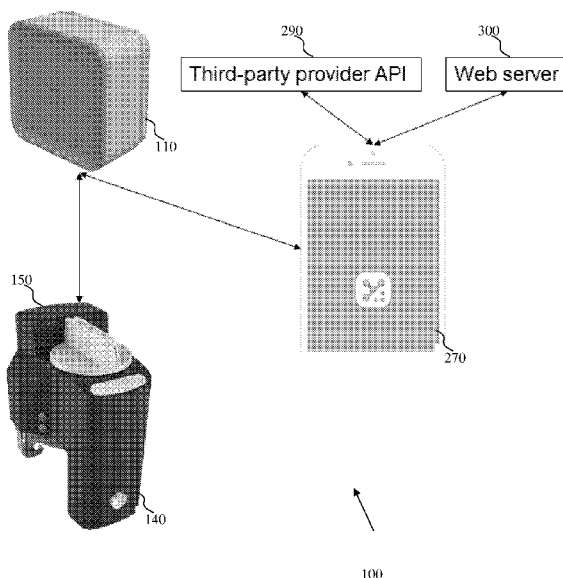
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(54) Title: GAS LEAKAGE DETECTION AND SHUT-OFF SYSTEM

FIG. 1



(57) Abstract: Systems and units for gas shut-off are provided. In one embodiment, a gas shut-off unit is adapted to be mounted on a gas control valve with no direct contact to fluid or gas disposed therein. The gas shut-off unit includes a transmitter configured to receive a signal that can cause the gas shut-off unit to urge the gas control valve to a closed position.



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))*
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INTERNATIONAL SEARCH REPORT

International application No.

PCT/QA2018/050005

A. CLASSIFICATION OF SUBJECT MATTER  
 IPC(8) - F17D 5/06; F23D 14/72; F23N 5/24; G01M 3/28 (2020.01)  
 CPC - F17D 5/06; F23D 14/72; F23N 5/24; G01M 3/28 (2020.05)

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)  
 see Search History document

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

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)  
 see Search History document

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X --- Y	US 2007/0289635 A1 (GHAZARIAN et al) 20 December 2007 (20.12.2007) entire document	1-4, 9, 11, 19, 20 --- 10
Y	US 4,916,437 A (GAZZAZ) 10 April 1990 (10.04.1990) entire document	10
A	US 5,379,794 A (BROWN) 10 January 1995 (10.01.1995) entire document	1-11, 19, 20
A	US 6,662,821 B2 (JACOBSEN et al) 16 December 2003 (16.12.2003) entire document	1-11, 19, 20

Further documents are listed in the continuation of Box C.  See patent family annex.

* Special categories of cited documents:	"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
"A" document defining the general state of the art which is not considered to be of particular relevance	"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
"D" document cited by the applicant in the international application	"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
"E" earlier application or patent but published on or after the international filing date	"&" document member of the same patent family
"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	

Date of the actual completion of the international search 06 July 2020	Date of mailing of the international search report <b>24 JUL 2020</b>
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INTERNATIONAL SEARCH REPORT

International application No.

PCT/QA2018/050005

**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.:  
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:
  
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:

See extra sheet(s).

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 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.:  
1-11, 19, 20

**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.

INTERNATIONAL SEARCH REPORT

International application No.

PCT/QA2018/050005

Continued from Box No. III Observations where unity of invention is lacking

This application contains the following inventions or groups of inventions which are not so linked as to form a single general inventive concept under PCT Rule 13.1. In order for all inventions to be examined, the appropriate additional examination fees must be paid.

Group I, claims 1-11 and 19-20, are drawn to a gas leakage detection and shut-off system comprising: a gas leakage detection sensor unit.

Group II, claims 12-18, are drawn to a gas shut-off unit comprising: a housing; a motor positioned in the housing.

The inventions listed as Groups I-II do not relate to a single general inventive concept under PCT Rule 13.1 because, under PCT Rule 13.2, they lack the same or corresponding special technical features for the following reasons: the special technical feature of the Group I invention: a gas leakage detection sensor unit; a first transmitter configured to transmit a signal when the gas leakage detection sensor unit detects liquid or gas; a power supply electrically coupled to the gas leakage detection sensor unit and the first transmitter; and a gas shut-off unit including a second transmitter, wherein the gas shut-off unit is adapted to be mounted on a gas control valve with no direct contact to fluid or gas disposed therein, wherein the second transmitter is configured to receive the signal from the first transmitter, and wherein the gas shut-off unit is configured to urge the gas control valve to a closed position in response to the signal as claimed therein is not present in the invention of Group II. The special technical feature of the Group II invention: a housing; a motor positioned in the housing; a substantially cylindrical opening in the housing for receiving a gas control valve therein, wherein the substantially cylindrical opening defines a cylinder axis; a first gear positioned in the housing with a rotational axis substantially parallel to the cylinder axis; and a second gear coupled to the motor and engaging the first gear, wherein rotation of the second gear rotates the gas control valve about the cylinder axis as claimed therein is not present in the invention of Group I.

Groups I and II lack unity of invention because even though the inventions of these groups require the technical feature of linking feature of a gas shut-off unit and a gas control valve, this technical feature is not a special technical feature as it does not make a contribution over the prior art.

Specifically, US 5,379,794 to Brown teaches a gas shut-off unit and a gas control valve (col. 2, lines 28-35).

Since none of the special technical features of the Group I or II inventions are found in more than one of the inventions, unity of invention is lacking.