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(54) Title: A VEHICLE INFOTAINMENT SYSTEM

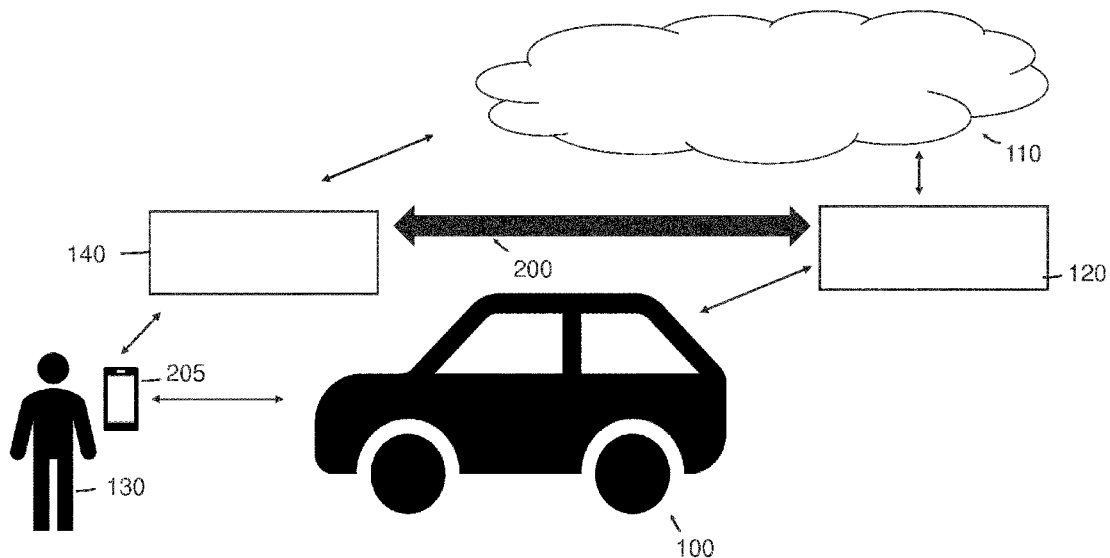


Figure 2

(57) Abstract: A method of providing network access to an in-vehicle infotainment system through a network access node is described

WO 2020/025557 A1

Title

A vehicle infotainment system

Field

The present application relates to vehicle infotainment systems and in particular to a method for enabling wireless data connectivity of a vehicle
5 infotainment system.

Background

There has for many years been a movement towards connected vehicles.
10 Since at least 2013, technology roadmaps such as those provided by the GSMA have identified that drivers and their passengers are increasingly seeking in-vehicle mobile connectivity to make travelling by car a safer, faster and richer experience. This need has been met by in-car entertainment (ICE), or in-vehicle infotainment (IVI), systems that have both Wifi and network modules-such as
15 5G/LTE/GSM modules. This enables the vehicle infotainment system to connect via Wifi to a user's smartphone and also simultaneously communicate to the network.

To enable this network connectivity, mobile operators and automakers
20 need to collaborate. In particular, mobile operators need to deploy network technologies that support widespread, high-bandwidth connectivity. At the same time automakers have a requirement for solutions that can adapt to a wide range of use cases, such as a change of business model, a change of mobile operator and a change in the ownership of the vehicle.

25

In this general scenario, automakers have a number of options in how to enable vehicle connectivity. These include embedded devices, tethered solutions and integrated solutions (using mobile handsets that are already associated with a user). These three connectivity solutions are not mutually
30 exclusive. A tandem approach is frequently used to separate the allocation of

costs to the beneficiary (i.e. the automaker or the driver) or to provide an option for technology upgrades for newer generation or higher bandwidth services.

5 Embedded solutions where the connectivity and the processing intelligence is built directly into the vehicle need to be able to access networks with the bandwidth and coverage characteristics that are sufficient to support the services required by the connected vehicle. These are typically provided by embedded SIMs within the vehicle. In this embedded solution, a SIM is typically either associated with the vehicle at the time of manufacture and “embedded”
10 into the vehicle or a subsequently provided SIM can be associated with the vehicle after manufacture, and typically after purchase of the vehicle. In such an arrangement, the vehicle will typically provide a slot or interface for user provision of a SIM.

15 Tethered solutions, where connectivity is provided through an external modem whilst the processing intelligence is retained by the vehicle are typically based routing communications through a paired handset. An integrated solution, is one where the connectivity is based on an integration between the vehicle and the handset associated with the user of the vehicle, in which all
20 connectivity and intelligence is done at the handset.

With recent changes in regulation such as the European regulation on eCall, automotive manufacturers are required to provide a built in automated emergency call for assistance in a road accident. With this obligation on the
25 automotive manufacturer and the need to ensure that connectivity can be provided across the fleet irrespective of the geography, automotive manufacturers are partnering with mobile operators to provide connectivity solutions. In these scenarios, a particular vehicle manufacturer configures their in-car entertainment (ICE), or in-vehicle infotainment (IVI), systems to access
30 network services through a pre-associated automotive carrier service platform (ACSP) which manages mobile carrier network connectivity of the infotainment

system and inter-operator relationships permitting the vehicle to access various carrier networks within a service area footprint. Figure 1 is an example of such an architecture where one or more vehicles (100) can access network services (110) through a pre-defined automotive carrier service platform, ACSP (120). In this exemplary schematic all three illustrated vehicles are associated are associated with the same ACSP (120), but it will be appreciated that in a similar fashion to how smartphone users access network services through particular mobile network operators (MNOs), that different vehicles can be associated with different ACSPs. The type of network services that can be accessed from a particular vehicle can be pre-configured on a number of levels including at the actual vehicle level, the vehicle type level or at the ACSP level. Authorised network access through the ACSP requires validation of the SIM that is associated with the vehicle by the ACSP.

Figure 1 also shows a conventional arrangement whereby a user 130 of the vehicle can also access network services 110 using their mobile device such as a smartphone. That network access is facilitated by the MNO 140 associated with the user's mobile device and similarly to the access by a vehicle requires validation by the MNO of the SIM that is associated with that mobile device. It will be appreciated that such association is typically achieved at a network level through association of a unique mobile identifier such as the device international mobile subscriber identity (IMSI) with a particular network operator.

In this example of Figure 1, the user 130 can access the same or different network services. Irrespective of the fact that the user 130 could also be the driver of one of the vehicles 100, in this conventional arrangement there is no association at a network level between the two. Each of the two network access points are independent of one another and require validation of a SIM card that is specific to that network access point, each require dedicated resources and there is therefore an inevitable duplication of network activity.

EP 3 270 245 describes an arrangement for exchanging data with an in-vehicle infotainment system. It provides for binding infotainment systems with mobile terminals so as to allow a user to control the infotainment system with their mobile terminal.

5 **Summary**

These and other problems are addressed in accordance with the present teaching by a method and architecture that associates at a network level, an in-vehicle network access point with a mobile operator of a user of that vehicle.

10 Accordingly, a first embodiment of the application provides a method as detailed in in claim 1. Advantageous embodiments are provided in the dependent claims. A system and a computer program which are respectively configured to carry out the method may also be provided.

15 **Brief Description Of The Drawings**

The present application will now be described with reference to the accompanying drawings in which:

Figure 1 is a schematic of a known system architecture for providing network connectivity.

20 Figure 2 is a modification to the architecture of Figure 1, where there is provided, in accordance with the present teaching, an association at a network level between a vehicle network access service and a user mobile device network access service.

25 Figure 3 is a process flow showing an exemplary process flow associated with enabling network access to an in-vehicle infotainment system.

Figure 4 shows in schematic form system components that may be usefully employed within the context of the present teaching.

Figure 5 is a process flow showing an exemplary process flow associated with enabling network access to an in-vehicle infotainment system.

Figure 6 shows exemplary screen shots of a process flow as viewed on a mobile device a part of a method in accordance with the present teaching.

Detailed Description Of The Drawings

5 The present teaching will now be exemplified with reference to provisioning network access services to an in-vehicle infotainment system. As shown in Figure 2, where similar the same reference numerals are provided to elements already described with reference to Figure 1, the present teaching provides a method and architecture that facilitates a data exchange 200 at a
10 network level between an automotive carrier service platform, ACSP (120) and a mobile device (205) mobile network operator (140). Such a data exchange is used in accordance with the present teaching to associate a SIM that is uniquely associated with the vehicle (100) with a SIM that is uniquely associated with the mobile device (205). Such association can be used to
15 enable and control network access from the vehicle (100) via the ACSP (120) based on parameters and profiles that are defined for the user (130) access to the network from their mobile device (205) via the MNO (140).

Figure 3 provides an exemplary methodology that provides such an
20 association between a dedicated vehicle SIM and a mobile device SIM, as provided in the user's mobile device. The process flow is from the perspective of the ACSP (120) that is in communication with in vehicle infotainment system. It will be appreciated from the schematic of Figure 4, that such an infotainment system (400) typically comprises hardware (405) and software modules (410)
25 that when suitably programmed facilitate both internet access via a wide area network channel (420) and can establish a local area network for example a WiFi hotspot for local area communications (425). The network access is typically associated with a SIM card (430) that is co-located in the vehicle with the infotainment system

30

The infotainment system (400) will typically include a graphical user interface and an input module to allow a user of the vehicle access services either locally stored – for example on a local database (415)- on a network service such as the internet or on their connected mobile device (205).

- 5 Similarly, the infotainment system will typically facilitate user control of the infotainment system 400 through their connected mobile device 205.

In accordance with the present teaching and as exemplified with reference to Figures 3, 5 and 6, a user wishing to associate the SIM of their mobile device
10 (205) with the SIM of the infotainment system (400) initiates (1) a WiFi connection request to the infotainment system (400). In response to this request, the user is presented on the screen (601) of their mobile device (600) a sign-up screen (602) - shown in 6A. After using the prompted interface, the user may then be presented with a geographic specific page that is based on the
15 geographic location of the vehicle. The user is prompted to selected one of a number of available mobile operators for that geography- identified in Figure 6B as “01” and “02”. They are also provided with an interface to enter the mobile number of their handset device “Enter #”.

20 The entering of data via that interface generates a data request (2) to the ACSP that includes an identifier of the mobile device. Desirably this identifier is the device Mobile Station International Subscriber Directory Number (MSISDN) which will be understood by those of ordinary skill to be the number used to identify a mobile phone number internationally. MSISDN is defined by the E.164
25 numbering plan. This number includes a country code and a National Destination Code which identifies the subscriber's operator. It will be appreciated that the mechanism via which the identifier is entered may vary. For example, the sign-in screen may present the user with an option to allow manual input of their MSISDN. In another arrangement, the launching of the
30 sign-in screen may effect a parsing of the device identifier to automatically pull this identifier into the network access device.

It will be appreciated that as an ASCP is typically pre-associated by the vehicle manufacturer for a specific jurisdiction that the specifics of the sign-in screen can be tailored to be specific to the country that the vehicle is in.

5

From the perspective of the ACSP, it receives a request for network access services (305). From that request, it can extract the mobile device identifier, MSISDN, (310). The ACSP can then initiate a validation process (3) whereby it uses header information in user provided MSISDN form to identify for example:

10

a) Visited MNO Network and Country of Purchase - *serving-network-plmnid MNC MCC*.

b) MSISDN of mobile device provided by user

c) MSISDN of Car Infotainment System

15

This validation process provides information to the ACSP of both the SIM associated with the mobile device but also the MNO that is associated with that SIM. The receipt of this network access request, triggers the ACSP to send a network request to the device associated with the MSISDN. This request is send via the MNO (140) that is associated with that MSISDN. Desirably that request is in the form of a short message such as a network initiated SMS message. Other data formats such as MMS and the like could equally be used. In this exemplary arrangement of Figure 5, the network initiated SMS message (4) includes an activation code URL that is sent to the mobile device associated with the received MSISDN.

20

25

Subsequent to the transmission of the network initiated confirmation request, the ACSP receives a confirmation of network delivery (320). This delivery receipt (5) receipt received from the MNO (14) of the mobile device proves end to end connectivity and confirms to the ACSP that there is an end to end service chain in place. Having now associated the mobile device of the

30

originating request with the specific vehicle, the ACSP can now associate the vehicle with the MNO of the originating mobile device (325). Having so established this association, the ACSP can now enable network access services to the infotainment system of the specific vehicle (330). During this
5 time the user is presented with a holding screen, the specifics of which may vary (Figure 6C).

In an extension of this simple use of MNO network confirmation of the authenticity of the mobile device that originated the network access request, the
10 present teaching also facilitates a user validation of the request in scenarios where such validation is required before initiating local WiFi services. In such an arrangement the URL that was embedded in the original network initiated SMS message is relayed to the user (6). The user selects the URL delivered in the message (4) on their mobile device. This facilitates a confirmation by the owner
15 of the device that the original MSISDN provided in the initial network access request was correct. Such a scenario is exemplified with reference to Figures 6D and 6E, where the ASCP relays an authorisation code to the user handset (Figure 6D) that was associated with the originating request. – (Figure 6B). The re-transmission of that code back to the ASCP can be used to enhance security
20 in that it ensures that the originating device is also used to confirm the final association of its MSISDN with the MSISDN of the in-vehicle infotainment system.

In a further modification the data exchange that is conducted as part of the
25 association process can be parsed to extract as the first unique identifier a SIM number of the mobile device and to extract as the second unique identifier an IMEI number of the in-vehicle infotainment system. Only when each of the IMEI number and the SIM number meet a predefined lookup requirement may the association be confirmed. For example, the ASCP may be provided with a
30 lookup table of pre-approved IMEI numbers that can be associated as part of this association process. For example this pre-approved table may specify that

specific IMEI numbers are associated with a specific geographical region. Only SIM numbers that are also associated with the same geographical region may be enabled to be associated with that set of IMEI numbers. As part of the association process, the present teaching effects confirmation that the threshold
5 criteria for association is met.

As part of a validation by the customer, the URL may direct the customer to a page where they are presented with terms and conditions (T&C's, 7) that are specific to the locality in which they are located. This can be done on the
10 basis of a look-up table whereby the MCC value received in the first request (3) is identified and used as a basis to determine which country the service is being requested for. The user is presented with an accept (8) or deny option. The confirmation of the accept option can be used to trigger a SMS Mobile Terminated, MT, message to the mobile device MNO from the ACSP (9). It will
15 be appreciated that MT messaging is known in the telecommunications industry as a mechanism for billing a user for additional services. It can for example be used for enabling subscription services and is advantageous in that if funds are not available at the time of transmission of a first MT message, the network service provider can retry sending second and subsequent MT messages at
20 times in the future until funds are available. This facilitates network control of continuity of services as the network operator can control the timing of the MT messaging.

Such a SMS MT message can be used for a variety of functionality. For
25 example, the MT message can trigger a charge for service request from the ACSP to the MNO associated with the MSISDN of the mobile device. A delivery receipt received (11) from mobile device MNO can be used to implement a reverse SMS billing whereby the user of the recipient mobile device associated with the mobile device MSISDN is charged for the cost of any network access
30 that is associated with the MSISDN of the vehicle. In such an implementation the activation of the MT billing can be used as a trigger for the ACSP to enable

(12) local WiFi Services for the vehicle and to associate data traffic originating from that vehicle with an account that is associated with the MSISDN of the mobile device that initiated the data request. Having so associated, a refresh data connection can be sent to the now WiFi connected mobile device.

5

It will be appreciated that the process outlined above advantageously associates traffic that originates with a first MSISDN (the vehicle MSISDN) with another otherwise unrelated MSISDN, the mobile device MSISDN. This association enables network services to the user of the vehicle without any configuration changes required at the vehicle, the enablement of the services are based on network configuration changes only. The functionality of the infotainment system can be delivered through embedded solutions where the connectivity and the processing intelligence is built directly into the vehicle and are provided by a network service provider selected by the vehicle manufacturer as having the bandwidth and coverage characteristics that are sufficient to support the services required by the connected vehicle, without the user of the vehicle having to directly engage with that network service provider to activate those services. The user of the vehicle continues to use their existing service provider for their mobile device network usage and can use a different service provider for their vehicle network usage without an active need to enrol or engage directly with that service provider.

It will be appreciated that as the association is browser based it can be provided on a device and operating system agnostic basis- there is no requirement for installation of applications or other dedicated program interfaces to facilitate a triggering of the vehicle originating network access.

It will be appreciated that not only is the functional interface between the mobile device user and the ACSP platform opaque to that user, there is also no direct commercial relationship required between the user and ACSP.

It will be further appreciated that conventionally when faced with the problem of how to enable in-vehicle network access, the person of skill has adopted the approach trying to avoid use of the ACSP entirely, by moving services from ACSP to the MNO to which the user has an existing relationship.

5 Per the present teaching the preferred network operator as determined by the vehicle manufacturer can retain responsibility for enabling network services for that vehicle but the user of the vehicle does not have to engage with that network service provider. An arrangement per the present teaching thereby enables an optimisation of network connectivity for vehicle originating network

10 traffic by using a MNO that is configured specifically for that vehicle's network requirements. At the same time, the user benefits in that they can, for example, use their MNO relationship to pay for this network access as required. Service is enabled by applying changes at a network only, Local ID verification requirements are met as the mobile device owner has provided their local

15 MSISDN which is already pre-registered with an existing MNO and hence already meets Local ID verification requirements.

A process per the present teaching can be configured to be automatically activated where there is no active customer service subscription or payment

20 method associated with the infotainment system. In other configurations the infotainment system may be configured to provide a portal through which user settings may be varied to allow changes to existing configuration settings. For example, the user can determine the duration of association of the traffic from the infotainment system with the MSISDN of their handset. This can be done on

25 a traffic volume- for example X MB, a time duration- for example 1 month or a combination of both. Continuation of service can be managed through modification of user settings and may be done on a roll-over basis or requiring re-activation. Termination of services can be configured by direct messaging from the handset, for example using an SMS STOP command.

30

By implementing an arrangement where the network functionality provided to a vehicle does not require a direct relationship between the network service provider providing that relationship and the user of the vehicle, the present teaching allows for switching between network service providers dependent on
5 network configurations or conditions. For example, the ACSP platform as discussed above, could provide an interface between a vehicle and a plurality of network operators. The vehicle manufacturer could use that single interface to implement changes in which network operator is serving a fleet of vehicles without requiring any changes by the users of those vehicles. Therefore, it will
10 be appreciated that whilst the present teaching has been described with reference to exemplary arrangements that modifications can be made to that described herein without departing from the scope of the present teaching.

The provision of an association per the present teaching also improves the
15 security in provision of data services to a vehicle. Using the vehicle infotainment system as a portal into the actual vehicle management system, the present teaching provides for a control and restriction of network data traffic originating from the vehicle and sent to the vehicle on the basis of that traffic being associated with a specific user device.

20

The words comprises/comprising when used in this specification are to specify the presence of stated features, integers, steps or components but does not preclude the presence or addition of one or more other features, integers, steps, components or groups thereof.

Claims

1. A method of providing network access to an in-vehicle infotainment system (400) through a network access node (120), the in-vehicle infotainment system being associated with a first unique network identifier,
5 the method comprising:
 - receiving, at the network access node (120), in response to a login request triggered at a mobile device, a data request (2) from the mobile device (205), the mobile device being associated with a second different unique network identifier, the data request being received over a first
10 communication channel, the first communication channel using a packet switched network;
 - initiating by the network access node (120), in response to the received data request, a mobile terminated SMS message to the mobile device over a second communication channel, the second
15 communication channel using a circuit switched network;
 - receiving, by the network access node (120), from the mobile device, a confirmation of delivery of the mobile terminated SMS message; and
 - in response to the received confirmation of delivery of the mobile
20 terminated SMS message, associating by the network access node, at the network access node, the first unique network identifier with the second unique network identifier such that subsequent network traffic that is received at the network access node that originates from the in-vehicle infotainment system and is identifiable with the first unique
25 network identifier is associated with the second unique network identifier.
2. The method of claim 1 wherein the first communication channel uses http protocols.
3. The method of any preceding claim wherein the data request is a browser-initiated communication session.
- 30 4. The method of any preceding claim wherein the second communication channel is over a cellular radio network.

5. The method of any preceding claim wherein the subsequent network traffic is enabled by the network access node without requiring authorisation of the first unique network identifier within the network.
6. The method of claim 1 wherein the associating by the network access node of the network traffic with the second unique network identifier triggers a billing event for the mobile device.
7. The method of any preceding claim wherein, in response to the login request triggered at the mobile device, the method further comprises displaying on a screen of the mobile device, a landing page specific to the vehicle in which in-vehicle infotainment system is located.
8. The method of claim 7 wherein the landing page includes geographic specific parameters.
9. The method of any preceding claim wherein the second unique network identifier is a SIM number.
10. The method of any preceding claim wherein the in-vehicle infotainment system has an IMEI number, the IMEI number being the first unique network identifier.
11. The method of any preceding claim wherein the data request (2) is parsed by the network access node to extract the second unique network identifier, the second unique network identifier being a SIM number and the in-vehicle infotainment system having an IMEI number as the first unique network identifier, and the mobile terminated message is transmitted on confirmation by the network access node that each of the SIM number and IMEI number meet a predefined lookup requirement.

25

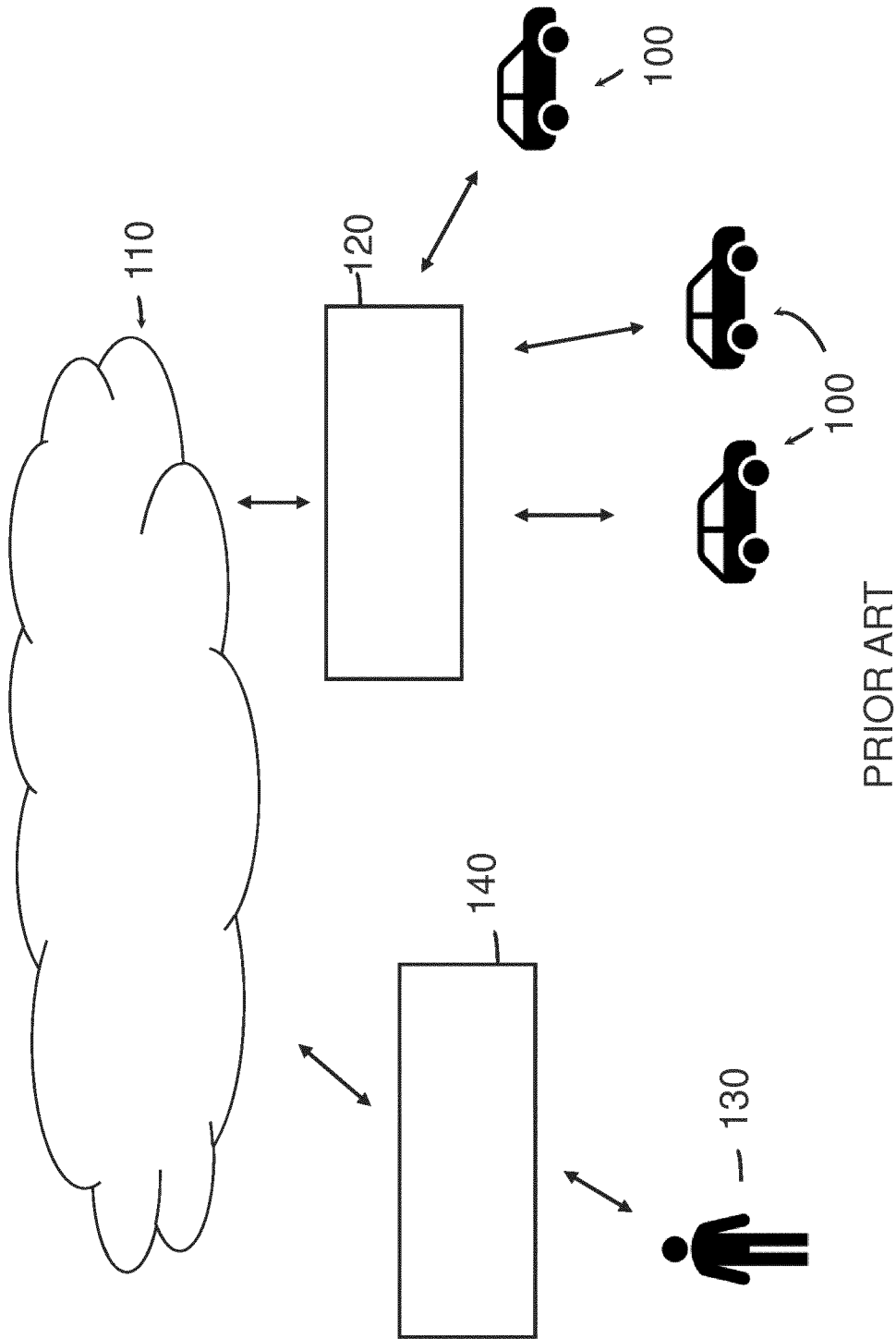


Figure 1

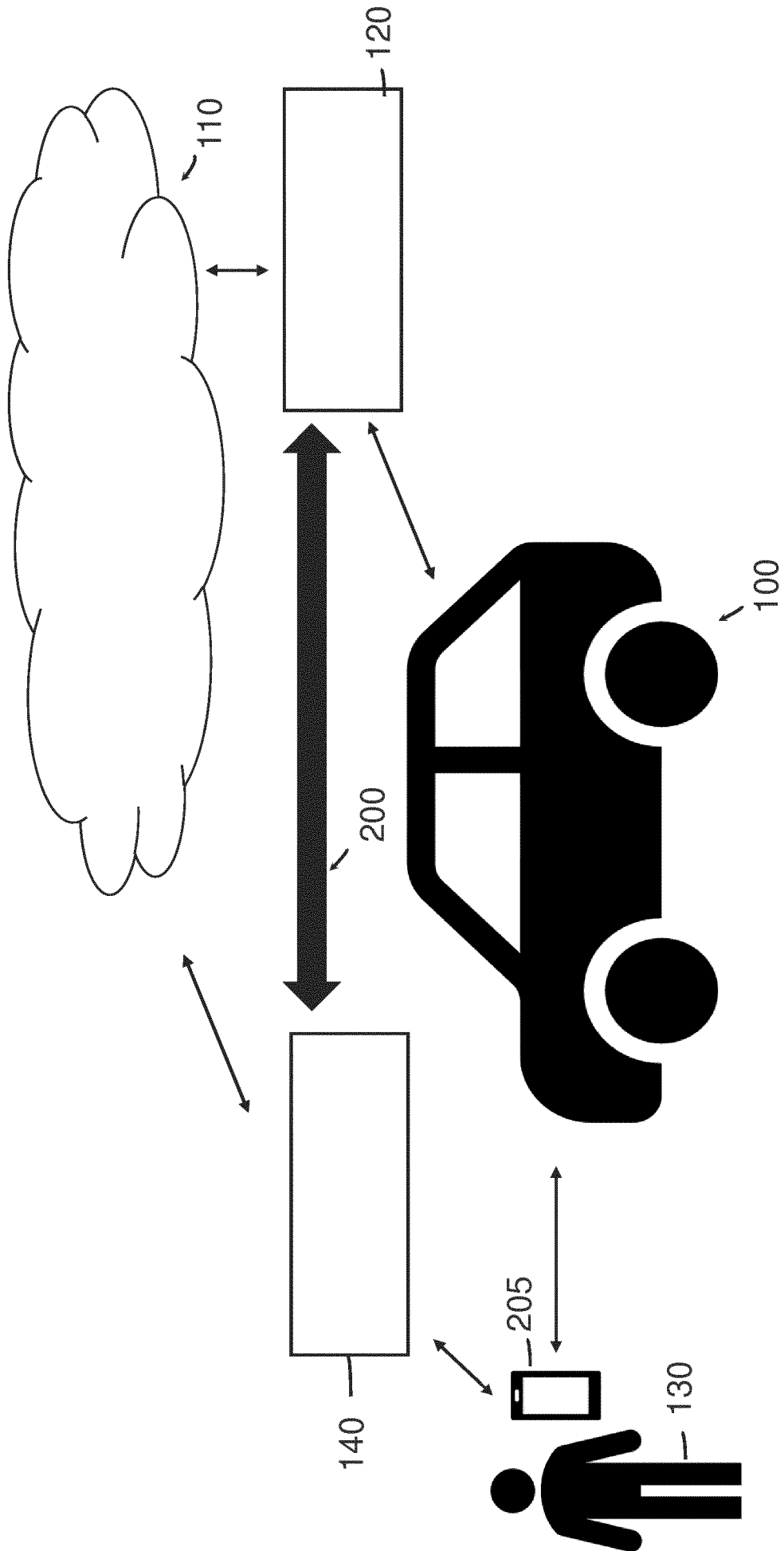


Figure 2

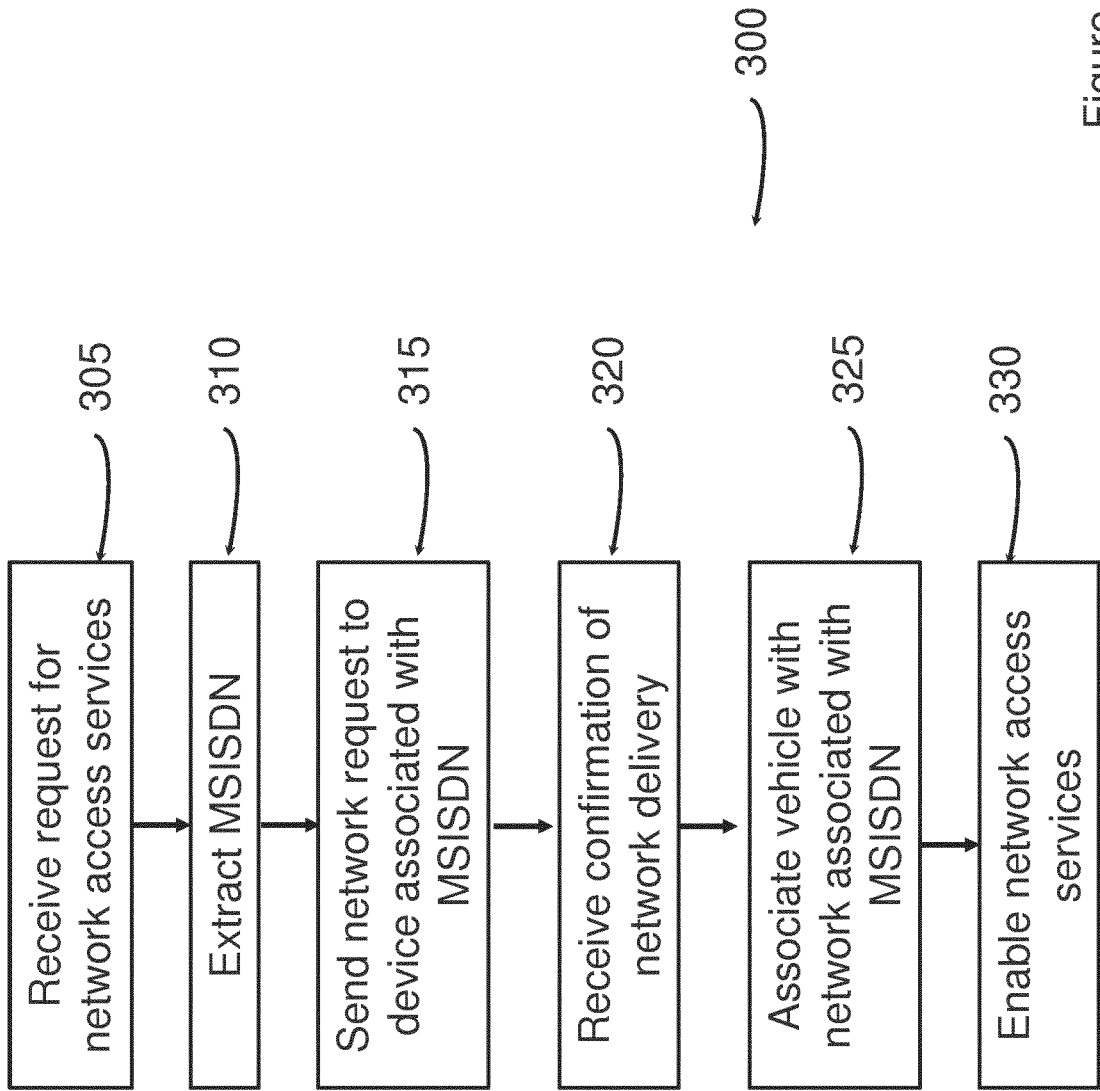


Figure 3

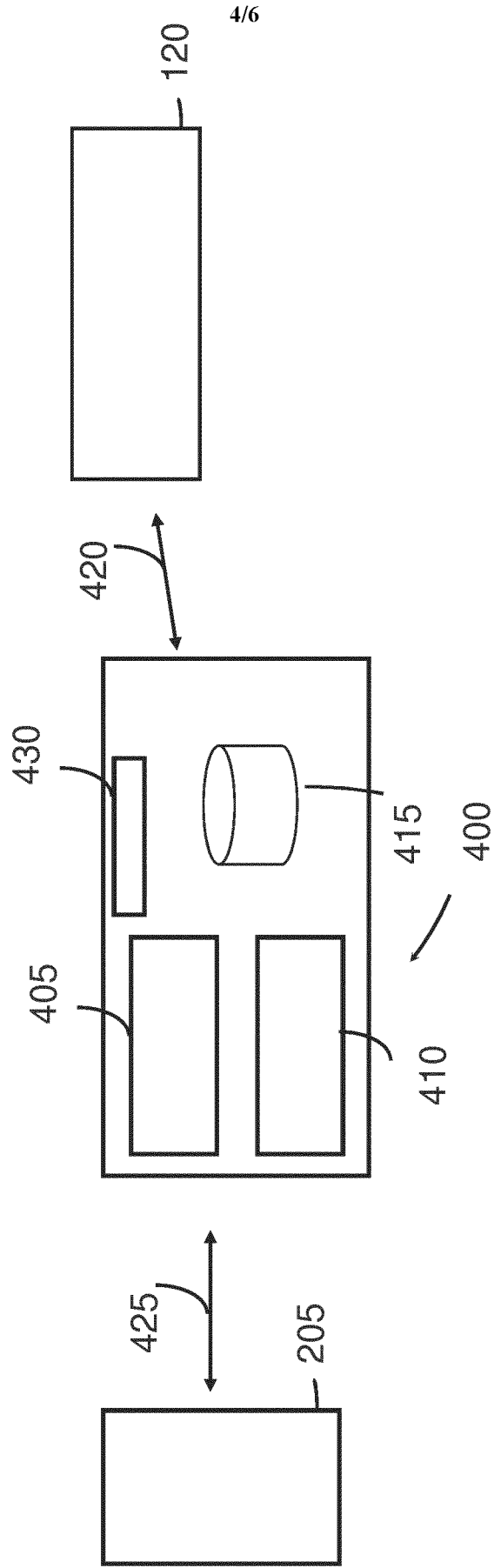


Figure 4

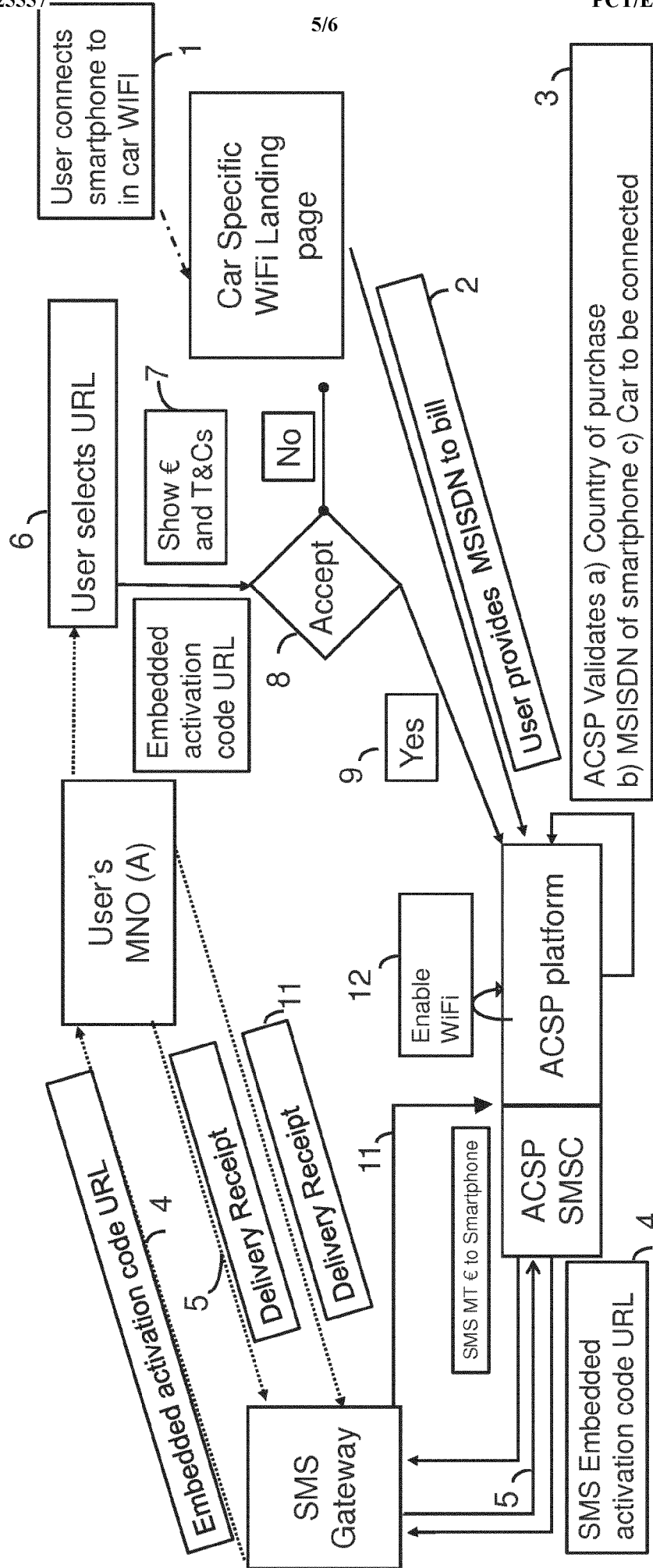


Figure 5

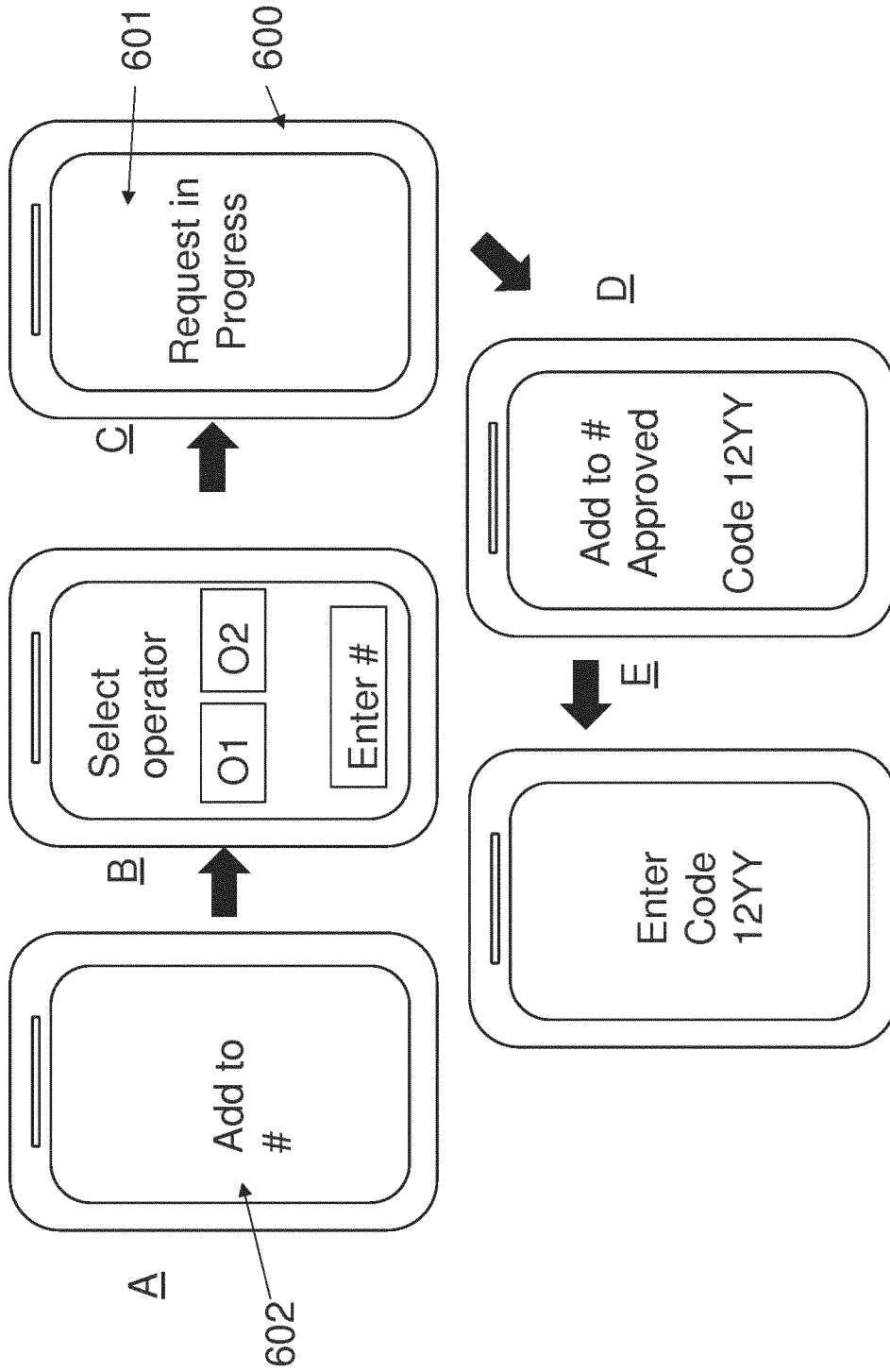


Figure 6

INTERNATIONAL SEARCH REPORT

International application No
PCT/EP2019/070394

A. CLASSIFICATION OF SUBJECT MATTER
 INV. H04W4/48
 ADD. H04B1/3822 H04L29/08 H04N21/00 H04W12/00 H04W4/40

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)
 H04W H04B

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	EP 3 270 245 A1 (HUAWEI TECH CO LTD [CN]) 17 January 2018 (2018-01-17)	1-10
A	paragraph [0007] - paragraph [0008] paragraph [0051] - paragraph [0056]; figures 4-1 paragraph [0066] - paragraph [0066] -----	11
Y	US 2015/111529 A1 (JOHNSON DREW S [US] ET AL) 23 April 2015 (2015-04-23)	1-10
A	paragraph [0024] - paragraph [0027] paragraph [0039] - paragraph [0044]; figure 6a -----	11
A	US 9 775 138 B1 (LEI OLIVER [CA]) 26 September 2017 (2017-09-26) column 5, line 37 - column 5, line 62; figure 3 -----	1-11
	-/--	

Further documents are listed in the continuation of Box C.

See patent family annex.

* Special categories of cited documents :

<p>"A" document defining the general state of the art which is not considered to be of particular relevance</p> <p>"E" earlier application or patent but published on or after the international filing date</p> <p>"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)</p> <p>"O" document referring to an oral disclosure, use, exhibition or other means</p> <p>"P" document published prior to the international filing date but later than the priority date claimed</p>	<p>"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</p> <p>"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</p> <p>"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</p> <p>"&" document member of the same patent family</p>
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Date of the actual completion of the international search 23 October 2019	Date of mailing of the international search report 06/11/2019
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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 Iannuzzi, Silvia
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INTERNATIONAL SEARCH REPORT

International application No
PCT/EP2019/070394

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 2016/126995 A1 (LI ZHIYUN [US]) 5 May 2016 (2016-05-05) paragraph [0003] - paragraph [0004] paragraph [0041] - paragraph [0075] -----	1-11

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No PCT/EP2019/070394

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
EP 3270245	A1	17-01-2018	CN 107430394 A
			EP 3270245 A1
			JP 6448158 B2
			JP 2018523176 A
			KR 20170134517 A
			US 2018146356 A1
			WO 2016191961 A1

US 2015111529	A1	23-04-2015	US 2015111529 A1
			US 2017257491 A1
			WO 2015057874 A2

US 9775138	B1	26-09-2017	CN 107395661 A
			DE 102017109364 A1
			US 9775138 B1

US 2016126995	A1	05-05-2016	CN 107079285 A
			EP 3213538 A1
			KR 20160051587 A
			US 2016126995 A1
