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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, DJ, DK, DM, DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID, IL, IN, IR, IS, JO, JP, KE, KG, KH, KN, KP, KR, KW, 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.
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(54) Title: HIGH FREQUENCY AC-POWERED DRAIN CLEANING AND INSPECTION APPARATUS & METHODS

(57) Abstract: A device for cleaning sewer pipes comprising a cable (120,540,630,700), a cable feed device (910,1250) a drum reel (140,520,620,1240) for storage of the cable and a cleaning apparatus (110,310,660). The cleaning apparatus includes cleaning implements (214,570,666,1104) such as blades or filaments for cutting through an obstruction in a sewer pipe (130) which cleaning implements are rotated by a motor (560, 664) in the cleaning apparatus. The cleaning apparatus further comprises a camera (650) and electronics to transmit data to the cable feed device. The cable feed device is powered by a second motor and responds to the data delivered by the cleaning apparatus by adjusting speed or pressure. The cleaning apparatus may further comprise a system with inertial sensors (1216) for determining the position of the apparatus.

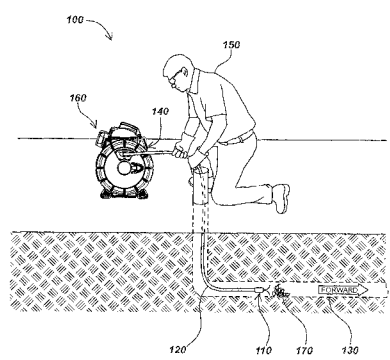


FIG. 1



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))*

(88) Date of publication of the international search report:

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INTERNATIONAL SEARCH REPORT

International application No
PCT/US2017/045750

A. CLASSIFICATION OF SUBJECT MATTER
INV. E03F9/00 H01B1/02
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)
E03F F28G H01B

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

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 2016/173829 A1 (OLSSON MARK S [US] ET AL) 16 June 2016 (2016-06-16) cited in the application	1-8, 10-19
Y	paragraph [0036] - paragraph [0067]; figures 1,4	2-6,8,9
Y	----- US 2005/275725 A1 (OLSSON MARK S [US] ET AL) 15 December 2005 (2005-12-15) the whole document	2-6
Y	----- US 5 199 129 A (SALECKER ROY [US] ET AL) 6 April 1993 (1993-04-06) the whole document	8,9

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 17 November 2017	Date of mailing of the international search report 19/03/2018
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Name and mailing address of the ISA/ European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Fax: (+31-70) 340-3016	Authorized officer Horst, Werner
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INTERNATIONAL SEARCH REPORT

International application No.
PCT/US2017/045750

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 additional sheet

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.:

1-19

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

This International Searching Authority found multiple (groups of) inventions in this international application, as follows:

1. claims: 1-19

a drain cleaning system and a cable for this system

1.1. claims: 1-13

a drain cleaning system having an electrically powered cleaning apparatus and a cable

1.2. claims: 14-19

a cable having certain features

2. claims: 20-46

an automatic cable feed device for feeding a cable into a pipe

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

PCT/US2017/045750

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 2016173829 A1	16-06-2016	EP 3234693 A1	25-10-2017
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		US 2014168406 A1	19-06-2014
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US 5199129 A	06-04-1993	NONE	
