



Europäisches Patentamt
 European Patent Office
 Office européen des brevets



(11) **EP 0 943 584 A1**

(12) **EUROPEAN PATENT APPLICATION**

(43) Date of publication:
22.09.1999 Bulletin 1999/38

(51) Int Cl.⁶: **B67D 5/14, B67D 5/33,
 E05B 73/00**

(21) Application number: **99200539.7**

(22) Date of filing: **24.02.1999**

(84) Designated Contracting States:
**AT BE CH CY DE DK ES FI FR GB GR IE IT LI LU
 MC NL PT SE**
 Designated Extension States:
AL LT LV MK RO SI

(72) Inventors:
 • **Haimovich, Yosef
 Rishon le Zion 75258 (IL)**
 • **Armoni, Yehuda
 Reut 71908 (IL)**

(30) Priority: **17.03.1998 IL 12370898**

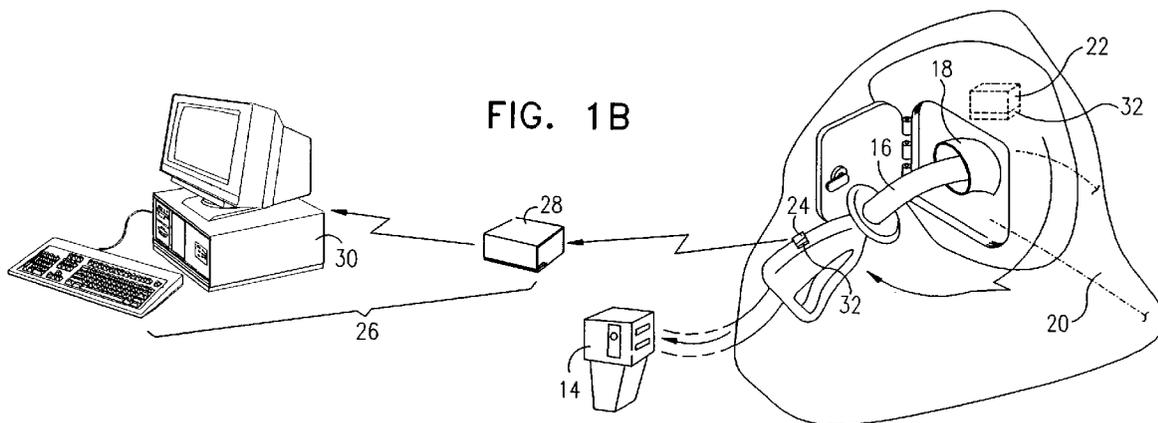
(74) Representative: **Ungria Lopez, Javier et al
 Avda. Ramon y Cajal, 78
 28043 Madrid (ES)**

(71) Applicant: **Hi-G-Tek Ltd
 Or Yehuda 60375 (IL)**

(54) **Fueling system**

(57) A fueling system (10) including a fuel supply subsystem (14) including at least one fueling nozzle (16), and a recipient identifier (22) associated with a fill location (18) of a recipient fuel store (20), characterized by a fueling communicator (24) associated with the at least one fueling nozzle (16) and communicating in a

wireless manner with the recipient identifier (22), at least in order to obtain recipient identification information therefrom, and an authorization and monitoring assembly (26) operative to communicate in a wireless manner with the fueling communicator (24) for receiving at least recipient identification information therefrom.



EP 0 943 584 A1

Description

FIELD OF THE INVENTION

[0001] The present invention relates generally to fuel management systems for use with motor vehicles and particularly to a wireless system for authorization and monitoring of fuel delivery.

BACKGROUND OF THE INVENTION

[0002] Fuel management systems which monitor fuel usage by vehicles and record the identity and other particulars of vehicles being fueled are known. Patents showing fuel management systems include the following U.S. Patents: 5,156,198; 4,934,419; 4,846,233; 4,469,149; 4,263,945; 4,109,686 and 3,642,036. In addition, PCT published patent application WO 95/14612 describes a vehicle mounted fueling system identification unit which employs an inductive communication loop arranged to surround a fuel intake pathway of a vehicle. Circuitry is provided which transmits, via the loop, various parameters, such as vehicle identification number, credit information, and required fuel particulars.

[0003] A drawback to prior art systems is that they require wired connections to transmit the fuel/vehicle parameters.

SUMMARY OF THE INVENTION

[0004] The present invention seeks to provide a wireless system for authorization and monitoring of fuel delivery.

[0005] There is thus provided in accordance with a preferred embodiment of the present invention a fueling system including a fuel supply subsystem including at least one fueling nozzle, a recipient identifier associated with a fill location of a recipient fuel store, a fueling communicator associated with the fueling nozzle and communicating in a wireless manner with the recipient identifier, at least in order to obtain recipient identification information therefrom, and an authorization and monitoring assembly operative to communicate in a wireless manner with the fueling communicator for receiving at least recipient identification information therefrom.

[0006] In accordance with a preferred embodiment of the present invention the authorization and monitoring assembly is also operative to communicate in a wireless manner with the fuel supply subsystem to authorize supply of fuel to the recipient.

[0007] Further in accordance with a preferred embodiment of the present invention the fueling communicator communicates with at least one of the authorization and monitoring assembly and the recipient identifier in an encrypted manner.

[0008] Still further in accordance with a preferred embodiment of the present invention the fueling communicator communicates with at least one of the authoriza-

tion and monitoring assembly and the recipient identifier in a manner requiring authentication by at least one of the authorization and monitoring assembly and the recipient identifier.

[0009] In accordance with a preferred embodiment of the present invention the fueling communicator is mounted onto the nozzle at least partially by means of an anti-theft tag including a monitored attachment mechanism which attaches the tag to the nozzle and which provides an output indication of tampering with the attachment mechanism.

[0010] Additionally in accordance with a preferred embodiment of the present invention the recipient identifier is mounted at the fill location of the recipient fuel store at least partially by means of an anti-theft tag including a monitored attachment mechanism which attaches the tag to the fill location of the fuel store and which provides an output indication of tampering with the attachment mechanism.

BRIEF DESCRIPTION OF THE DRAWINGS

[0011] The present invention will be understood and appreciated more fully from the following detailed description, taken in conjunction with the drawings in which:

Fig. 1A is a simplified illustration of a fueling system constructed and operative in accordance with a preferred embodiment of the present invention embodied in a filling station;

Fig. 1B is a more detailed illustration of components of the fueling system of Fig. 1A;

Fig. 2 is a simplified sectional illustration of an anti-theft tag used to mount certain components of the fueling system of Fig. 1 in accordance with a preferred embodiment of the present invention; and

Fig. 3 is a simplified illustration of a fueling system constructed and operative in accordance with a preferred embodiment of the present invention embodied in mobile fueling system.

DETAILED DESCRIPTION OF A PREFERRED EMBODIMENT

[0012] Reference is now made to Figs. 1A and 1B which illustrate a fueling system 10 constructed and operative in accordance with a preferred embodiment of the present invention embodied in a filling station 12.

[0013] Fueling system 10 includes a fuel supply subsystem 14 which includes one or more fueling nozzles 16. In Fig. 1B, one of the fueling nozzles 16 is being used to supply fuel to a fuel intake pipe 18 of a fuel tank 20 of a vehicle 21, herein referred to as a fill location 18 of a recipient fuel store 20. A recipient identifier 22 is provided in association with fill location 18. Recipient identifier 22 is preferably mounted inside vehicle 21 in propinquity to fill location 18. Recipient identifier 22 pref-

erably comprises a transceiver for wirelessly communicating recipient identification information to a fueling communicator 24 which is preferably mounted on fueling nozzle 16. Typical recipient identification information may include vehicle license plate number, charge account number and credit status, for example.

[0014] Fueling communicator 24 preferably comprises a transceiver for wirelessly communicating data, such as the recipient identification information, to an authorization and monitoring assembly 26. Assembly 26 preferably includes a transceiver 28 which communicates with a CPU 30 which controls and manages operation of filling station 12.

[0015] A typical example of operation of fueling system 10 is as follows. Nozzle 16 is initially inserted in fill location 18. Recipient identifier 22 is activated, such as by the insertion of nozzle 16 or by some other mechanism, to wirelessly transmit the recipient identification information to fueling communicator 24. Fueling communicator 24 relays this information to assembly 26. Upon verification of the information by CPU 30, transceiver 28 of assembly 26 preferably wirelessly communicates with fuel supply subsystem 12 to authorize supply of fuel to vehicle 21.

[0016] In accordance with a preferred embodiment of the present invention, in order to increase communication security, fueling communicator 24 communicates with assembly 26 and/or recipient identifier 22 in an encrypted manner. For example, well known encryption algorithms, such as RC-5, DES or DVB, may be employed. To provide an even greater level of trust, mutual zero-knowledge interaction authentication sessions between fueling communicator 24, assembly 26 and/or recipient identifier 22 may be held, such as the so-called Fiat-Shamir authentication methods taught in US Patent 4,748,668 to Shamir and Fiat, the disclosure of which is incorporated herein by reference.

[0017] As one example, fueling communicator 24 may communicate with assembly 26 in a manner requiring authentication by recipient identifier 22. Additionally or alternatively, fueling communicator 24 may communicate with assembly 26 only upon authorization from assembly 26 itself. Similarly, fueling communicator 24 may communicate with recipient identifier 22 in a manner requiring authentication by assembly 26. Additionally or alternatively, fueling communicator 24 may communicate with recipient identifier 22 only upon authorization from recipient identifier 22 itself.

[0018] In accordance with a preferred embodiment of the present invention fueling communicator 24 is mounted onto nozzle 16 at least partially by means of an anti-theft tag 32 including a monitored attachment mechanism 34 which attaches tag 32 to nozzle 16 and which provides an output indication of tampering with attachment mechanism 34.

[0019] Reference is now made to Fig. 2 which illustrates tag 32. Tag 32 is preferably a tag of the type described in applicant/assignee's US Patent Application

08/815,389, the disclosure of which is incorporated herein by reference. Tag 32 preferably includes electronics (not shown) comprising a battery, a receiver antenna, receiver circuitry, a transmitter antenna, transmitter circuitry, a microprocessor, a timer, a logic and memory component, an analog-to-digital (A/D) converter and a current source, for example. The electronics of tag 32 is not limited to the abovementioned components, and may include more or less components, depending upon the application.

[0020] The electronics of tag 32 are in electrical communication with an electrically resistive element 34, such as via I/O pads 36. Resistive element 34 is preferably bonded to an nozzle 16 with an adhesive 42 so as to define an electrical resistance. Any change in bonding of element 34 to nozzle 16 causes a change in the electrical resistance. Adhesive 42 may be a double sided adhesive tape or adhesive foam.

[0021] Resistive element 34 may be constructed in a variety of manners, as taught in US Patent Application 08/815,389. For example, resistive element 34 may be printed in any suitable pattern to provide a desired resistance value which may be adjusted after curing by laser trimming, abrasion or mechanical punching, for example. Resistive element 34 is preferably attached to tag 32 by means of a conductive adhesive 50, such as a metal impregnated adhesive. Preferably the adhesive strength of adhesive 42 is greater than the adhesive strength of conductive adhesive 50, so that removal of tag 32 from nozzle 16 causes shearing or other deformation of conductive adhesive 50, and alters the resistance of resistive element 34. Alteration of the resistance of element 34 may then alert fueling system 10 of tampering with the system.

[0022] Similarly, recipient identifier 22 may be mounted at fill location 18 by means of anti-theft tag 32.

[0023] Reference is now made to Fig. 3 which illustrates a fueling system 60 constructed and operative in accordance with a preferred embodiment of the present invention embodied in mobile fueling system. Fueling system 60 is substantially identical with fueling system 10, except that in fueling system 60, the fill location is a fuel intake pipe 62 and the recipient fuel store is a fuel tank 64 of a domicile. Fueling communicator 24 is mounted in a cabin or on top of a fuel delivery truck.

[0024] It will be appreciated by persons skilled in the art that the present invention is not limited by what has been particularly shown and described hereinabove. Rather the scope of the present invention includes both combinations and subcombinations of the features described hereinabove as well as modifications and variations thereof which would occur to a person of skill in the art upon reading the foregoing description and which are not in the prior art.

Claims

vides an output indication of tampering with said attachment mechanism (34).

1. A fueling system (10) comprising:
 - a fuel supply subsystem (14) including at least one fueling nozzle (16); and
 - a recipient identifier (22) associated with a fill location (18) of a recipient fuel store (20); characterized by a fueling communicator (24) associated with said at least one fueling nozzle (16) and communicating in a wireless manner with said recipient identifier (22), at least in order to obtain recipient identification information therefrom; and
 - an authorization and monitoring assembly (26) operative to communicate in a wireless manner with said fueling communicator (24) for receiving at least recipient identification information therefrom.

2. The fueling system (10) according to claim 1 further characterized in that said authorization and monitoring assembly (26) is also operative to communicate in a wireless manner with said fuel supply subsystem (14) to authorize supply of fuel to said fill location (18).

3. The fueling system (10) according to claim 1 further characterized in that said fueling communicator (24) communicates with at least one of said authorization and monitoring assembly (26) and said recipient identifier (22) in an encrypted manner.

4. The fueling system (10) according to claim 1 further characterized in that said fueling communicator (24) communicates with at least one of said authorization and monitoring assembly (26) and said recipient identifier (22) in a manner requiring authentication by at least one of said authorization and monitoring assembly (26) and said recipient identifier (22).

5. The fueling system (10) according to claim 1 further characterized in that said fueling communicator (24) is mounted onto said at least one nozzle (16) at least partially by means of an anti-theft tag (32) including a monitored attachment mechanism (34) which attaches the tag (32) to said at least one nozzle (16) and which provides an output indication of tampering with said attachment mechanism (34).

6. The fueling system (10) according to claim 1 further characterized in that said recipient identifier (22) is mounted at said fill location (18) of said recipient fuel store (20) at least partially by means of an anti-theft tag (32) including a monitored attachment mechanism (34) which attaches the tag (32) to said fill location (18) of said fuel store (20) and which pro-

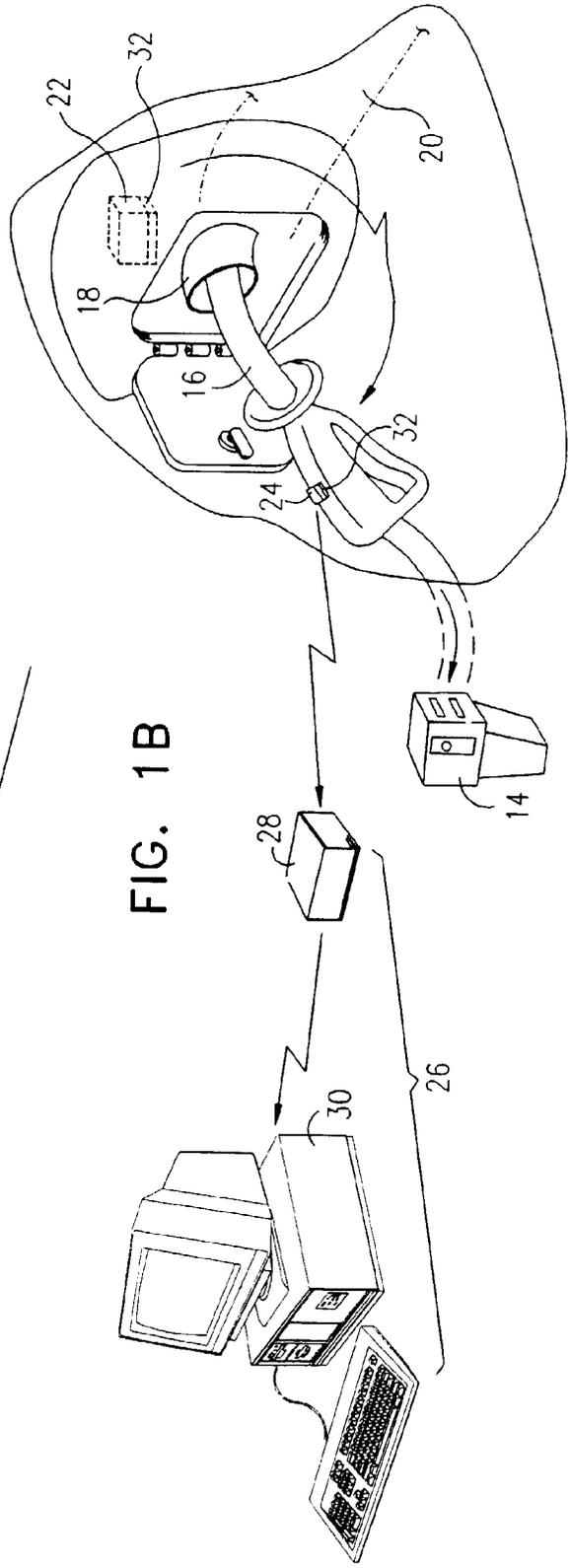
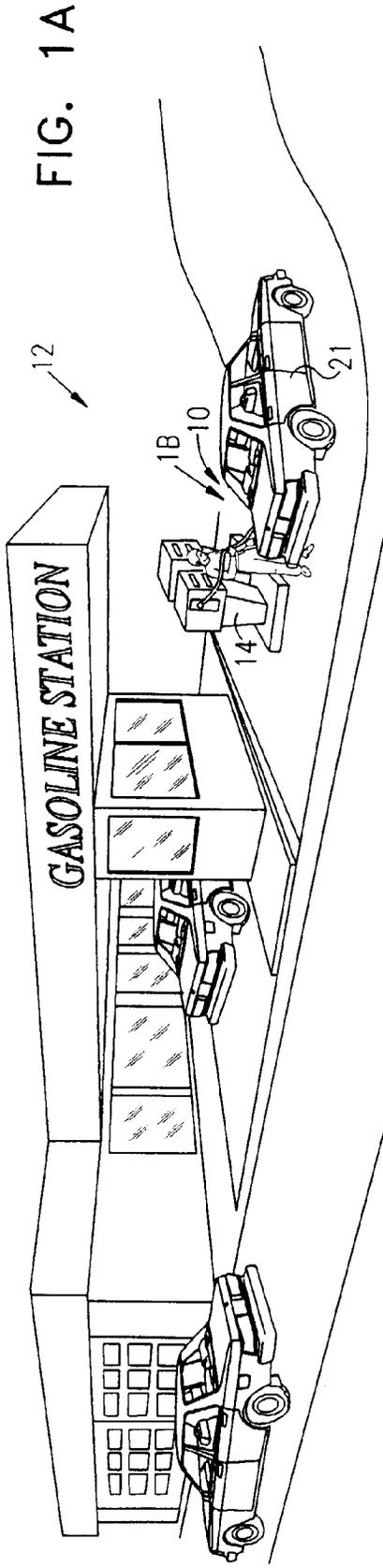


FIG. 2

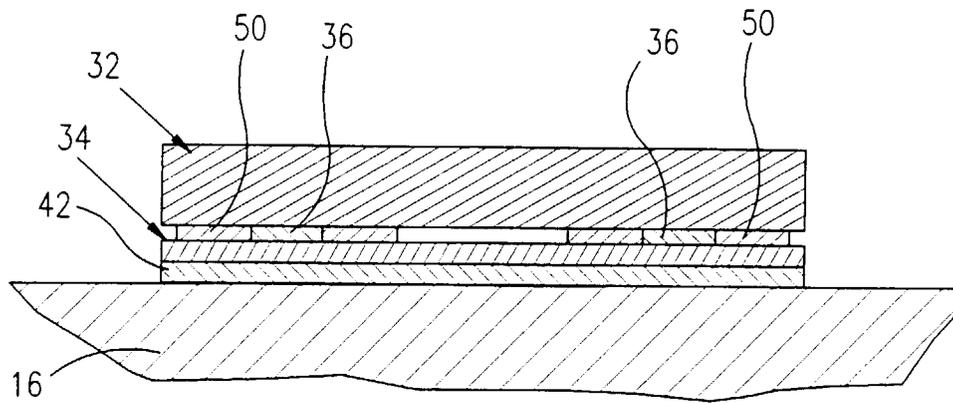
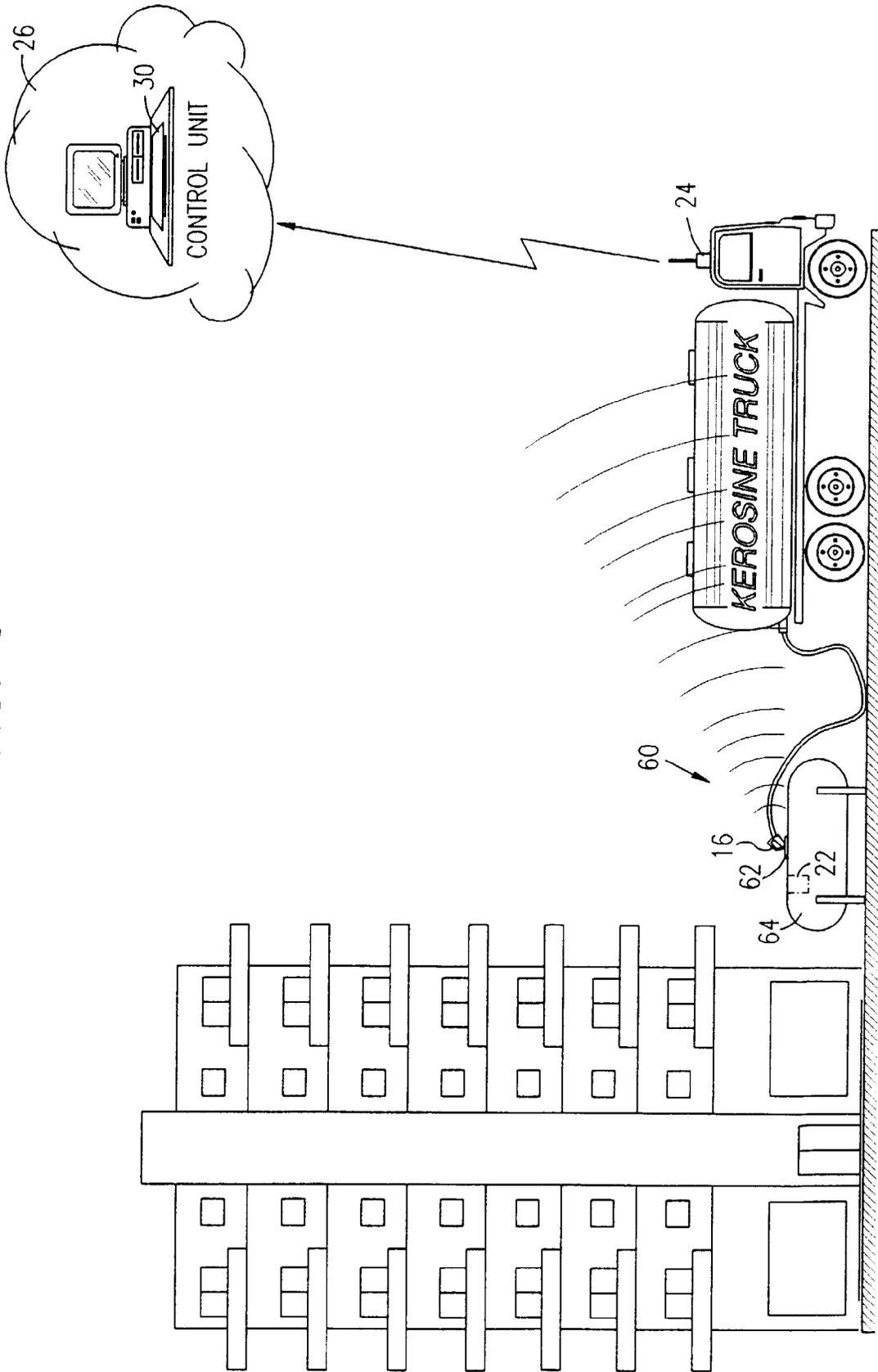


FIG. 3





European Patent
Office

EUROPEAN SEARCH REPORT

Application Number
EP 99 20 0539

| DOCUMENTS CONSIDERED TO BE RELEVANT | | | |
|--|---|---|--|
| Category | Citation of document with indication, where appropriate, of relevant passages | Relevant to claim | CLASSIFICATION OF THE APPLICATION (Int.Cl.6) |
| X | EP 0 736 484 A (RYAN MICHAEL C) 9 October 1996 | 1,2,4 | B67D5/14 B67D5/33 E05B73/00 |
| Y | * column 10, line 21 - line 50 * * column 14, line 52 - column 15, line 4; figures 1,2 * | 3 | |
| Y | --- US 5 448 638 A (JOHNSON WILLIAM S ET AL) 5 September 1995 * abstract * | 3 | |
| X | --- WO 97 35284 A (SHELL INT RESEARCH) 25 September 1997 * page 5, line 22 - page 6, line 1; figure 2 * | 1,2 | |
| A | --- DE 38 17 428 A (HUBER UWE) 23 November 1989 * abstract * | 1,5,6 | |
| A | --- US 5 646 592 A (TUTTLE JOHN R) 8 July 1997 * abstract * | 1,5,6 | |
| A | --- EP 0 822 160 A (LOGITRON SRL) 4 February 1998 | | |
| The present search report has been drawn up for all claims | | | |
| Place of search THE HAGUE | | Date of completion of the search 2 June 1999 | Examiner Martínez Navarro, A. |
| CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document | | T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document | |

EPO FORM 1503 03.92 (P04C01)

ANNEX TO THE EUROPEAN SEARCH REPORT
ON EUROPEAN PATENT APPLICATION NO.

EP 99 20 0539

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
The European Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

02-06-1999

| Patent document cited in search report | Publication date | Patent family member(s) | Publication date |
|--|------------------|---|--|
| EP 0736484 A | 09-10-1996 | NONE | |
| US 5448638 A | 05-09-1995 | US 5384850 A US 5228084 A | 24-01-1995 13-07-1995 |
| WO 9735284 A | 25-09-1997 | AU 2159397 A CA 2248343 A CZ 9803005 A EP 0888593 A NO 984359 A | 10-10-1997 25-09-1997 13-01-1999 07-01-1999 17-11-1998 |
| DE 3817428 A | 23-11-1989 | NONE | |
| US 5646592 A | 08-07-1997 | US 5406263 A US 5831531 A | 11-04-1995 03-11-1995 |
| EP 0822160 A | 04-02-1998 | IT F1960182 A | 29-01-1998 |