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Canadian Intellectual Property Office

CA 2858634 C 2021/01/12

(11)(21) **2 858 634**

(12) **BREVET CANADIEN**
CANADIAN PATENT

(13) **C**

(86) Date de dépôt PCT/PCT Filing Date: 2012/12/10
(87) Date publication PCT/PCT Publication Date: 2013/06/13
(45) Date de délivrance/Issue Date: 2021/01/12
(85) Entrée phase nationale/National Entry: 2014/06/09
(86) N° demande PCT/PCT Application No.: CA 2012/050886
(87) N° publication PCT/PCT Publication No.: 2013/082725
(30) Priorité/Priority: 2011/12/09 (US61/568,828)

(51) Cl.Int./Int.Cl. *B60R 16/02* (2006.01), *B60J 5/00* (2006.01), *G06K 9/78* (2006.01)

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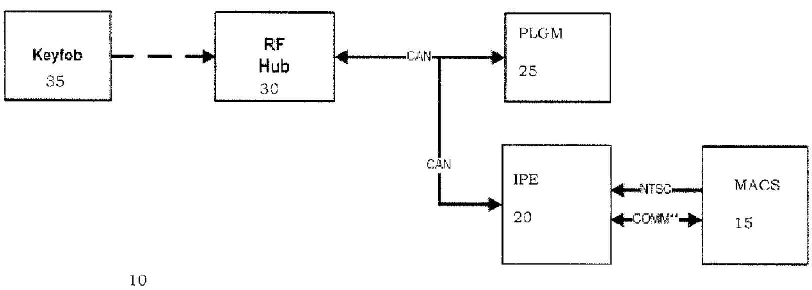
(54) Titre : CAMERA AUTOMOBILE MODULAIRE ET SYSTEME DE TRAITEMENT D'IMAGE POUR ENTREE DE PORTE AUTOMATISEE

(54) Title: MODULAR AUTOMOTIVE CAMERA AND IMAGE PROCESSING SYSTEM FOR AUTOMATED PORTAL ENTRY



(57) Abrégé/Abstract:
Described herein is a system and method for vehicle portal activation without a user having to use a manually activated mechanism. In one embodiment, a modular automotive camera solution (MACS) module in conjunction with an image processing system is used for automated portal entry. The MACS module recognizes the presence of a user and controls the opening of, for example, a lift gate, when operating as a rear view camera and working in conjunction with a passive entry system and power lift gate module (PLGM). The MACS module has a camera module functioning as a continuous sensor. The camera module is a complementary metal-oxide-semiconductor (CMOS) sensor based camera configured to output analog National Television System Committee (NTSC) composite video and digital video. The image processing module performs image processing and communicates with the PLGM and the MACS module. The system is configured for local interconnect network (LIN) communication.

(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property Organization
International Bureau

(43) International Publication Date
13 June 2013 (13.06.2013)

WIPO | PCT

(10) International Publication Number
WO 2013/082725 A1

(51) International Patent Classification:
B60R 16/02 (2006.01) ***G06K 9/78*** (2006.01)
B60J 5/00 (2006.01)

(21) International Application Number:
PCT/CA2012/050886

(22) International Filing Date:
10 December 2012 (10.12.2012)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:
61/568,828 9 December 2011 (09.12.2011) US

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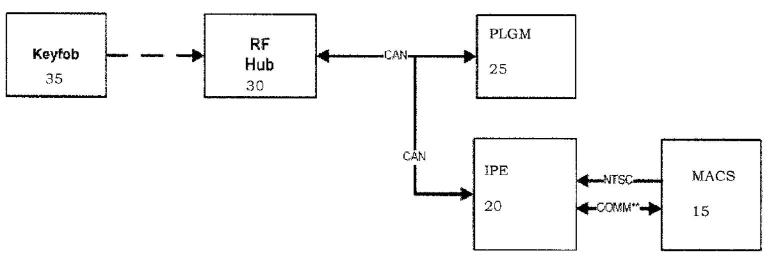
(81) **Designated States** *(unless otherwise indicated, for every kind of national protection available)*: AE, AG, AL, AM, AO, AT, AU, AZ, BA, BB, BG, BH, BN, BR, BW, BY, BZ, CA, CH, CL, CN, CO, CR, CU, CZ, DE, DK, DM, DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID, IL, IN, IS, JP, KE, KG, KM, KN, KP, KR, KZ, LA, LC, LK, LR, LS, LT, LU, LY, MA, MD, ME, MG, MK, MN, MW, MX, MY, MZ, NA, NG, NI, NO, NZ, OM, PA, PE, PG, PH, PL, PT, QA, RO, RS, RU, RW, SC, SD, SE, SG, SK, SL, SM, ST, SV, SY, TH, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, ZA, ZM, ZW.

(84) **Designated States** *(unless otherwise indicated, for every kind of regional protection available)*: ARIPO (BW, GH, GM, KE, LR, LS, MW, MZ, NA, RW, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, RU, TJ, TM), European (AL, AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HR, HU, IE, IS, IT, LT, LU, LV, MC, MK, MT, NL, NO, PL, PT, RO, RS, SE, SI, SK, SM, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

Published:
— *with international search report (Art. 21(3))*

(54) **Title**: MODULAR AUTOMOTIVE CAMERA AND IMAGE PROCESSING SYSTEM FOR AUTOMATED PORTAL ENTRY



10 FIG. 1

(57) **Abstract**: Described herein is a system and method for vehicle portal activation without a user having to use a manually activated mechanism. In one embodiment, a modular automotive camera solution (MACS) module in conjunction with an image processing system is used for automated portal entry. The MACS module recognizes the presence of a user and controls the opening of, for example, a lift gate, when operating as a rear view camera and working in conjunction with a passive entry system and power lift gate module (PLGM). The MACS module has a camera module functioning as a continuous sensor. The camera module is a complementary metal-oxide-semiconductor (CMOS) sensor based camera configured to output analog National Television System Committee (NTSC) composite video and digital video. The image processing module performs image processing and communicates with the PLGM and the MACS module. The system is configured for local interconnect network (LIN) communication.

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MODULAR AUTOMOTIVE CAMERA AND IMAGE PROCESSING SYSTEM FOR AUTOMATED PORTAL ENTRY

[0001]

FIELD OF INVENTION

[0002] This application is related to vehicle electronics.

BACKGROUND

[0003] Vehicles have a number of portals including automatic power lift gates, sliding doors, and doors. Drivers may need to get access to a vehicle's lift gate or trunk but may be unable to access their keys in order to unlock and open the portal due to, for example, carrying objects or the cold. It is one aspect of the invention to provide a system and method of activating a door, gate or other apparatus of a vehicle without the user having to retrieve a key or other manually activated device.

SUMMARY

[0004] Described herein is a system and method of activating a vehicle portal without a user having to retrieve a key or use a manually activated mechanism. In one embodiment, a modular automotive camera solution (MACS) module is used in conjunction with an image processing system and for automated portal entry. The MACS module can be used to recognize the presence of a user and to control the opening of, for example, a lift gate when installed in the vehicle as a rear view camera and working in conjunction with a passive entry system and a powered lift gate module (PLGM). The MACS module has a camera module functioning as a continuous sensor as part of a lift

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gate motor control mechanism. The camera module is a complementary metal–oxide–semiconductor (CMOS) sensor based camera that can be configured to output both analog National Television System Committee (NTSC) composite video and digital video through a low voltage differential signaling (LVDS) output. An image processing module performs the image processing and communicates with both the PLGM and the MACS module. The system is configured for local interconnect network (LIN) communication.

BRIEF DESCRIPTION OF THE DRAWINGS

[0005] Figure 1 is an embodiment of an automated portal entry system;

[0006] Figure 2 is an embodiment of a modular automotive camera solution (MACS module);

[0007] Figure 3 is an embodiment of an image processing engine (IPE) module;

[0008] Figures 4A and 4B are embodiments of a power management circuit with connections to other circuits for the MACS and IPE modules;

[0009] Figure 5 is an embodiment of an enable circuit and a local interconnect network circuit with connections to other circuits for the MACS and IPE modules;

[0010] Figures 6 is an embodiment of a microcontroller circuit with connections to other circuits for the MACS and IPE modules;

[0011] Figure 7 is an embodiment of circuitry interconnecting the microcontroller circuit of Figure 6 and an image sensor of Figure 8;

[0012] Figure 8 is an embodiment of an image sensor with connections to other circuits for the MACS and IPE modules; and

[0013] Figure 9 is an embodiment of a serializer with connections to other circuits for the MACS and IPE modules;

[0014] Figure 10 is an embodiment of an automated portal entry system with a MACS module integrated with an IPE module; and

[0015] Figure 11 is an embodiment of an automated portal entry system with a power lift gate module (PLGM) integrated with an IPE module.

DETAILED DESCRIPTION

[0016] It is to be understood that the figures and descriptions of embodiments of the system for automated vehicle portal entry have been simplified to illustrate elements that are relevant for a clear understanding, while eliminating, for the purpose of clarity, many other elements found in typical vehicle systems. Those of ordinary skill in the art may recognize that other elements and/or steps are desirable and/or required in implementing the present invention. However, because such elements and steps are well known in the art, and because they do not facilitate a better understanding of the present invention, a discussion of such elements and steps is not provided herein.

[0017] The non-limiting embodiments described herein are with respect to an automated vehicle portal entry system. Other electronic devices, modules and applications may also be used in view of these teachings without deviating from the spirit or scope as described herein. The automated vehicle portal entry system may be modified for a variety of applications and uses while remaining within the spirit and scope of the claims. The embodiments and variations described herein, and/or shown in the drawings, are presented by way of example only and are not limiting as to the scope and spirit. The descriptions herein may be applicable to all embodiments of the automated vehicle portal entry system although it may be described with respect to a particular embodiment.

[0018] Described herein is a system and method of automated vehicle portal entry where a user does not have to retrieve a key or use a manually activated mechanism. Figure 1 is an embodiment of an automated portal entry system 10. The automated portal entry system 10 includes a MACS module 15 in communication with an image processing engine (IPE) 20 over a communications bus (COMM), which may be a local interconnect network (LIN) bus or a hardwired input. The IPE 20 is in communication with a power lift gate module (PLGM) 25 and a radio frequency (RF) hub 30 over a controller area network (CAN) bus.

[0019] Operationally, the RF hub 30 will detect and identify a key fob 35 or some other like device and send an enable or wake-up signal to the IPE 20, which in turn will send the enable or wake-up signal to the MACS module 15. The MACS module 15 will send image or video information to the IPE 20. The information may be an analog or digital signal. For example, the analog signal may be a National Television System Committee (NTSC) composite video signal. The IPE 20 uses an image processing algorithm to determine if a person is standing at the back of the car. For example, the algorithm may be based on light, contour, or color gradient changes. The algorithm is robust enough to differentiate between a person standing next to the vehicle or a passerby. If the IPE 20 determines that a person is standing at the back of the vehicle, the IPE 20 sends an open signal to the PLGM 25 to open the lift gate.

[0020] Figure 2 is an embodiment of a MACS module 100. The MACS module 100 includes a power management module 120 that is connected to a microcontroller 140, an image sensor 125, and if available, a serializer 130. The microcontroller (MCU) 140 may be further connected to a local interconnect network (LIN) transceiver 150 and to the image sensor 125, which in turn may be connected to the serializer 130.

[0021] The MACS module 100 receives as inputs a battery voltage 155 and enable signal 160 from a passive entry system 195. The power management module 120 converts the battery voltage 155 and supplies the required voltages to the MCU 140, the image sensor 125, and if available, the serializer 130. The image sensor 125 is a complementary metal–oxide–semiconductor (CMOS) sensor based camera. The enable signal 160 is sent to the power management module 120 and the MCU 140 when identification is authenticated or verified, (for example, a key fob is detected). The MACS module 100 can be configured to output an analog National Television System Committee (NTSC) composite video signal 185 from the image sensor 125 and/or a digital video 180 through a low voltage differential signaling (LVDS) output in the serializer 130. The LIN transceiver 150 is configured to communicate via a LIN bus 170 with other vehicle electronic components or modules in the vehicle such as, for example, a passive entry system/module and a power lift gate module (PLGM) 190.

[0022] In general, the MACS module 100 is configured to recognize the presence of a user and to control the opening of, for example, a lift gate. The MACS module 100 is installed as a rear view camera module in the vehicle and works in conjunction with a passive entry system and PLGM. The MACS module 100 functions as a continuous sensor as part of a lift gate motor control mechanism. The MACS module can also be used in a minimal configuration as an automotive rear view camera or can be used in conjunction with a master module for image processing in driver assist applications like bird eye view, blind spot detection, and the like.

[0023] Figure 3 is an embodiment of an image processing engine (IPE) module 200 that includes a power management module 210 connected to a digital signal processor (DSP) 215 and if applicable or available, a deserializer 220. The DSP 215 may be further connected to a local interconnect network (LIN) transceiver 230 and to the deserializer 220. The LIN transceiver 230 is configured to communicate via a LIN/ controller area network (CAN) bus 245 with other vehicle electronic components or modules in the vehicle such as, for example, a passive entry system/module and a PLGM 190.

[0024] The IPE 200 receives as input a battery voltage 240 and a video information signal 250. The power management module 210 converts the battery voltage 240 and supplies the required voltages to the DSP 215 and if available, the deserializer 220. The video signal 250 is received by the deserializer 220, which in turn sends the video information signal 250 to the DSP 215 for analysis.

[0025] The IPE 200 performs image processing and communicates with both the PLGM 190 and the MACS module 100. The IPE 200 receives the video information signal 250 and based on an image processing algorithm in the DSP 215 decides if a person is standing at the back of the car. The algorithm can be based on light, contour or color gradient changes. The algorithm differentiates between a person standing and a passerby. In case of a positive determination, the IPE 200 communicates to the PLGM 190 via the LIN transceiver 230 over the LIN/CAN bus 245 to open the lift gate.

[0026] Operationally, a person will need to carry the proper identification, i.e. a key fob or other similar identification and be in the field of view of the rearview camera of the MACS module 100. The passive entry system 195 detects and/or authenticates the key fob, and sends an enable signal 160 to the PLGM 190, IPE 200 and the MACS module 100. The IPE 200 reads the image captured by the rearview camera/image sensor 125 of the MACS module 100 and determines if the lift gate should be opened. In an embodiment, the person may need to gesture in a predetermined manner, for example, waving a knee in front of the rearview camera, (which may be located above the license plate, inside the license plate lights bar), to ensure or increase the reliability or robustness of the detection algorithm. The decision is communicated to the PLGM 190 that controls the lift gate.

[0027] Figures 4A – 9 show an embodiment of the MACS module 100. The power management module 120 may include an example switch mode power supply circuit 300 and an example linear low dropout regulator circuit 305, embodiments for which are shown in Figures 4A and 4B. The switch mode power supply circuit 300 is configured to convert the battery voltage into the 3.3V required to supply the microcontroller 140, the serializer 130, and the analog and internal circuitries of the image sensor 125. The linear low dropout regulator 305 is configured to convert the 3.3V to the 1.5V required to supply the digital core of the image sensor 125.

[0028] Figure 5 shows an embodiment of an enable circuit 410 and a LIN circuit 420. The enable circuit 410 is a digital input interface which allows the camera module to be awakened on an external hard wired input. In the case of the rear view camera application, this input can be the backup lights signal. The LIN circuit 420 includes a LIN transceiver integrated circuit (IC) 425 which interfaces the LIN bus 170 with the MCU 140. The LIN circuit 420 may also be used to wake up the MACS module 100 on a bus request and may be used for MCU 140 re-flashing. It may also be used for remote and/or real time update of the registers in the image sensor 125. For example, on a birds view application when four cameras are used, the image sensor parameters of each camera need to be controlled as a function of specific light conditions. This is also applicable for lift gate control applications if the IPE 200 needs to control and/or adjust the MACS module 100/camera parameters.

[0029] Figure 6 shows an embodiment of a microcontroller circuit 140 and Figure 7 shows an embodiment of circuits 600 interconnecting the microcontroller circuit 140 of Figure 6 and an image sensor 700 of Figure 8. The microcontroller circuit 140 updates the registers on an image sensor 700 through the I^2C bus after a power on reset. It monitors the vehicle battery voltage through the Rl, R2 resistive voltage divider network shown in Figure 4A. It also controls the power up/down of the image sensor 700 via the circuits 600 and a serializer IC 805 of a serializer circuit 130 as shown in Figure 9, (i.e. output pins 8 and 20). The microcontroller circuit 140 communicates with the other modules in the vehicle via the LIN circuit 420 shown in Figure 5.

[0030] Figure 8 shows an embodiment of the image sensor 700, which may be for example, an Omnivision® OV07955, an automotive video graphics array (VGA) sensor. The image sensor 700 outputs both an analog video signal, (i.e. NTSC or PAL) and an 8 bit digital video signal. For example, the analog video signal is NTSC signal 185 in Figure 9.

[0031] Figure 9 shows an embodiment of the serializer circuit 130 that includes the serializer IC 805. The serializer IC 805 processes a parallel digital video output together with a vertical synchronization signal (VSYNC), a horizontal synchronization signal (HSYNC) and pixel clock information and outputs a two wire differential serial signal. This signal is sent to the IPE 200 and used to detect the presence of the driver at the back of the vehicle.

[0032] Figure 10 is an embodiment of an automated portal entry system 1000 with a MACS module integrated with an IPE module. The automated portal entry system 1000 is in part located at a lift gate 1005 and includes a drive system 1015, a MACS module 1020 and PLGM 1010 which are interconnected as described herein above. The MACS module 1020 includes an

IPE submodule 1030 and a MACS submodule 1025. The automated portal entry system 1000 functions or operates as described herein above for any of the embodiments.

[0033] Figure 11 is an embodiment of an automated portal entry system 1100 with a power lift gate module (PLGM) integrated with an IPE module. The automated portal entry system 1100 is in part located at a lift gate 1105 and includes a PLGM 1110, a drive system 1115, and a MACS module 1120, which are interconnected as described herein above. The PLGM module 1110 includes a a PLGM submodule 1125 and an IPE submodule 1130. The automated portal entry system 1100 functions or operates as described herein above for any of the embodiments. In another embodiment, the IPE may be part of a rear zone module electronics package.

[0034] In general, embodiments for a system for automated vehicle portal entry are described herein. The system includes a camera or imaging system collocated with the portal and a mechanical or electromechanical system configured to open the portal. An image processing engive/module is configured to determine when to open the portal. This determination includes a user detection determination, a user gesture determination and a key fob determination. The user detection determination and the user gesture determination are based on images received from the camera and the key fob determination is based on radio frequency detection or the like. The key fob is associated with the user, the vehicle or both.

[0035] As described herein, the methods described herein are not limited to any particular element(s) that perform(s) any particular function(s) and some steps of the methods presented need not necessarily occur in the order shown. For example, in some cases two or more method steps may occur in a different order or simultaneously. In addition, some steps of the described methods may be optional (even if not explicitly stated to be optional) and, therefore, may be omitted. These and other variations of the methods disclosed herein will be readily apparent, especially in view of the description of the modular automotive camera solution (MACS) described herein, and are considered to be within the full scope of the invention.

[0036] Although features and elements are described above in particular combinations, each feature or element can be used alone without the other features and elements or in various combinations with or without other features and elements.

CLAIMS

What is claimed is:

1. A system for automated vehicle portal entry, comprising:

a camera collocated with the portal, wherein the camera is a continuous operating sensor;

a mechanical system configured to open the portal;

a radio frequency (RF) hub configured to detect and identify a key fob; and

an image processing engine comprising a digital signal processor communicatively coupled to the camera, the mechanical system, and the RF hub,

wherein the digital signal processor is configured to:

detect the key fob using the RF hub,

on a condition that the key fob is detected, detect, based on images received from the camera, that a user is standing and maintaining position adjacent to the vehicle and is not a passerby, and

on a condition that the user is detected standing and maintaining position adjacent to the vehicle, detect, based on images received from the camera, that a pre-determined gesture has subsequently been performed by the user, and

on a condition that the user is detected standing and maintaining position adjacent to the vehicle and that the pre-determined gesture has been detected, control the mechanical system to open the portal.

2. The system of claim 1, wherein the image processing engine further includes a power management unit, local interconnect network/control area network transceivers, and a deserializer.

3. The system of claim 1, wherein the image processing engine is configured to verify key fob detection associated with a user.

4. The system of claim 1, wherein the image processing engine is integrated with one of the camera or a power lift gate module.

5. A method for automatically activating a portal of a vehicle, the method comprising:

detecting and identifying a key fob using a radio frequency (RF) hub based upon verification of the key fob, wherein the RF hub is configured to send an enable signal to a digital signal processor;

capturing images using a camera collocated with the portal;

receiving an image from the captured images using an image processing engine;

processing the image using the digital signal processor; and

activating the mechanical system to open the portal using the digital signal processor based on:

the detecting and identifying of the key fob,

on a condition that the key fob is detected, detecting, based on images received from the camera, that a user is standing and maintaining position adjacent to the vehicle and is not a passerby, and

on a condition that the user is detected standing and maintaining position adjacent to the vehicle, detecting, based on images received from the camera that a pre-determined gesture has subsequently been performed by the user, and

on a condition that the user is detected standing and maintaining position adjacent to the vehicle and that the pre-determined gesture has been detected, controlling the mechanical system to open the portal.

6. A vehicle, comprising:

a camera system collocated with a portal on the vehicle wherein the camera system is a continuous operating sensor;

a controller configured to set parameters for the camera to capture images used for automated vehicle portal entry;

an electromechanical system configured to open the portal;

an image processing system configured to receive video information of the captured images from the camera; and

a radio frequency (RF) system having an RF hub configured to detect and identify a key fob, wherein the RF hub is configured to send an enable signal to the controller and the image processing system upon verification of the key fob, wherein

the image processing system comprises a digital signal processor communicatively coupled to the camera system, the electromechanical system, and the RF system, and

the image processing system is configured to:

detect the key fob using the RF hub,

on a condition that the key fob is detected, detect, based on images received from the camera system, that a user is standing and maintaining position adjacent to the vehicle and is not a passerby,

on a condition that the user is detected standing and maintaining position adjacent to the vehicle, detect, based on images received from the camera system, that a pre-determined gesture has subsequently been performed by the user, and

on a condition that the user is detected standing and maintaining position adjacent to the vehicle and that the pre-determined gesture has been detected, control the electromechanical system to open the portal.

7. The vehicle of claim 6, wherein the image processing system includes a power management unit, local interconnect network/control area network transceivers, and a deserializer.

8. The vehicle of claim 6, wherein the image processing system is integrated with the camera system.

9. A system for automated vehicle portal entry, comprising:

an imaging system collocated with the portal, wherein the imaging system is a continuous operating sensor;

a controller configured to set parameters for the imaging system to capture images used for automated vehicle portal entry;

an electromechanical system configured to open the portal;

a radio frequency (RF) module configured to detect and identify a key fob; and

a processing module communicatively coupled to the imaging system, the electromechanical system, and the RF module,

wherein the processing module is configured to:

detect, identify, and verify the key fob,

on a condition that the key fob is detected, identified, and verified, detect, based on images received from the imaging system, that a user is standing and maintaining position adjacent to the vehicle and is not a passerby,

on a condition that the user is detected standing and maintaining position adjacent to the vehicle, detect, based on images received from the imaging system, that a pre-determined gesture has subsequently been performed by the user, and

on a condition that the user is detected standing and maintaining position adjacent to the vehicle and that the pre-determined gesture has been detected, control the electromechanical system to open the portal.

10. The system of claim 9, wherein the processing module includes a power management unit, local interconnect network/control area network transceivers, a digital signal processor, and a deserializer.

11. The system of claim 9, wherein the pre-determined gesture is based on images from the imaging system.

12. The system of claim 9, wherein the processing module is integrated with the imaging system.

13. The system of claim 1, wherein the images received from the camera are processed by the image processing engine based on light, contour, or color gradient changes.

14. The system of claim 1, further comprising a controller configured to set parameters for the camera to capture images used for rear view depiction and driver assist processing.

15. The system of claim 9, wherein the images received from the imaging system are processed by the image processing engine based on light, contour, or color gradient changes.

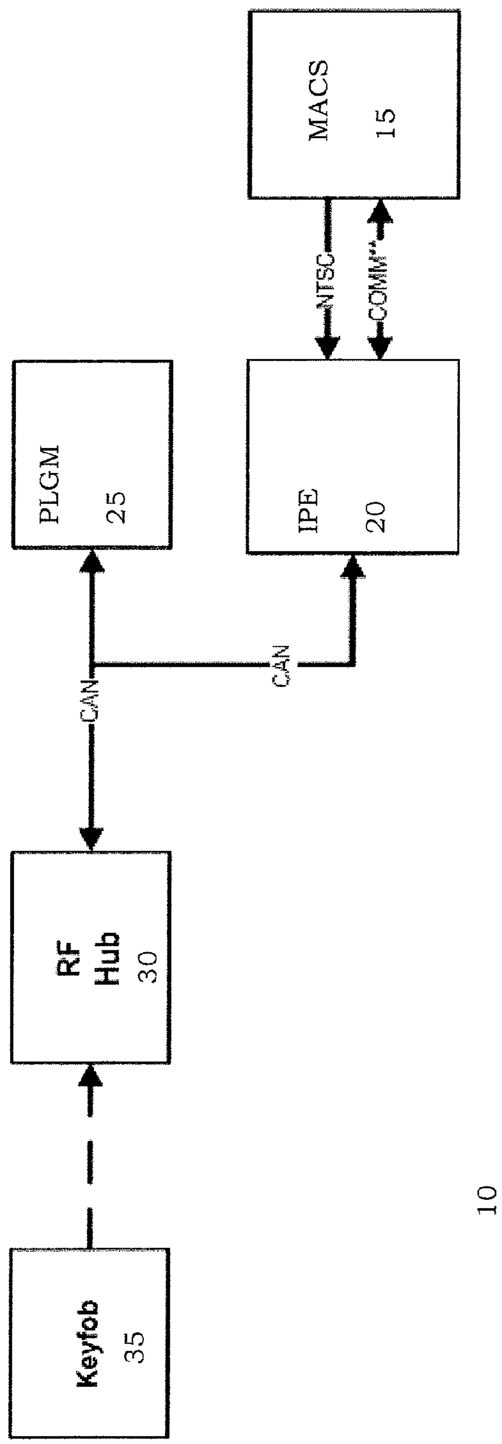


FIG. 1

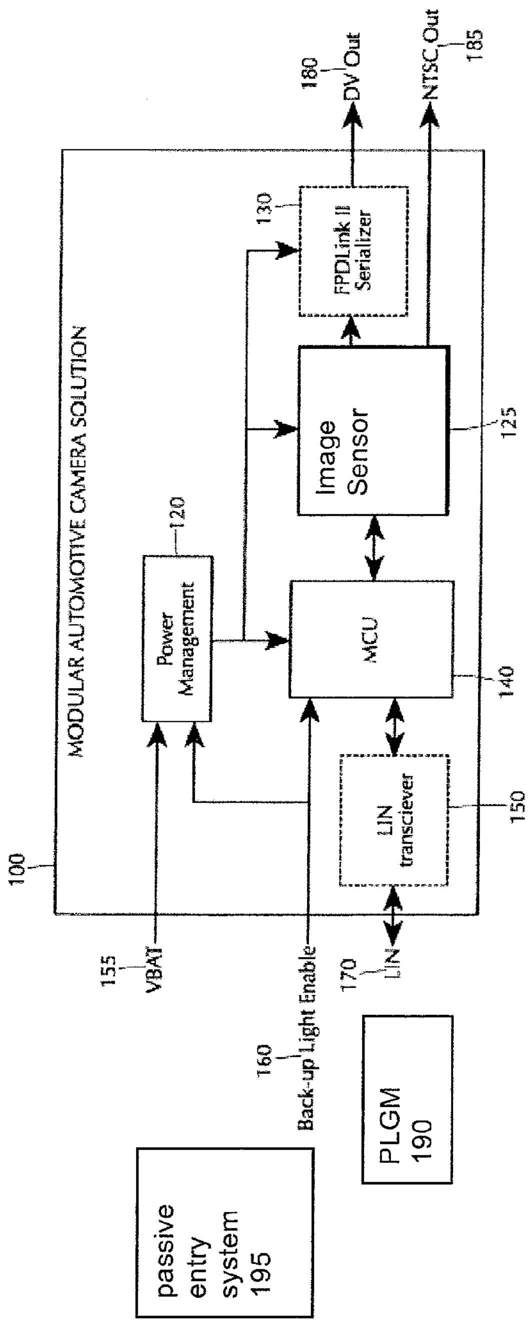

MODULAR AUTOMOTIVE CAMERA SOLUTION
100
Power Management
120
MCU
140
Image Sensor
125
FPDLink II Serializer
130
LIN transciever
150
VBAT
155
Back-up Light Enable
160
LIN
170
DV Out
180
NTSC Out
185
PLGM 190
passive entry system 195

FIG. 2

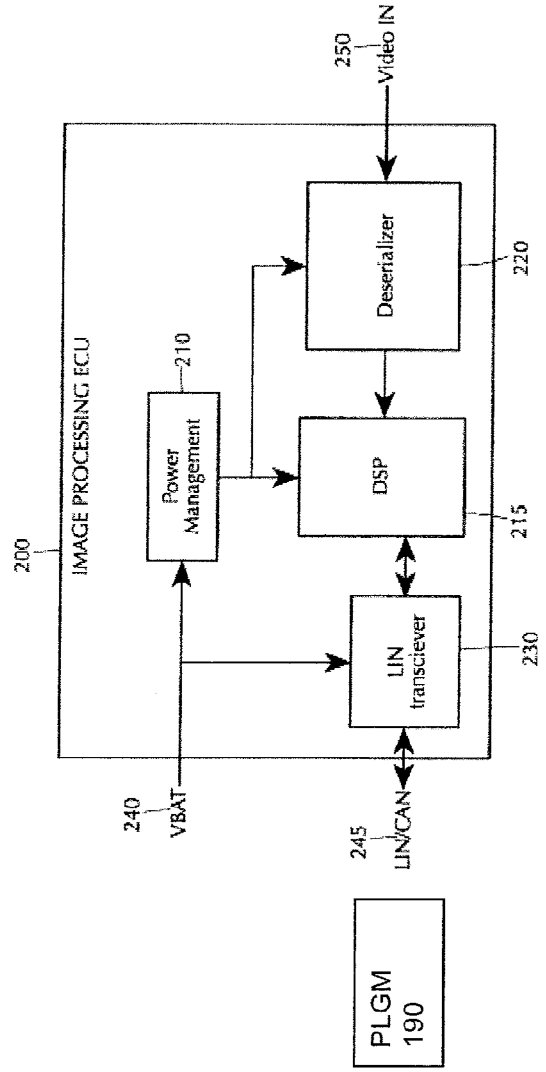

200
IMAGE PROCESSING ECU
Power Management
210
Deserializer
220
DSP
215
LIN transciever
230
240
VBAT
245
LIN/CAN
250
Video IN
PLGM 190

FIG. 3

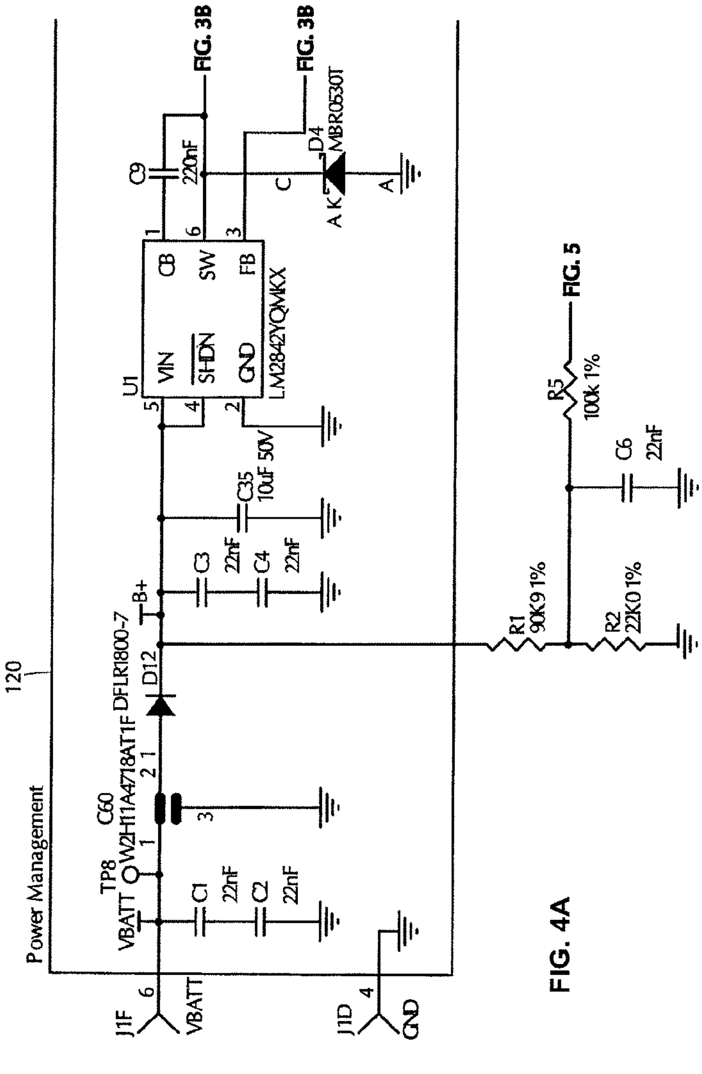

Power Management
120
FIG. 3B
FIG. 3B
C9
220nF
D4
MBR0530T
U1
VIN
SHDN
GND
CB
SW
FB
LM2842YQMKX
FIG. 5
R5
100k 1%
C6
22nF
C35
10uF 50V
C3
22nF
C4
22nF
B+
D12
DFLR1800-7
R1
90K9 1%
R2
22K0 1%
C60
W2H11A4718AT1F
TP8
VBATT
C1
22nF
C2
22nF
J1F
VBATT
J1D
GND

FIG. 4A

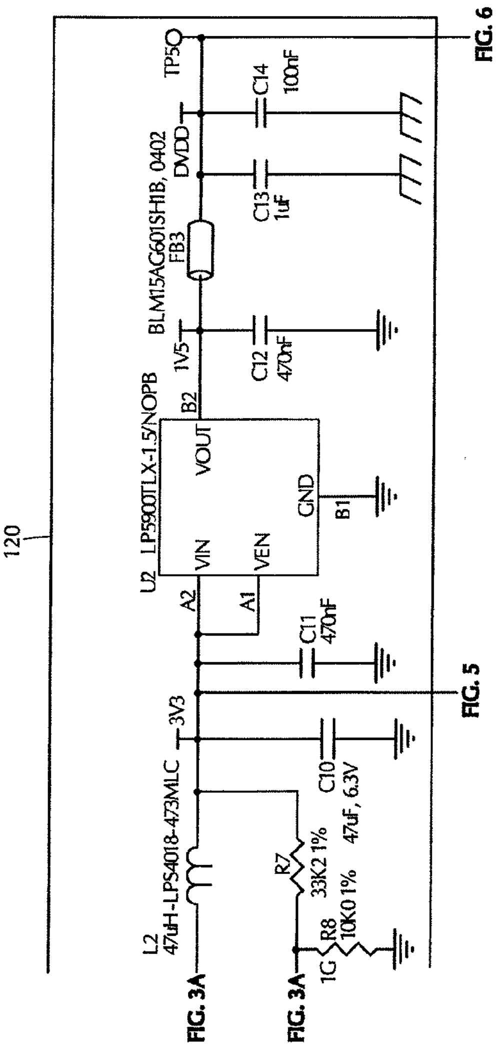

120
U2
LP5900TLX-1.5/NOPB
VIN
VEN
VOUT
GND
A2
A1
B2
B1
1V5
C12
470nF
BLM15AG601SH1B, 0402
FB3
DVDD
C13
1uF
C14
100nF
TP5
FIG. 6
C11
470nF
FIG. 5
3V3
C10
47uF, 6.3V
L2
47uH-LPS4018-473MLC
R7
33K2 1%
R8
10K0 1%
1G
FIG. 3A
FIG. 3A

FIG. 4B

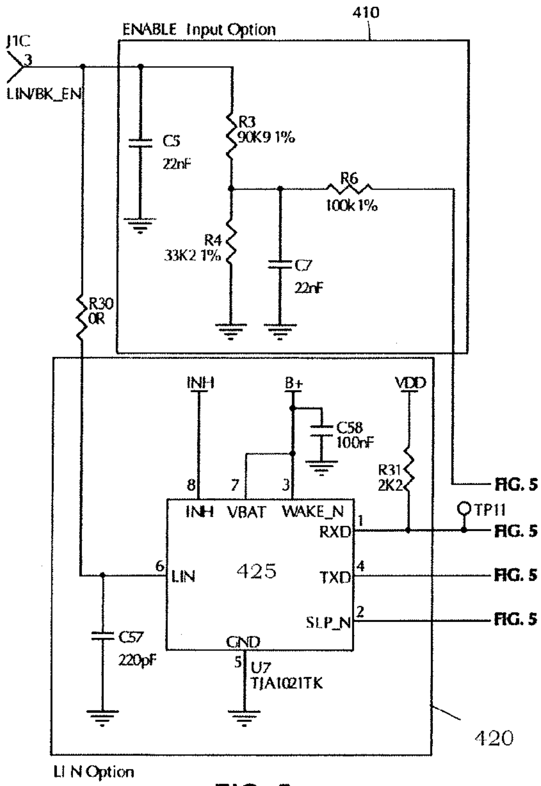

410
ENABLE Input Option
J1C
3
LIN/BK_EN
C5
22nF
R3
90K9 1%
R6
100k 1%
R4
33K2 1%
C7
22nF
R30
0R
INH
B+
VDD
C58
100nF
R31
2K2
8
7
3
INH
VBAT
WAKE_N
1
RXD
TP11
FIG. 5
FIG. 5
6
LIN
425
TXD
4
FIG. 5
SLP_N
2
FIG. 5
C57
220pF
GND
5
U7
TJA1021TK
420
LIN Option

FIG. 5

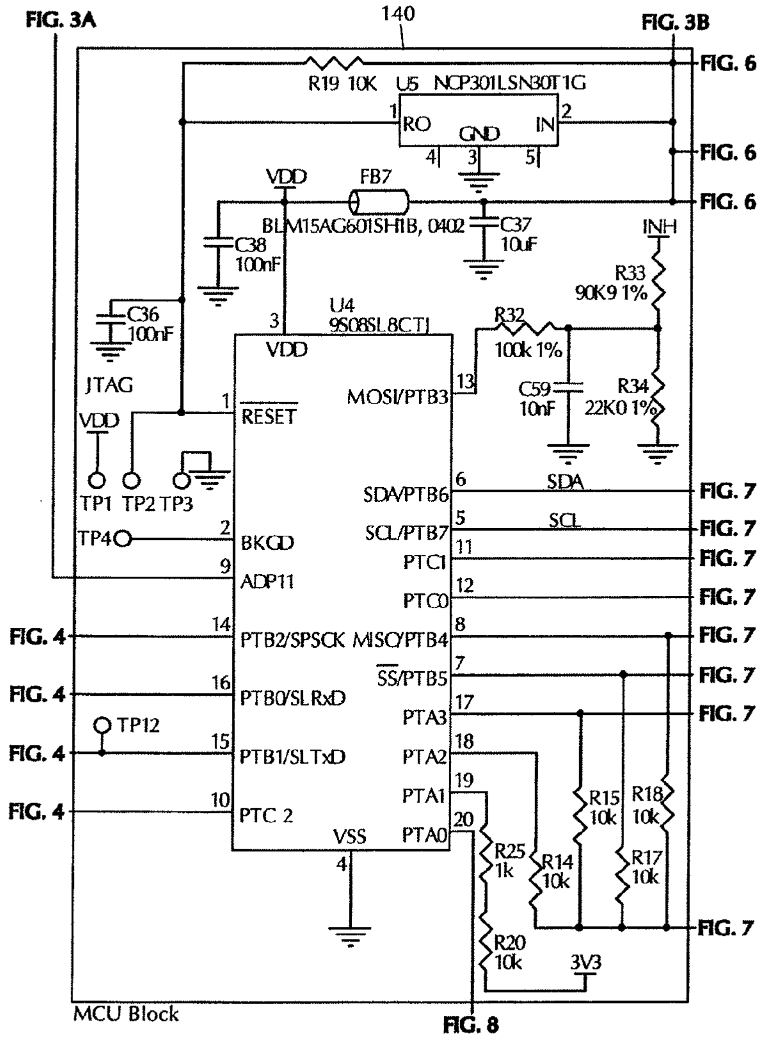


FIG. 3A
140
FIG. 3B
FIG. 6
R19 10K
U5 NCP301LSN30T1G
RO
GND
IN
FIG. 6
VDD
FB7
FIG. 6
BLM15AG601SH1B, 0402
C37
10uF
C38
100nF
INH
R33
90K9 1%
C36
100nF
U4
9S08SL8CTJ
R32
100k 1%
VDD
JTAG
MOSI/PTB3
C59
10nF
R34
22K0 1%
RESET
VDD
TP1 TP2 TP3
SDA/PTB6
SDA
FIG. 7
TP4
BKGD
SCL/PTB7
SCL
FIG. 7
ADP11
PTC1
FIG. 7
PTC0
FIG. 7
FIG. 4
PTB2/SPSCK
MISO/PTB4
FIG. 7
SS/PTB5
FIG. 7
FIG. 4
PTB0/SLRxD
PTA3
FIG. 7
TP12
FIG. 4
PTB1/SLTxD
PTA2
R15
10k
R18
10k
FIG. 4
PTC 2
PTA1
VSS
PTA0
R25
1k
R14
10k
R17
10k
FIG. 7
R20
10k
3V3
MCU Block
FIG. 8

FIG. 6

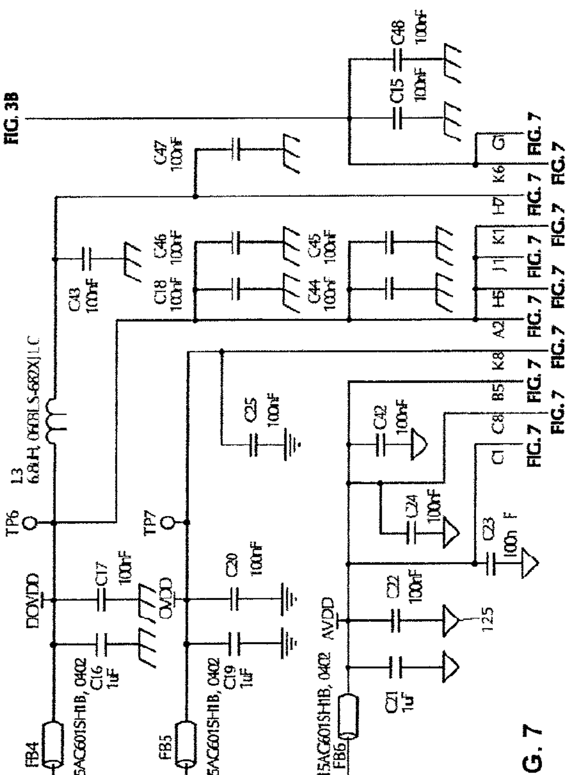


FIG. 3B
FIG. 5
FIG. 5
FIG. 5
FB4
FB5
FB6
BLM15AG601SH1B, 0402
BLM15AG601SH1B, 0402
BLM15AG601SH1B, 0402
DCVDD
CVDD
AVDD
TP6
TP7
L3
6.8uH, 0603LS-682XJLC
C16
1uF
C17
100nF
C19
1uF
C20
100nF
C21
1uF
C22
100nF
C23
100nF
C24
100nF
C25
100nF
C42
100nF
C43
100nF
C18
100nF
C46
100nF
C44
100nF
C45
100nF
C47
100nF
C15
100nF
C48
100nF
125
C1
C8
B5
K8
A2
H5
J1
K1
H7
K6
G1
FIG. 7

FIG. 7

600

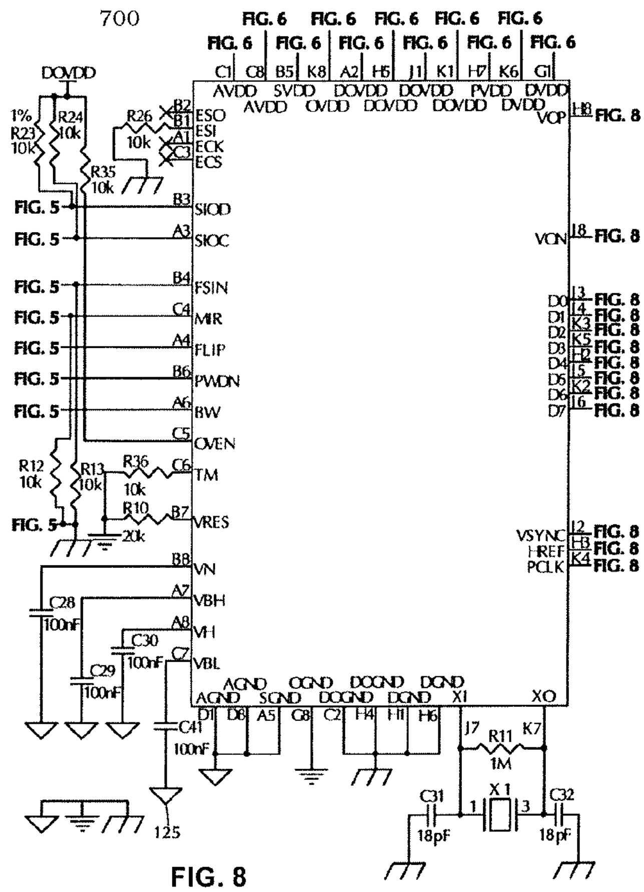

700
FIG. 6
FIG. 5
FIG. 8
DOVDD
R23
10k
R24
R35
R26
R12
R13
R36
R10
20k
C28
C29
C30
C31
C32
C41
100nF
18pF
R11
1M
X1
SIOD
SIOC
FSIN
MIR
FLIP
PWDN
BW
OVEN
TM
VRES
VN
VBH
VH
VBL
VOP
VON
VSYNC
HREF
PCLK
XO
125

FIG. 8

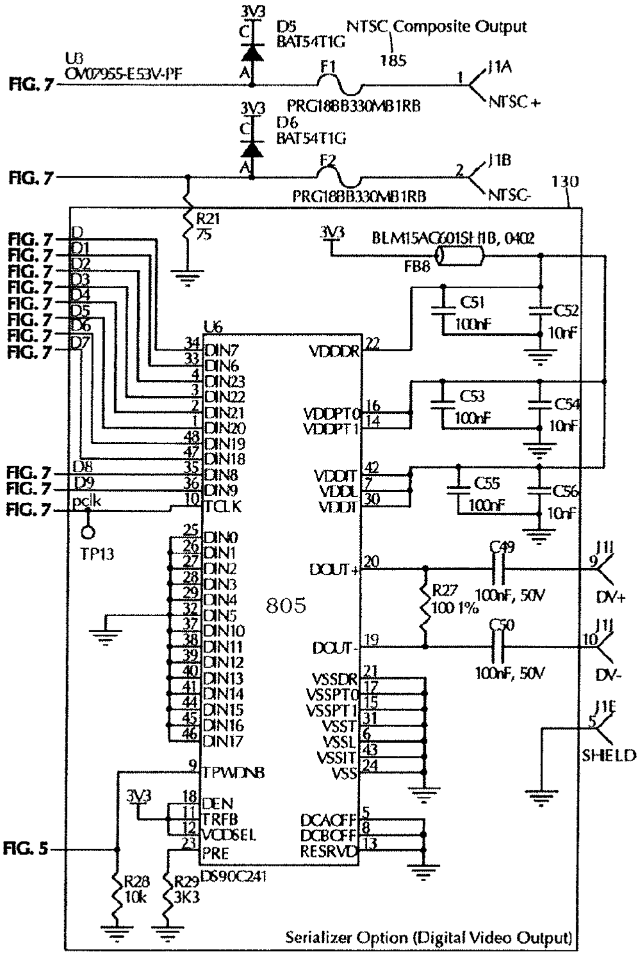

3V3
D5
BAT54T1G
NTSC Composite Output
185
U3
OV07955-E53V-PF
FIG. 7
F1
J1A
NTSC +
PRG18BB330MB1RB
3V3
D6
BAT54T1G
FIG. 7
F2
J1B
NTSC-
PRG18BB330MB1RB
130
R21
75
3V3
BLM15AG601SH1B, 0402
FB8
U6
C51
100nF
C52
10nF
VDDDR
C53
100nF
C54
10nF
VDDPT0
VDDPT1
VDDIT
VDDL
VDDT
C55
100nF
C56
10nF
DIN7
DIN6
DIN23
DIN22
DIN21
DIN20
DIN19
DIN18
DIN8
DIN9
TCLK
pclk
TP13
DIN0
DIN1
DIN2
DIN3
DIN4
DIN5
DIN10
DIN11
DIN12
DIN13
DIN14
DIN15
DIN16
DIN17
805
DOUT+
C49
100nF, 50V
J1I
DV+
R27
100 1%
DOUT-
C50
100nF, 50V
DV-
VSSDR
VSSPT0
VSSPT1
VSST
VSSL
VSSIT
VSS
J1E
SHIELD
TPWDNB
DEN
TRFB
VODSEL
PRE
DCAOFF
DCBOFF
RESRVD
FIG. 5
R28
10k
R29
3K3
DS90C241
Serializer Option (Digital Video Output)

FIG. 9

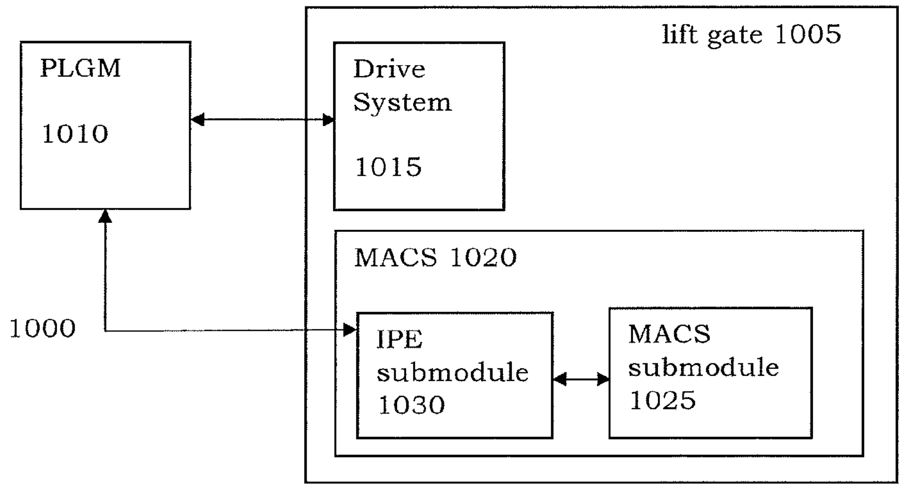

PLGM
1010
lift gate 1005
Drive
System
1015
MACS 1020
1000
IPE
submodule
1030
MACS
submodule
1025

FIG. 10

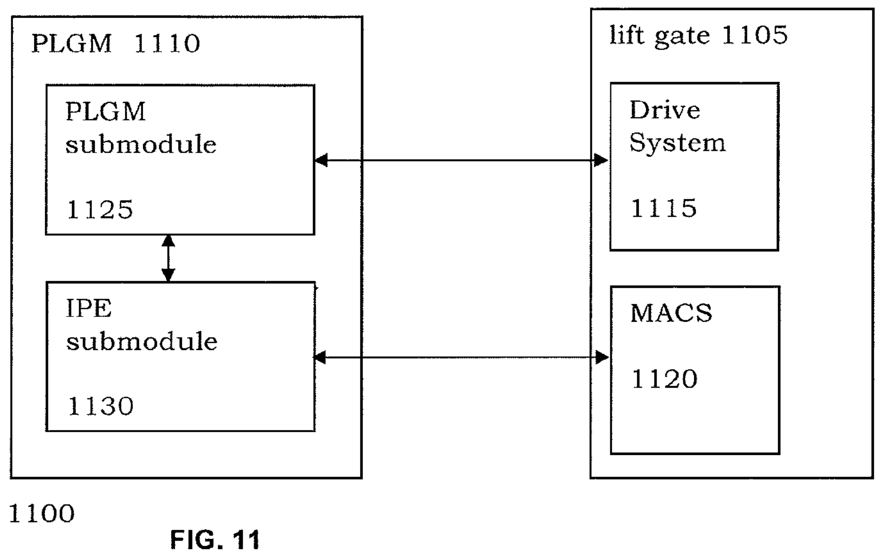
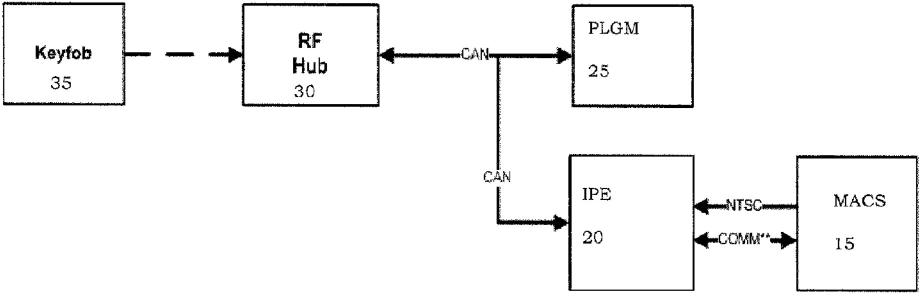

PLGM 1110
PLGM
submodule
1125
IPE
submodule
1130
lift gate 1105
Drive
System
1115
MACS
1120
1100

FIG. 11



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