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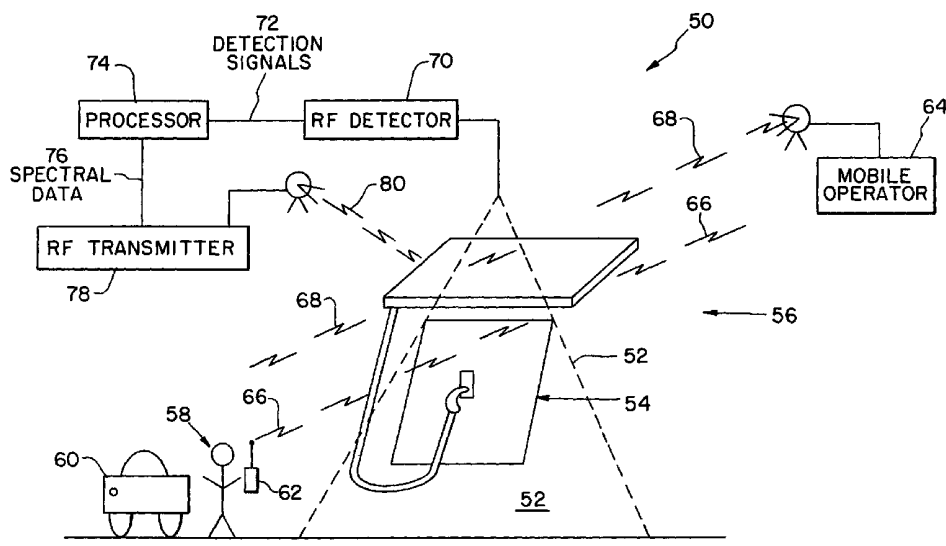
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(54) Title: A SYSTEM TO DENY CELLULAR SERVICE AT REFUELING STATIONS



(57) Abstract: A system for monitoring RF transmissions (66) at a refueling service station (56) includes a first jamming transmitter 78 arranged to generate RF interference signals (80) which act to inhibit wireless transmissions by a customer cellular phone (62) from reception by a mobile operator. The system further includes a second jamming transmitter arranged to generate RF interference signals which act to inhibit wireless transmissions by the mobile operator from reception by the customer cellular phone. The wireless transmissions subject to jamming are preferably defined in relation to a predetermined operating zone (52) encompassing the fuel dispenser (54). Outbound RF transmissions originating within the zone from the customer cellular phone are jammed, while inbound RF transmissions originating from the mobile operator and propagating into the zone are likewise jammed.



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A SYSTEM TO DENY CELLULAR SERVICE AT REFUELING STATIONSBACKGROUND OF THE INVENTION

## 1. Field of the invention.

The present invention relates to a method and apparatus for monitoring RF transmissions at a refueling service station, and, more particularly, to a system for performing a jamming operation that inhibits transmissions originating from a customer wireless device from reception by a mobile operator and/or inhibits transmissions originating from the mobile operator from reception by the wireless device, thereby effectuating a denial of cellular service.

## 2. Description of the related art.

The emergence of wireless technology as a principal means of providing telecommunications relative to the more traditional wireline systems has enabled customers to experience a near continuous access to resources (both wireless and wireline) without any concern for location. Unlike the public switched telephone network (PSTN), which requires customers to gain access through fixed communications equipment (i.e., stationary handsets), wireless service providers have developed virtually seamless nationwide coverage areas that allow a mobile user to establish communications at virtually any location covered by the service provider.

However, the development of cellular communications has also been met by an increased effort to examine the potential impact of RF signal transmissions on user-interactive commercial electronic equipment, which typically remain unshielded from the effects of ambient electromagnetic interference (EMI) of the type generated by wireless devices. It is well known that sufficient levels of EMI can disrupt and interfere with the proper operating conditions of electronic components. This lack of EMI protection takes on added importance when cellular transmissions propagate through hazardous areas such as refueling service stations where residual or scavenger fuel vapors reside.

Refueling equipment is typically, but not always, provided with vapor recovery systems that use a vacuum-assisted transport mechanism to collect vapors that may be discharged during refueling. If the apparatus used to implement this vapor recovery operation is not suitably shielded or otherwise protected from RF signal penetration, RF energy may have access to the fuel vapors. Even if sufficient shielding measures are adopted, the possibility always exists that any unrecovered vapors may stray into the atmosphere where contact with RF transmission devices may occur.

#### SUMMARY OF THE INVENTION

According to the present invention there is provided a method and apparatus for use at a refueling service station that denies or otherwise renders cellular service unavailable

to refueling customers seeking to establish a connection with a mobile station operator.

In one arrangement, the invention is designed to interrupt or otherwise interfere with outbound radio frequency (RF) signals transmitted by a wireless device in use by a customer. These signals, conventionally intended for reception by a mobile operator, are suppressed at a predetermined radial distance from a reference point, such as the fuel dispensing equipment. The suppression activity preferably takes place as the customer is attempting to establish a wireless communications link with the mobile operator. By jamming RF transmissions in this manner, there is effectively created a substantially signal-free operating zone that preferably encompasses the fuel dispenser.

In another arrangement, the invention is designed to interrupt or otherwise interfere with inbound RF signals transmitted by a mobile operator and intended for reception by the customer cellular phone. This arrangement is used to jam base station transmissions that represent, for example, attempts by a third party to place a call with the customer or a response by the base station to a request by the customer to establish a wireless communications link. This arrangement may be used alone or in combination with the outbound RF jamming apparatus.

The jamming equipment utilized for suppressing either the inbound RF transmissions (i.e., generated by a mobile

operator) or the outbound RF transmissions (i.e., generated by a customer wireless device) preferably includes conventional RF detectors to detect the transmissions and RF transmitters to generate the signals necessary to jam the detected transmissions. A processor or other suitable means is provided to determine the necessary parameters of the jamming transmissions, such as signal strength and frequency. The processor would operate in conjunction with the RF detectors to analyze the detected transmissions and identify the relevant signal characteristics useful in determining the properties of the jamming signals and then controlling the RF transmitters in accordance therewith.

The jamming operation has the effect of denying or otherwise making cellular service unavailable between the customer wireless device and a mobile operator. The inability to establish a link with the mobile operator will therefore serve to inform the customer that at the present location cellular calls cannot be transmitted or received.

As used herein, the process of jamming a signal relates to any suitable activity aimed at inhibiting, suppressing, regulating, or otherwise interfering with an existing transmission. As applied to one form of the present invention, the jamming operation can be considered as actively interfering with a transmission between at least two wireless assemblies (e.g., a customer cellular phone and mobile operator) in a manner that effectively denies cellular

communication or service therebetween. Additionally, it should be understood that a wide range and/or degree of jamming is possible within the scope of the present invention.

For example, the RF transmitters that accomplish the jamming action can be suitably controlled to reduce the signal strength of the target transmission to a level insufficient to support or otherwise accommodate a wireless link, although still being capable of detection by the receiving apparatus (i.e., customer cellular phone or mobile operator).

Alternatively, the jamming signals can be generated in a manner enabling the target transmissions to become effectively nulled, thereby leaving none or substantially no trace of the original transmission.

Additionally, the jamming operation can act to interfere with the original transmission in a manner that makes or otherwise renders the information-bearing portion unintelligible or otherwise incapable of meaningful reception. This type of interference, for example, could introduce a scrambling pattern or sequence into the message portion which, upon demodulation and decoding, would prevent the original message from being retrieved, reproduced, or otherwise recovered, thereby signifying that cellular service is unavailable.

In broad terms, the jamming apparatus employed by the present invention attempts to regulate at least one characteristic of an existing RF transmission, such as signal

strength. The effect of this regulation can range from total or substantially total suppression of the transmission to a suppression activity that (i) inhibits customer cellular phone transmissions from reception by a mobile operator and/or (ii) inhibits mobile operator transmissions from reception by the customer cellular phone. In one form, this inhibiting action reduces the signal strength of the original transmission to a level insufficient to support a wireless link, thereby rendering the communication unrecoverable and preventing the wireless communication from being completed.

As used herein, an operating zone relates to a predetermined spatial area that represents a boundary for use in determining the allowable extent of propagation of various wireless transmissions vis-à-vis the jamming operation. In one form, the present invention detects the presence of RF transmissions within the operating zone and directs the RF jamming transmitters to emit signals for use in jamming the detected wireless transmissions. These detected transmissions, for example, may correspond to outbound signals generated by a customer wireless device that are intended for reception by a mobile operator. Other RF signals emanating from or originating within the operating zone may also be the subject of jamming by the present invention.

In another form, the present invention detects the presence of RF transmissions outside the operating zone which are evidently propagating into the operating zone. These

transmissions, for example, may correspond to inbound signals generated by a mobile operator that are intended for reception by the customer wireless device.

In a preferred form, the respective operating zones for use in conducting the jamming operation relative to the inbound and outbound wireless transmissions are preferably coextensive and coincident with one another. However, in one alternative form, the inbound zone (which is directed at jamming mobile operator transmissions) may be larger than and encompass the outbound zone (which is directed at jamming customer cellular phone transmissions). In this configuration, the outbound zone may be defined at a peripheral boundary of the refueling station such that all incoming transmissions are the target of jamming by the present invention, regardless of their destination (i.e., the jammer operates indiscriminately with respect to which customer cellular phone is intended for reception).

The outbound zone would preferably encompass at least the fuel dispenser assembly and possibly the expected situs of the vehicle fill tank. In particular, each dispenser site would preferably be associated with a respective dedicated operating zone having an associated jamming apparatus, such that the outbound jamming operation can focus only on the transmissions generated by a single customer or other occupants of the relevant zone.

The general purpose and aim of the operating zones are to define an area at the refueling service station where the jamming apparatus of the present invention attempts either to eliminate the continued propagation of existing RF transmissions past the operating zone (i.e., outbound communications) or prevent existing RF transmissions from propagating into the operating zone (i.e., inbound communications). As described above, the jamming operation is tailored both towards regulating RF transmissions generated by a customer cellular phone and by a mobile operator.

It is a principal object of the jamming operation, and hence a factor in selecting the configuration of the operating zones, to provide a mechanism by which fuel-related equipment and other such machinery or arrangements are shielded from exposure to RF transmissions. Examples of such equipment include the fuel pump, vapor recovery system, fuel storage canisters, fuel piping, and fuel conveying apparatus (e.g., fuel dispensing hose and nozzle assembly). At the vehicle side, the operating zone will preferably encompass the vehicle fill tank. It is also advisable to tailor the operating zone so as to protect certain electrical circuits from EMI, such as the dispenser control circuitry.

It should be apparent that any form or configuration of operating zone shown herein is for illustrative purposes only and should not be considered in limitation of the present invention, as it is possible to develop various other types

and forms of operating zones. The shape and extent of the relevant zone are preferably formulated and otherwise defined in relation to the pattern or coverage area of the jamming operation.

5           In particular, the RF transmitters may be configured and otherwise arranged to enable the development of any operating zone of suitably selected shape. Additionally, the extent and contour of the operating zone may be dynamically variable by making the appropriate changes to the jamming apparatus (e.g.,  
10           increasing the detection and transmission range) or otherwise controlling the jamming apparatus in a manner known to those skilled in the art.

          As used herein, the term "inbound transmissions" and equivalents thereof relate to signals propagating or  
15           attempting to propagate into the service station environment. Inbound transmissions, for example, preferably include signals generated by a mobile operator or other such signals originating apart from the service station that are intended for reception by a customer cellular phone.

20           As used herein, the term "outbound transmissions" and equivalents thereof relate to signals generated or otherwise originating within the service station environment. Outbound transmissions, for example, preferably include signals  
25           generated by a customer or vehicle wireless device that are intended for reception by a mobile operator or other suitable party, for example.

As used herein, a mobile operator relates to any system, method, process, or apparatus capable of rendering or otherwise providing wireless communications services, functionality, or capability. A mobile operator may be variously understood as relating to or representing a base station, cellular equipment, cellular terminal, cellular service facility, or other such wireless communications assembly. As conventionally understood, a mobile operator may include features such as fixed transceiver terminals, antennas, and wireline arrangements.

The invention, in one form thereof, is directed to a system for use with a refueling station having a fuel dispenser assembly. The system includes, in combination, a jamming assembly operatively arranged to jam wireless transmissions having a predetermined spatial relationship to the fuel dispenser assembly, and a controller to control the operation of the jamming assembly. The predetermined spatial relationship is preferably defined by a zone encompassing the fuel dispenser assembly.

The wireless transmissions subject to jamming by the jamming assembly comprise wireless transmissions originating inside the zone from a wireless device associated with a customer of the fuel dispenser assembly, and/or wireless transmissions originating outside the zone from a mobile operator. In particular, the jamming operation acts to inhibit wireless transmissions by the customer cellular phone

from reception by the mobile operator, and/or to inhibit wireless transmissions by the mobile operator from reception by the cellular phone.

The jamming assembly, in one form thereof, includes an RF signal detection assembly and an RF signal transmission assembly.

The invention, in another form thereof, is directed to a system for use with a refueling station having a fuel dispenser assembly. The system includes, in combination, a jamming assembly operatively arranged to jam wireless transmissions between a wireless device disposed within a defined zone and a mobile operator, and a controller to control the operation of the jamming assembly. The wireless device is preferably associated with a customer of the fuel dispenser assembly, while the defined zone preferably encompasses the fuel dispenser assembly.

The jamming operation of the jamming assembly acts to inhibit wireless transmissions by the wireless device from reception by the mobile operator, and/or to inhibit wireless transmissions by the mobile operator from reception by the wireless device.

The invention, in another form thereof, is directed to a system for use with a refueling station having a fuel dispenser assembly. The system includes a jamming assembly and a controller to control the operation of the jamming assembly. The jamming assembly is operative to jam wireless

transmissions present within a defined zone and/or to jam wireless transmissions evidently propagating into the defined zone, wherein the defined zone encompasses at least a portion of the fuel dispenser assembly.

5           The jamming assembly, in one form thereof, is operatively arranged to jam wireless transmissions between a wireless device disposed within the defined zone and a mobile operator.

10           The jamming assembly, in another form thereof, acts to inhibit wireless transmissions originating within the defined zone from reception by a mobile operator, and/or to inhibit wireless transmissions originating outside the defined zone from reception by a wireless device disposed within the defined zone.

15           The invention, in another form thereof, is directed to a system for use with a refueling station having a fuel dispenser assembly. The system comprises, in combination, a jamming assembly operatively arranged to jam wireless transmissions between a first wireless assembly associated with a customer of the fuel dispenser assembly and a second wireless assembly, and a controller to control the operation of the jamming assembly.

20           The jamming operation of the jamming assembly acts to inhibit wireless transmissions by the first wireless assembly from reception by the second wireless assembly, and/or to inhibit wireless transmissions by the second wireless assembly

25

from reception by the first wireless assembly. The second wireless assembly is preferably a mobile operator.

The invention, in yet another form thereof, is directed to a system for use with a refueling station having a fuel dispenser assembly. The system includes a first means which is arranged to inhibit wireless transmissions by a wireless device associated with a customer from reception by a mobile operator, and/or to inhibit wireless transmissions by the mobile operator from reception by the wireless device. A controller is arranged to control the operation of the first means.

The inhibiting action of the first means relative to the wireless device is carried out with respect to wireless transmissions originating within a defined first zone, while the inhibiting action of the first means relative to the mobile operator is carried out with respect to wireless transmissions originating outside a defined second zone. In one form, the defined first zone is substantially equal to the defined second zone. In an alternate form, the defined second zone is larger than and encompasses the defined first zone.

The invention, in yet another form thereof, is directed to a system for use with a refueling station having a fuel dispenser assembly and a customer associated therewith. The system includes, in combination, a first means for inhibiting wireless transmissions by a first wireless assembly associated with the customer from reception by a second wireless

assembly; a second means for inhibiting wireless transmissions by the second wireless assembly from reception by the first wireless assembly; a first controller to control the operation of the first means; and a second controller to control the operation of the second means.

The invention, in still yet another form thereof, is directed to a system for use with a refueling station having a fuel dispenser assembly and a customer associated therewith. The system comprises, in combination, a first transmitter apparatus arranged to generate RF signal transmissions acting to inhibit wireless transmissions by a first wireless assembly associated with the customer from reception by a second wireless assembly; a second transmitter apparatus arranged to generate RF signal transmissions acting to inhibit wireless transmissions by the second wireless assembly from reception by the first wireless assembly; a first controller to control the operation of the first transmitter apparatus; and a second controller to control the operation of the second transmitter apparatus.

One advantage of the present invention is that the jamming operation reduces or substantially eliminates the risk that refueling service stations otherwise face from the possible ignition of fuel vapors due to their interaction with cellular RF transmissions.

Another advantage of the present invention is that the denial of cellular service can be accomplished in various

equivalent ways, namely, by jamming outbound signals transmitted by the customer wireless device and intended for reception by the mobile operator or, in the alternative, by jamming inbound signals transmitted by the mobile operator and intended for reception by the customer cellular phone.

A further advantage of the invention is that the jamming operation will preferably take place before a communications link is established, namely, by jamming an initial outbound transmission by the customer which attempts to establish a cellular link, and by jamming the header or leading portion of an inbound transmission forwarded by a mobile operator from a third party.

A further advantage of the invention is that the consequential effect of the jamming operation (namely, that a cellular connection cannot be established) is made demonstrably self-evident to both the customer and the mobile operator since the transmitting party will be alerted in due course to the failed connection via their respective devices; accordingly, further attempts at transmission will presumably not be undertaken in response to the failed connectivity status.

#### BRIEF DESCRIPTION OF THE DRAWINGS

The above-mentioned and other features and advantages of this invention, and the manner of attaining them, will become more apparent and the invention will be better understood by reference to the following description of an embodiment of the

invention taken in conjunction with the accompanying drawings, wherein:

Fig. 1 is a block diagram illustration of a system for jamming RF transmissions at a refueling service station, according to the present invention;

Fig. 2 is a schematic block diagram view of an RF jamming system, in accordance with one embodiment of the present invention; and

Fig. 3 is a schematic block diagram view of an RF jamming system, in accordance with another embodiment of the present invention.

Corresponding reference characters indicate corresponding parts throughout the several views. The exemplification set out herein illustrates one preferred embodiment of the invention, in one form, and such exemplification is not to be construed as limiting the scope of the invention in any manner.

#### DETAILED DESCRIPTION OF THE INVENTION

Referring now to the drawings and particularly to Fig. 1, there is shown a block diagram illustration of a system 10 for use in jamming wireless transmissions present at a refueling service station, according to the present invention. The illustrated system 10 includes an outbound jamming apparatus 12 for use in jamming outbound or outgoing RF transmissions, and an inbound jamming apparatus 14 for use in jamming inbound or incoming RF transmissions. For purposes of discussion

herein, and not in limitation thereof, the outbound RF transmissions preferably relate to wireless communications generated by a wireless device (e.g., cellular phone) in use by a customer associated with a fuel dispenser assembly (not shown), while the inbound RF transmissions preferably relate to wireless communications generated by a mobile operator or other such cellular service provider.

The illustrated outbound jamming apparatus 12 includes an outbound RF transmission detector 16, a processor 18, and an RF jamming transmitter apparatus 20. The illustrated detector 16 is provided in the form of any conventionally known or otherwise suitable detection assembly capable of detecting radio frequency transmissions or other such wireless signals propagating within a specified area. For example, detector 16 would monitor the air space within a defined operating zone, such as the spatial area encompassing the fuel dispensing equipment, and determine whether any RF signals are present within the operating zone. Based upon this monitoring activity, detector 16 generates a detection signal 20 representative of any RF transmissions present within the defined operating zone.

The illustrated processor 18 is provided in the form of a signal processor, data analyzer, or other such suitable evaluation apparatus capable of examining the detection signal 22 generated by detector 16 and determining any relevant characteristics of the detected RF transmissions necessary to

implement the jamming functionality of the present invention, namely with respect to the operation of RF jamming transmitter apparatus 20. For example, processor 18 may be conventionally provided in the form of a spectral analysis machine capable of determining the spectral characteristics of the outbound RF transmissions detected by detector 16, such as the component or constituent frequencies, bandwidth, the signal strength (i.e., amplitude) of the individual spectral components, and any modulation properties. It should be apparent that processor 18 may ascertain any of various signal characteristics known to those skilled in the art. The results of such signal analysis or processing which is performed, obtained, or otherwise determined by processor 18 is provided in the form of spectral information 24 generated by processor 18.

The illustrated transmitter apparatus 20 is provided in the form of any conventionally known transmission arrangement capable of generating RF signals in accordance with input control information. For example, transmitter apparatus 20 generates RF jamming signals 26 based upon, and in response to, spectral information 24 provided by processor 18. The generation of such RF jamming signals 26 is executed in a conventionally known manner such that jamming signals 26 will have the effect of jamming or otherwise interfering with the continued propagation of the outbound RF transmissions past

the operating zone (i.e., jamming the signals present within the defined operating zone and detected by detector 16).

This jamming activity, in particular, will prevent or otherwise inhibit the reception of such outbound RF transmissions by a wireless receiving apparatus located outside the operating zone, e.g., a mobile operator.

The illustrated inbound jamming apparatus 14 includes an inbound RF transmission detector 28, a processor 30, and an RF jamming transmitter apparatus 32 that are similar in construction and operation to detector 16, processor 18, and transmitter apparatus 20, respectively, of outbound jamming apparatus 12. The jamming operation of inbound jamming apparatus 14 is preferably aimed at wireless communications originating outside the refueling service station that are attempting to reach a wireless device of the customer.

The illustrated detector 28 detects radio frequency transmissions or other such wireless signals propagating within a specified area. Preferably, detector 28 monitors the air space outside the predetermined operating zone that is defined in relation to the outbound jamming apparatus 12, in order to determine whether any RF signals currently have a propagation path directed into the operating zone. Based upon this monitoring activity, detector 28 generates a detection signal 34 representative of any RF transmissions evidently propagating into the operating zone.

The illustrated processor 30 analyzes or otherwise processes the detection signal 34 generated by detector 28 and determines any relevant characteristics of the detected RF transmissions which are necessary to implement the jamming functionality of the present invention, namely with respect to the operation of RF jamming transmitter apparatus 32. The results of such signal processing is provided in the form of spectral information 36 generated by processor 30.

The illustrated transmitter apparatus 32 is provided in the form of any conventionally known transmission arrangement capable of generating RF signals in accordance with input control information. For example, transmitter apparatus 32 generates RF jamming signals 38 based upon, and in response to, spectral information 36 provided by processor 30. The generation of such RF jamming signals 38 is executed in a conventionally known manner such that jamming signals 38 will have the effect of jamming or otherwise interfering with the continued propagation of the inbound RF transmissions into the operating zone (i.e., jamming the wireless signals present outside the defined operating zone and detected by detector 28).

This jamming activity, in particular, will prevent or otherwise inhibit the reception of such inbound RF transmissions by a wireless receiving apparatus inside the operating zone, e.g., the customer cellular phone.

Although shown as separate configurations, it should be apparent that outbound jamming apparatus 12 and inbound jamming apparatus 14 can be provided as an integral unit having a single detector, processor, and transmitter adapted for use in jamming both inbound and outbound RF transmissions. In such an integrated arrangement, it would be preferable to include a controller to implement the respective control functions relating to the jamming of inbound RF transmissions and outbound RF transmissions.

Referring now to Fig. 2, there is shown in schematic block diagram format a system 50 for use in monitoring the RF activity present or otherwise occurring within a defined operating zone 52 encompassing an illustrative fuel dispensing assembly 54 at a refueling service station site 56 where a customer 58 has positioned a vehicle 60 for refueling, according to one embodiment of the present invention.

As shown, customer 58 is illustratively equipped with a wireless device 62 such as a cellular phone that is communicating with, or attempting to communicate with, a mobile operator 64. Such outbound transmissions are illustratively represented by RF signals 66 shown emanating from cellular phone 62 along the indicated propagation path traversing operating zone 52. Likewise, inbound transmissions from mobile operator 64 that are communicating with, or attempting to communicate with, cellular phone 62 are illustratively represented by RF signals 68 shown emanating

from mobile operator 64 along the indicated propagation path traversing operating zone 52.

The illustrated system 50 combines the functionality of inbound jamming apparatus 12 and outbound jamming apparatus 14 of Fig. 1 with respect to jamming inbound RF signals 68 and outbound RF signals 66, respectively. System 50, in particular, includes an RF detector 70 for use in detecting outbound RF transmissions 66 and inbound RF transmissions 68 present within zone 52. In one form, detector 70 can also operate to detect one or both of these signal groups before they enter zone 52. In another typical scenario, customer 58 (and hence cellular phone 62) will be located within zone 52 such that RF detector 70 detects the outbound transmissions 66 originating within zone 52.

RF detector 70 generates detection signals 72 which are representative of inbound RF signals 68 and outbound RF signals 66 present within zone 52. Processor 74 analyzes or otherwise processes detection signals 72 to generate spectral data 76 representative of spectral information concerning the detected RF transmissions (e.g., signal strength and frequency characteristics). This spectral data 76 is used by RF transmitter 78 to generate RF jamming signals 80 effective in jamming outbound RF transmissions 66 and inbound RF transmissions 68.

The jamming operation of system 50 may be arranged in various forms to jam RF transmissions actually present within

zone 52 and/or to jam RF transmissions potentially propagating into zone 52, namely by jamming the signals before they enter zone 52.

Although Fig. 2 shows system 50 as a single unit, it should be understood that separate apparatus may be provided (such as in Fig. 1) for independently directing the jamming operations involving inbound and outbound RF transmissions.

Referring now to Fig. 3, there is shown in schematic block diagram format a system 100 for use in (i) jamming inbound RF transmissions attempting to propagate into an outer operating zone 102, and (ii) jamming respective outbound RF transmissions attempting to propagate beyond each one of a plurality of inner operating zones 104 each associated with a respective fuel dispensing assembly 106, according to another embodiment of the present invention.

As shown, there is provided a plurality of individual refueling sites or terminals 56 each having a vehicle 60 positioned for refueling and accompanied by customer 58. Customer 58 has a cellular phone 62, although it should be apparent that the present invention can be applied to all situations where any type of wireless device is either disposed within zone 104 or transmitting into zone 104. Outer zone 102 is preferably configured to encompass all of the individual refueling sites at a particular service station. Each inner operating zone 104 is dedicated to a respective

refueling terminal and is preferably configured to encompass the associated fuel dispenser assembly 106.

At each respective refueling terminal 56 there is provided a dedicated outbound jamming apparatus 108 including, in combination, an RF detector 110, a processor 112, and an RF transmitter 114. The illustrated jamming apparatus 108 broadly functions to detect and jam outbound RF transmissions 66 generated by customer wireless device 62 that are present within the local operating zone 104, which preferably encompasses the associated fuel dispenser assembly 106.

In particular, the illustrated RF detector 110 detects RF transmissions present within operating zone 104 and generates a detection signal 116 representative thereof. Processor 112 analyzes detection signal 116 in a conventional manner and generates spectral data 118 that represents the information necessary to produce the appropriate interference signals, e.g., signal strength and transmitting frequencies of the detected RF spectrum. RF transmitter 114 generates RF jamming or interference signals in response to the spectral data 118 provided by processor 112 for use in jamming the detected RF transmissions present within local operating zone 104.

As shown, system 100 includes an outer zone 102 which is defined to encompass the plural refueling service station sites 56. The illustrated system 100 is provided with an inbound jamming apparatus 120 including, in combination, an inbound RF detector 122, processor 124, and an RF transmitter

126. The inbound jamming apparatus 120 broadly functions to detect and jam inbound RF transmissions (illustrated generally at 128) that originate from a mobile operator or other cellular service provider, for example.

5           The illustrated RF detector 122 detects incoming RF transmissions 128 evidently propagating into outer zone 102 and generates a detection signal 130 representative thereof. Processor 124 analyzes detection signal 130 in a conventional manner and generates spectral data 132 that represents the  
10           information necessary to produce the appropriate interference signals, e.g., signal strength and transmitting frequencies of the detected RF spectrum. RF transmitter 126 generates RF jamming or interference signals in response to the spectral data 132 provided by processor 124 for use in jamming the  
15           detected incoming RF transmissions 128 propagating into zone 102.

          The usefulness of having the illustrated outer zone 102 which encompasses the entire refueling station is that a single jamming apparatus 120 can be employed to cause jamming  
20           interference with respect to the entire spectrum of incoming RF transmissions 128, while localized outbound RF transmissions such as wireless communications 66 generated by customer cellular phone 62 can be handled individually by dedicated outbound jamming apparatus 108.

25           While this invention has been described as having a preferred design, the present invention can be further

modified within the spirit and scope of this disclosure. This application is therefore intended to cover any variations, uses, or adaptations of the invention using its general principles. Further, this application is intended to cover  
5 such departures from the present disclosure as come within known or customary practice in the art to which this invention pertains and which fall within the limits of the appended claims.

WHAT IS CLAIMED IS:

1. A system for use with a refueling station having a fuel dispenser assembly, said system comprising:

a jamming assembly operatively arranged to jam wireless  
5 transmissions having a predetermined spatial relationship to said fuel dispenser assembly; and

a controller to control the operation of said jamming assembly.

2. The system as recited in Claim 1, wherein the predetermined spatial relationship being defined by at least one zone encompassing at least a portion of said fuel dispenser assembly.

3. The system as recited in Claim 2, wherein the wireless transmissions subject to jamming by said jamming assembly comprise wireless transmissions originating inside said zone from a wireless device associated with a customer of  
5 said fuel dispenser assembly, and/or wireless transmissions originating outside said zone from a mobile operator.

4. The system as recited in Claim 2, wherein the jamming operation of said jamming assembly acts to inhibit wireless transmissions originating inside said zone from propagating therebeyond, and/or to inhibit wireless transmissions  
5 originating outside said zone from propagating thereinto.

5. The system as recited in Claim 2, wherein the jamming operation of said jamming assembly acts to inhibit wireless transmissions by a wireless device disposed within said zone

from reception by a mobile operator, and/or to inhibit  
5 wireless transmissions by said mobile operator from reception  
by said wireless device.

6. The system as recited in Claim 2, wherein said zone  
further encompassing at least a refill portion of a vehicle  
being serviced by said fuel dispenser assembly.

7. The system as recited in Claim 1, wherein said  
jamming assembly includes an RF signal detection assembly and  
an RF signal transmission assembly.

8. A system for use with a refueling station having a  
fuel dispenser assembly, said system comprising:

a jamming assembly operatively arranged to jam wireless  
transmissions between a wireless device disposed within a  
5 defined zone and a mobile operator; and

a controller to control the operation of said jamming  
assembly.

9. The system as recited in Claim 8, wherein said  
wireless device being associated with a customer of said fuel  
dispenser assembly.

10. The system as recited in Claim 8, wherein the defined  
zone encompassing at least a portion of said fuel dispenser  
assembly.

11. The system as recited in Claim 8, wherein the  
wireless transmissions subject to jamming by said jamming  
assembly comprise wireless transmissions originating from said

wireless device, and/or wireless transmissions originating  
5 from said mobile operator.

12. The system as recited in Claim 8, wherein the jamming operation of said jamming assembly acts to inhibit wireless transmissions originating inside the defined zone from propagating therebeyond, and/or to inhibit wireless  
5 transmissions originating outside the defined zone from propagating thereinto.

13. The system as recited in Claim 8, wherein the jamming operation of said jamming assembly acts to inhibit wireless transmissions by said wireless device from reception by said mobile operator, and/or to inhibit wireless transmissions by  
5 said mobile operator from reception by said wireless device.

14. A system for use with a refueling station having a fuel dispenser assembly, said system comprising:

a jamming assembly, said jamming assembly being operative to jam wireless transmissions present within a defined zone  
5 and/or to jam wireless transmissions evidently propagating into the defined zone, the defined zone encompassing at least a portion of said fuel dispenser assembly; and

a controller to control the operation of said jamming assembly.

15. The system as recited in Claim 14, wherein said jamming assembly being operatively arranged to jam wireless transmissions between a wireless device disposed within the defined zone and a mobile operator.

16. The system as recited in Claim 14, wherein the jamming operation of said jamming assembly acts to inhibit wireless transmissions originating within the defined zone from reception by a mobile operator, and/or to inhibit  
5 wireless transmissions originating outside the defined zone from reception by a wireless device disposed within the defined zone.

17. A system for use with a refueling station having a fuel dispenser assembly, said system comprising:

a jamming assembly operatively arranged to jam wireless transmissions between a first wireless assembly associated  
5 with a customer of said fuel dispenser assembly and a second wireless assembly; and

a controller to control the operation of said jamming assembly.

18. The system as recited in Claim 17, wherein the jamming operation of said jamming assembly acts to inhibit wireless transmissions by said first wireless assembly from reception by said second wireless assembly, and/or to inhibit  
5 wireless transmissions by said second wireless assembly from reception by said first wireless assembly.

19. The system as recited in Claim 18, wherein said second wireless assembly being a mobile operator.

20. A system for use with a refueling station having a fuel dispenser assembly, said system comprising:

a first means arranged to inhibit wireless transmissions by a wireless device associated with a customer from reception  
5 by a mobile operator, and/or to inhibit wireless transmissions by said mobile operator from reception by said wireless device; and

a controller arranged to control the operation of said first means.

21. The system as recited in Claim 20, wherein the inhibiting action of said first means with respect to said wireless device being carried out with respect to wireless transmissions originating within a defined first zone, and  
5 wherein the inhibiting action of said first means with respect to said mobile operator being carried out with respect to wireless transmissions originating outside a defined second zone.

22. The system as recited in Claim 21, wherein the defined first zone being substantially equal to the defined second zone.

23. The system as recited in Claim 21, wherein the defined second zone being larger than and encompassing the defined first zone.

24. A system for use with a refueling station having a fuel dispenser assembly and a customer associated therewith, said system comprising:

a first means for inhibiting wireless transmissions by a  
5 first wireless assembly associated with said customer from  
reception by a second wireless assembly;

a second means for inhibiting wireless transmissions by  
said second wireless assembly from reception by said first  
wireless assembly;

10 a first controller to control the operation of said first  
means; and

a second controller to control the operation of said  
second means.

25. The system as recited in Claim 24, wherein said first  
means includes a first RF jamming assembly, and said second  
means includes a second RF jamming assembly.

26. The system as recited in Claim 25, wherein said first  
RF jamming assembly and said second RF jamming assembly being  
integrally configured.

27. The system as recited in Claim 24, wherein the  
inhibiting action of said first means being carried out with  
respect to wireless transmissions originating within a defined  
first zone, and wherein the inhibiting action of said second  
5 means being carried out with respect to wireless transmissions  
originating outside a defined second zone.

28. The system as recited in Claim 27, wherein the  
defined first zone being substantially equal to the defined  
second zone.

29. The system as recited in Claim 27, wherein the defined second zone being larger than and encompassing the defined first zone.

30. The system as recited in Claim 24, wherein said second wireless assembly being a mobile operator.

31. A system for use with a refueling station having a fuel dispenser assembly and a customer associated therewith, said system comprising:

a first transmitter apparatus arranged to generate RF  
5 signal transmissions acting to inhibit wireless transmissions by a first wireless assembly associated with said customer from reception by a second wireless assembly;

a second transmitter apparatus arranged to generate RF  
signal transmissions acting to inhibit wireless transmissions  
10 by said second wireless assembly from reception by said first wireless assembly;

a first controller to control the operation of said first transmitter apparatus; and

a second controller to control the operation of said  
15 second transmitter apparatus.

32. The system as recited in Claim 31, wherein said second wireless assembly being a mobile operator.

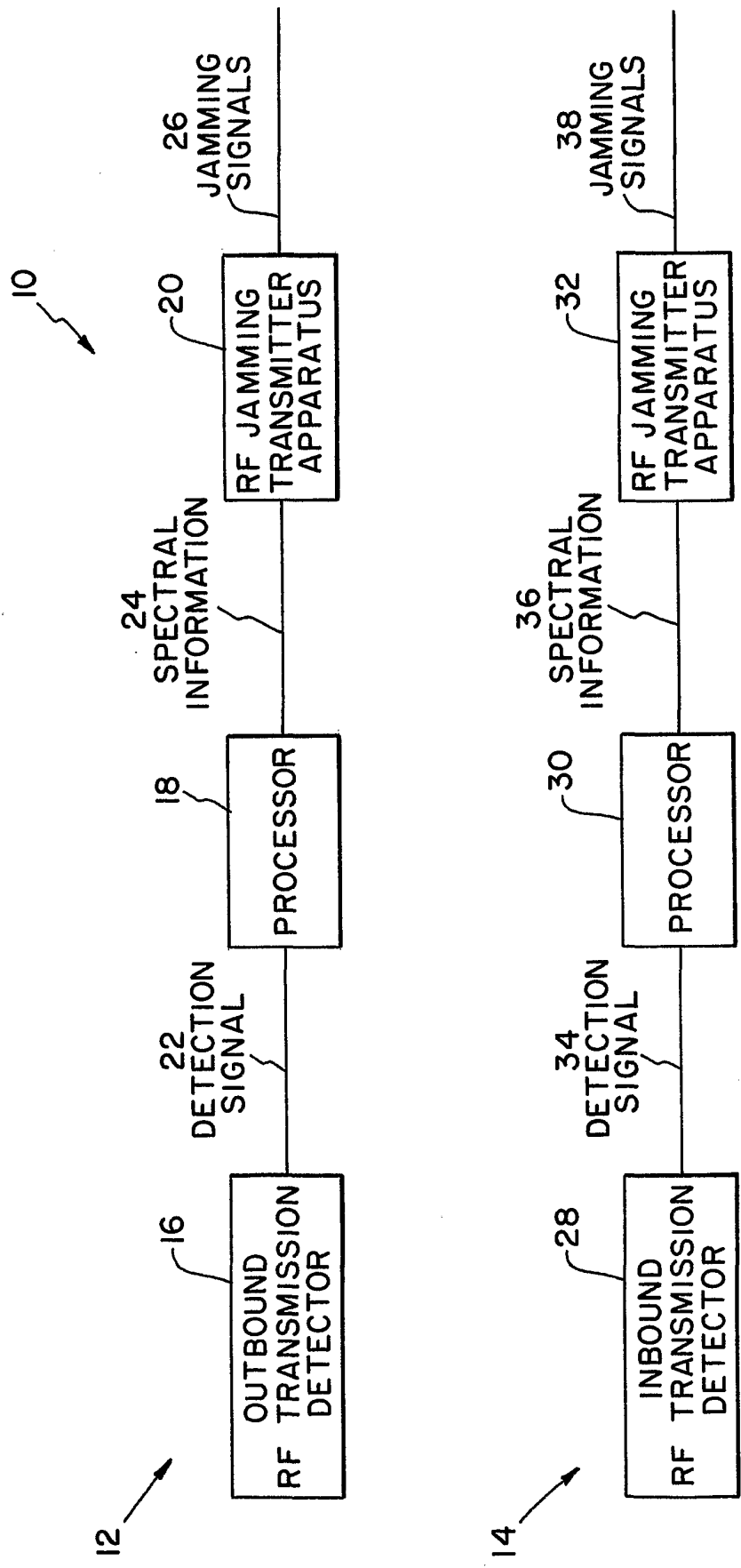


Fig. 1

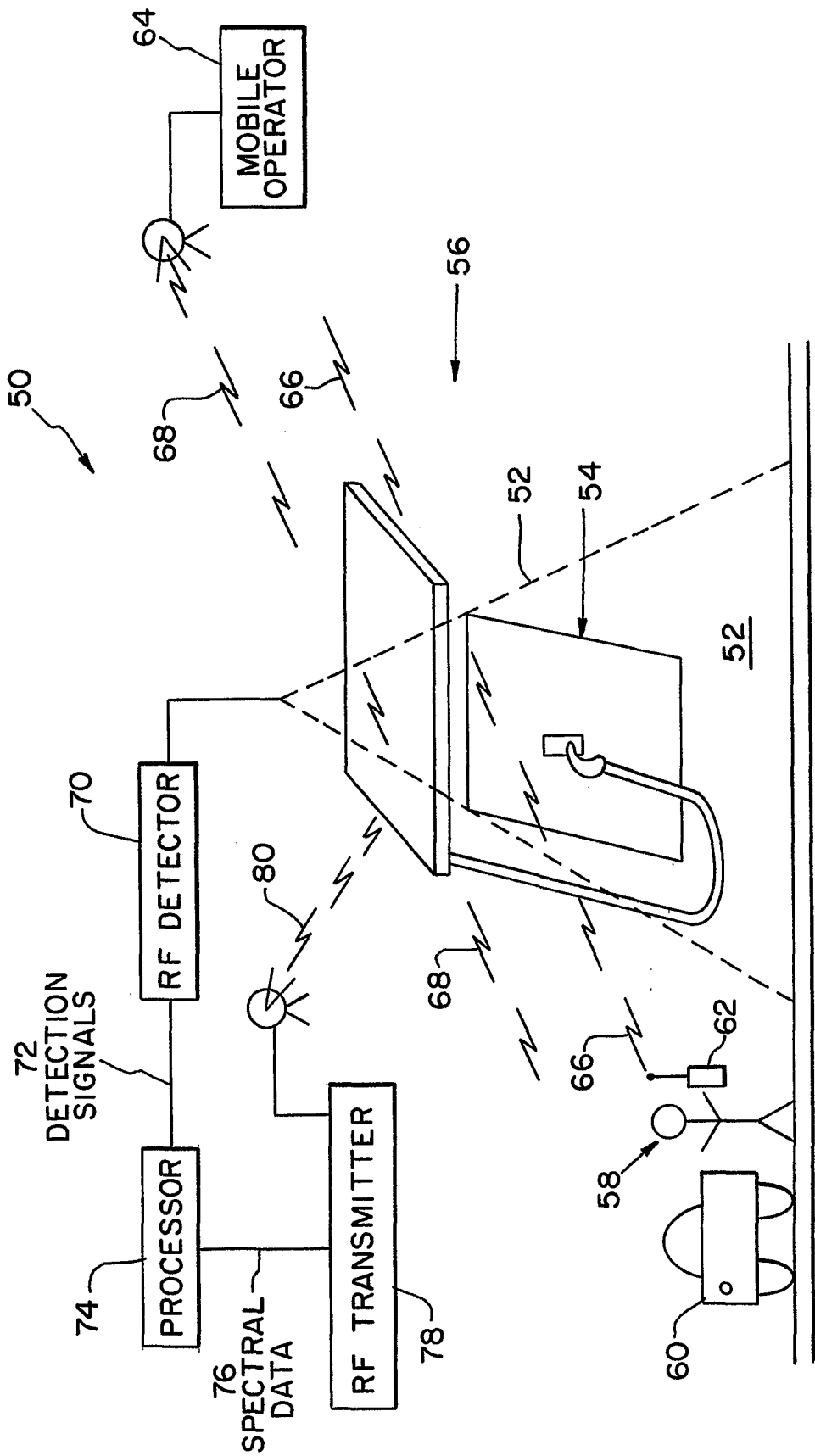


Fig. 2

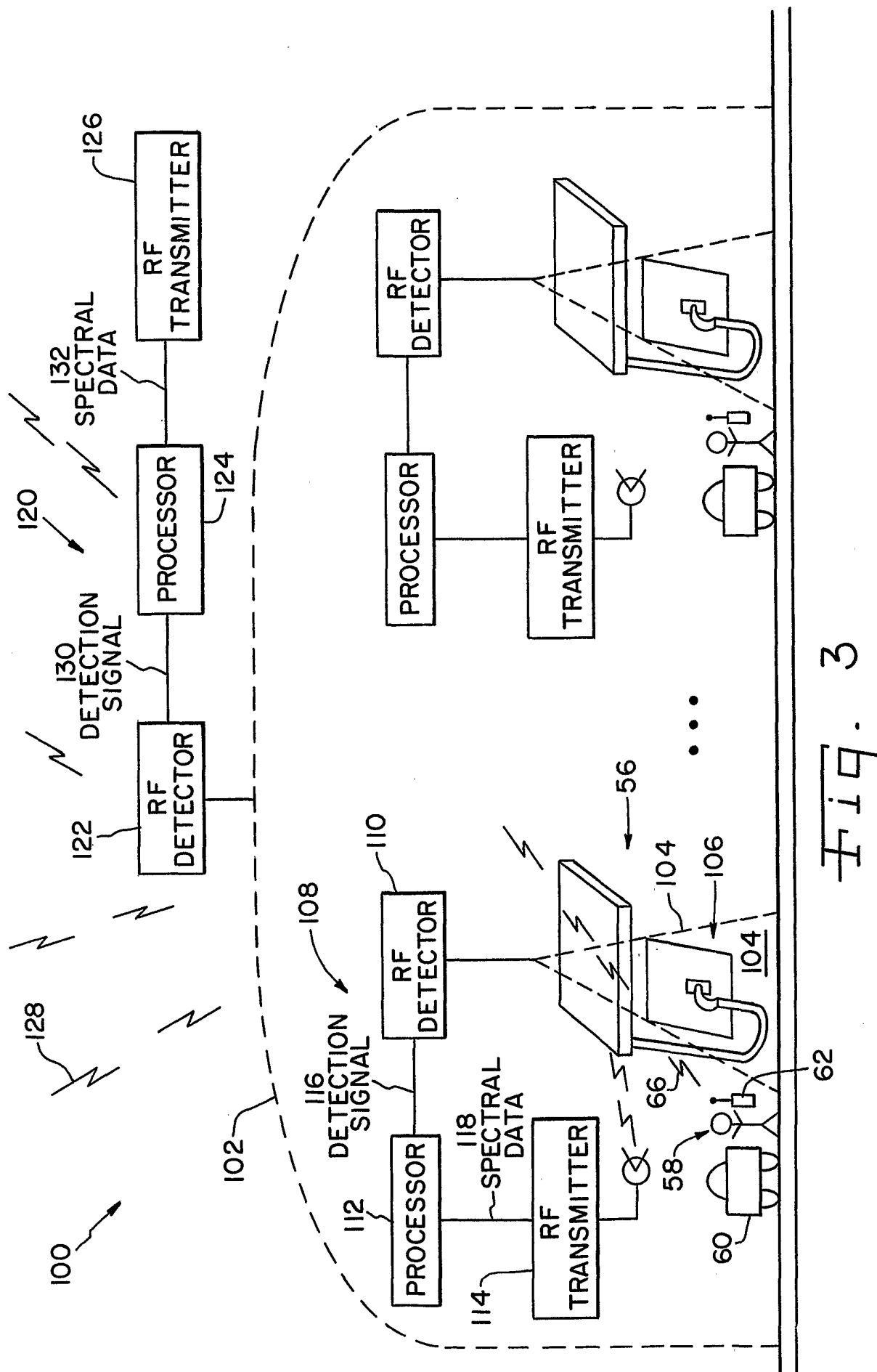


Fig. 3

## INTERNATIONAL SEARCH REPORT

International application No.

PCT/US01/20572

**A. CLASSIFICATION OF SUBJECT MATTER**

IPC(7) : G08B 21/00; H04Q 7/00; H04B 1/00

US CL : 455/456, 422, 528 457; 340/686.06, 825.06, 825.07

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)

U.S. : 455/456, 422, 528 457; 340/686.06, 825.06, 825.07

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)

**C. DOCUMENTS CONSIDERED TO BE RELEVANT**

| Category* | Citation of document, with indication, where appropriate, of the relevant passages                  | Relevant to claim No. |
|-----------|-----------------------------------------------------------------------------------------------------|-----------------------|
| Y,P       | US 6,222,458 B1 (HARRIS) 24 April 2001, fig. 1-2, col. 3, lines 19-53.                              | 1-32                  |
| Y         | US 6,011,973 A (VALENTINE et al) 04 January 2000, abstract, fig. 3, col. 4, line 50-col. 5, line 6. | 1-32                  |
| Y,P       | US 6,122,486 A (TANAKA et al) 19 September 2000, abstract, fig. 1-3.                                | 1-32                  |
| Y,P       | US 6,230,017 B1 (ANDERSSON et al) 08 May 2001, abstract, fig. 3, col. 9, line 43-col. 10, line 50.  | 1-32                  |

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

|                                                                                                                                                                         |                                                                                                                                                                                                                                                  |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
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|-----------------------------------------------------------------------------|-------------------------------------------------------------------|
| Date of the actual completion of the international search<br>23 AUGUST 2001 | Date of mailing of the international search report<br>02 NOV 2001 |
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