Convention Application for a Patent

We, ROBERT BOSCH GMBH, a Company organized under the laws of the Federal Republic of Germany,

of Postfach 50, 7000 Stuttgart 1, Federal Republic of Germany,

hereby apply for the grant of a Patent for an invention entitled "MEASURING MEANS FOR PROVISION OF MEASUREMENT VALUES IN MOTOR VEHICLE OPERATION"

which is described in the accompanying complete specification.

This application is a Convention application and is based on the application numbered P 34 28 879.1 for a patent or similar protection made in Federal Republic of Germany on 4th August, 1984.

Our address for service is: CALLINAN AND ASSOCIATES Patent Attorneys, of 48-50 Bridge Road, Richmond, State of Victoria, Australia.

Dated this 29th day of July, 1985.

ROBERT BOSCH GMBH
By its Patent Attorneys:
CALLINAN AND ASSOCIATES

The present invention relates to measuring means for provision of...
COMMONWEALTH OF AUSTRALIA
Patents Act 1952

Declaration in Support of
(a) A Convention Application
(b) An Application
for a Patent or Patent-of-Addition

In support of the Application/Convention Application made by

(c) ROBERT BOSCH GMBH

for a patent/patent-of-addition for an invention entitled:

"MEASURING MEANS FOR PROVISION OF MEASUREMENT VALUES IN MOTOR VEHICLE OPERATION"

1/We (a) Klaus Voss and Georg Müller
Postfach 50, D-7000 Stuttgart 1
of (b) Federal Republic of Germany
do solemnly and sincerely declare as follows:—

1. (a) I am/we are the applicant(s) for the patent/patent-of-addition of

(b) Pat/h we are authorised by ROBERT BOSCH GMBH
the applicant for the patent/patent-of-addition to make this declaration on its behalf.

2. (a) The basic application(s) as defined by Section 141 of the Act was/were made
in Federal Republic of Germany on the 4th day of August 1981
by ROBERT BOSCH GMBH

3. (a) I am/we are the actual inventor(s) of the invention or

(b) I am/we are the actual inventor(s) of the invention referred to in the basic application.
or

Rolf Kohler, of 13, Breslauerstraße, 7141 Schwieberdingen, Federal Republic of Germany

of

is/are the actual inventor(s) of the invention and the facts upon which
I am/we are/the applicant is entitled to make the application as follows:

The applicant is a person who would, if a patent were granted upon an application made by the said actual inventor, be entitled to have the patent assigned to it.

4. The basic application(s) referred to in paragraph 2 of this Declaration was/were the first application(s) made in a Convention country in respect of the invention the subject of the application. Federal Republic of Germany.
In motor vehicle operation there are a number of conditions which can be detected by means of a potentiometer for the control or regulation of the vehicle engine. Typical examples are the detection of the induction duct throttle flap valve position, the setting of an induction air flow quantity measuring flap, the setting of an accelerator pedal, and the position of the regulating rod in a Diesel injection pump. A few of these examples of application for potentiometric measurement value pick-up require a very exact setting. In the case of the mass-produced motor vehicle equipment, however, this is not always free of problems, as consideration must be taken of drift due to age and also of inaccuracies resulting from repairs.

Claim

1. Measuring means for provision of measurement values in motor vehicle operation, comprising a potentiometer operable to provide measurement values from a range bounded by preset limit values and correction means able to cause the limit value in at least one limit region of the tap of the potentiometer to follow the measurement value.
MEASURING MEANS FOR PROVISION OF MEASUREMENT VALUES IN MOTOR VEHICLE OPERATION

The following statement is a full description of this invention, including the best method of performing it known to me:

* Note: The description is to be typed in double spacing, pica type face, in an area not exceeding 250 mm in depth and 160 mm in width, on tough white paper of good quality and it is to be inserted inside this form.
The present invention relates to measuring means for provision of measurement values in motor vehicle operation, especially for control or regulation of the vehicle engine.

In motor vehicle operation there are a number of magnitudes which can be detected by means of a potentiometer for the control or regulation of the vehicle engine. Typical examples are the detection of the induction duct throttle flap valve position, the setting of an induction air flow quantity measuring flap, the setting of an accelerator pedal, and the position of the regulating rod in a Diesel injection pump. A few of these examples of application for potentiometric measurement value pick-up require a very exact setting. In the case of the mass-produced motor vehicle equipment, however, this is not always free of problems, as consideration must be taken of drift due to age and also of inaccuracies resulting from repairs.

If high demands are made on the accuracy of potentiometer settings, it is usual to determine the setting of the potentiometer wiper by means of a fine setting screw. Although an instantaneous calibration can be achieved in this manner, it remains inaccurate over a longer term for various reasons.

It would thus be desirable to provide equipment for measurement value detection, which is free of problems in its operation and remains accurate over a longer period.

According to the present invention, there is provided measuring means for provision of measurement values in motor vehicle operation, comprising a potentiometer operable to provide measurement values from a range bounded by preset limit values and correction means able to cause the limit value in at least one limit region of the tap of the potentiometer to
follow the measurement value.

With such measuring means the original or subsequent installation of a potentiometer does not require particular precision in setting up and thus can be carried out by less skilled personnel. Moreover, a long term constancy is provided by the feature of continuous automatic compensation.

Embodiments of the present invention will now be more particularly described by way of example with reference to the accompanying drawings, in which:

Fig. 1a is a schematic view of a potentiometer and associated measuring range and band;

Fig. 1b is a diagram showing voltage output of the potentiometer across this range and band; and

Fig. 2 is a computer flow diagram for correction of the measurement range and band in dependence on measurement value position.

Referring now to the drawings, there is shown equipment for measurement value detection in a motor vehicle in conjunction with a fuel injection system, in which a fuel metering signal is formed in dependence on throttle flap valve position and engine speed. Inevitably increasing with the accuracy of the measurement value detection is that of the fuel metering, which in turn has a direct influence on the composition of the exhaust gas.

Fig. 1a shows a wiper track 10 which, for reasons of simplicity, has been drawn linearly and with a wiper 11 movable therealong. The measuring range of the wiper 11 is limited by DKmin and DKmax and in a special case of application corresponds to a throttle flap valve angle
range of 90°. It is essential that the entire measuring range of the wiper lies within the wiper track 10. Also shown in Fig. 1a is a measuring band with the limits GKmin and GKmax, the band having a smaller extent than the measuring range of the wiper between DKmin and DKmax.

Fig. 1b illustrates voltage relationships across the wiper track on the assumption of a linear course. In that case, the entire operating voltage of the potentiometer, for example 5 volts, drops across the entire wiper track. If the wiper track is divided into increments, then 0 to 255 = 256 increments result over the entire wiper track in the case of 8 bits. The measuring range of the wiper, in accordance with the illustration of Fig. 1b in conjunction with Fig. 1a, scans merely part of the wiper track. The smallest wiper voltage, for a special position of the measuring range of the wiper, lies at DKmin and the greatest at DKmax. The limit values GRmin and GRmax for the measuring band are correspondingly disposed. The individual association or the magnitude ratios of the individual data are, of course, matched to the individual case and can, if needed, exhibit a very small difference between DKmax and GRmax or between DKmin and GRmin.

The measuring range of the wiper between DKmin and DKmax is, as a rule, determined by mechanical abutments. This measuring range can, through influences of any kind, be displaced to the left or right relative to the wiper track 10 so that the absolute association of wiper to electrical measurement value is no longer correct.

Two cases of displacement of the abutments are to be distinguished, namely displacement of the abutments outwardly and displacement of the abutments inwardly.

On displacement of the abutment outwardly, a measurement value DK
is detected at, for example, the position of the point 110 of Fig. 1a. In that case DKmax is also redisposed outwardly and DKmin pulled along correspondingly so that ultimately an electrical displacement of the entire measuring range of the wiper to the right is undertaken.

The same applies in the case of a measurement value at the point 111, which symbolises a displacement of the abutment to the left and in consequence of which DKmin and DKmax are moved to the left.

The recognition of an outward abutment displacement is thus relatively free of problems and can engender an appropriate response by way of the definition of new electrical limits.

By contrast, an inward abutment displacement cannot be recognised so readily. If the righthand abutment of the wiper lies at the point 112, for example by reason of a measuring range displacement, then it is not readily evident from the measurement signal that the measuring range of the wiper has displaced to the left.

Accordingly, this problem can be solved by displacing the limit value DKmax stepwise to the left with a relatively large time constant insofar as it still lies to the right of a defined limit value GRmax. Between GRmin and GRmax, the measurement values are picked up as such and passed on, whilst outside the measuring band between GRmin and GRmax, the limit values GRmin and DKmax, respectively, are made to follow the respectively measured value.

The measurement values are thus continuously made to follow electrical abutment signals insofar as these measurement values themselves lie in limit ranges, i.e. above GRmax and below GRmin. The speed of follow-up is small relative to the dynamic change in the measurement value.

In certain cases, it has proved expedient for the displacement speed
from DKmax in the direction to the right relative to the direction to the left to be determined by the factor 256:1.

The flow diagram of Fig. 2 serves for further explanation of equipment embodying the invention. The flow diagram starts with "beginning" 20. There follows an interrogation 21 whether the measurement value DK is greater than a stored DKmax value. This corresponds to a measuring point 110 of Fig. 1. If this case is given, then DKmax is displaced incrementally to the right (block 22). At the same time, the measurement value is set to the full value. At 8 bits, this value is 255. It is followed by a displacement of the measurement band to the right in a block 23. The new absolute limit value in that case results from the new DKmax minus a tolerance value K. Expediently, the righthand limitation of the measuring band GRmax is also allowed to run incrementally outwards, which takes place by the interrogation unit 24 in conjunction with the incrementation of block 25. Simultaneously with the displacement of the limit value GRmax to the right, a displacement of the limit value GRmin to the right is undertaken, which corresponds to a displacement of the measuring band to the right. The end follows as a final program step in 26.

If the measurement value DK lies at the point 112 of Fig. 1a, i.e. in the region between GRmax and DKmax, then the interrogation unit 30 delivers a corresponding signal and DKmax as well as DKmin are displaced incrementally to the left in correspondence with the statements in block 31. The measurement signal then results according to block 32 from the quotients (DK - DKmin)/(DKmax - DKmin). This program branch also ends at 26.

As shown in the flow diagram, the interrogation unit 30 is followed
by the corresponding arrangement for the lower abutments as they apply for the righthand abutment side in the interrogation units 21 and 30. The unit 40 detects whether the measurement value DK is smaller than the value GRmin. If this is the case, an incrementing of DKmin takes place in block 41 and correspondingly a displacement of the value DKmax to the right. At the output side, the block 41 is connected with 32.

An interrogating unit 50 ascertains whether the measurement value DK is smaller than DKmin. In this case, a leftward displacement of DKmin takes place in block 51, the formation of a new limit value DKmin + K as tolerance value in block 52 as well as an adaptation of the position of the measuring band with GRmin and GRmax by the interrogating unit 53 and the decrementing block 450. The end of the program course 26 follows in this case at the output side of block 54.

If DK lies within the measuring band between GRmin and GRmax (line 55), then the measurement value calculating unit 32 follows the interrogating unit 50 directly.

The measuring band between GRmin and GRmax can be chosen in dependence on vehicle (including engine) operating parameters in order to influence the sensitivity of the follow-up. Moreover, the follow-up operation can, of course, take place only at one side.

Whilst the embodiment hereinbefore described concerns the use of the equipment in connection with the detection of the throttle flap valve position in an internal combustion engine, the measuring means is usable wherever a measurement is to be taken within a displaceable measuring range.
the claims defining:

1. Measuring mean values from a means able to cause the tap of the potential.
2. Measuring mean arranged to cause the place at a speed of the potential.
3. Measuring mean correction means be with the limit value.
4. Measuring mean correction means be take place when the displacement.
5. Measuring mean determined in the displacement.
6. Measuring mean arranged to cause speed in the measurement.
7. Measuring mean speed of follow-up follow-up in an is.
8. Measuring mean reference to Figs. 1a and 9.
9. Measuring mean reference to Fig. 2 of
THE CLAIMS DEFINING THE INVENTION ARE AS FOLLOWS:-

1. Measuring means for provision of measurement values in motor vehicle operation, comprising a potentiometer operable to provide measurement values from a range bounded by preset limit values and correction means able to cause the limit value in at least one limit region of the tap of the potentiometer to follow the measurement value.

2. Measuring means as claimed in claim 1, the correction means being arranged to cause the follow-up displacement of the limit value to take place at a speed dependent on the direction of such displacement.

3. Measuring means as claimed in either claim 1 or claim 2, the correction means being arranged to displace the entire range together with the limit value.

4. Measuring means as claimed in any one of the preceding claims, the correction means being arranged to cause the follow-up displacement to take place when the measuring value lies outside a predetermined measuring band.

5. Measuring means as claimed in claim 4, wherein the measuring band is determined in dependence on correction values.

6. Measuring means as claimed in claim 2, the correction means being arranged to cause said speed to be low in relation to the dynamic change in the measurement value.

7. Measuring means as claimed in claim 2, wherein the ratio of the speed of follow-up displacement in an outward direction to the speed of follow-up in an inward direction is 256:1.

8. Measuring means substantially as hereinbefore described with reference to Figs. la and lb of the accompanying drawings.

9. Measuring means substantially as hereinbefore described with reference to Fig. 2 of the accompanying drawings.

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D A T E D this 29th day of August, 1985.

ROBERT BOSCH GMBH
By its Patent Attorneys:
CALLIMAN AND ASSOCIATES