
BEFORE THE PATENT TRIAL AND APPEAL BOARD

CUB ELECPARTS INC.

Petitioner

v.

ORANGE ELECTRONIC CO., LTD.

Patent Owner

Patent No. 8,031,064 C3

DECLARATION OF TOM QINGFENG TANG, Ph.D.

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I, Tom Qingfeng Tang, Ph.D., do hereby declare and state that all statements made herein are of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code.

Dated: 13 February 2024

Tom Qingfeng Tang, Ph.D.



2/13/2024

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I, Dr. Tom Qingfeng Tang, declare the following to be true to the best of my knowledge and belief:

1. I am the first-named inventor of U.S. Patent No. 7,518,495 (Tang), entitled “Universal Tire Pressure Monitor.” I am a coinventor of U.S. Patent No. 6,941,801 (Lemense), entitled “Tire Pressure Monitoring System.” Thomas Lemense and I were part of a group of engineers at Lear Corporation who worked together on the TPMS system components of both patents.

2. I have over 20 years’ experience in the design of TPMS sensors and other TPMS-related products for the OEM and aftermarket automotive industry and retired as CEO of Lear Asia and China (Lear is the original assignee of the Tang and Lemense patents prior to later assignment to Schrader). Please see my resume, attached in Appendix 1.

3. The Tang/Lemense patents form the IP basis for the best-selling aftermarket programmable TPMS sensors and ID-copying setting tools from Schrader/Sensata called “EZ Sensor” and “EZ Tool,” respectively (The Tang and Lemense patents were sold by Lear and purchased by Schrader). The EZ Sensor is a programmable aftermarket sensor while the EZ tool copies an ID from a

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sensor to be replaced and writes it into the “blank” EZ Sensor. Please see Appendix 2.

4. Based on my education and experience, I offer the following opinions regarding my patents, Tang and Lemense.

a. The Tang and Lemense patents describe an aftermarket TPMS system in which the Tang sensors are universal programmable sensors that “clone” an OEM sensor. They are used when an OEM sensor needs to be replaced and are programmed such that they mimic the original OEM system and can therefore act as the original OEM sensor when replacing the OEM sensor. Lemense is a setting tool/service tool that uses the Tang sensors. The Lemense tool wirelessly copies the ID code from the old OEM sensor to be replaced and writes it into a Tang sensor. This programmed sensor then is used as a “clone” sensor in the existing TPMS system of a vehicle.

b. Column 4, lines 1-4 of Lemense states: “The sensor units may preferably be comprised of a universal replacement sensor of the type described in co-pending U.S. application serial number (Lear attorney docket 4056).” The Tang patent is the “Lear attorney docket 4056” cited in Lemense. These two patents were designed to be used together as evidenced by this statement in Lemense. Therefore, I consider the inventions in the Tang and Lemense patents as one “system” of sensor plus setting tool.

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c. I have read the Orange patent, U.S. 8,031,064C to Yu (Yu). Yu relates to an identical aftermarket system for cloning OEM sensors using a wireless setting tool as the system of Tang/Lemense. In particular, the following identical system features are noted based on the Yu disclosure and claims.

i. **“identification rewriteable tire pressure detector comprising a micro-processing module have a rewriteable memory unit to record an identification”**

The Tang universal tire pressure monitor has a microprocessor controller that includes memory which is rewriteable. We designed the memory to be rewriteable so that an ID can be programmed into the memory using the Lemense setting tool. The Tang patent states, “A controller (32) is provided in communication with transmitter (30) and with a receiver (34). Controller (32) preferably comprises a microprocessor, which preferably includes a storage device or memory, such as a read-only memory (ROM) and/or any type of random access memory (RAM). According to one embodiment of the present invention, controller (32) is for storing a plurality of manufacturers' codes...” (2:21-25).

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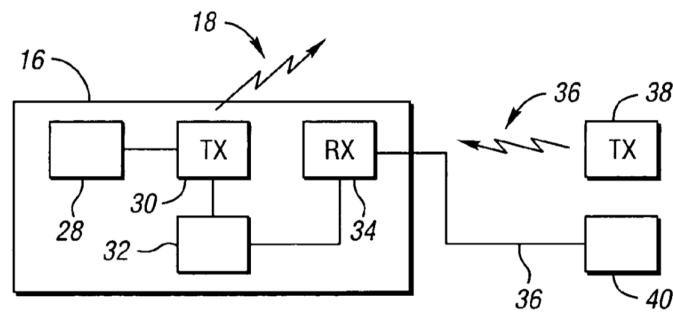


Fig. 2

We designed this tire pressure monitor to be programmed with the ID from an existing sensor. As such, the “storage device or memory” of the microprocessor is “rewriteable” in that an ID can be written into the memory (e.g., by signal 36, above) and can be overwritten, if needed. Note that the Tang patent uses the term “manufacturers’ codes” while the Lemense patent uses the term “ID code.” Both terms relate to the identical sensor identification code (which includes both the specific sensor number as well as other numbers relating to signal formats and parity checks used by individual manufacturers); as the two patents were written by two different patent attorneys at two different law firms there are some minor discrepancies between the terminology of the two patents.

ii. **“a sensing module electrically connected to the micro-processing module and having a pressure-detecting unit to detect a tire pressure and send a detection result to the micro-processing module”**

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The pressure sensor 28 connects to the transmitter/controller assembly in order to send out the pressure signal. “A transmitter (TX) (30) is provided in communication with sensor (28) for transmitting wireless signals (18) representative of the sensed tire pressure... In that regard, wireless signals (18) are preferably radio frequency (RF) signals...” (4:10-15).

The transmitter 30 and microcontroller 32 are a single integrated unit. When the patent says that the pressure sensor 28 sends the signal to the transmitter, it sends this signal to the single integrated unit of 30/32 which is the same feature of the Yu patent claims.

iii. an interface arranged to receive an external signal and send the external signal to the microprocessing module, wherein the external signal comprises an external identification to be written into the rewriteable memory unit or to be used to overwrite a preset identification in the rewriteable memory unit;

The Tang patent states, “Referring still to FIG. 2, receiver (34) is for receiving a program signal (36). Program signal (36) is preferably a low frequency (LF) signal, such as in the range of approximately 125-135 kHz, transmitted from a remote LF transmitter (38). Receiver (34), program signal (36) and remote transmitter (38), however, could take other forms known in the art, such as RF” (4:33-43).

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Our “program signal” that is written into the universal monitor memory includes the “external identification” of the Yu patent. This is because the monitor is designed to “clone” the OEM sensor that it being replaced. In the TPMS system in the vehicle, the sensor ID (“manufacturer code”) is required for the vehicle to identify which tire is sending which pressure number. Without a sensor ID, the TPMS system cannot display the tire pressure for each tire.

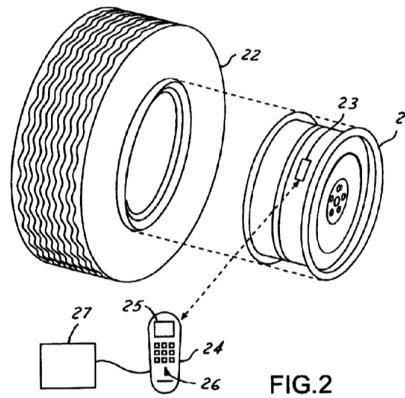
iv. [a] setting apparatus is configured to:

obtain an update identification to be written into a new identification rewriteable tire pressure detector either by (1) receiving the RF signal from an old tire pressure detector by the receiving module, retrieving an old identification of the old tire pressure detector from the RF signal, and using the old identification as the update identification, or by (2) receiving a manual input of the identification from the input module, and using the identification as the update identification;

Turning to the setting tool/service tool portion of our Tang/Lemense aftermarket TPMS replacement system, the Lemense patent is where we described, in detail, how to “clone” an OEM sensor so that our universal sensor becomes the “drop-in” replacement sensor for a broken sensor in an existing vehicle TPMS system. The handheld wireless service tool 24 of Lemense FIG. 2 below corresponds to the “remote LF transmitter 38” in the Tang patent that sends

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a program signal with the ID code to program the Tang universal TPMS monitor 23 in the wheel.



The sensor ID code can be transmitted wirelessly to service tool 24 or it can be read from the label of the sensor 23.

In Lemense we said, “Preferably, the service tool [24] is used to replicate or clone the ID code of a broken sensor unit into a replacement sensor unit over a LF communication link between the service tool and the replacement sensor unit... If sensor unit damage prevents RF communication, then the corresponding ID code may be determined by other means (e.g., reading from a printed label on the sensory unit...)...The sensor units may preferably be comprised of a universal replacement sensor of the type described in co-pending U.S. application serial number (Lear attorney docket 4056)” (3:57-4:4). Note that Lear 4056 is our Tang patent, as discussed above.

When we say to “clone the ID” this corresponds to the program signal 36 in Tang that was sent by remote LF transmitter 38. Note that “ID” is a rather broad term that encompasses both the particular sensor ID and the manufacturer

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ID code/format, as described above (which are transmitted together as a single string of information).

v. verify the update identification newly recorded in the rewriteable memory unit of the new identification rewriteable tire pressure detector, wherein the verifying step comprises:

receiving, by the setting apparatus, a wireless signal from the new identification rewriteable tire pressure detector, wherein the wireless signal comprises the update identification newly recorded in the rewriteable memory unit; and

judging, by the setting apparatus, consistency of the update identification newly recorded in the rewritable memory unit and the old identification of the old tire pressure detector.

In Lemense, we described that the tire service technician should test all the tire pressure sensors with the service tool 24 as a last step after programming the universal tire pressure sensor with the ID from the old tire pressure sensor using the service tool 24. This testing includes receiving a signal, wirelessly, from the newly-programmed sensor and determining if it is working properly. “It may be desirable to retest each sensor after mounting to ensure that each is still functioning using the same test procedure shown in steps 40 through 43” (4:10-13). Steps 40-43 are shown in the Lemense flowchart of FIG. 4 which shows a comprehensive sensor testing (to ensure proper sensor functioning), replacement

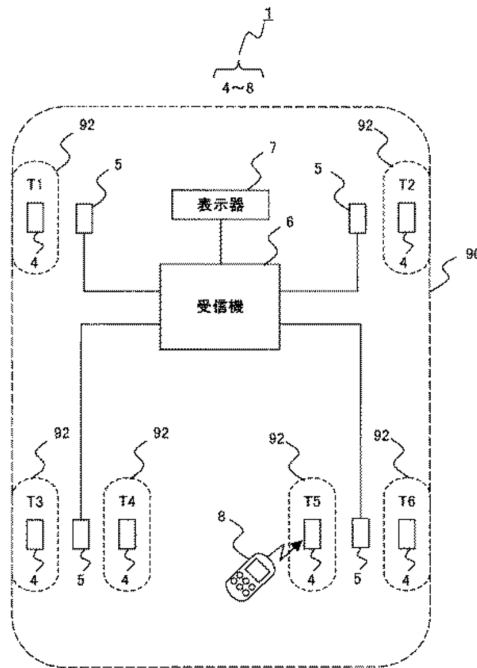
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(for non-working sensors), and retesting protocol (for new sensors that have been cloned using IDs from old sensors) for a tire service technician using the service tool 24.

As we stated in Lemense, the newly-programmed sensor is interrogated by the service tool and then the newly-programmed sensor responds with its information (sending its pressure signals as well as its ID since all transmissions include the sensor ID as well as the measured conditions). During this transmission by the newly programmed sensor, the service tool of Lemense sees the ID and whether it is the same as the code that was programmed into the sensor. In general, the service technician determines to reprogram the sensor if the code is incorrect after this interrogation following programming. This is because the service technician will also check the vehicle TPMS controller to ensure that the newly-programmed sensor is being read by the vehicle controller. Since the vehicle controller is not reprogrammed, it will only recognize the old ID from the old sensor. Therefore, every tire repair technician will, as a matter of shop protocol, ensure that the entire system is working before returning the vehicle to the customer.

To this end, I have reviewed the Japanese Patent Publication to Matsui (JP 2006-15832). In Matsui, a setting tool 8 sends a new ID to a detector 4 as seen in Matsui FIG. 1, below.

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Note that Matsui refers to pressure detector 4 as a “transmitter” since it transmits the tire pressure to the car controller. After the ID is sent from setting tool 8 to detector/transmitter 4, the setting tool checks the sensor and if there is no response corresponding to the setting tool transmitted ID, the setting process terminates and a new setting process is initiated. In paragraph [0034], Matsui states, “Next, in step 80, the generated transmitter identifier TID is transmitted and set to the transmitter 4 [tire pressure sensor/detector]. Then, in the determination step 82, it is determined whether or not a response has been returned from the transmitter 4. If it does not return, a registration process failure message is displayed in step 88 and the setting process is terminated... Next, in the determination step 84, it is determined whether or not an instruction to complete registration has been issued by the user. If the registration is not completed, return to step 72 and set another transmitter 4 identifier.”

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As discussed above, in the programming/sensor replacement process, checking the wirelessly-programmed ID to determine that the sensor has received the correct ID code and is transmitting this ID, followed by reprogramming if the correct ID is not returned is a standard industry practice. Therefore, the use of the process in Matsui in our Tang/Lemense aftermarket system to “judge the consistency” of the IDs would have been at least obvious within the meaning of 35 U.S.C. 103 since we explained that checking the programming after the ID has been copied into the blank sensor is something that the tire repair technician should do as a final check.

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APPENDIX 1: RESUME

Dr. Tom (Qingfeng) Tang

EDUCATION

Degree	School	Major	Year
Post Doctor	Wayne State University	Electrical Engineering	1990.9.1-1992.12.20
PH.D.	Beijing Jiaotong University	Electrical Engineering	1985.9.1-1988.9.1
Master	Beijing University of Aeronautics & Astronautics	Electrical Engineering	1982.9.1-1985.9.1
Bachelor	Beijing University of Posts & Telecommunications	Electrical Engineering	1978.9.1-1982.9.1

EXPERIENCE

Lear Corporation Asia, China

2008.5.1 – 2019.4.1

President of Asia & China

CEO of Lear Asia, with P&L responsibility of 60+ manufacturing locations, 20000 employees, and \$4B revenues annually. Successful experience in establishing new business units, technical centers and partnership; growing business from \$300M to \$4B in 5 years; working with global teams to implement Lear global strategies and plans, for the achievement of local people running local business.

Lear Corporation Detroit, USA

1992.12.20- 2008.5.1

Principal engineer-Executive Director of Global Wireless Division

Executive director of global wireless engineering and products, growing the business from a single product with annual sales around \$50M to covering all low power automotive wireless products with annual sales around \$650M. Traveled globally to visit most global major OEMs to sell capabilities and products, owning 100+ U.S. patents and expertizing in auto electronics and wireless products.

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APPENDIX 2: SCHRADER EZ-SENSOR:



Americas

PROGRAMMING TOOL UPDATES

PRODUCT CATALOGUE

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ONLINE CATALOG

UPDATE YOUR PROGRAMMING TOOL

Schrader's single SKU EZ-sensör® family of products enables ONE EZ-sensör® to cover over 100 million TPMS-enabled vehicles in North America, supporting a diverse set of global vehicle platforms. In 2010, Schrader launched EZ-sensör®, the automotive industry's first patented, programmable OEM-replacement TPMS sensor that is fully-programmable to function across diverse car makes and models.

EZ-sensör® is compatible with TPMS installation, relearn, and verification functions. This means that installation requires only the EZ-sensör® itself and a single programming/scan tool to complete vehicle service. Compatible with all major TPMS programming devices in the market, the family of products can also be fit with a variety of stem options to allow for unique rim fitment.



• EZ-sensör® comes "blank" and is fully programmable to cover the majority of vehicles in North America



Product Materials

[EZ-sensör® Product Overview](#)

[EZ-sensör® Programming Tool Compatibility Chart](#)

[EZ-sensör® Application Guide](#)

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