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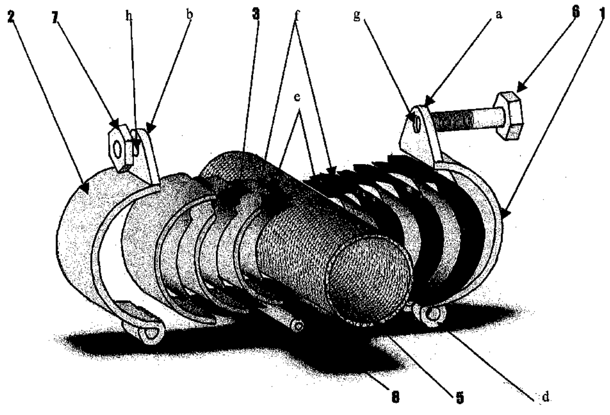

FIG.1

(57) Abstract: The invention relates to a device and a process for lowering the noxious substances content, particularly of CO and CO2, in the exhaust gases discharged into the atmosphere as a consequence of the operation of a heat engine equipping the land, sea and aerial motor vehicle, with a view of reducing the greenhouse effect generated thereby, as well as to an exhaust pipe equipped with such devices. According to the invention, the device consists of two semicasings (1 and 2) wherebetween there are located some pairs (A) of ring-shaped elements (3 and 4) made of copper and of lead, respectively, provided with some transverse cuts (e and T), and in each element (3) there are drilled some through holes (i) whose centres describe longitudinal lines parallel between them and transverse lines parallel between them as well as some secondary through holes Q) whose holes describe an evolute (k) of a logarithmic shape. The process claimed by the invention consists in treating the gas stream in at least two regions by means of some thermal gradient of 600... 1300° C/m achieved by processing the thermal energy of the gas stream by at least three pairs (A) of elements (3 and 4) located in each of the regions, which creates a quantic field due to the holes (i and j) arranged according to some logarithmic evolutes (i and k)

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whose beginnings are displaced as against the preceeding region by an angle of 30... 120 °. The exhaust pipe claimed bz the invention has disposed in at least two treating regions, including in the portion wherein there is placed a catalyst (9) some pairs (A) of elements (3 and 4) located coaxially with the axis of pipe (5), the first pair (A) in each treating region having the element (3) located in direct contact with pipe (5), and the last pair (A) in each treating region having the element (4) located outside in contact with the semicasings (1 and 2).

Device and Process for Lowering Noxious Substance Content in Exhaust Gases Resulting from the Heat Engine Combustion and the Exhaust Pipe Equipped with Such Devices

The invention relates to a device and a process for lowering noxious substances, particularly CO and CO_2, in the exhaust gases discharged into the atmosphere as a consequence of the operation of a heat engine equipping a land, sea or aerial vehicle, with a view to lowering the greenhouse effect caused thereby, as well as to a discharge pipe equipped with such devices wherethrough the gases are discharged into the environment.

There are known devices for controlling the exhaust gases resulting from an internal combustion engine, which comprise a converter in which there was previously placed a catalyst for catching/lowering the NOx and which is in communication with an exhaust pipe, in connection with a manifold for discharging exhaust gases from the engine cylinders, each containing a catalyst which consists of a support coated with an alumina layer containing noble metals, alkaline metals, alkaline-earth metals and rare earths and which retains the NOx as nitride ion, in connection with an engine and with the exhaust pipe, respectively there being mounted some sensors for adjusting the ratio between the air and fuel, placed in various points on the exhaust gases disharge path, namely before and after the catalyst regions, the signals from sensors being processed with a view to making a decision by an electric-thermal unit in the situation when the ratio between the air and fuel has a prescibed value the converter also ensures a simultaneous purification of H, CO, NOx and HC (US patent 7305820 B2).

The disadvantages of these devices consist in that they have a relatively complicated construction, the operation duration is relatively reduced mainly due to the catalyst life span, and the maintenance thereof is relatively difficult.

There are known processes for dissociating CO_2 which consist in irradiating CO_2 under critical temperature and pressure conditions, the critical pressure having a value of 7.38 Mpa, the critical temperature having a value of 304.20 K, the critical density of 466 kg/m^3 and the laser radiations in the UV wave field, having the wave lengths equal to 355 nm; 266 nm; 248 nm (EP 1752419 A1).

The disadvantage of these processes consist in that they require distinct energy sources to ensure high value energies and enclosures confined by walls made of a material ensuring the develipment of relatively high temperature and pressure values within the enclosure.

The problem solved by the inventions claimed in the group of inventions consists in substantially lowering particularly the CO and CO_2 presence within the exhaust gases resulting from a heat engine discharged into the atmosphere under the conditions in which there take place the lowering at the hydrocarbon (HC) llevel and at the nitrogen oxides level (NOx), respectively.

CO and CO_2 are carbon compounds which represent minimum 0.7% by volume CO and 14% by volume CO_2 in the composition of the gases resulting from the fuel combustion in a heat engine.

There is known that CO formation enthalpy has a value of 110.5 Kj/mole, and CO_2 formation enthalpy has a value of 395.5.Kj/mole.

Unexspectedly, it was found that the gases resulting from a fuel combustion inside a heat engine having a temperature in the range of 800 to 900°C and a pressure by 10 – 20% higher than the environment pressure, if while moving towards the discharge they are successively exposed, at preferably equal time intervals, in at least two regions, to a thermal field action wherein the thermal gradients have values ranging from 600 to 1300°C/m, there takes place the cleavage particularly of the carbon containing compounds consisting of CO and CO_2.

Under the same conditions, there was also ascertained an effect on lowering the noxious substances consisting of not burnt HC and NOx by inclreasing the N content and by lowering the not burnt HC content in the exhaust gases discharged into the atmosphere.

These results were obtained by providing in the thermal field regions some devices containing materials with different thermal conductivities and densities to provide the desired thermal gradient.

In carrying out the process claimed by the inventionb, the formation enthalpy values were considered, these being known per se for not burnt hydrocarbons and nitrogen oxides, thus, for example, for $C2H4$, the formation enthalpy has the value of 36.63 Kj/mole and for $C2H6$ the formation enthalpy has the value of – 59.318 Kj/mole, and for example, for $NO2$ the formation enthalpy is of 33.85 Kj/mole.

According to the invention, the device eliminates the previously mentioned disadvantages by that it consists of two semicasings, each being provided with one of some lugs and one of some curved end portions, respectively, some pairs of ring-shaped elements provided with some transverse cuts, carried out of electrotechnical copper and lead, respectiverly, being located between the semicasings, the lugs being provided with some orifices confined by some threaded walls which allow fixing a screw positioned by means of a nut and through the end portions there is introduced a bolt ensuring the semicasings to be articulated to each other, in each element made of copper there being drilled some through main holes whose radii are equal to one another and the centres are located according to longitudinal lines parallel to one another, and namely according to some transverse lines also parallel to one another, each of the holes being adjacent to some secondary through holes having the centres located on an evolute having the shape of a logarithmic curve, in the position in which the copper made element has a ring shape, the main through hole centres are located on an evolute having the shape of a logarithmic curve.

The device claimed by the invention is also characterized by that the beginnings of the secondary through hole evolutes are displaced from one another by an angle of 30 ... 120° and between the beginnings of the main through hole evolutes there is an angular displacement of 30 ... 120, the number of evolutes of the main through hole centres being selected depending on the longitudinal density of these main holes which ranges between 8 ... 9 holes/m.

The device claimed by the invention is further characterized by the ratio between the surface of the material removed from the copper made elements in order to obatin the main and secondary holes and the surface of the remaining material has a value of 0.1 ... 0.6, under the conditions in whicjh the diameter of a main hole has a value ranging from 1.5 mm ... 3 mm, and the diameter of a secondary hole has a value ranging from 0.1 ... 0.8 mm, the diameter of a secondary hole is by 500% less than the diameter of a main hole.

The process claimed by the invention, applied by means of the device eliminates the disadvantages shown before by that the gases composing the gas stream are treated in at least two regions of the thermal field wherein the thermal gradients have values in the range from 600 ... 1300° each of the thermal gradients being obtained by taking over the thermal energy from the gas stream by means of at least three pairs of elements made of copper and lead, respectively, located in each of the regions as well as bby that of the main and secondary through holes drilled in each of the elements made of copper, in each region of the thermal field the copper elements forming the overlapped pairs have the centres of the main and secondary through holes arranged according to some evolutes in the shape of logarithmic curves whose beginnings are displaced in each following treating region as against the preceeding one by an angle of 30° ... 120°, so that the beginnings of anz one of the evolutes in the last treating region should be displaced by an angle of 360° as against the beginnings of the evolutes in the first treating region, the lowering of noxious substances resulting from the exhaust gases treated this way being made by the electric field created by the potential difference ΔU generated according to Bardeen relation of the atomic interaction potential in the metal network, by the temperature gradient generated between two metal elements with different temperatures, this electric field facilitating the chemical dissociation of CO and CO_2 molecules.

According to the invention, the process is further characterized in that the optimal value of the gradients defining the thermal field in each of the regions is obtained under the conditions in which the evolutes of the centres of the main through holes are located in a plane perpendicular to another plane which contains the evolutes of the centres of the secondary through holes, and an angle between the normal to the plane containing the evolutes of the centres of the secondary through holes and the tanget to the evolute of the centres of the main through holes has a value of 70 ... 78°.

According to the invention, the process is further characterized by that in the regions for treating the gas stream the actual values of the temperature gradients defining the thermal field vary from one another, to the effect of lowering the gas temperature value by 10 ... 20%.

The exhaust pipe claimed by the invention eliminates the disadvantages mentioned before by that in contact with the said exhaust pipe there are arranged, in at least two treating regions, including in the portion wherein there is placed a catalyst , some pairs of copper and lead elements, respectively, located coaxially with the pipe axis, the first pair in each treating region having the element made of copper, arranged in direct contact with the pipe and the last pair in each treating region having the element made of lead, located to the outer side in contact with the semicasings, the distance between the successive treating regions having a value close to that equal to three times the width of a pair.

The exhaust pipe claimed by the invention is further characterized by that the consecutive copper elements arrangement is made so that the distance therebetween should be two to three times the width of an element made of copper that has a value of 30 ... 60 mm.

The device, process and exhaust pipe equipped with such a device as claimed by the invention, under the conditions of application, exhibit the following advantages:

- they particularly lower the share bof the gases having greenhouse effect, namely CO and CO_2 in the composition of the exhaust gases discharged by the engines into the atmosphere;
- during operation, the energy supply is made directly from the discharged gas stream;
- the device and the equipped exhaust pipe have a relatively simple construction, being easy to be mounted and dismounted;

- they do not interact with the adjoining electric installations as a consequence of the fact that no associated magnetic fields occur;
- the materials of the device components can be recovered entirely, without causing pollution to the environment;
- they can be applied to heat engines, irrespective of the power developed by them and the arrangement of cylinders.

There is given hereinafter an embodiment for the device, process and exhaust pipe equipped with such a device according to the invention, with reference to Figures 1 – 10, which represent:

Figure 1, expanded view of a device as claimed by the invention, located around an exhhaust pipe;
Figure 2, top view with partial fractures of some copper and lead elements which constitute the device;
Figure 3, top view of the element made of copper;
Figure 4, view of an exhaust pipe on which there is mounted a device wherein there is practiced a fracture;
Figure 5, a plane view of the arrangemenmt of centres of some main holes practiced in the element made of copper in a section about a plane A-A given in Figure 4;
Figure 6, a plane view of the arrangement around the exhaust pipe of the elements made of copper and lead, which are given schematically;
Figure 7, constructive detail B indicated in Figure 6;
Figure 8, a schematic representation of the geometric locus of the centres of the main holes as against the geometric locus of the secondary hole centres;
Figure 9, side view of an exhaust pipe equipped with devices carried out according to the invention;
Figure 10, side view of an exhaust pipe wherein there is mounted a catalyst having mounted lengthwise some devices carried out according to the invention.

The device claimed by the invention consists of two semicasings **1** and **2** each preferably having a semicylindrical shapoe and being provided with one of some lugs **a** and **b**, respectively, with one of the curved end protions **c** and **d**.

Between the semicasings **1** and **2** there are provided some pairs consisting of some resilient ring -shaped elements **3** and **4**, provided with some transverse cuts **e** and **f** made of electrotechnical copper and lead, respectively.

Each pair **A** may be mounted concentrically with the first pair **A**, with the mention that the inner element **3** made of copper thereof is arranged in direct contact and concentrically with an exhaust pipe **5** known per se, and the last element **4** made of lead of the last pair **A** is in direct contact with the semicasings **1** and **2**. The number of pairs **A** may be equal to 3 or with an upper limit number for ensuring a caloric energy dissipartion of the exhaust gases circulating through the pipe **5** with a thermal gradient within the range from 600 ... 1300° C/m and the actual values of the temperature gradients vary to the effect of lowering the gas temperature value by 10 ... 20%.

For mouting the device onto the pipe **5** through some orifices **g** and **h** drilled in the lugs **a** and **b** confined by a threaded wall, there is passed a screw **6** after penetrating the orifice **h** it is positioned by means of a nut **7**. Also, through the portions **c** and **d** there is introduced a bolt **8** which ensures the articulation of the semicasing **1** to the semicasing **2**.

Due to the resilience of elements **3** and **4** the clearances **e** and **f** are reduced by clamping the semicasings **1** and **2**.

Between the elements **3** and **4** and as a matter of fact, between all pairs **A** of elements **3** and **4** there exists an intimate contact on all their surfaces, under the conditions in which the dimensions thereof differ only with regard to their radius.

The thickness of element **4** made of lead is higher than the thickness of element **3** made of copper with a percentage ranging from 800% to 1200%.

In each element **3** there are drilled some main through holes **i** having the radii equal to one another and the centres arranged according to longitudinal parallel lines, namely according to some transverse lines also parallel between them.

Each of the holes **i** is adjacent to some secondary through holes **j** whose centres are located on an evolute **k** in the shape of a logarithmic curve when element **3** is curved. The beginnings of the imaginary evolutes **k** are displaced from one another by an angle of 30° ... 120°.

The ratio between the total area without holes **i** and **j** of the element **3** made of electrotechnical copper and the total area of the holes **i**, **j** have a value ranging from 1.66 ... 10..

In the position in which the element **3** has a ring shape, the centres of the through holes **i** are located on an evolute **l** having the shape of a logarithmic curve.

In the position in which the element **3** is ring shaped, all evolutes **l** have the same shape, namely the shape of a logarithmic curve.

The number of evolutes **l** depends on the longitudinal density of holes **i**.

The value of this density ranges from 8 ... 9 holes/meter.

The diameter of a hole **l** has a value ranging from 1.5 ... 3 mm and the diameter of a hole **j** has a value ranging from 0.1 ... 0.8 mm. The diameter of a secomndary hole **j** is by up to 500% less than the diameter of a main hole **i**.

Between the beginnings of evolutes **l** there exists an angular displacement of 30° ... 120°.

According to the invention, the process comprises contating the pipe **5** with at least two copper elements **3** having the centres of the holes **i** located on evolutes l and the centres of holes **j** located on the evolutes **k** whose beginnings are displaced between them by the same angle having a value in the range of 30 ... 120°.

This arrangement is made in order to achieve an action upon the carbon monoxide and carbon dioxide existing in the exhaust gases flowing through the pipe **5** under the conditions in which the molecular velocity distribution of these gases follows a Maxwell distribution according to velocities .

The arrangement of the consecutive elements **3** is made so that the distance therebetween is two to three times the width of an element **3** which has a value of 30 ... 60 mm.

Above the element **3** there is located the element **4** and above them there are located pairs of elements **3** and **4** brought into contact with one another by securing the semicasings **1** and **2** by means of screw **6** and nut **7**.

Depending on the CO and CO2 concentrations in the composition of the exhaust gases resulting from the combination and discharged through the exhaust pipe **5**, on the exhaust pipe there are mounted at least two devices which convert a part of the exhaust gas energy necessary for the atomic cleavage thereof by the pairs of elements **3** and **4** under the conditions in which the thermal gradient ranges from 600 ... 1300°C-m, as a consequence of the absoption of heat from the exhaust gases.

The associastion of the materials that the elements **3** and **4** are made of has in view the crystalline structures of copper and of lead, respectively, so as to create, between two consecutive copper elements **3**, a thermal gradient due to the thermal properties of element **4** made of lead which has a reduced thermal conductivity of 397 J/(s m.degree C), and lead has a thermal conductivity of 34.7 J/(s m. degree C).

In order to decompose into atomic components CO and CO2, there are necessary specific energies corresponding to the formation enthalpies. Thus, for CO the value for decomposing into carbon and oxygen is of 110.5 Kj/mole and for CO2 the value for decomposing into carbon and oxygen is of 395.5 Kj/mole.

This molecuar cleavage is facilitated by the electric field generated by the thermal gradient which determines an interaction potential difference as against the exhaust gas atoms.

Treating the gas stream is achieved by means of some thermal gradients whose values range from 600 ... 1300°C/m.

The temperature gradient is achieved by taking over the thermal energy from the gas stream, in at least two regions confined along the gas stream flow path. In these regions, the gas stream comprising CO and CO2 is subjected to the action of a thermal field in the presence of the evolutes **I** of the centres of the through holes **i** with the beginnings displaced from one another by the same angle, but having the evolutes displaced from one another by an angle ranging from 30 ... 120 °. In each region there are concentrically placed more elements **3** made of copper, having the same arrangement of the evolutes.

The evolutes **l** of the centres of holes **i** are located in a plane **P** perpendicular to a plane **Q** which comprises the evolutes **k** of the centres of holes **j**. An angle α between the normal to plane **Q** and the tangent to evolute **l** has a value in the range of 70 ... 78°.

In each treating region, elements **3** made of copper which constitute the overlapped pairs **A** have the centres of holes **i** and **j** arranged after the evolutes **l** and **k** whose beginnings are displaced in each treatiung region following to the preceeding one by an angle of 30 ... 120°, so that the beginning of any one of the evolutes **l** and **k** in the last treating region are displaced by an angle of 360 ° as against the beginnings of evolutes **l** and **k** in the first treating region.

In order that the gas stream should concomitantly pass through regions covering the whole positioning range of evolutes **l** it is necessary that the number of these regions should preferably be equal to six.

The process claimed by the invention, in another embodiment, comprises achieving a gas stream treating region in front of the portion of pipe **5** in which a catalyst **8** is placed, said catalyst having a composition known per se, which creates a thermal gradient with a value of 600 ... 1300°C/m.

This thermal gradient is constituted by using part of the caloric energy of the gas stream which crossed a previous treating region, created by the packets of elements **3** and **4** by subjecting the stream to the thermal field action, to which there is associated another thermal gradient with the value given before, created by the packets of overlapped elements **3** and **4** arranged to the outer side of catalyst **8**.

Between the two regions of treating the gas stream by the action of the thermal field, the evolutes **l** in the region in front of the portion containing the catalyst **8** are displaced by an angle of 30 ... 120° as against the evolutes **l** in the previous treating region.

After the treating region created in front of the portion containing the catalyst **8** there can be created other regions for treating the gas stream by mounting the overlapped packets of elements 3 and 4 onto the pipe **5** at pre-established distances.

The effect of the region for treating the gas stream created by the overlapped elements **3** and **4** in the portion containing the catalyst **8** consists in the action of the thermal field in front of the overlapped elements both on the ga strwam components and on the catalyst **8** components.

By producing this effect there takes place an increase of the operation duration of catalyst **8** under the condityions in which the poisoning process is slowed down.

The gas stream temerature upon the outlet from pipe **5** and their release into the atmosphere by carrying out the regions for treating the gas stream along the pipe **5** by means of the packets of overlapped elements **3** and **4** has a value by 10 – 15% less than the value of the gas stream temperature in atmosphere under the conditions in which along the pipe **5** there are not carried out regions for treating the gas stream.

The energy required for the chemical dissociation of the components in the CO and CO2 compounds is a liniar function given by the relation (I):

$$E_{(CO\,;\,CO2)} = A \times grad.(T) \times d + b \qquad (1)$$

wherein:

E — represents the energy required for the chemical dissociation of the CO and CO2 compounds components;

A and b — constants that are determined experimentally depending on the concentrations in CO and CO2 in the gas stream;

d — value of the average semidiameter of the packets of overlapped elements **3** and **4**, arranged in a treating region.

This energy can be considered to result from the electriuc field E generated by the potential difference ΔU produced by the thermal gradient according to Bardeen relation of the atomic interaction potential in the metal network given by the relation (2):

$$U(r) = -\frac{a\,Z1\,Z2}{\gamma} + \frac{b}{\gamma^2} + \frac{c}{\gamma^3} \qquad (2)$$

wherein:

a, b, c are constants

Z1 Z2 – loads of atoms in interaction.

The first term representing the Coulombian interaction, the second term – repulsive, being generated by the kinetic energy of electrons, consequently being dependent on temperature according to the liniar expansion relation, and the third term being of zero energy.

The electric field E generated between two metal elements of the same metal, located at a distance d therebetween and at temperatures T1 and T2, respectively, is given by the relation (3).:

$$E = \frac{\Delta U\,(d)}{d} = \frac{b2\,(T2) - b1\,(T1)}{d^2} \qquad (3)$$

and results in the approximation form by considering the dependence given by the relation (4):

$b_k = b_0\,(1 + \alpha T)$ – according to the expansion relation (4)

in the relation (5):

$$E = \frac{b_0\, \alpha\, \Delta T}{d^2} \cong \frac{b_0\, \alpha}{d} \text{ degree } T\,; \qquad (5)$$

wherein:

α represents a linear expansion constant, the relation (5) explaining the relation (1).

The physical mechanism described previously is created in the conditions in which the temperature gradient values in each treating region vary from one another by 10 ... 20%, to the effect of lowering the gas temperature value.

The exhaust pipe **5** as claimed by the invention has at least two treating regions in which it is contacted with some pairs **A** of overlapped elements **3** and **4** made of copper and lead, respectively, located coaxially with the pipe axis **5**.

The first pair **A** in each treating region of element **3** made of copper, arranged in direct contact with the pipe **5**, and the last pair **A** in each treating region has element **4** located to the outer side in contact with the semicasings **1** and **2**.

The distance between the successive treating zones have a value close to that equal to three times the width of a pair **A**.

The arrangement of consecutive elements **3** is made so that the distance between them is twice to three times the width of an element **3** which has a value of 30 ... 60 mm.

The arrangement on pipe **5** of two or more devices makes possible a cleavage of CO and CO2 into atoms along their whole width, and in the space between two adjacent devices there takes place a relaxation of the energy levels of atoms in CO and CO2, thereafter by crossing the immediately following device there takes place a new absorption of the thermal energy from the exhaust gases by the elements **3** and **4**, which leads to continuing the cleavage into atoms of CO and CO2.

On the pipe **5**, under the stablished conditions between the maximum range of temperatures of 700 ... 900°C and the minimum range of 400 ... 480°C some treating regions having temperature ranges between 760 ... 850°C, 770 ... 840°C, 780 ... 830°C, 610 ... 690°C, 510 ... 600°, 480 ... 550°C and 430 ... 480°C, respectively are provided.

Thus, depending on the values of these intervals, there are mounted on the pipe 5 two devices, in front of catalyst **9** there are mounted other two devices, then, up to the gas stream discharge into the atmosphere there are mounted four devices.

Except that within the pipe 5 there was not provided the catalyst **9** the tests presented were performed on this pipe **5** which had a diameter of 44 mm.

The results of testing a gas stream resulting from the internal combustion in an Otto engine by using as fuel gasoline, there were obtained results from the analysis of the gas stream discharged into the atmosphere.

The Otto engine has a cylinder capacity of 1940 cubic centimeters and uses gasoline as fuel. The pipe 5 is not equipped with a probe λ, for sensing theamount of oxygen present in the exhaust gases.

Under the conditions in which during the engine operatioin the oil temperature has a value of 74°C and the angu lar speed of the driving shaft has a value of 630 rpm, the gas composition is given in Table no. 1

Table no. 1

Crt. No	**Compounds of the exhaust gases**	**Amounts**
1.	CO	0.8%
2.	CO2	15.5%
3.	HC	268 ppm
4.	O2	0.98%

The results of the test performed after equipping the pipe **5** with the packets **A** under the conditions in which the oil temperature is of 70° C and the angular speed of the driving shaft is equal to 700 rpm, the exhaust gas composition is given in Table 2.

Table no. 2

Crt. No.	**Compounds of the exhaust gases**	**Amounts**
1.	CO	0.1%
2.	CO2	9.11%
3.	HC	105 ppm
4.	O2	8.35%

By comparing the results prsented in Tables 1 and 2 it results that by equipping the pipe **5** with devices as claimed by the invention, there takes place a 70% volume lowering of CO2, an 800% volume lowering of CO and an 852% volume increase of oxygen

There were also performed tests concerning the lowering of noxious substances in an exhaust gas stream resulting from an internal combustiuon engine, by using gasoline as fuel.

The results of tests concerning the opacity of the exhaust gas stream discharged into the atmosphere in the present conditions for a Diesel engine having a cylinder capacity of 297 cm^3 , wherein diesel fuel is used, at an oil temperature of 26^0C and an angular speed value of the driving shaft of 4790 rpm, are given in Table 3.

Table no. 3

Crt. No	**Compounds of the exhaust gases**	**Amounts**
1.	Opacity index k (1/m)	3.13

The results of the test performed under the conditions in which on the pipe **5** there are mounted six devices according to the invention and the oil temperature has a value of 31^0C and the angular speed value of the driving shaft is of 4800 rpm, are given in Table 4.

Table no. 4

Crt.no	**Compounds of the exhaust gases**	**Amounts**
1.	Opacity index k (1/m)	1.5

By comparing the results of the opacity index values in Tables no. 3 and no. 4 it results that the opacity index value in the situation in which on the pipe **5** there are mounted six devices made according to the invention, there takes place a lowering by 208.6% of the opacity index **k** expressed in l/m.

CLAIMS

1. Device for lowering the noxious substances content in the exhaust gases resulting from the combustion in a heat engine and discharged into an exhaust pipe, characterized in that it consists of two semicasings (**1** and **2**) each provided with one of some lugs (**a** and **b**) and with one of some curved end portions (**c** and **d**), between the semicasings (**1** and **2**) there being placed some pairs (**A**) of ring-shaped elements (**3** and **4**) provided with some transverse cuts (**e** and **f**) made of electrotechnical copper lead, respectively, the lugs (**a** and **b**) being provided with some orifices (**g** and **h**) confined by some threaded walls which allow the fixing of a screw (**6**) positioned by means of a nut (**7**) and through the end portions (**c** and **d**) there is introduced a bolt (**8**) which ensures the articulation of the two semicasing (**1** and **2**), in each element (**3**) made of copper there being practiced some main through holes (**i**) whose radii are equal to one another and the centres are arranged according to some longitudinal lines parallel to one another, namely according to some transverse lines also parallel to one another, each of the holes (**i**) being adjacent to some secondary through holes (**j**) having the centres located on an evolute (**k**) in the shape of a logarithmic curve, in the position in which the element (**3**) made of copper has a ring shape, the centres of the main through holes (**i**) being located on an evolute (**l**) having the shpe of a logarithmic curve.

2. Device according to claim 1, **characterized in that** the beginnings of the evolutes (**k**) of the centres of secondary through holes (**j**) are displaced from one another by an angle of 30 ... 120 ° and between the beginnings of the evolutes (**l**) of the centres of main through holes (**i**) there exists an angular displacement of 30 ... 120°, the number of evolutes (**l**) of the centres of main holes (**i**) being selected depending on the longitudinal density of these main holes which ranges from 8 ... 9 holes/m.

3. Device according to claims 1 and 2, **characterized in that** the ratio between the surface of the material removed from elements (**3**) made of copper in order to obtain the main and secondary holes (**i** and **j**) and the surface of the remaining material has a value of 0.1 ... 0.6 under the conditions in which the diameter of a main hole (**i**) has a value ranging from 1.5 ... 3 mm, and the diameter of a secondary hole (**j**) has a value ranging from 0.1 ... 0.8 mm, the diameter of a secondary hole (**j**) is by 500% less than the diameter of a main hole (**i**).

4. Process for lowering the noxious substances content from the exhaust gases resulting from combustioin in a heat engine, as claimed by the invention, applied in a device as claimed by claims **1 ... 3** which is placed next to and to the outer side of an exhaust gas stream which contains minimum 14% by volume CO2 and minimum 0.7% by volume CO, the exhaust gas stream temperature varying generally between a value of maximum 700 ... 900°C and a minimum value of 400 ... 480 C , finally the exhaust gas stream being dischsarged into the atmosphere, **characterized in that** the gases composing the gas stream are treated in at least two regions of the thermal field wherein the thermal gradients have values situated within the range 600 ... 1300°C, each of the thermal gradients obtained by taking over the thermal energy from the gas stream by means of at least three pairs (**A**) of overlapped elements (**3** and **4**) made of copper and lead, respectively, located in each of the regions as well as by that of the main and secondary through holes (**i** and **j**) drilled in each of the elements (**3**) made of copper, in each regioin of the thermal field the elements (**3** made of copper which compose the overlapping pairs (**A**) have the centres of main and secondary through holes (**i** and **j**) arranged after the evolutes (**l** and **k**) in the shape of logarithmic curves whose beginnings are displaced in each treating region following to the preceeding region by an angle of 30 ... 120°, so that the beginnings of any one of the evolutes (**l** and **k**) in the last treating region are displaced by an angle of 360 ° in relation to the beginnings of evolutes (**l** and **k**) from the first treating region, the lowering of the noxious substances being made by facilitating the atomic dissociation of CO and CO2 bz the thermal gradient

between two adjacent metal elements (**3** and **4**).

5. Process according to claims 4 and 5, **characterized in that** the gas stream treating regions, the actual values of the temperature gradients defining the thermal field vary from one another by 10 ... 20%, to the effect of lowering the gas temperature..

6. Exhaust pipe as claimed by the invention equipped with devices as claimed in claims 1 ... 3 for the application of the process claimed according to claims 4 ... 6 on a stream of exhaust gases resulting from the combustion in a heat engine, discharged through an exhaust pipe wherein there can also be mounted a catalyst, **characterized in that** in contact with the said exhaust pipe (**5**) there are located at least two treating regions including the portion wherein there can be located a catalyst (**9**) some pairs (**A**) of overlapped elements (**3** and **4)** made of copper and lead, located coaxially with the axis of pipe (**5**), the first pair (**A**) of each treating region having the element (**3**) made of copper arranged in direct contact with the pipe (**5**) and the last pair (**A**) in each treating region having the element (**4**) made of lead, placed at the outer side in contact with the semicasings (**1** and **2**), the distance between the successive treating regions having a value close to that equal to three times the width of a pair (**A**).

7. Pipe according to claim 7 **characterized in that** the consecutive elements (3) made of copper are arranged so that the distance between them should be twice to three times the width of an element (**3**) made of copper which has the value of 30 ... 60 mm.

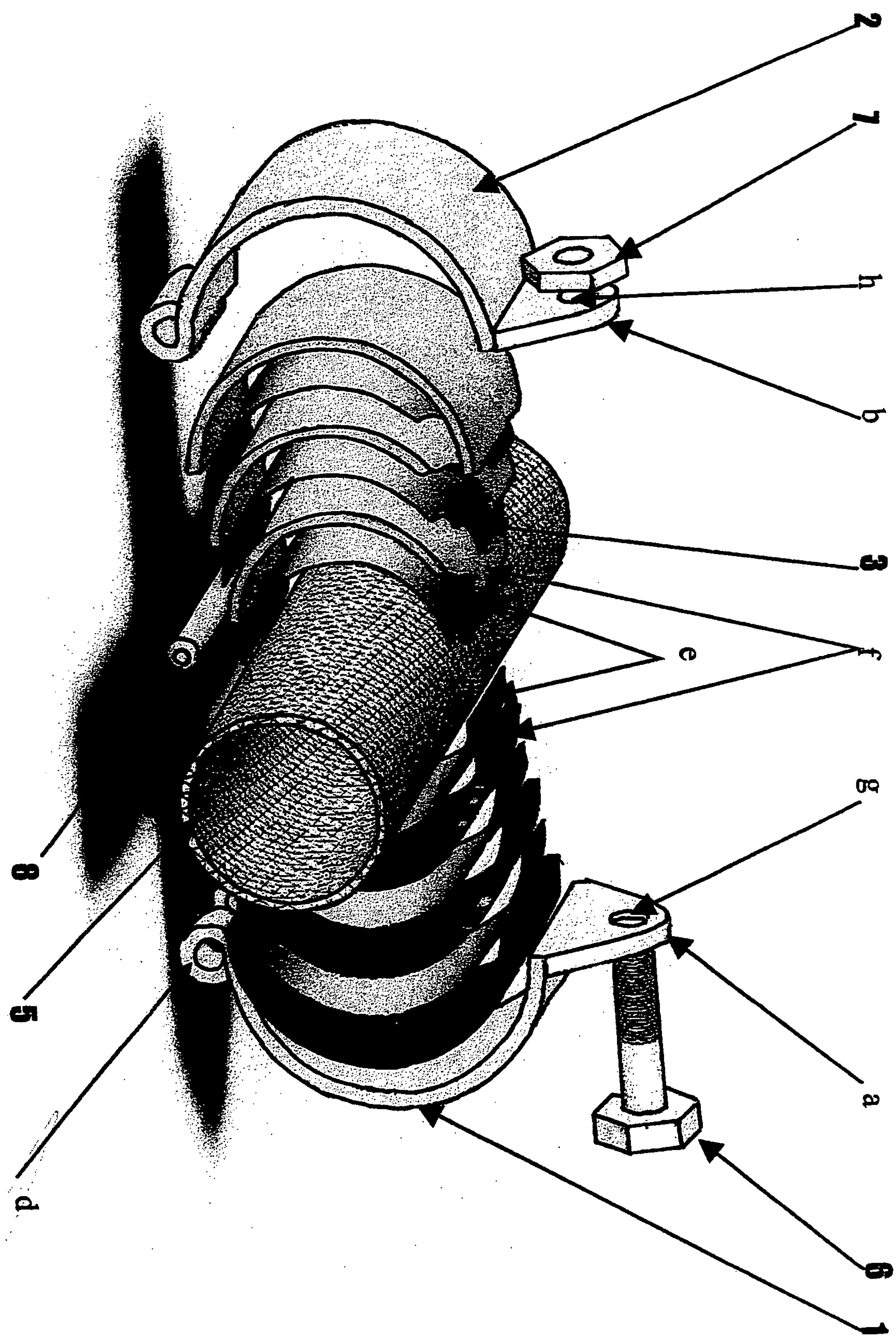

FIG.1

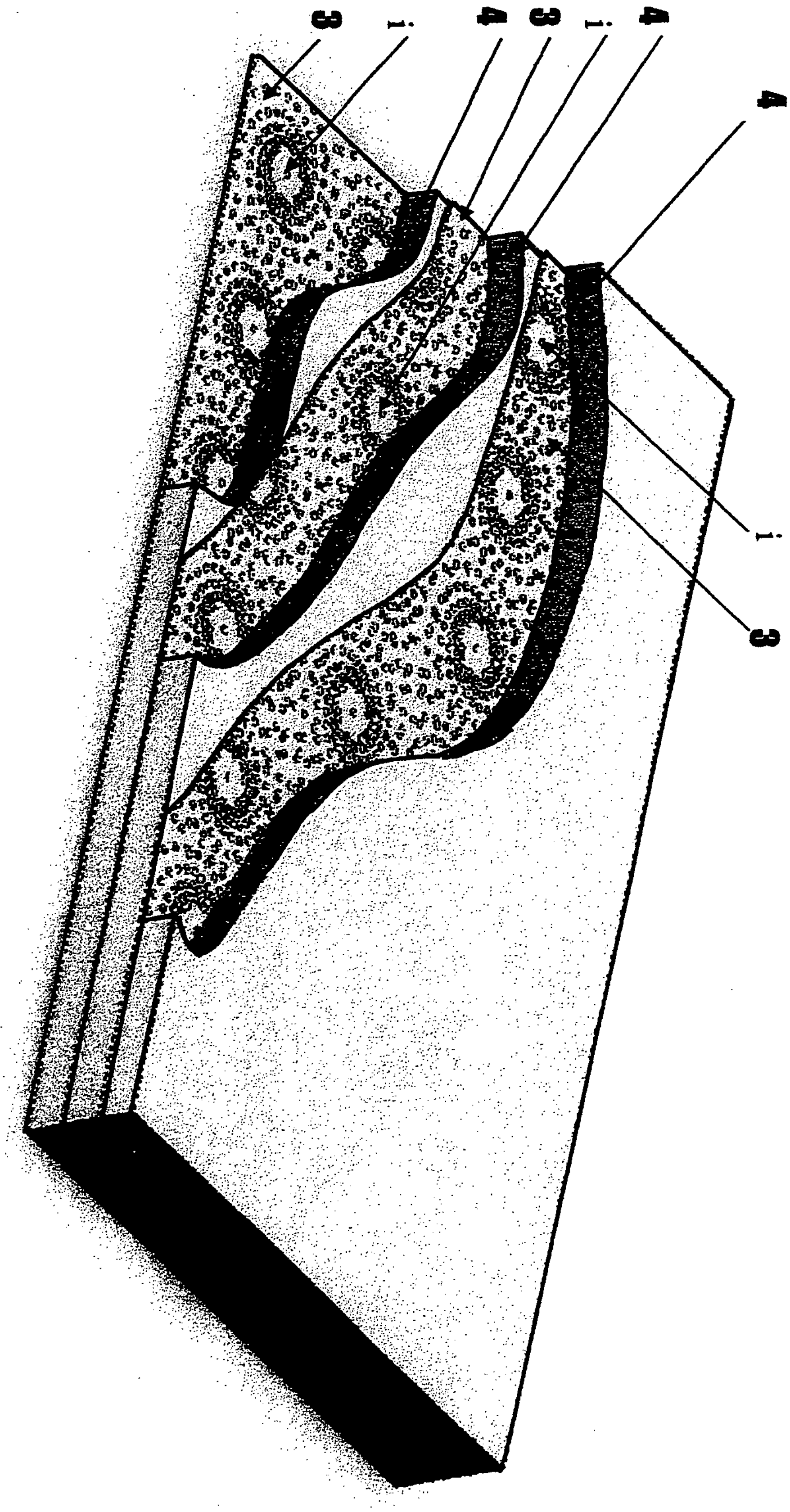

FIG.2

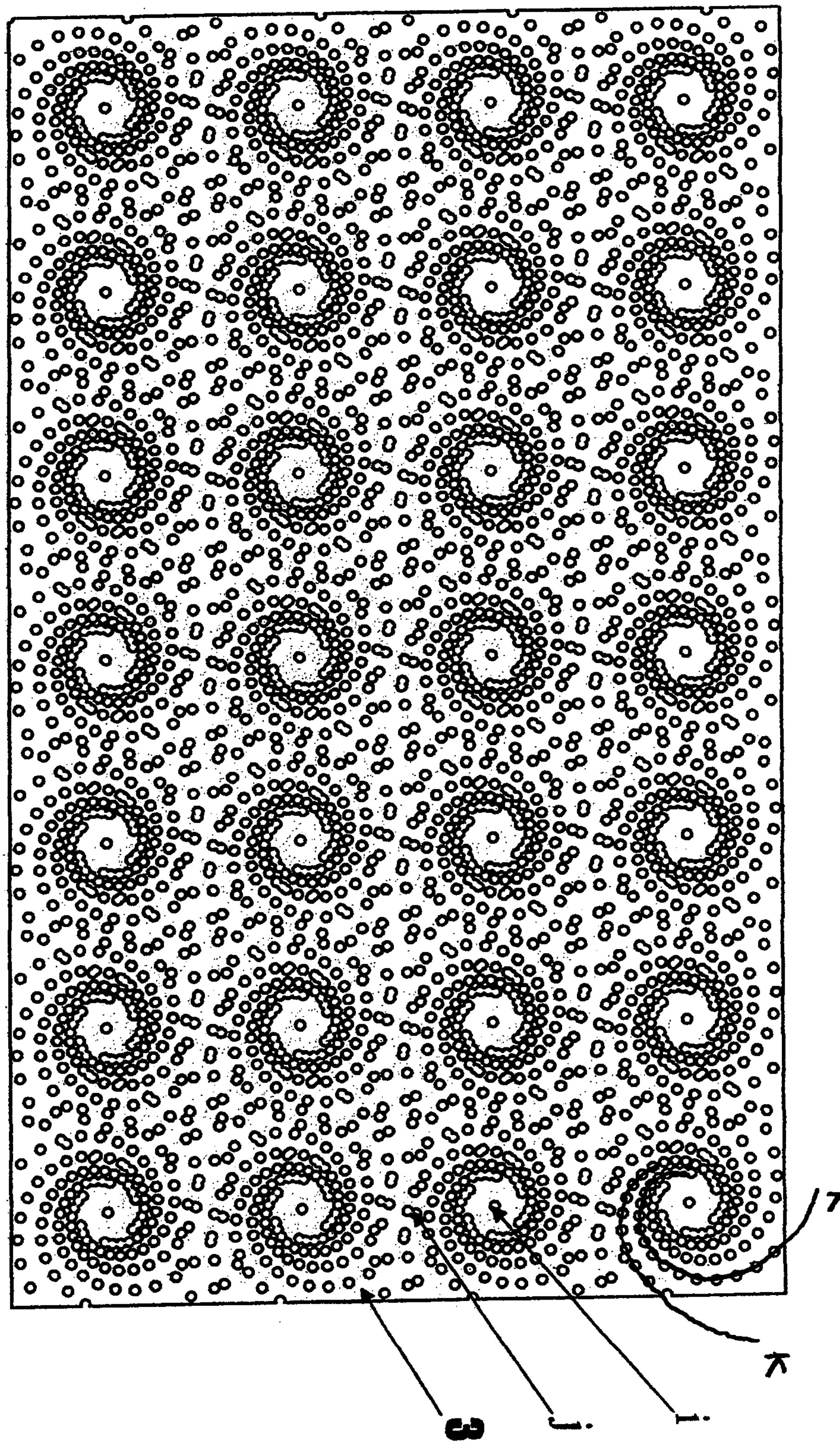

FIG.3

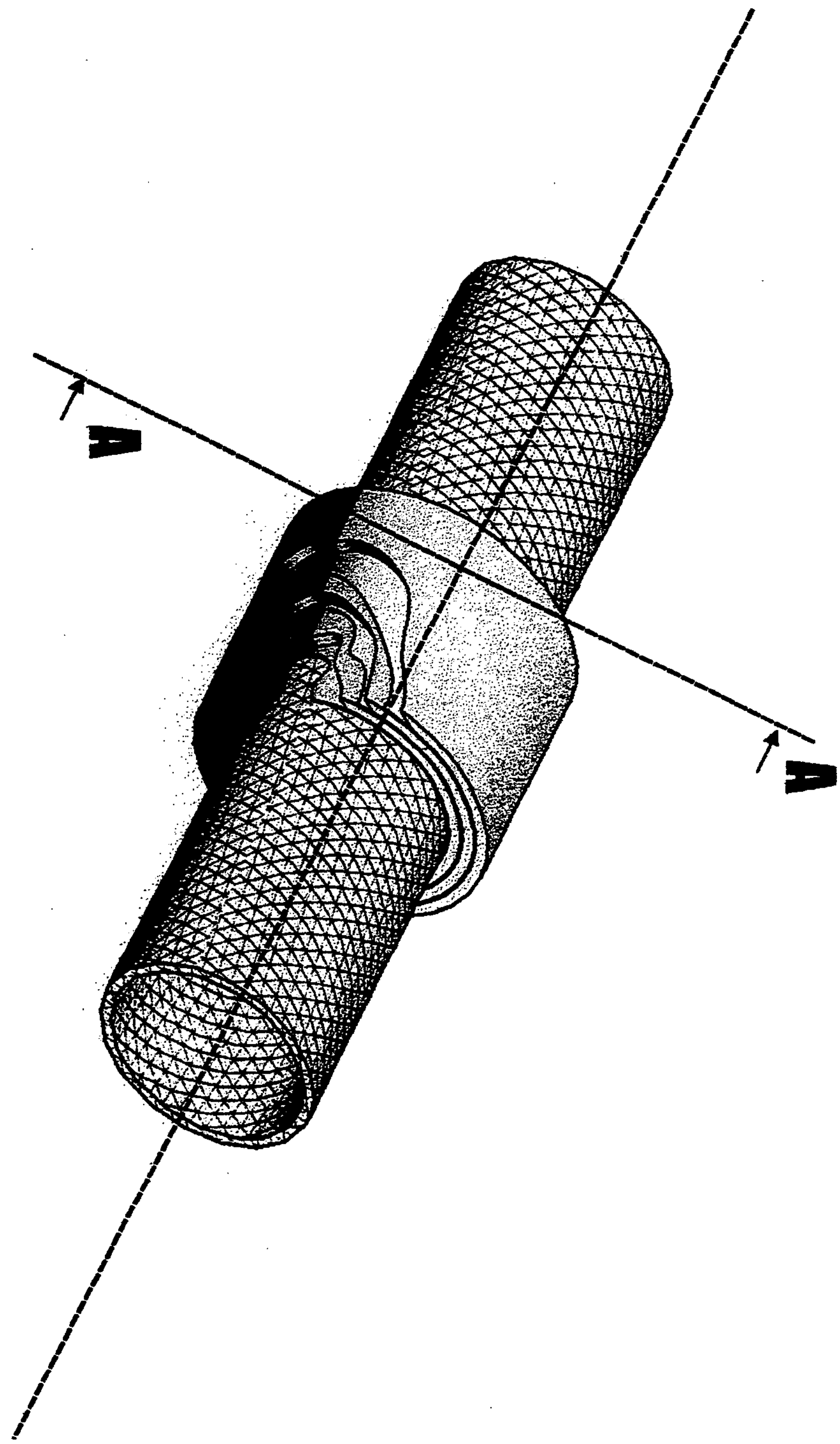

FIG.4

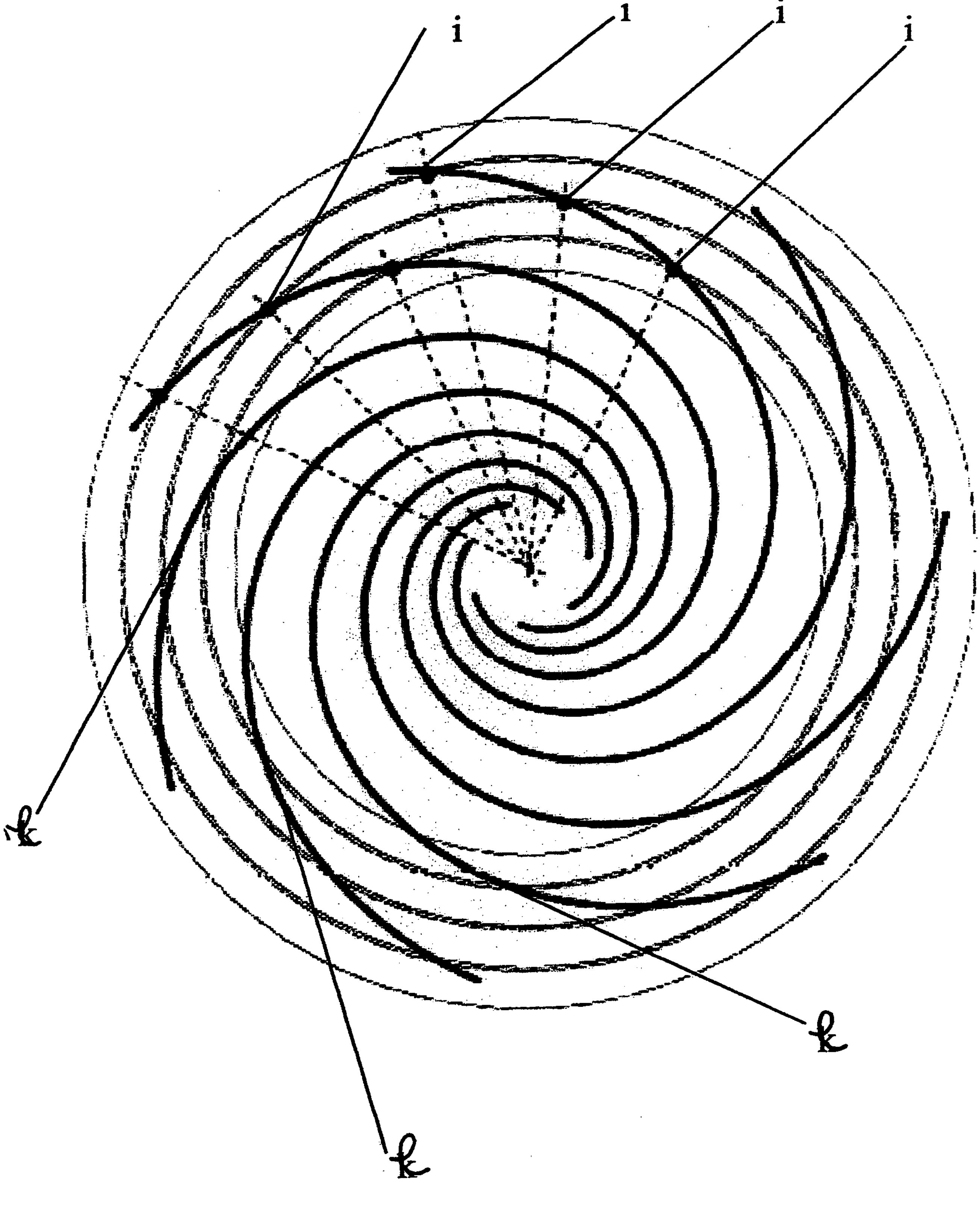

FIG.5

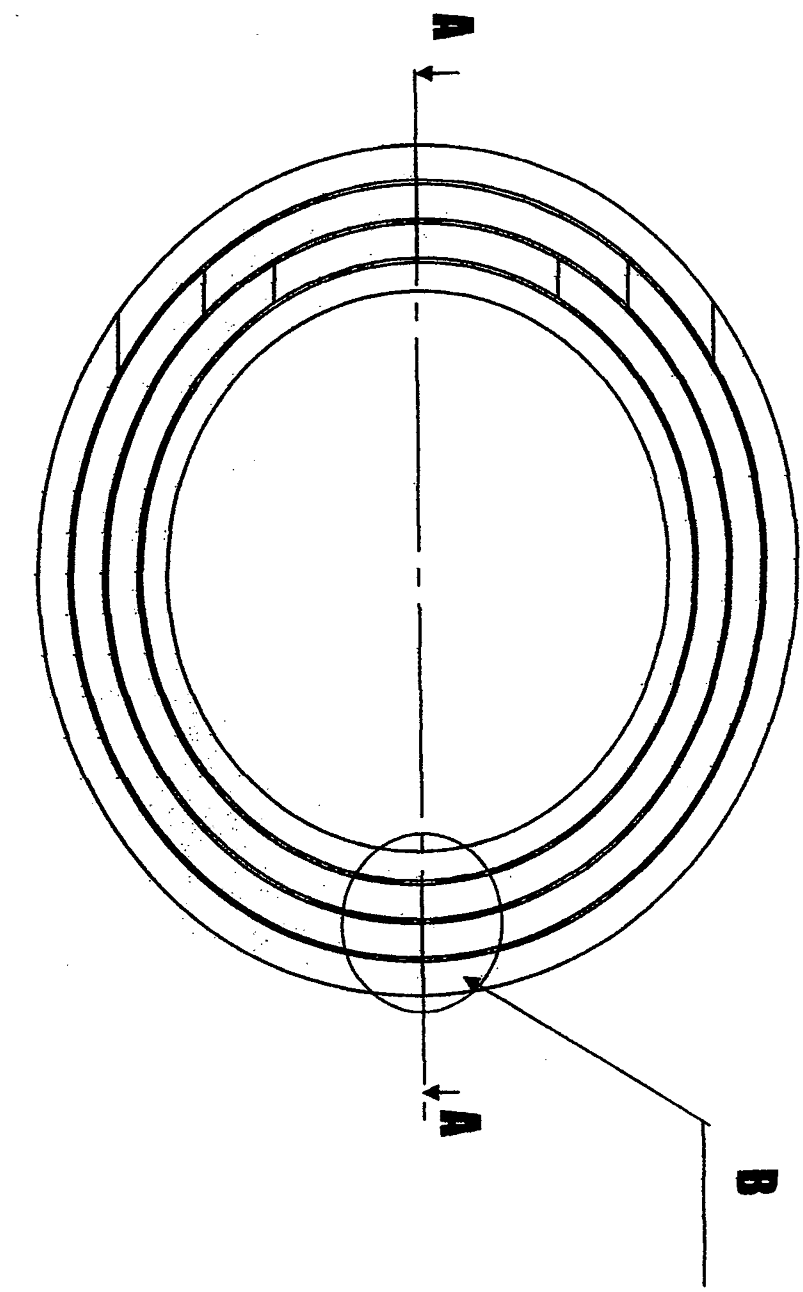

Fig.6

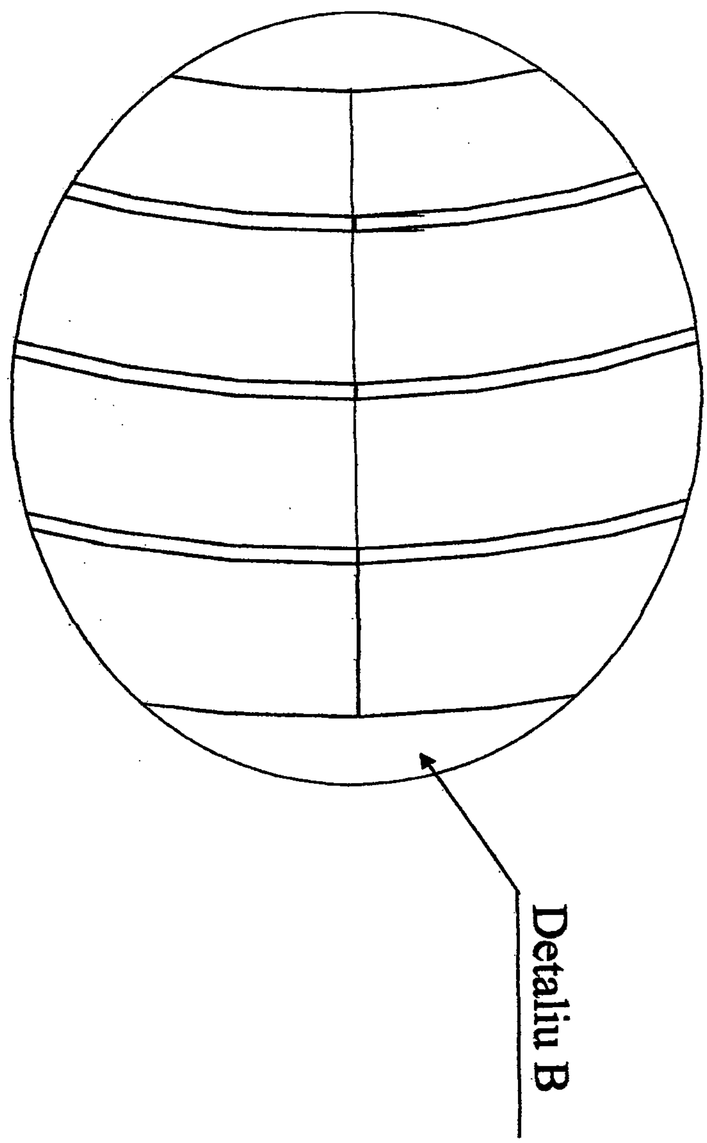

FIG.7

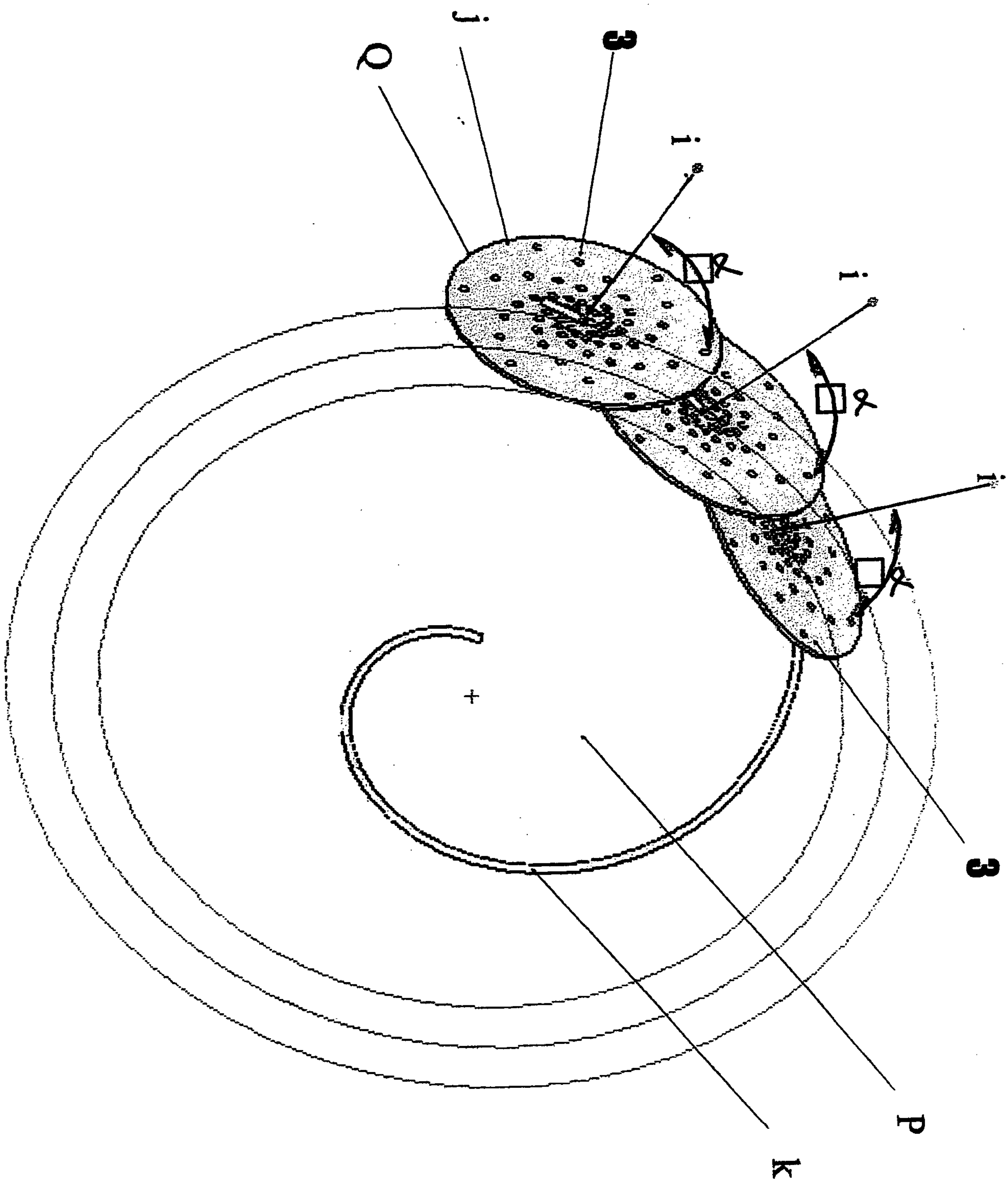

FIG.8

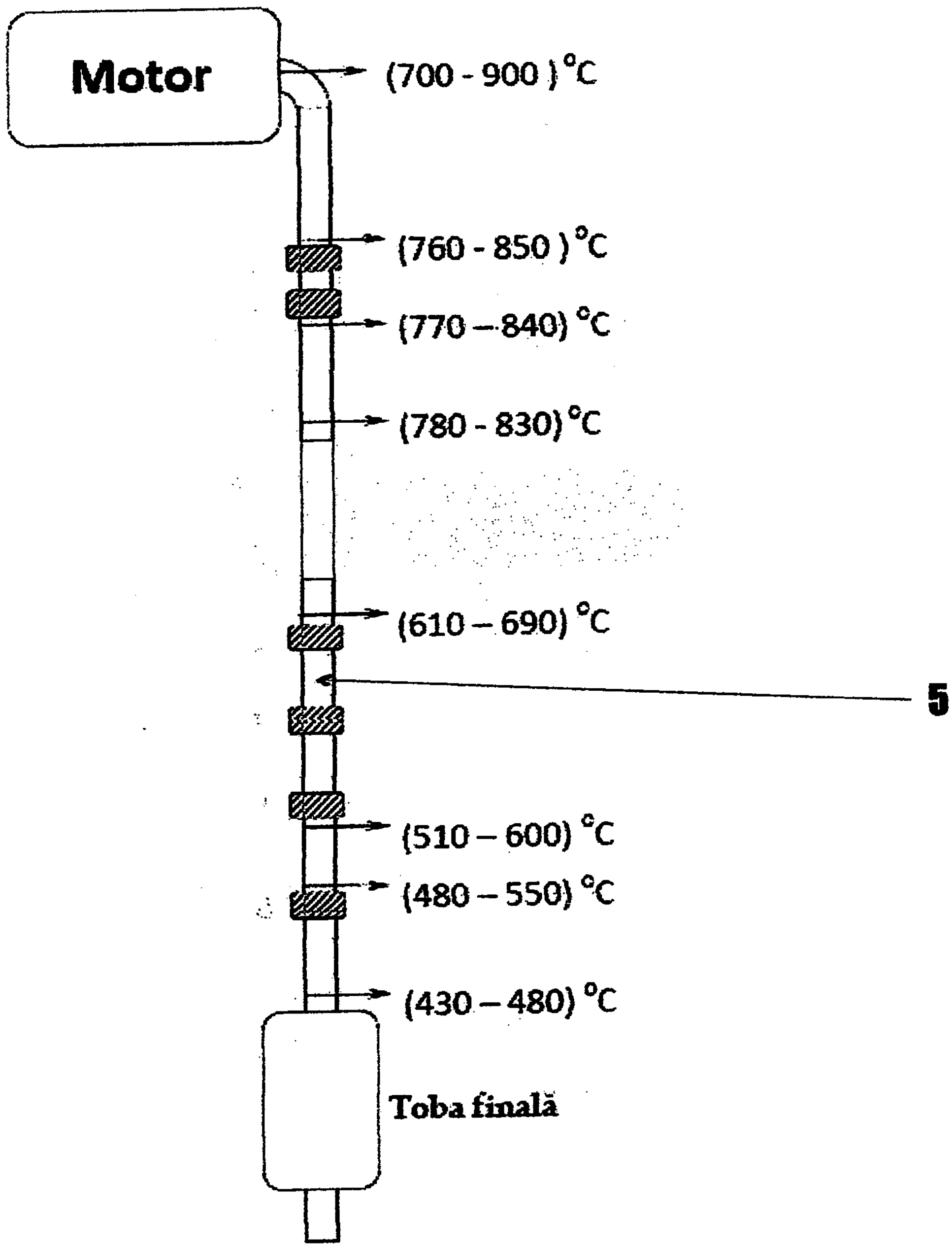
Motor
(700 - 900) °C
(760 - 850) °C
(770 – 840) °C
(780 - 830) °C
(610 – 690) °C
5
(510 – 600) °C
(480 – 550) °C
(430 – 480) °C
Toba finală

FIG.9

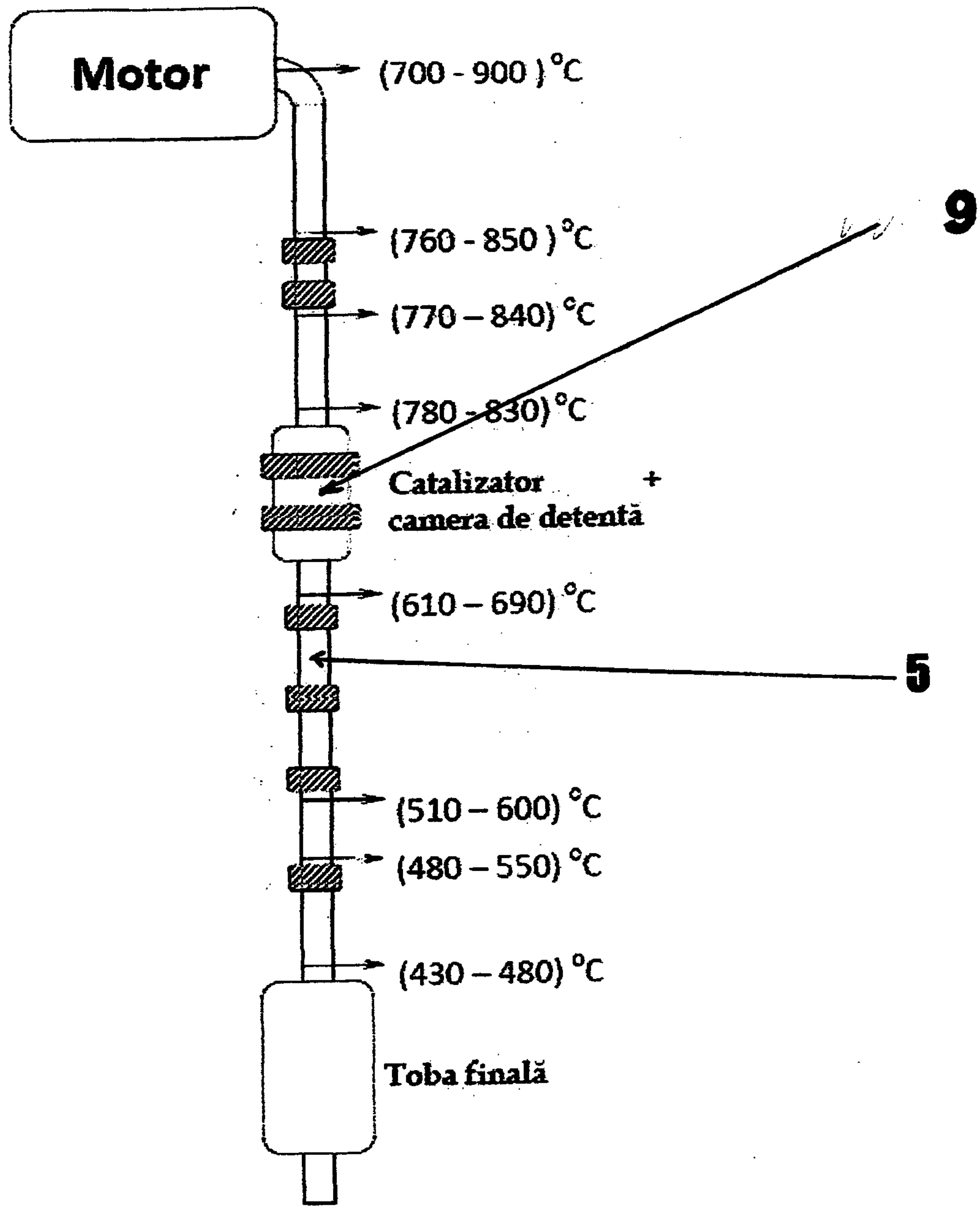
Motor
(700 - 900) °C
(760 - 850) °C
(770 – 840) °C
(780 – 830) °C
9
Catalizator +
camera de detentă
(610 – 690) °C
5
(510 – 600) °C
(480 – 550) °C
(430 – 480) °C
Toba finală

FIG.10