

METHOD AND SYSTEM FOR TYRE PRESSURE
MEASURING AND ADJUSTING
OBJECT OF THE INVENTION

5 The present invention relates, as its title indicates, to a method which allows to measure tyre pressure and adjust it to reference values, bearing in mind those variations which are produced in said reference values due to changes in tyre temperature.

BACKGROUND OF INVENTION

10 One of the factors which directly contribute to the conduction of a vehicle is tyre pressure and, although checking the pressure should be in principle a simple operation, when user prepares to carry it out user finds a series of problems that in many times lead him to give up as such operation implicates a waste of time as the same
15 time as it gives rise to get hands dirty, or in the best of cases, user swells tyres untill a value of pressure which is to his mind the correct one, although the appropriate pressure at this moment would be another.

20 The problem which driver finds on checking the pressure is that user has to seek the pressure values corresponding to front and rear wheels, but these vary depending on if tyres are cold or warm; as quantification of these factors is subjective, driver usually chooses an average pressure or the reference pressure value that user
25 thinks is the most suitable.

30 Nowadays there are pressured-air supplying machines in the commerce, which incorporate a series of buttons, each one of which corresponds to one determined pressure value, so that when one of the buttons is pressed the machine adjusts the tyre pressure to the value assigned to the pressed button.

The influence of temperature of tyres on their pressure is important; that is why tyre manufacturers recommend to increase the reference value in 0.3 bar if pressure is checked when tyres are warm; then it appears
5 the problem of tyre temperature determination, as it can vary more than 50°C depending on the ambient temperature and on the other hand on if tyre had been resting or it has just been running at a high speed.

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DESCRIPTION OF THE INVENTION

To settle these problems, it has been devised the system which is object of this invention which allows to determine the pressure equivalent to the rated pressure given by tyre manufacturer, in terms of the temperature at
15 which tyre is when performing the reading and to provide it with this equivalent pressure by a pressured-air machine, which forms a part of the system. The equivalent pressure is therefore a pressure which under temperature conditions unequal to ambient temperature would be the appropriate for
20 tyre use.

The method of the invention therefore permits, during the pressure checking and during the adjustment of the same, to know which is the present pressure of the tyre, the temperature inside the same and the corresponding
25 pressure that it should have, in terms of the temperature inside the tyre and the rated pressure at ambient temperature given by manufacturer.

Once temperature and present pressure of tyre are known, user can effect the pressure adjustment handly as
30 well as by using an automatic adjustment procedure.

To know data corresponding to present temperature and pressure of tyre, the system of the invention uses a sensor mechanism installed inside the tyre.

5 According to an embodiment of the invention, the system consists of a valve which may be the conventional swelling valve which incorporates a thermocouple, a portable pressure tester and a pressured-air supplying machine.

10 The valve incorporates a thermocouple which juts out the back zone of the valve, which permits that when valve is mounted in the tyre, the thermocouple remains fitted into the tyre, the conductors of the thermocouple ending up in each connections outside the valve by the front zone of the same.

15 The portable pressure tester, of digital kind, has a tip for connection with the valve, and several connections which contact those connections of the valve thermocouple, the tester performing the simultaneous reading of the pressure of the tyre and the temperature inside the same.

20 The tester has several buttons by which the rated pressure value of the tyre at ambient temperature, which is a datum given by the own manufacturer, is handily fixed and a display on which rated pressure values, temperature detected by the thermocouple, present pressure of the tyre
25 and the correct pressure of the tyre are visualized; this later is calculated from the rated pressure at ambient temperature and from the registered temperature, by a microprocessor included in the same tester.

30 To obtain the equation which permits to make the estimate of the pressure corresponding to a rated pressure in terms of temperature, the following premises are assumed:

1. Tyre volume variation is negligible in spite of pressure changes, as this pressure variation acts on the tyre stiffness and the inside canvas frame avoids a substantial change of volume.

5 2. Pressure variation due to temperature is linear, as there are no changes in gas physical state.

The above point bases on Gay-Lussac's Law of the Behaviour of Perfect Gases, that shows the following equation:

10
$$P \cdot V = n \cdot R \cdot T$$

Wherein P, V and T are the variables, n is the number of moles and R is the gas constant; this equation derives, in case of volumes being constant, in the following proportion:

15
$$P_0/T_0 = P_1/T_1$$

Wherein P_0 is the rated pressure recommended by the manufacturer at ambient temperature (293 K, equal to 20°C).

20 Therefore, the equation that permits to calculate the equivalent pressure in terms of temperature is the following:

$$P_1 = (T + 273) \cdot P_0 / 293$$

25 Wherein P_1 is the equivalent pressure corrected in terms of temperature, T is temperature (in °C) measured inside the tyre by the thermocouple, and P_0 is the pressure recommended by car manufacturer at ambient temperature (293 K).

30 The system which is object of this invention further comprises an air supplying machine to adjust tyre pressure, taking into consideration the temperature inside the same; this machine has a tip for connection with the valve,

provided with several connections suitable for connecting with those of the thermocouple when the tip is coupled with the valve, the machine making the simultaneous reading of the present pressure of tyre and the temperature inside the same.

In the same manner than the pressure tester, the air supplying machine has a keyboard, by which the rated pressure value is fixed, a microprocessor which makes the estimate of the equivalent pressure, from the rated pressure and from the inner temperature of the tyre, and a display on which data regarding to rated pressure, present pressure, temperature and equivalent pressure are visualized.

Said tip for connection with the valve further has ways to effect a safe blocking on the valve when said tip gets fastened on this later.

The disposal of blocking ways permits the tip to remain firmly attached on the valve during the operation of pressure adjusting, whereas on finishing the operation, it can get easily free by the user by pulling an external case of the same. This disposal is facilitated thanks to the use of a generally cylindric body with longitudinal grooves which allow said body to be subject to perimetal compression, its diameter being therefore reduced, then facilitating the firm attachment of the same on a valve.

Likewise, said air supplying machine optionally incorporates an auxiliary tool which permits to screw in or to unscrew the howitzer of the valve if necessary.

Said tool consists of an essentially cylindric body which has a cavity, in one of its ends, axially disposed to allow the lodging of a rod shaped utensil whose free end has a suitable configuration for getting coupled on a howitzer. Likewise, said tool has, in the opposite end,

another cavity axially disposed too, which has a keywise configuration which permits the working of valves, end caps or any element related to this field.

5 Tyre pressure adjustment is carried out by a pneumatic equipment included in the machine, which is operated by a control circuit managed by the own microprocessor. If user chooses the equivalent pressure calculated by the machine, or handly by buttons (+) and (-), in case of user prefers to put a pressure different to the calculated.

10 According to another embodiment of the invention, the process to check the present temperature and pressure of the tyre is carryed out through a receiving and emitter device leant on the rim surface which remains inside the tyre, so that when operating it can directly detect said
15 present pressure and temperature of the tyre.

Obtained data are subsequently converted into electronic signals which are then converted into radiofrequency waves and are transmitted outside the tyre.

20 Said radiofrequency waves are later received by a portable receiving set as a remote control apparatus which is suitable for switching said receiving and emitter device on.

25 Said remote control apparatus further has several buttons through which the rated pressure value of tyre at ambient temperature, this being a datum given by the manufacturer, is handly introduced and a display on which values of rated pressure, present temperature and pressure both detected by the sensor device, as well as the equivalent pressure of the tyre which is calculated by a
30 microprocessor included in the remote control apparatus in the manner described yet in the case of the pressure portable tester.

Once equivalent pressure which tyre requires at the moment of checking is known, user introduces this datum into an air supplying machine, with above mentioned characteristics, in order to adjust tyre pressure.

- 5 It is possible to point out that in this embodiment, the air supplying tip would not need the use of contact ways to realize the proper reading of present temperature and pressure inside the tyre.

10 The receiving and emitter device essentially consists of at least one thermocouple, a pressure detector, a circuit for radiofrequency waves reception and emission, a circuit for converting radiofrequency waves into electronic signals and vice versa and a supply circuit which operates by using electronic energy supplying batteries.

15 Advantageously the air supplying machine incorporates ways for receiving radiofrequency signals coming from said remote control apparatus in order to detect said signals and process them to obtain data related to the equivalent pressure which has to be given to the tyre by the own air
20 supplying machine.

 For that purpose, said machine will incorporate a radiofrequency waves receiver, a set for converting radiofrequency waves into electronic signals which will be later given to the microprocessor incorporated in the air
25 supplying machine.

 This way, user will initially use the remote control apparatus to detect present temperature and pressure of the tyre, calculate the equivalent pressure to be given to the tyre, and transmit this later datum to the air supplying
30 machine, which once said datum is received, will start working to adjust tyre pressure in accordance with the equivalent pressure.

Optionally, remote control apparatus can be incorporated in the frontal panel inside the vehicle where user can control and check the pressure and temperature of tyre without getting out the vehicle, or on driving.

5 In this later case, remote control apparatus will effect the measurement of present pressure and temperature of each tyre of vehicle separately and it will visualize them successively, or by user selection.

10 For that, the microprocessor of the remote control apparatus will be programmed to effect independant readings of the wheels.

15 The method and system for vehicle tyre pressure measuring and adjusting described above further allows the automatic execution of certain functions, without user direct intervention.

20 One of said functions, here described in a non-limitative manner, is to realize the pressure measurement and adjustment of every tyre of the vehicle using a mechanism for valve localization and a further connection of air supplying tips with each valve.

25 To carry this operation out, vehicle wheels will be located on rollers operated by an engine or a similar mechanism so that their synchronized rotation makes vehicle wheel to go round untill its valve is placed in a predetermined possition where it will receive the air supplying tip and this later will realize the measurement and the further adjustment of tyre pressure.

To place tyre valve in said predetermined position a proximity detection process will be used.

DESCRIPTION OF THE DRAWINGS

To complete the description that is being made and in order to achieve a better comprehension of the features of the invention the present descriptive memo is attached with a series of drawings, as an integrant part of the same, wherein there has been represented in an illustrative and non-limitative manner what follows:

10 -Figure 1 shows an elevation view of the valve which forms a part of the system for measurement and adjustment of tyre pressure, mounted on a tyre, and wherein the peripheral material of the same has been longitudinally sectioned to allow the observation of the thermocouple.

15 -Figure 2 shows an elevation view of the pressure tester, wherein the connection tip of the same has been partially sectioned.

 -Figure 3 represents a partially sectioned elevation view of the connection tip of the pressured-air supplying machine.

20 -Figure 4 shows an elevation view of the air supplying machine.

 -Figure 5 shows the air supplying machine block diagram.

25 -Figure 6 shows a scheme of sensor and emitting device disposal on the wheel rim as well as the remote control apparatus in relation to the tyre and the air supplying machine.

 -Figure 7 is a block diagram of the main components of sensor and emitting device.

-Figure 8 is a block diagram of remote control apparatus.

5 -Figure 9 is an elevation view axially sectioned according to a vertical plane of the air supplying tip with blocking ways.

-Figure 9(a) is a perspective of a blocking body of the tip of Figure 9.

10 -Figure 10 is an elevation view axially sectioned according to a vertical plane of an auxilliary tool to screw in and to unscrew the howitzer of the valve.

-Figure 11 is a scheme of a pressure measurement and automatic adjustment using gyratory rollers.

A PREFERRED EMBODIMENT OF THE INVENTION

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As it is possible to notice in mentioned figures, the tyre pressure measuring and adjusting system consists of a valve (1), a pressure tester (2) and an air supplying machine (3).

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The valve (1) incorporates a thermocouple (4) which juts out the back zone of the same, the thermocouple (4) remaining fitted into the tyre (5); one of the conductors (6) of the thermocouple is connected to a cylindric metallic body (7) of the valve (1) whereas the other (8) is

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connected to a peripheral ring (9) fitted in the insulite which coats the metallic part (7), both contact ways (7) and (9) remaining separated and electronically isolated.

The pressure tester (2) has a tip (10), which can be coupled on the valve (1) to read the inner pressure of the

tyre (5); this tip has an extension made of insulite (11) and a central conductive part (12).

5 A contact (13), sized to touch the contact (9) of the thermocouple when the tester (2) is coupled on the valve (1), juts out the isolating part (11); when realizing this coupling to determine tyre pressure, the metallic body (7) of the valve and the central part of the tester (12) also contact each other, that is why it carries out the reading of the present pressure and the temperature inside the tyre
10 (5) simultaneously.

Present pressure and temperature values are registered by a microprocesor lodged inside the tester (2).

15 The tester has several buttoms (14) externally which have some defintied values assigned, corresponding to the most used pressure values; by switching on the corresponding button (14) the rated pressure value, at ambient temperature, given by the vehicle manufacturer, is introduced in the microprocessor.

20 The tester (2) further has other two buttons (15) which allow to increase or diminish the rated pressure value given by any button (14), these being employed to introduce the rated pressure value in the microprocessor, in case of said value would not coincide with anyone of the the assigned to the buttons (14).

25 When the microprocessor of the tester (2) already has the rated pressure values of the tyre, the temperature inside the same and its present pressure, it calculates the pressure equivalent to the rated one bearing in mind temperature variation and it visualizes all data on the
30 tester display (16), so that user can check if present pressure corresponds to the calculated equivalent pressure.

The machine (3), in charge of adjusting tyre pressure incorporates a hose (17) which ends in a tip (18), suitable to be coupled on the valve (1).

5 The tip (18) defines an external isolating part (19), from which a contact (20) juts out, and an inner part (21) made of conductive material which shapes another contact; so as when the tip (18) of the machine (3) is coupled on the valve (1), contact ways (20) and (21) of the tip (18) are related to those (7) and (9) of the thermocouple, the
10 machine (3) simultaneously realizing the checking of temperature and pressure in a microprocessor located into the same.

According to an embodiment in the tip, represented in Figure 9, this (40) consists of an envolving body (41)
15 which has a cylindric portion with a longer diameter on whose surface there are several ribs shown to facilitate tip handling and another cylindric portion with a shorter diameter which shapes together with the first portion the envolving body inside which there are the tip components
20 lodged. Said components include an outlet tip (42) which screws in an end inside a blocking body (43). This blocking body (43) has a generally cylindric configuration which, in an end where screws in said outlet tip (42), has a longer diameter and along the remaining surface has several
25 longitudinal grooves (44) as it can be shown in Figure 9(a). Said grooves allow the mobility of movable portions (45) adjacent to the same since the blocking body (43) is made of a preferably metallic material which has certain flexibility in a radial direction.

30 Blocking body (43) has movility in an axial direction inside the envolving body (41) whereas movable portions (45) remain lodged into the same. Said envolving body (41) has in its end opposite to the outlet tip (42) and on its inner surface, a perimeteral rabbet (46). Likewise blocking

body (43) has in the free ends of each one of the mobile portions (45) a salient portion (47).

5 With this arrangement blocking body (43) has available movility inside the envolving body (41) untill that point of coincidence of salients (47) with the perimetalal rabbet (46). In this point salients (47) fit into perimetalal rabbet (46) thanks to the effect of mobile portions (45) which tend to open outside in a radial direction thereby obtaining a longer diameter in the opening part (48) .
10 Therefore, once the end of a tyre valve is introduced into the opening (48) of blocking body (43) when this is situation of longest diameter of opening (48) , the envolving body (41) slides over blocking body (43) in the sense opposite to valve inlet, for example in the direction
15 of arrow "F" in Figure 9. Said moving forces salient portions (47) of blocking body (43) to project out perimetalal rabbet (46) therefore reducing the diameter of the opening (48) which has the end of the tyre valve inside.

20 Said diameter reduction of opening (48) on the valve, makes the blocking effect of blocking body (43) on the valve.

To achieve the unblocking of the valve, envolving body (41) slides in a sense opposite to arrow "F" untill salient
25 portions (47) fit into perimetalal rabbet (46) again, thereby increasing the diameter of opening (48) which will allow the outlet of the valve of the same.

The tip (40) further consists of a series of pieces which allow its functionality such as a cylindric jacket
30 (49) which in an end relates to outlet tip (42) and in other end has a base surface (50) with a central hole through which the rod (51) goes. This later has in the end corresponding to the entry of tyre valve a plane base which

lays on valve howitzer, and in the opposite end it has a cubic or rectangular prismatic configuration which permits air pass and which lays on the end of a spring (52) whose effect is that rod (51) would exert pressure on valve
5 howitzer. On base surface (50) of the jacket (49) an elastic joint (53), made of rubber, for example, is set out whose aim is to provide sealing when valve is introduced into the opening (48) and lays on the joint (53). Likewise the cervoclip (54) arranged in the opening corresponding to
10 outlet tip (42) tends to avoid the outlet of inner mechanism out of envolving body (41).

Air supplying machine (3) optionally has an additional tool which permits to screw in or to unscrew the howitzer of tyre valves..

15 Said tool (60), as shown in Figure 10 consists of an essentially cylindric body (61) which has in an end a cavity (62) axially disposed to permit the lodging of a rod shaped utensil (63) whose free end (64) has a suitable configuration to couple on a howitzer. Said rod (63)
20 remains fixed inside the cylindric body (61).

In its opposite end, tool (60) has another cavity (65) axially disposed which has a first portion (66) with a longer diameter and a keywise configuration which permits the working of valves, end caps or any element related to
25 the field of tyres. Said cavity (65) also consists of a second portion (67) whose aim is to allow the introduction of ends of valves while they are handled through the first keywise portion (66).

The machine (3), as well as the tester, externally has
30 several buttons (22) which have some defined values assigned, corresponding to the most used pressure values. Each one of said buttons (22) may preferably have a colour specially assigned to its pressure value. By switching the

corresponding button (22) on, the rated pressure value of tyre, at ambient temperature, given by the vehicle manufacturer, is introduced in the microprocessor, the microprocessor making the estimate of the pressure equivalent to the rated in terms of temperature. Machine
5 (3) further incorporates two buttons (23) which permit to adjust rated pressure value in case of it would not coincide with any button (22).

Machine microprocessor is connected to a display (24),
10 on which data regarding rated pressure, present pressure, equivalent pressure and temperature are visualized, and to a control circuit (25) which manages a pneumatic equipment (26) in charge of adjusting tyre pressure by the introduction or extraction of air in the same, by means of
15 the hose (17).

Therefore, if button (22) corresponding to a determined rated pressure is worked and the tip (18) is connected to the valve (1), microprocessor calculates the equivalent pressure and actuates on the pneumatic equipment
20 (26) by means of control circuit (25), adjusting tyre pressure to the calculated equivalent pressure value.

If rated pressure did not coincide with any of the values assigned to the buttons (22), the value is handly adjusted by buttons (23), the machine then providing the
25 selected pressure, as a conventional machine.

If any pressure is handly selected by working buttons (23) and later machine is desired to provide the pressure equivalent to this, in terms of temperature, it will be sufficient to work the button (27), which makes
30 microprocessor to make the estimate of equivalent pressure and to manage pneumatic equipmenet to supply said pressure.

Regarding to Figures 6, 7 and 8 an alternative embodiment of the object of the invention, according to

which a sensor and emitting device (30) leant on a surface of the rim (31) so that when rim has the corresponding tyre (shown sketched), said device (30) remains inside the tyre to effect the detection of present pressure and temperature of tyre, is used to realize the detection of present pressure and temperature of tyre, is next described.

Said device, as it can be shown in Figure 7, consists of a microprocessor which manages the operation of the same, a radiofrequency receiver and emitter, a converter of radiofrequency waves into electronic signals and vice versa, a pressure measurer and a thermocouple.

Remote control apparatus (32) consists of a microprocessor, a visualization device (DISPLAY), a radiofrequency receiver and emitter, a converter of radiofrequency waves into electronic signals and vice versa, a climatation device, normally a battery, a keyboard (33) and several buttons (34). To increase and decrease values shown in the display.

With this arrangement and to realize the measurement of present pressure and temperature of tyre, user will use the keyboard (33) to send the correspondig signal to manage the sensor and emitting device (30) in order to get this later realizing the corresponding readings of pressure and temperature.

As it has been mentioned above said management is realized through radiofrequency waves which are transmitted through the transmitter set of remote control apparatus and which are received by the receiveer of the sensor and emitting device (30). Said radiofrequency waves are later converted into electronic signals by means of the converter of said device (30), which are sent to the microprocessor of the same. This later when receiving the corresponding signal, effects the measurement of pressure by pressure

measurer, and of temperature by the thermocouple of sensor and emitting device (30). Once measurements are yet realized, microprocessor sends the signals corresponding to measurement data to the converter for their conversion into
5 radiofrequency waves which are outside emitted by the radiofrequency emitter of the sensor and emitting device (30).

Waves emitted by said device (30) are received by the radiofrequency receiver of the remote control apparatus
10 (32) and once converted into electronic signals by said apparatus converter are sent to the microprocessor of the same. This later, according to received values calculates the equivalent pressure with which tyre should be provided. All data regarding to present pressure and temperature and
15 rated pressure can be visualized through the display of the remote control apparatus (32).

Therefore, user obtains the pressure value which is the appropriate for tyres under checking condions. For that reason it will be sufficient to introduce the value
20 corresponding to said equivalent pressure in the air supplying machine and proceed with the adjustment of tyre pressure.

Advantageously, the air supplying machine (3) incorporates a radiofrequency waves receiving device (35)
25 capable of receiving those waves emitted by remote control apparatus (32) as it is shown in Figure 6. In the same way, once the value of pressure equivalent to the rated for tyre has been obtained, user positiones remote control apparatus to air supplying machine (3) and by pressing the
30 corresponding button, user immediately sends as radiofrequency waves the value of equivalent pressure to receiving set (35) of the air supplying machine (3). Said receiving set (35) provides the microprocessor of air supplying machine (3) with the value of equivalent pressure

by means of electronic signals, the microprocessor automatically starting to supply the equivalent pressure to the tyre. the procedure for reception of radiofrequency waves untill their sending to the microprocessor is similar to those of the sensor and emitting device (30) and the remote control apparatus (32) that is way its detailed description will be ommited to avoid repetitions.

It is possible to say that air supplying machine by means of its microprocessor can make the estimate of the pressure equivalent to the rated, so that in this case this task will not be carried out in the remote control apparatus; this later would be limited to sending the values of present temperature and pressure of tyre to the air supplying machine.

Optionally remote control apparatus (32) may be installed into the vehicle, for example in the frontal panel of the inner space of the same, in such a manner that user for example driver while driving can effect the checking out of present pressure and temperature of each tyre in the vehicle.

Methods for measurement and calculation of equivalent pressure are similar to those of the case above except for in this case remote control apparatus will emit and receive radiofrequency waves regarding to each wheel through independent activator devices installed near each tyre and destined for activating sensor and emitting device (30) of each corresponding wheel.

Said independent activator devices are installed in vehicle bodywork and are connected through wires to remote control apparatus installed into the vehicle.

By this way driver or any other occupant of vehicle will be able to check data about present pressure and

temperature and to calculate the equivalent pressure of each wheel including while vehicle is moving.

5 In this case remote control apparatus will visualize the values corresponding to each wheel independently, successively or by pushing a key corresponding to a wheel and following keys corresponding to other wheels.

10 Method and system for pressure measurement and adjustment described above further permit the execution of certain functions in an automatic manner and without user direct intervention.

One of said functions, here described in a non-limitative manner, is to automatically effect the pressure measurement and adjustment of every tyre of vehicle.

15 For that a mechanism for locating tyre valve is used. As it is shown in Figure 11, said localization mechanism (70) consists of several rollers (71) arranged to allow the wheel (72) to be situated on themselves while these are able to rotate around the respective axis (73) through the
20 working of an engine (79) or a similar system, in such a way that their synchronized rotation forces the wheel to rotate (72) around its axis (74).

Thanks to said rotation of the wheel (72), tyre valve (75) moves in circle untill a proximity detection device
25 (76) detects its location. Detection of valve (75) position is communicated by electronic signals to a control equipment (77).

Said equipment uses a microprocessor (non-shown in figure) which manages the automatic working of the whole
30 system.

After having detected valve position, said microprocessor sends a stopping signal to the working

mechanism (79) thereby stopping roller (72) rotation. Therefore valve (75) remains situated in a predetermined position to later receive the air supplying tip (80).

5 Once valve is situated in said predetermined position, the microprocessor of control equipment (77) manages a working mechanism (78) of the air supplying tip (80) to make this to move and place on the valve (75).

10 Once tip (80) is placed on valve (75), the process of pressure measurement and adjustment will be carried out as described above.

 This automatic operation system may be installed in places where vehicles go to get services such as car wash, vehicle technical inspection stations and the similar.

15 It is considered non necessary to make present description more extensive in order to let any expert in the matter to understand the scope of the invention and the advantages which are derived from the same.

 The terms in which this memo has been redacted should always be taken in a wide and non-limitative sense.

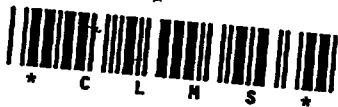
20 Materials, shape, size and disposal of elements will be liable to variation whenever it would not imply an alteration of essential features of the invention, which are claimed next.

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METHOD AND SYSTEM FOR TYRE PRESSUREMEASURING AND ADJUSTINGCLAIMS

- 5 1.- Method and system for vehicle tyre pressure
measuring and adjusting in order to provide tyre with an
appropriate pressure when it is under temperature and
pressure conditions unequal to the rated ones which
correspond to a temperature defined as ambient temperature,
10 and a pressure of tyre at rest, characterized in that it
comprises the following steps:
- measuring pressure inside the tyre.
 - measuring temperature inside the tyre.
 - calculating a pressure value called equivalent
 - 15 to the rated in terms of said values of measured pressure
and temperature, said calculated pressure being appropriate
to use the tyre without having neither pressure excess nor
pressure shortage inside it.
 - visualizing measured values corresponding to
 - 20 present temperature and pressure, as well as the value of
pressure calculated as equivalent to the rated in terms of
said measured values of temperature and pressure.
 - Introducing said calculated pressure value into
 - an air supplying machine.
 - 25 - Supply said calculated pressure to the tyre.
- 2.- Method according to first claim, characterized in
that measured values corresponding to present pressure and
temperature of tyre are communicated outside the tyre by
means of electronic signals.
- 30 3.- Method according to first claim, characterized in
that measured values corresponding to present pressure and



temperature of tyre are communicated outside the tyre by means of radiofrequency waves.

4.- Method according to the aforementioned claims, characterized in that the calculation of pressure value equivalent to the rated in terms of values of present and measured temperature and pressure is realized in a pressure tester by a microprocessor incorporated in the same.

5.- Method according to the aforementioned claims, characterized in that the calculation of pressure value equivalent to the rated in terms of values of present and measured temperature and pressure is realized in a air supplying machine by a microprocessor incorporated in the same.

6.- Method according to the aforementioned claims, characterized in that the calculation of pressure value equivalent to the rated in terms of values of present and measured temperature and pressure is realized in a remote control apparatus by a microprocessor incorporated in the same.

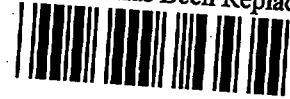
7.- Method according to the aforementioned claims, characterized in that rated pressure values of tyre at ambient temperature are introduced into the tester through several buttons.

8.- Method according to the aforementioned claims, characterized in that rated pressure values of tyre at ambient temperature are introduced into the air supplying machine through several buttons.

9.- Method according to the aforementioned claims, characterized in that rated pressure values of tyre at ambient temperature are introduced into the remote control apparatus through several buttons.



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10.- Method according to the aforementioned claims, characterized in that the value of pressure equivalent to the rated in terms of present temperature and pressure of tyre is communicated to the air supplying machine by electronic signals.

11.- Method according to the aforementioned claims, characterized in that the value of pressure equivalent to the rated in terms of present temperature and pressure of tyre is communicated to the air supplying machine by radiofrequency signals.

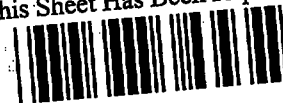
12.- System for tyre pressure measurement and adjustment, characterized in that it comprises the following components: a) a valve for tyres which incorporates a thermocouple, b) a pressure tester with a tip provided with a pressure inlet and some ways for contact suitable for being connected to the thermocouple, and c) a pressured-air supplying machine, provided with a swelling pneumatic equipment associated to a hose for air pass, which ends up in a connection tip, provided with several ways for contact suitable for being connected to tyre valve thermocouple too.

13.- System according to the previous claim, characterized in that thermocouple juts out the back zone of the valve to get placed inside the tyre and it consists of several conductors which pass through an electrically isolating body of said valve and they each end up in external and independent ways for contact, located in the front zone of the valve.

14.- System according to the previous claim, characterized in that one of the thermocouple ways for contact consists of a metallic ring externally mounted on the isolating body of the valve, whereas the other one



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consists of the own metallic body of the valve which includes the elements for closing the same.

15.- System according to claim 12 characterized in that pressure tester incorporates: a) a microprocessor
5 which registers tyre pressure and temperature values which receives from the tip of the same when coupling to tyre valve; b) a series of buttons, arranged to introduce the value of tyre rated pressure at ambient temperature into microprocessor; c) a display arranged to visualize values
10 corresponding to tyre rated pressure, pressure and temperature inside the tyre the pressure equivalent to the rated in terms of temperature inside the tyre; d) several buttons which have assigned determined pressure values, and two other buttons suitable for increasing or decreasing
15 those chosen pressure values.

16.- System according to claim 12 characterized in that air supplying machine includes: a) a microprocessor which simultaneously registers tyre pressure and temperature values when coupling hose tip with tyre valve;
20 b) a keyboard arranged to introduce the value of tyre rated pressure at ambient temperature into microprocessor; and c) a display arranged to visualize values corresponding to tyre rated pressure, pressure and temperature inside the tyre the pressure equivalent to the rated in terms of
25 present temperature of the tyre, d) several buttons which have assigned determined pressure values, and two other buttons suitable for increasing or decreasing those chosen pressure values.

17.- System according to the previous claim,
30 characterized in that pneumatic equipment of air supplying machine is managed by a microprocessor to supply the tyre with the pressure equivalent to the rated, in terms of tra, or handly through machine buttons.



18.- System for tyre pressure measurement and adjustment, characterized in that it comprises the following components: a) at least one sensor and emitting device arranged on rim surface inside a tyre, b) at least one remote control apparatus arranged to emit and receive radiofrequency signals and c) a pressured-air supplying machine provided with a pneumatic equipment for swelling associated to a hose for air pass, which ends up in a connection tip.

19.- System according to claim 18 characterized in that sensor and emitting device consists of ways for measuring pressure and temperature inside the tyre, ways for emitting and receiving radiofrequency waves, ways for converting radiofrequency waves into electronic signals and vice versa, a microprocessor suitable for managing the operation of sensor and emitting device and a power supply device, preferably an electric energy supplying battery.

20.- System according to claim 18 characterized in that remote control apparatus consists of ways for emitting and receiving radiofrequency waves, ways for converting radiofrequency waves into electronic signals and vice versa, a microprocessor suitable for managing the operation of remote control apparatus, ways for visualizing processed data, a keyboard which consists of a series of buttons arranged to introduce and to change pressure values in remote control apparatus and a power supply device, preferably an electric energy supplying battery.

21.- System according to claim 18 characterized in that air supplying machine essentially consists of a microprocessor suitable for managing the operation of the machine, a keyboard which consists of a series of buttons arranged to introduce and to change pressure values in the air supplying machine.



22.- System according to claim 20 characterized in that air supplying machine incorporates ways for receiving radiofrequency waves and ways for converting said waves into electronic signals and for supplying them to said machine microprocessor.

23.- System according to claim 20 characterized in that remote control apparatus is portable.

24.- System according to claim 20 characterized in that remote control apparatus is attached on the inside of the vehicle, preferably on the frontal panel inside the same.

25.- System according to claim 24 characterized in that ways for receiving and emitting radiofrequency waves are attached on the vehicle bodywork near each wheel of the same.

26.- System according to the aforementioned claims, characterized in that air supplying tip consists of an envolving body in inside which there are: an outlet tip screwed in an end inside a blocking body which has a generally cylindric configuration with a portion of longer diameter and provided with a series of movable portions separated by several longitudinal grooves in a shorter diameter portion; a cylindric jacket inside which there is a rod which goes through a central hole located in a base surface at one of the ends of the jacket; a spring on which rod end lays; an elastic joint arranged on the base surface of said jacket; and a cervoclip located at one of the ends of said envolving body which corresponds to said outlet tip.

27.- System according to claim 26 characterized in that envolving body has a cylindric portion of longer diameter on whose surface a series of ribs is shown.



28.- System according to claim 26 characterized in that blocking body is made of a, preferably metallic, material which has flexibility in a radial direction.

5 29.- System according to claim 26 characterized in that blocking body has in the free ends of each one of the movable portions a salient portion and the envolving body has in its end opposite to outlet tip and on its inner surface a perimeteral rabbet coinciding with said salient portions of blocking body.

10 30.- System according to claim 26 characterized in that the rod of air supplying tip has a cubic or rectangular prismatic configuration in the end which remains inside the tip jacket, and a plane base in the opposite end.

15 31.- System according to claim 26 characterized in that envolving body may be moved on blocking body until salient portions of this later fit into the perimeteral rabbet of the first due to these salient portions tendency to move in a radial direction outside in unblocking position.

20 32.- System according to the aforementioned claims, characterized in that air supplying machine includes a tool which consists of an essentially cylindric body which has in an end a cavity axially arranged to permit the lodging of
25 a rod shaped utensil whose free end has a suitable configuration for getting coupled on a howitzer, said rod remaining fixed inside said cylindric body; another cavity axially arranged in the opposite end having a first portion of longer diameter and with a keywise configuration
30 suitable for handle valves, end caps and the similar and a second portion next to the first one and with a shorter diameter to allow the introduction of valves ends while they are handled by the first portion.



33.- Automatic system for tyre pressure measurement and adjustment according to the aforementioned claims, characterized in that it consists of several rollers which are capable of gyrating in a synchronized manner around their respective axial axles and are arranged to permit vehicle wheel to get placed on the same, for transmitting the rotation of said rollers to said wheel, said rollers being operated by a working mechanism such as an electric engine; a proximity detection device, an air supplying tip, an equipment for said air supplying tip moving, and a control equipment destined for managing the working of system components.

34.- System according to the previous claim, characterized in that working mechanism of rollers is managed by control equipment.

35.- System according to claim 33 characterized in that proximity detection device is destined for detecting the position of tyre valve during wheel rotation and for sending electronic signals of proximity detection to control equipment.

36.- System according to claim 33 characterized in that the equipment for air supplying tip moving receives signals from control equipment to move air supplying machine to tyre valve, and effect said tip coupling on said valve.