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(54) Recessed speed reducing system for street traffic

(57) The present invention relates to a speed reducing system for street traffic, which includes a speed bump recessed into a corresponding housing near the carriageway and designed to be suddenly brought in working position, partially protruding with respect to the surface of the carriageway, when the remote speed detector that cooperates with it detects an approaching vehicle travelling at excessive speed.

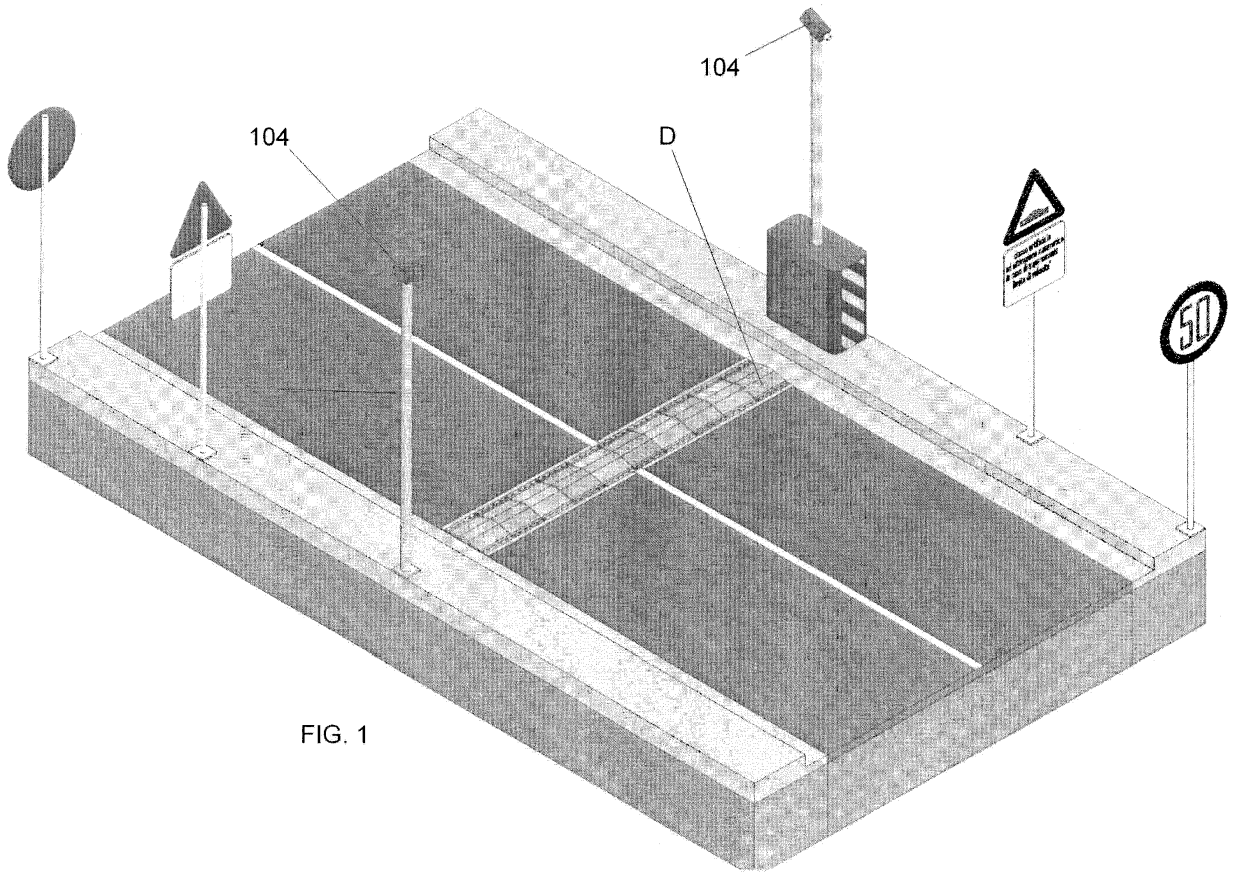

FIG. 1

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Description

[0001] The present patent application relates to a recessed speed reducing system for street traffic.

[0002] Solutions used to force drivers to moderate their speed near urban centres or other critical points of the road network have been studied for long.

[0003] To that end, large use is made of traffic lights controlled by speed detectors for the approaching vehicles, and of the so-called speed bumps.

[0004] As it is known, the term "speed bump" refers to a raised bump positioned along the carriageway in transversal direction, in such a way that it cannot be avoided by approaching vehicles.

[0005] Although they are rounded, the said bumps are quite higher than the surface of the road where they are installed, thus making vehicles bump when they pass over the bump at a speed higher than the speed limit.

[0006] Although largely diffused, this technology is impaired by a serious drawback: reference is made to the fact that traditional speed bumps generate some discomfort also for drivers who respect the speed limit.

[0007] This is because, when passing over the speed bump, including at moderate speed, vehicles are subjected to jolting, with negative effects not only for vehicles, but also for the driver's safety.

[0008] A careful study of the specific situation has resulted in the system of the invention, which is able to slow down drivers who exceed the speed limit, without disturbing the circulation of drivers who respect the said speed limit.

[0009] The system of the invention includes a recessed speed bump, which is alternatively positioned in rest position, in which it is completely contained in a corresponding housing obtained in the road, or working position, in which it protrudes from the road to create the necessary "slow down" interference with a vehicle approaching at high speed.

[0010] To that end, the operation of the said speed bump is coordinated by a suitable electronic unit interfaced with a traditional remote speed detector.

[0011] As long as the speed detector detects that the vehicle is approaching at moderate speed, the speed bump of the invention remains inside its housing, with the upper side basically flush with the road surface, without creating a sensible discontinuity with respect to the road surface and without discomfort for vehicles.

[0012] When the speed detector detects a vehicle that is approaching at high speed, the speed bump immediately "emerges" from its housing and is brought in very visible position for the approaching driver, forcing him to slow down dramatically.

[0013] Finally, it must be noted that the speed bump of the system of the invention has a modular structure, being composed of a plurality of single elements designed to be mounted side by side and operated in perfect coordination.

[0014] This allows for installing the said speed bump in any type of carriageway, regardless of the road width, as long as the correct number of similar modules is installed in side-by-side position.

[0015] For purposes of clarity, the description of the invention continues with reference to the enclosed drawings, which are intended for purposes of illustration only and not in a limiting sense, whereby:

- figure 1 is a diagrammatic view that shows the system of the invention installed in the carriageway;
- figure 2 is an exploded axonometric view of a module of the speed bump used in the said system;
- figure 3 is a three-quarter axonometric view of the said module in working position;
- figure 4 is a front view of figure 3;
- figure 5 is a sectional view with plane A-A of figure 4;
- figure 6 is a three-quarter axonometric view of the said module in rest position;
- figure 7 is a front view of figure 6;
- figure 8 is a sectional view with plane A-A of figure 7;
- figure 9 is a block diagram of the electronic and hydraulic circuits provided in the system of the invention.

[0016] With reference to fig. 1, the system of the invention includes a speed bump (D) usually provided with rectilinear structure, designed to cover the entire width of a carriageway.

[0017] In this figure, the said bump (D) is shown in working position, protruding from the carriageway; in rest position, the same bump (D) is designed to be "lowered" in order to be perfectly flush with the road surface.

[0018] Two infrared devices (104) are installed on posts at the sides of the speed bump (D), for remote speed detection, being aimed at opposite directions in order to monitor traffic in both directions.

[0019] In view of the speed detected by the said remote speed detectors (104), the speed bump (D) will be either maintained in rest position or brought in working position, as shown in fig. 1.

[0020] Regardless of this possible practical application, the speed bump of the invention (D) may also be associated with one speed detector only, since the need to slow down vehicles is often required in one direction only.

[0021] As anticipated, the bump of the invention (D) is provided with modular structure, which is composed from time to time of the correct number of identical modules (M) designed to operate in perfect coordination.

[0022] With reference to figs. 2 to 8, each module (M) is made of a basically U-shaped bearing frame designed to be inserted and fixed in transversal direction into the corresponding housing obtained in the road surface.

[0023] The frame (1) includes a horizontal bearing wall (1 a) with rectangular shape, with two identical wings (1 b) protruding from the sides.

[0024] A rectangular platform (2) is fixed in central position on the upper side of the said bearing wall (1 a)

between the two vertical wings (1 b).

[0025] Two opposite pairs of uprights (3) are fixed above the platform (2) at the two longitudinal ends of the platform (2), being designed to support a horizontal grid (4) having exactly the same area and rectangular section as the horizontal bottom wall (1 a) of the frame (1).

[0026] In this way, the two transversal borders (4a) of the rectangular grid (4) are designed to be fitted on top of the vertical wings (1 b) of the frame (1) and suitably screwed in.

[0027] The two longitudinal ends of the grid (4) are fitted to the transversal borders of a strip (5) made of rubber or any other elastically stretchable material, designed to exactly cover the surface of the grid (4).

[0028] Four short columns (6) with vertical direction are tightened on the lower side of the grid (4).

[0029] The short columns (6) are designed to be exactly inserted into corresponding bushes (7) fixed under a grated head (8) that operates under the grid (4).

[0030] The grated head (8) is composed of a rectangular plate (8a) with horizontal direction, above which some transversal partitions (8b) in edgeways position with upper convex curved section are mounted and regularly spaced.

[0031] Each partition (8b) is suitably dimensioned and positioned in order to be exactly inserted, from down upwards, into a corresponding longitudinal slot (4b) of the grid (4); the length of the bearing plate (8a) is such that it occupies the space bordered by the two pairs of uprights (3) under the grid (4).

[0032] The upper end of the stem (9) with vertical axis of a double-effect hydraulic cylinder (10) tightened in the centre of the platform (2) fitted above the bearing frame (1) is fitted in central position on the lower side of the bearing plate (8a) of the grated head.

[0033] The grated head (8) is designed to slide vertically in parallel direction, together with the stem (9) of the hydraulic cylinder (10) from a lower stop position to an upper stop position.

[0034] After illustrating the components of the module (M) and their mutual connections, this description continues by explaining the working principles of the system of the invention.

[0035] With reference to figures 6, 7 and 8, as long as the bump of the invention (D) is maintained in rest position, the stem (9) of the hydraulic cylinder (10) mounted on the bottom of the support frame (1) is maintained in "retracted" position inside the sleeve.

[0036] In this situation the grated head (8) is in lower stop position, which corresponds to a height in which the convex partitions (8b) are maintained inside the corresponding slots (4b) of the grid (4) without protruding from the top.

[0037] In this way, in absence of any deformation stress, the rubber strip (5) is maintained in a perfectly horizontal position above the grid (4) and therefore perfectly flush with the road surface.

[0038] With reference to figures 3, 4 and 5, when the module (M) is brought in working position, the stem (9) of the hydraulic cylinder (10) is extended and the grated head (8) is consequently brought to the upper stop position.

[0039] In this situation, the convex partitions (8b) "emerge" upwards from the corresponding slots (4b) of the grid (4) until they protrude from the top, thus consequently deforming the flexible strip (5).

[0040] Since the grid (4) is basically flush with the road surface, although they are covered by the flexible strip (5), the convex partitions (8b) of the grated head (8) protrude from the road surface, thus adequately interfering with a vehicle approaching at excessive speed.

[0041] As soon as such working requirement no longer exists, the stem (9) of the hydraulic cylinder (10) is retracted again, thus causing a new travel of the grated head (8) to the lower stop position.

[0042] In this way, the convex partitions (8b) are retracted inside the slots (4b) of the grid (4) and the rubber strip (5) spontaneously recovers perfect planarity.

[0043] It must be noted that the perfect planarity of the grated head (8) during the said alternate vertical travels is favoured by the coupling of the columns (6) fitted under the grid (4) with the corresponding bushes (7) fitted under the bearing plate (8a) of the grated head (8).

[0044] With reference to fig. 9, the working principles of the system of the invention are described in detail below.

[0045] It must be noted that the various modules (M) of the speed bump (D) - or, more precisely, their hydraulic pistons (10) - are connected to the same hydraulic circuit (100) provided with a pressure regulator (101), and a valve (102) designed to close and open the circuit (100) and therefore alternatively actuate the hydraulic pistons (10) of the various modules (M).

[0046] The same system also includes an electrical circuit for the automatic control of the said valve (102) of the hydraulic circuit.

[0047] The electrical circuit includes an acoustic sensor (103), one or two infrared sensors (104) for remote speed detection, a manual switch (105) and two safety stops (106, 107).

[0048] In particular, the two safety stops (106, 107) consist in two photocells mounted near the ground, one immediately upstream and one immediately downstream the speed bump (D), in such a way that the luminous rays cross the entire carriageway.

[0049] Because of their position, the two photocells (106, 107) immediately detect the passage of vehicles over the bump (D) when they interrupt the luminous rays.

[0050] According to the main working mode of the system, the hydraulic cylinders (10) of the various modules (M) of the speed bump (D) are actuated, thus "raising" the speed bump (D), when one of the infrared sensors (104) detects an approaching vehicle with excessive speed.

[0051] As soon as the said vehicle has passed, the hydraulic pistons (10) return to rest position, in which the

entire speed bump (D) is recessed into the corresponding housing.

[0052] In particular, the control to restore the rest position of the speed bump (D) is given as soon as the two photocells (106, 107) detect that the vehicle for which the speed bump (D) was raised has completely passed over the said bump (D).

[0053] The photocells (106, 107) are also designed to carry out another important function in the system of the invention: to prevent the speed bump (D) from assuming the working position every time a vehicle stops over the said bump (D).

[0054] This measure has been studied in order to avoid the risk of damaging the vehicle stopped over the bump (D) because of the sudden energetic raising of the speed bump (D).

[0055] Taking into account that the interruption of the luminous ray of the two photocells (106, 107) always corresponds to the rest position of the speed bump (D), the photocells (106, 107) are able to prevent the speed bump (D) from assuming the working position while a vehicle stopped "astride" the bump interrupts the luminous rays.

[0056] Whilst reference has been made so far to an embodiment of the system of the invention with two photocells, it is understood that the same working modes can be also actuated in the presence of one photocell only.

[0057] The function of the acoustic sensor (103) is to capture the siren sound of emergency vehicles (fire brigade, ambulances, police, etc.) and temporarily exclude the operation of the infrared speed detectors (104).

[0058] This is done to avoid that these vehicles may unexpectedly find the speed bump (D) in working position, with the consequent need to reduce their speed.

[0059] Moreover, the system of the invention is provided with a manual switch (105) used to permanently "block" the speed bump (D) in working or rest position, until the same switch is actuated again.

[0060] Finally, it must be noted that, despite the foregoing description, various constructive variants may be devised according to the present inventive idea, without modifying the working principles of the system of the invention.

[0061] For instance, the hydraulic cylinders (10) designed to raise the speed bump (D) may be replaced with different actuators with similar capacity.

[0062] Likewise, the infrared sensor (104) may be replaced with a different remote speed detector, such as, for instance, sensors composed of two electrical cables drowned transversally in the road surface that are able to determine the speed of an approaching vehicle by detecting the weight of the vehicle and calculating the time taken to cover the distance between the two transversal cables.

Claims

1. Recessed speed reducing system for street traffic, **characterised in that** it includes a speed bump (D), recessed into a corresponding housing near the carriageway and associated with suitable actuators (10), designed to be suddenly brought from rest position, in which it is completely contained inside the said housing, to working position, in which it partially protrudes with respect to the surface of the carriageway, when one or more remote speed detectors (104) that cooperate with it detect an approaching vehicle travelling at excessive speed, and designed to be suddenly brought back to rest position when one or more sensors (106, 107) that cooperate with it detect that the vehicle has completely passed over the said bump (D).

2. System as claimed in claim 1, **characterised in that** it comprises an acoustic sensor (103) able to prevent the said speed bump (D) from being raised when the siren of an approaching emergency vehicle is detected.

3. System as claimed in the first or both the above claims, **characterised in that** it comprises a manual switch (105) used to permanently block the speed bump (D) in working or rest position.

4. System as claimed in one or more of the above claims, **characterised in that** one or more sensors (106, 107) are designed to prevent the speed bump (D) from raising when they detect the presence of a vehicle parked over the bump (D).

5. System as claimed in one or more of the above claims, **characterised in that** the speed bump (D) is composed of a series of identical cooperating modules (M) mounted side-by-side, each of them provided on top of a strip made of rubber (5) or other elastically stretchable materials in horizontal position flush with the road surface, designed to suffer the interference, from down upwards, of a suitable shaped head (8) that emerges from the housing obtained in the road surface to determine its convex curved position.

6. System as claimed in one or more of the above claims, **characterised in that** each module (M) of the speed bump (D) comprises:

   - a basically U-shaped frame (1) formed of a horizontal wall (1 a) with two identical opposite wings (1 b) protruding from the sides
   - a platform (2) transversally fixed in central position on the upper side of the said horizontal wall (1 a) of the frame (1) in intermediate position between the two vertical wings (1 b)

- an actuator (10) fixed above the platform (2) designed to actuate a stem (9) able to make alternate vertical travels
- a grated head (8) fixed at the upper end of the stem (9) and composed of a rectangular plate (8a) with horizontal direction, above which some transversal partitions (8b) in edgeways position with upper convex curved section are mounted and regularly spaced
- a horizontal grid (4) supported above the said grated head (8) by uprights (3) fixed to the platform; it being provided that each slot (4b) exactly receives one of the partitions (8b) of the grated head (8) in such a way that, during the alternate vertical travels of the said head (8), each partition (8c) is brought from a lower stop position, in which its top convex section
is inserted inside the corresponding slot (4b) to an upper stop position, in which it considerably emerges above the said slot (4b)
- an elastically stretchable strip (5) that exactly covers the upper surface of the said grid (4), being fixed at the ends on the transversal borders (4a) of the grid (4).

7. System as claimed in claim 6, **characterised in that** the grid (4) is provided in the lower part with short columns (6) with vertical direction, designed to be exactly inserted into corresponding bushes (7) fixed under the grated head (8) in such a way that the first ones are able to drive the alternate vertical travels of the second ones.

8. System as claimed in one or more of the above claims, **characterised in that** the actuators (10) designed to raise and lower the speed bump (D) are hydraulically actuated.

9. System as claimed in one or more of claims 1 to 7, **characterised in that** the actuators (10) designed to raise and lower the speed bump (D) are pneumatically actuated.

10. System as claimed in one or more of claims 1 to 7, **characterised in that** the actuators (10) designed to raise and lower the speed bump (D) are electromechanically actuated.

11. System as claimed in one or more of the above claims, **characterised in that** the one or more remote speed detectors consist in infrared detectors (104).

12. System as claimed in one or more of claims 1 to 10, **characterised in that** the one or more remote speed detectors are drowned in the road surface, and able to detect the weight of the approaching vehicles.

13. System as claimed in one or more of the above claims, **characterised in that** the sensors (106, 107) are optical sensors.

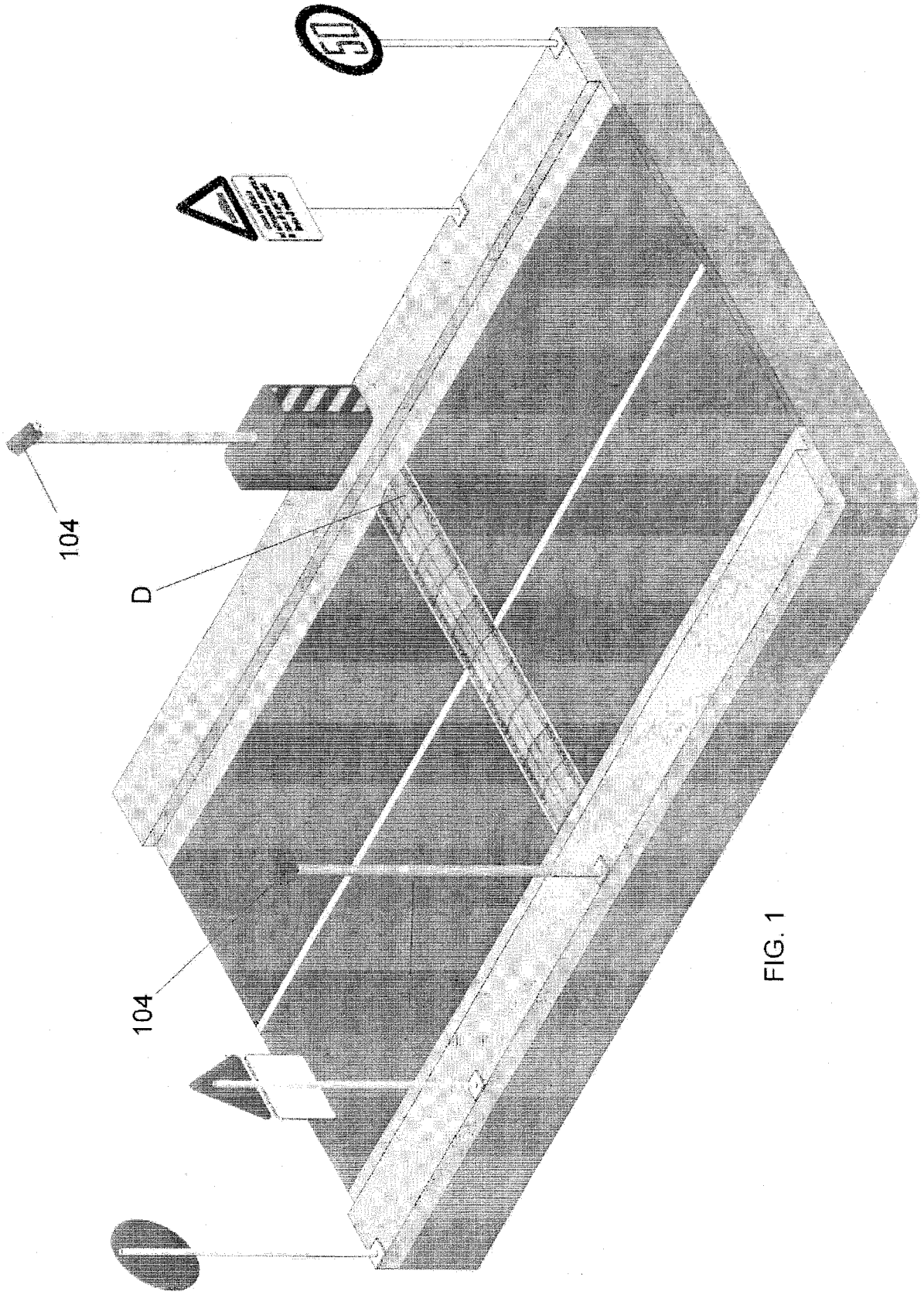


FIG. 1

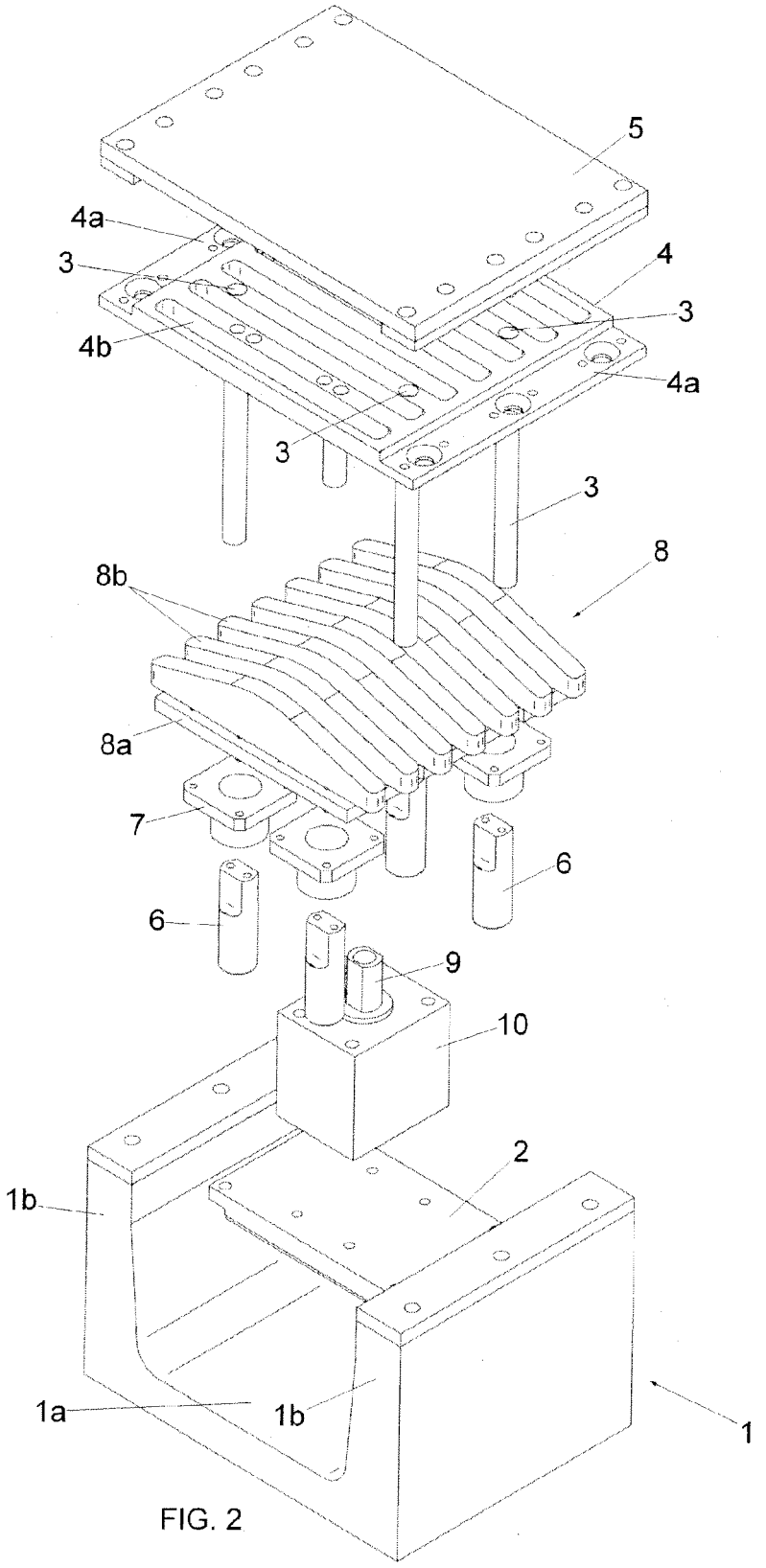


FIG. 2

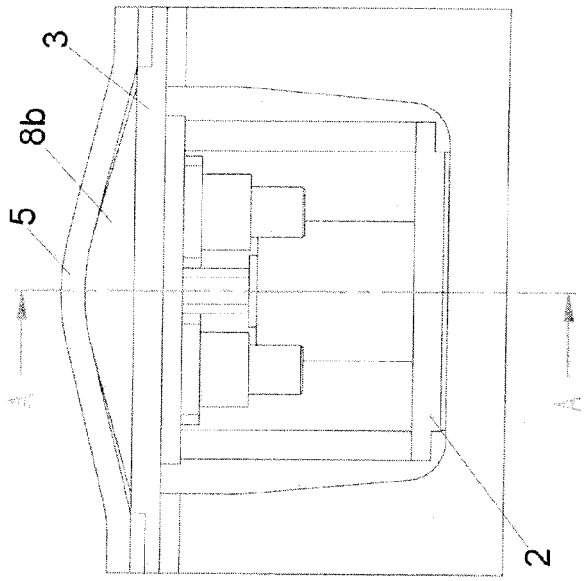
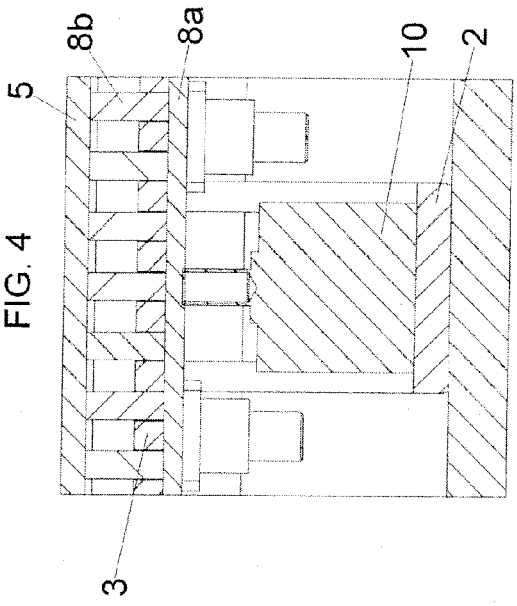


FIG. 4



SEZIONE A-A

FIG. 5

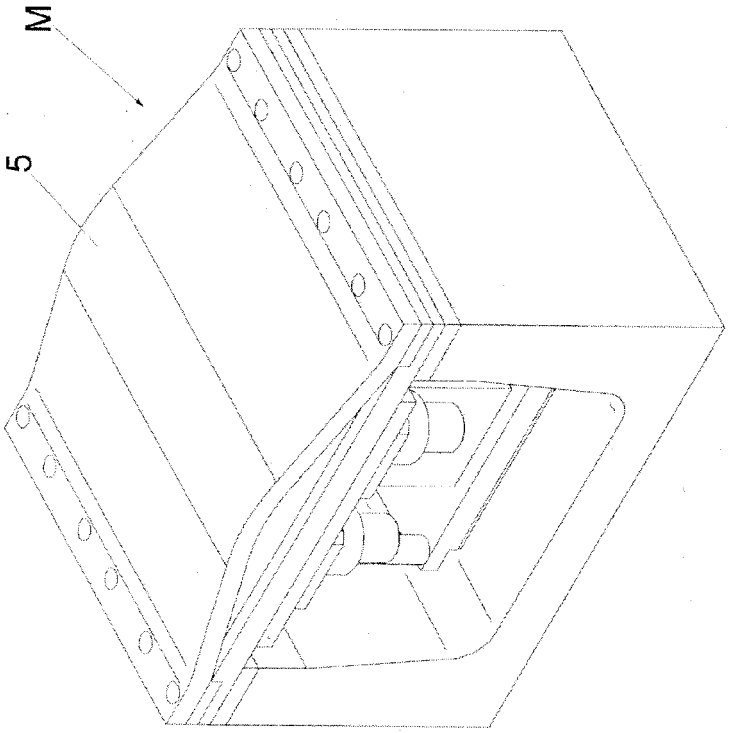


FIG. 3

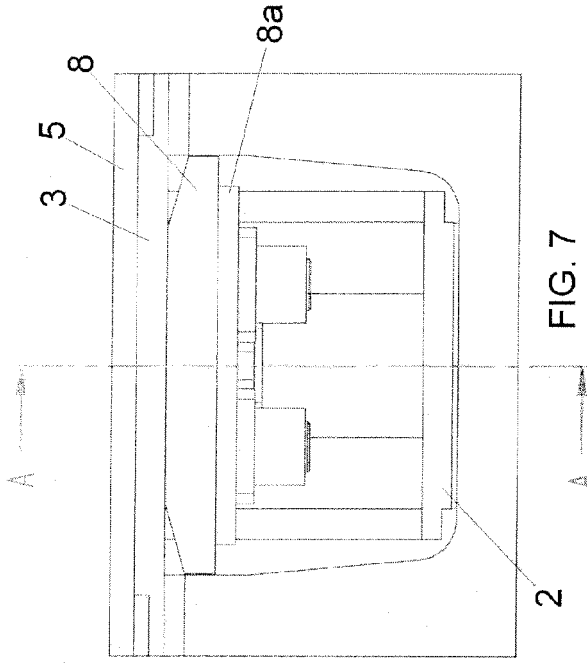


FIG. 7

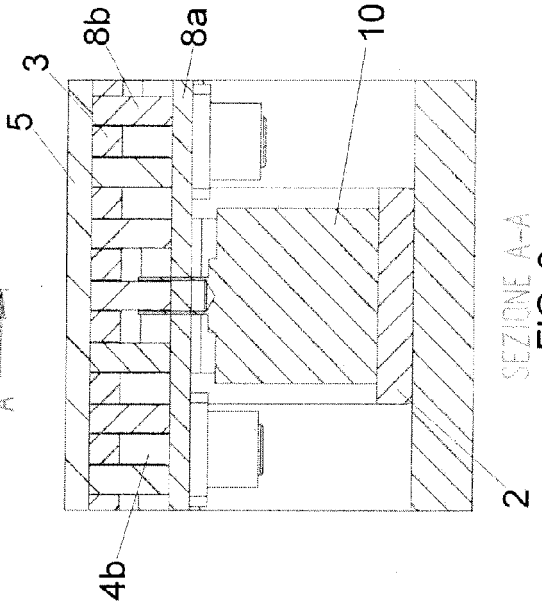


FIG. 8

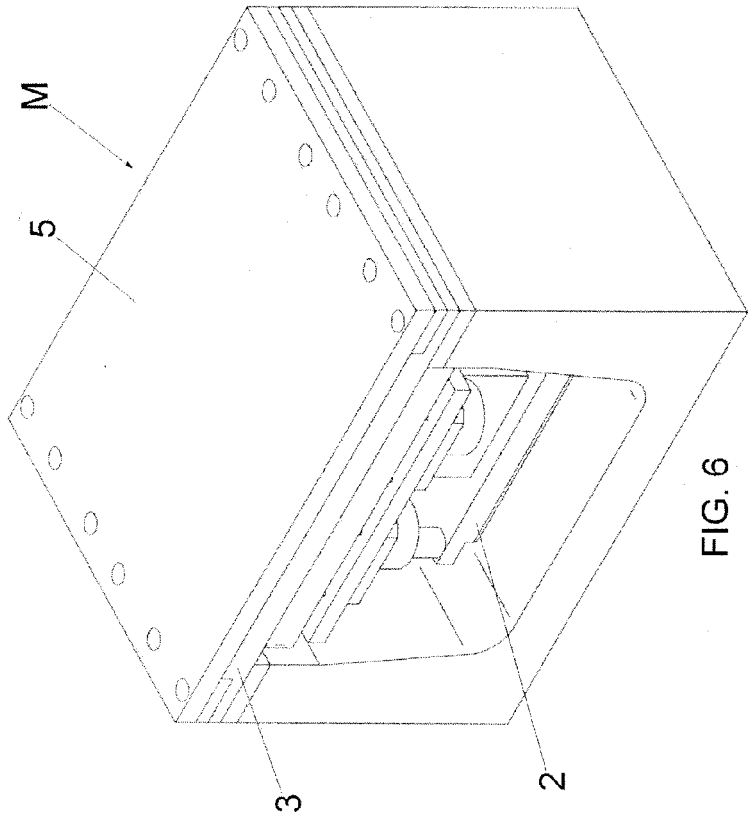


FIG. 6

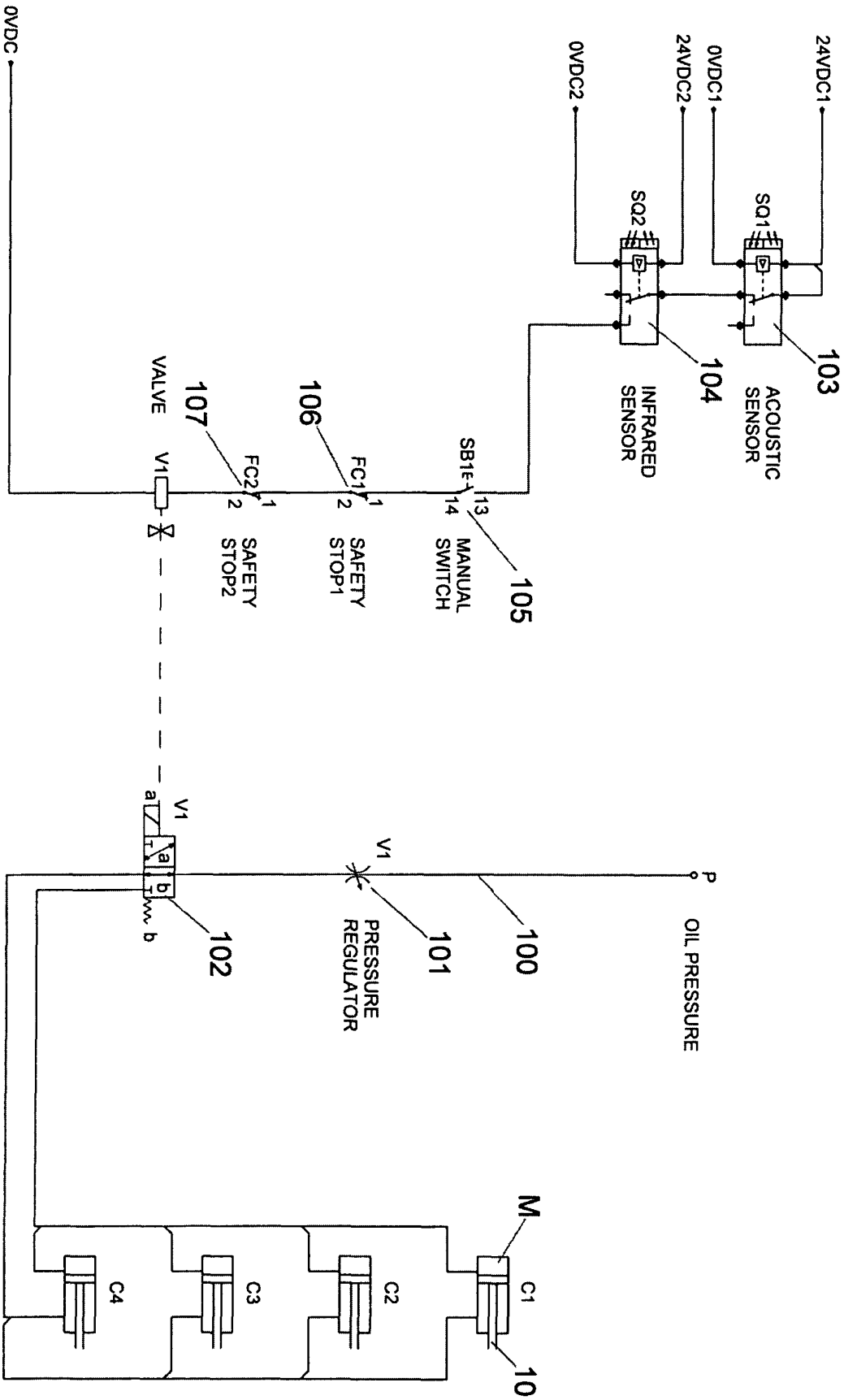

24VDC1
0VDC1
24VDC2
0VDC2
0VDC
SQ1
SQ2
ACOUSTIC SENSOR
INFRARED SENSOR
103
104
105
MANUAL SWITCH
SB1E-1
13
14
106
FC1
1
2
SAFETY STOP1
107
FC2
SAFETY STOP2
VALVE
V1
a
b
102
V1
PRESSURE REGULATOR
101
100
P
OIL PRESSURE
M
C1
C2
C3
C4
10

FIG. 9