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(54) Electronic dispenser of nebulized liquid products.

(57) The liquid product to be dispensed in nebulized doses is packaged in a canister (6) having a pump located preferably in a non-axial position, so that its nebulizing cylinder (107) is a short distance from a window in the container (3) that carries the various components of the dispenser. The canister (6) is inserted so that the base of its body and said cylinder (107) are between a fixed or reaction part and a part mounted on the movable member of an electromagnet (4) which when energized exerts the force required to actuate the pump and dispense a nebulized dose of the product, which is discharged through said window. The electromagnet (4) is constructed in such a way as to generate sufficient force gradually so as to ensure complete nebulization of the product dispensed while absorbing only a small amount of electrical energy. Also provided are low-consumption electronic components which not only control said electromagnet (4) but also make it possible to program the frequency with which the dispenser is actuated and to signal when the canister (6) is at its reserve level or is exhausted.

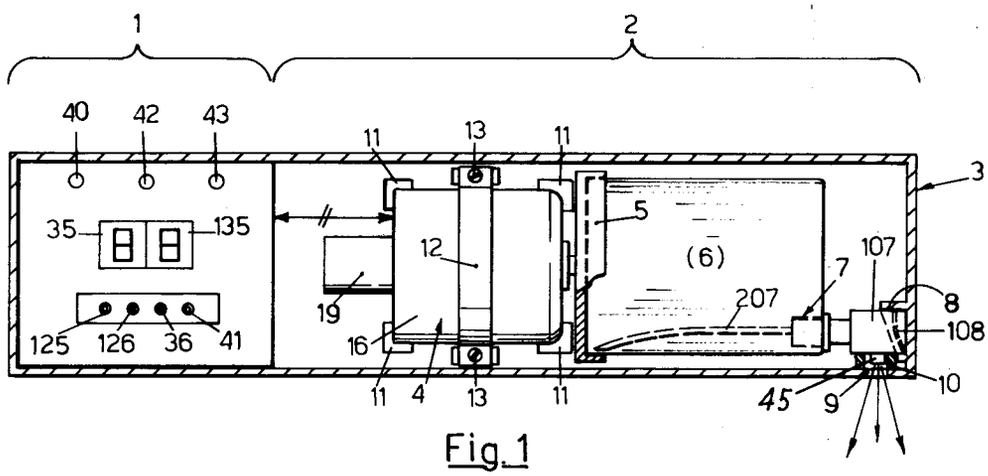

Fig.1

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The invention relates to an electronic dispenser of nebulized liquid products, such as perfumes and/or deodorizing, disinfecting or medicinal products, especially suitable for installing in the passenger compartment of cars and other motor vehicles.

The dispenser according to the invention is characterized by small size and by the use of replaceable or refillable canisters containing the product to be dispensed, which are not under pressure and are therefore safe and environmetally friendly. The pump that dispenses the product contained inside the canister is actuated by an electromagnet, whose power and progressive action simulate perfectly the action of a person's finger, thus ensuring that the product dispensed through the pump is completely nebulized. The dispenser has means for adjusting and programming the interval of time that lapses between successive dispensed doses of product, and has signalling means to warn the user when the canister is nearly empty.

These and other features of the invention, and the advantages procured thereby, will be clear from the following description of a preferred embodiment of the invention, illustrated purely by way of a non-limiting example in the figures of the accompanying drawings, in which:

- Fig. 1 is a longitudinal sectional view through the dispenser according to the invention.
- Fig. 2 shows a block diagram of the electronic circuit controlling the dispenser according to the invention, and further shows an axial section through the electromagnet used in the dispenser according to the invention, and
- Fig. 3 is a longitudinal sectional view, in enlarged scale, of one embodiment of the liquid pumping and atomizing device used in the dispenser according to the invention.

With reference to Fig. 1, it will be seen that the dispenser comprises a section 1 containing the entire electronic programming, controlling and signalling components of the device, and a section 2 containing the electromechanical part which dispenses the product. In the embodiment shown, the said two sections 1 and 2 are assembled in a single body 3. Of course, it will be evident that the said two section may be separated, and connected only through electrical cables, and thus for example section 1 may be fitted to the dashboard of the motor vehicle, and section 2 may be installed anywhere in the passenger compartment of the motor vehicle.

The section 2 of the device contains a pushing electromagnet 4 having a fixed body (see below) arranged preferably with its axis parallel with the longitudinal direction of the container 3, and mounted on its movable member is a flanged disc 5 into which the base of the canister 6 containing the liquid product to be dispensed is inserted and centred. The axis of the canister 6 is also parallel with the long dimension of the container 3. The cannister 6 is in communication with the pump 7 that dispenses through the spray nozzle 45 the doses of product. With particular reference to Figure 3, the pump 7 will be described. The said pump comprises a cylinder 107 closed at one end, and provided at the opposite end with a port through which the rod 46 of a piston 47 slidably mounted in the cylinder 107 is passed. The cylinder 107 is further provided near its closed end with a radially projecting nozzle 45, communicating with the cylinder 107 in the manner which will be described later. The closed end of the cylinder 107 is centred in a seat 8 formed for example integrally with a wall of the container 3 and provided with a projection 108 that engages a corresponding recessed part 48 of said cylinder 107, so as to assure that the nozzle 45 be pointed correctly towards a window 9 formed in the side wall of the container 3. The numeral 10 indicates an annular seal disposed around the nozzle 45 in the region of the window 9, in order to insulate these means from the internal volume of the container 3. The rod 46 of the piston is made tubular, and is provided at an intermediate portion with a flange 49 bearing against the outer surface of the bottom wall of the cannister 6. The said rod 46 penetrates through a boring in the bottom wall of the cannister 6 into said cannister, and is provided at its free end with a tubular extension 207 formed by a flexible tube extending in the bottommost part of the canister 6 in order to ensure that all the product contained inside the canister be dispensed. The piston 47, in turn, is provided with an axial through-boring, communicating at one end with the tubular duct of the rod 46 through a suitable non-return valve 50 urged by spring means against a valve seat, and at its other end with the cylinder 107. The piston is constantly urged in one direction by a spring 51 disposed between the piston head and the bottom wall of the cylinder 107. A second non-return valve 52 is disposed so as to close the port 53 between the cylinder and the spray nozzle 45.

The container 3 will be provided with a door (not shown) and all such means as will simplify insertion and removal of the canister 6 into and from its use position. There is no preference as to whether the dispenser is installed in the passenger compartment of the motor vehicle in a horizontal or inclined position, though always with the window 9 pointing down, or else in a vertical position, in which case there is no restriction as to the direction in which said window points.

As a result of the electromagnet's 4 being energized, the canister 6 is moved towards the

cylinder 107 which is held stationary by the seat 8, thereby executing the compression stroke of the pump 7 and consequently dispensing through the nozzle 45 and through the window 9 a dose of the product contained inside the canister. When, however, the electromagnet 4 is de-energized, the spring means 51 of the pump 7 return the piston 47 to its starting position, thus sucking through the tubular extension 207, the hollow rod 46 of the piston, and the non return valve 50 a new dose of product in the cylinder 107. Concurrently, the electromagnet 4 is returned to the rest position. The unit 7, 107 is not in line with the axis of the body of the canister but located in the bottom of the canister in a horizontal position so as to be very close to the window 9.

The electromagnet 4 may for example be securely fitted by means of its own body in a housing defined by projections 11 integral with a wall of the container 3 and is held in this housing by a band 12 fastened by means of screws 13.

The piston 47 of the pump 7 must be able to be worked by a great enough force, progressively, so that the product dispensed is completely nebulized. In order to reconcile this need with that of limiting the consumption of electrical energy by the electromagnet 4, this component has been carefully designed and its construction will now be described with reference to the detail of Figure 2. The numeral 14 indicates the can of insulating material, wound around which is the coil of enamelled copper wire 15, which is then enclosed in the casing 16, integral with which at one end is a fixed ferromagnetic core 17 which extends a certain distance into the axial cavity of the can, where it terminates in a tapered frustoconical end 18. Mounted so as to slide in the other free part of the axial cavity of the can is the ferromagnetic core 19 whose inner end is a frusto-conical recess 20 complementary to the end 18 of the fixed core. A rod 21, which may either be formed in one piece with or attached to the movable core, passes with sufficient play through an axial hole 22 in the fixed core and projects from the latter to support the pushing disc 5 already referred to and made of a non-magnetic material. The movable core is guided by the parts 21, 22 and is also guided by a ring 23 of a non-magnetic material located on the base of the casing 16, in which it is locked by a springy ring 24. When the electromagnet is at rest owing to the action of the springy means 51 of the pump 7 of the canister 6, the disc 5 is pressed against the fixed core 17 and the movable core is in the position of maximum distance from the fixed core and of maximum extension from the assembly 14, 15. When the coil 15 is energized, the movable core 19 is attracted into the can both by the direct action of the magnetic flux produced by the electric current passing through the coil, and by the force of attraction which this flux creates between the ferromagnetic parts 17 and 19, whose opposing inner surfaces are of opposite magnetic polarities. The conical shaping 18 and 20 of the two cores 17 and 19 has the dual function of augmenting the surface area by which the two cores attract each other and of making the strength of this attraction more gradual and suitable for the purpose in question. If the dimensions of the play between the movable parts 19, 21 and the associated fixed guiding parts 14, 17 are properly calculated, it will be possible to achieve a choking effect that will suitably control the outflow of air from the chamber 114 during the active stroke of the core 19, in order to ensure a gradual actuation of the pump 7 and complete nebulization of the product which the latter dispenses as a result of the energizing of the electromagnet 4. The electromechanical dimensions of the electromagnet are not considered here as these may vary as a function of the elastic properties of the pump 7 and because they can easily be worked out by those skilled in the art.

Figure 2 shows that the electronic part assembled in section 1, and entirely of low-consumption MOSFET technology, comprises a timer that can be programmed from 10 minutes to 99 minutes. The program can be selected manually by pressing the cylinders 125 and 126 of the blocks 25 and 26 and is passed to the timer 27 by the logic switches 28, 29. When the interval of time that is to lapse between one actuation of the dispenser and the next has been programmed, the block 27 repeats this until the program is changed. At the end of each programmed cycle, the timer 27 produces a pulse which temporarily triggers the two monostables 30, 31, the last of which sends a control signal to the transistor 32 which passes the necessary current through the electromagnet 4 to activate the pump 7 and dispense one dose of product, as already discussed with reference to Figure 1. The monostable 30 sends a control signal to the decoder-driver 33, 34 which shows in the low-consumption display 35, 135 a value representing the time programmed in. After a few hundred milliseconds, the function of 31 terminates and after one minute that of 30 also terminates. If, during the interval between one actuation and the next, it is desired to reprogram the timer 27, the cylinder 36 is pressed and this, via 30, sends a control signal to the display 35, 135 on which the previously selected time is displayed, after which cylinders 125, 126 of blocks 25, 26 are pressed to input the new program. During the operation of the dispenser, a counter formed by the components 37, 38 with their memory unit 39 senses the number of actuations of the electromagnet 4 and when this number approaches a predetermined number

stored in block 39, corresponding to almost complete exhaustion of the product in the canister 6, it illuminates a yellow LED 40 indicating the reserve level and the need to replace the assembly 6, 7 in the near future. After replacing the canister, the user operates cylinder 41 to reset the calculating memory of the counter 37, 38, 39 which can thus monitor the succeeding operating cycles of the dispenser. The numerals 42 and 43 respectively show green- and red- coloured LEDs, which indicate power being supplied to the electronic circuit as a result of the closing of the switch 44 and cyclical activation of the electromagnet 4 as a result of 32 being turned on. Figure 1 indicates, purely by way of an example, a possible mounting in volume 1 of the aforesaid LEDs 40, 42, 43, the two displays 35, 135 and the cylinders 36, 41 and 125, 126.

Finally, it should be understood that the description refers to a preferred embodiment of the invention, which may be varied and modified in many ways, especially from the constructional point of view, without thereby departing from the principle informing the invention as set forth above, as illustrated and as claimed below. The invention also encompasses that variant in which the dispenser is designed to run on mains electricity, for example for use in a room, or to run on batteries, in order to be usable in closed environments. In the following claims, references in brackets have the sole purpose of facilitating the reading of the claims and must in no way therefore be interpreted as restricting the scope of protection of said claims.

Claims

1. A dispenser for dispensing nebulized liquid products, such as deodorants and/or perfumes, disinfecting and/or medicinal products, especially suitable for installing in the passenger compartment of a motor vehicle, characterized by a container (3); a canister (6) in said container (3); said canister (6) containing the liquid product to be dispensed; pump means (7) associated to said canister (6), said pump means (7) comprising a cylinder (107) provided with a nebulizing nozzle (45); a piston (47) slidably mounted in said cylinder (107); said piston (47) being provided with a piston rod (46) connected to said canister (6); spring means (51) in said cylinder (107) for urging said piston (47) in one direction; tubular means connecting said canister (6) to one end of said cylinder (107); non return valve means (50) in said tubular means permitting only the flow of liquid from the canister (6) to said cylinder (107); an outlet port (9) in said container (3) in correspondence of said nozzle (45); an electromagnet (4) provided with a movable core member (19) and a fixed core member (17); means (11, 12, 13) for supporting and securing said electromagnet (4) to said container (3); the said canister (6) being supported at one end by a supporting element (5) carried by the said movable core member (19) of the said electromagnet (4), so that whenever the said electromagnet (4) is energized, the movable core (19) pushes said supporting element (5) and said canister (6) in a first direction in which said pump (7) is actuated so as to dispense a dose of nebulized product through said nozzle (45), whereas when the electromagnet (4) is de-energized, the spring means (51) of the piston (47) of said pump (7) move the piston (47) and the canister (6) back along the suction stroke for the next dose of product and return the movable core (19) of said electromagnet (4) to its rest position; and further comprising electronic control means comprising: means (27) for programming the interval of time that lapses between one actuation of the electromagnet (4) and the next; means for displaying the program selected; means that monitor and store the number of dispensed doses of product, and indicator means associated with said monitoring means which, whenever the number of doses dispensed is such that the liquid in the canister (6) is about to be exhausted, they provide a signal; and means for supplying current to the said electromagnet (4).

2. Dispenser according to Claim 1, in which the axis of said canister (6) is parallel to the longitudinal axis of said container (3) and in which the said canister supporting element is formed by a flanged disc (5) secured to the movable core member (19) of the said electromagnet (4), the axis of said movable core member (19) being in line with the axis of said canister (6), while the said cylinder (107) of the pump means (7) attached at one end to said canister (6) is partly inserted by its opposite end in a seat (8) formed in the said container (3) and having a projection (108) that fits in a complementary recessed part (48) of said end of said cylinder (107) in order to point the latter's nebulizing nozzle (45) towards said outlet port (9) formed in the wall of said container (3).

3. Dispenser according to anyone of the preceding claims, in which the nebulized-product outlet port (9) is connected to the nebulizing nozzle (45) of said cylinder (107) by means of a seal (10) that isolates said nozzle (45) from the

internal volume of the said dispenser container (3).

4. Dispenser according to anyone of the preceding claims, in which the seat (8) in which one end of the cylinder (107) of the canister pump (7) is housed, and the seat (11) in which the body of the said electromagnet (4) is housed and secured to the said container (3) are made integral or preferably in one piece with corresponding walls of the dispenser container (3), the said container (3) being further provided with a door to allow the canister (6) to be replaced when exhausted.

5. Dispenser according to Claim 1, in which the bobin (15) of the said electromagnet (4) is engaged in part by a fixed core (17) and the remaining part may be engaged by said movable core (19), both being of ferromagnetic material; and in which the said movable core carries, integral with itself, a rod (21) that passes with play through an axial hole in the fixed core and that is fixed outside the latter to the said flanged disc (5), made of non magnetic material, on which the body of the canister (6) presses.

6. Dispenser according to Claim 5, in which the opposing inner surfaces of the said fixed core (17) and movable core (19) of the said electromagnet (4) are conical and complementary, one (18) projecting and the other (20) recessed, in order that as a result of the increased polar surface and of the better relative positioning of the conical surfaces (20, 18), when the electromagnet (4) is energized, the magnetic attraction between the two cores (17, 19) is stronger and more progressive.

7. Dispenser according to Claim 5 in which the said movable core (19) of the electromagnet (4) is provided with an axially extending rod (21) which passes through the said fixed core (17), the said rod (21) being formed in one piece with the said movable core (19), the said movable core (19) being further guided axially by a ring (23) of non-magnetic material secured to the base of the outer casing of said electromagnet (4).

8. Dispenser according to Claim 5, in which the play between the said movable core members (19, 21) of the said electromagnet and the associated fixed parts is such as to choke to a suitable degree the outflow of air from the chamber defined by the aforesaid parts, the volume of which chamber decreases during the active stroke of said movable member, in order thereby to retard this stroke to a suitable degree and to ensure that gradualness of actuation of the pump (7) which is necessary for complete nebulization of the product being cyclically dispensed as a result of the energizing of said electromagnet (4).

9. Dispenser according to anyone of the preceding claims, in which the said electronic monitoring and controlling elements comprises:

- a timer (27) having a programming unit (25, 26, 28, 29) operated by means of buttons (125, 126) connected via a decoder-driver (33, 34) to a double display (35, 135) that displays the interval of time after which said timer (27) emits a signal that activates two monostables (30, 31), one (31) of which activates a transistor (32) which energizes the said electromagnet (4) and energizes an appropriately coloured LED (43), while the other (30), which has a button (36) for activation if and when the programmed interval is to be changed, acts on said decoder-driver (33, 34) and activates the display (35, 135) in order to display the programmed time interval, and also acts on a counter (37, 38) with a memory unit (39) that has a reset button (41) and that controls the monitoring of the number of activations of the electromagnet (4) in order, when the canister (6) is at its reserve level, to activate an appropriately coloured LED (40) as a signal of this condition.

10. Dispenser according to claim 9, in which the electronic monitoring and controlling part is made with low-consumption MOSFET technology.

11. Dispenser according to claim 1, in which the said tubular means connecting said canister (6) to one end on said cylinder (107) are are in the form of an axial tubular boring formed through said piston rod (46) and said piston (47).

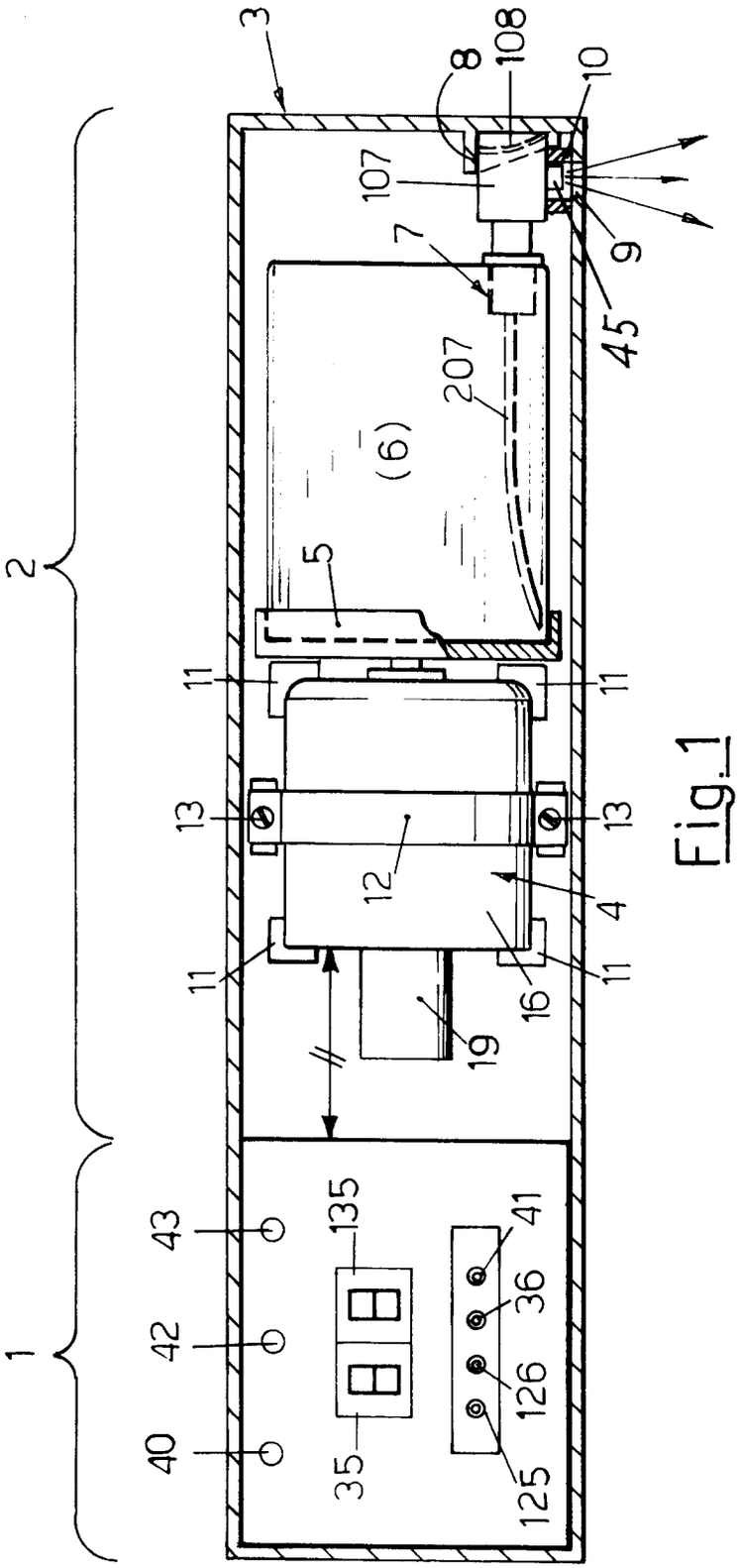
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Fig.1

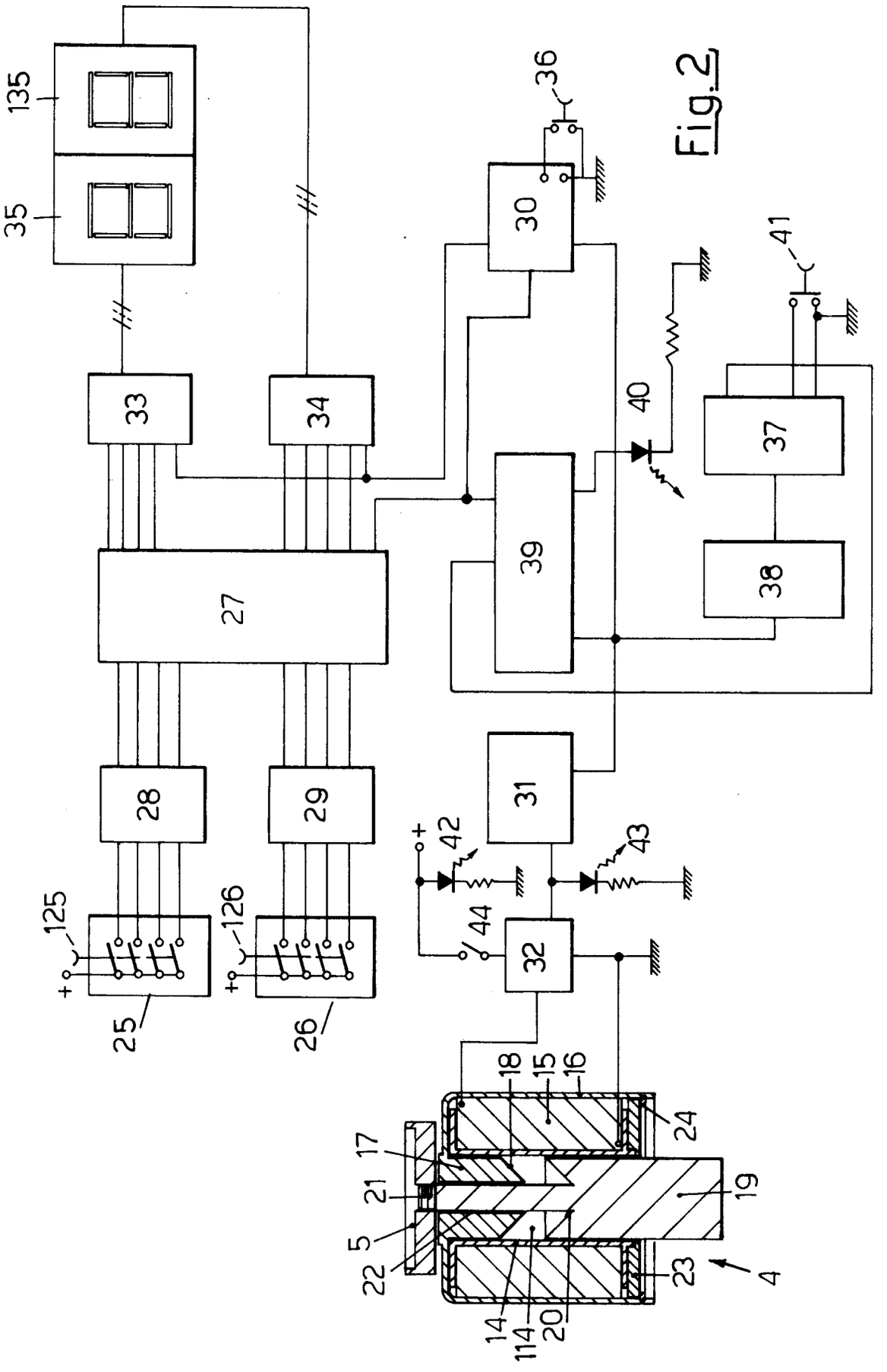
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Fig.2

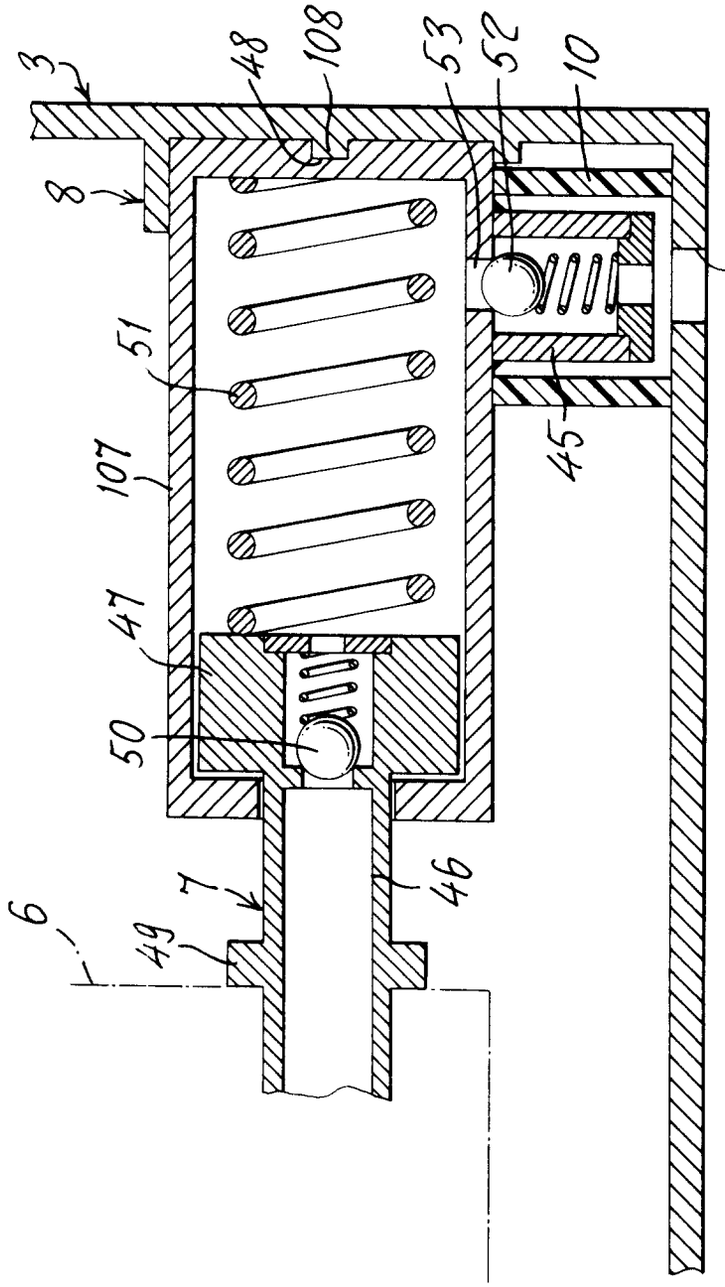

Fig. 3

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EUROPEAN SEARCH REPORT

Application Number
EP 94 11 9894

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.6)
E	WO-A-94 29032 (CONCEPTAIR ANSTALT) * page 8, line 21 - line 26 * * page 12, line 2 * * page 16, line 30 - line 37 * * page 17, paragraph 3; figures 1-7,17-19 * ---	1	B05B11/00 B05B12/08
A	PATENT ABSTRACTS OF JAPAN vol. 13, no. 501 (C-652) 10 November 1989 & JP-A-01 198 562 (OMRON TATEISI ELECTRON CO) 10 August 1989 * abstract * ---	1	
A	EMBALLAGE DIGEST, vol.34, no.374, February 1993, BOULOGNE (FR) pages 10 - 12 HENRI SAPORTA 'UN PROCESSEUR À PARTICULES POUR LE VYP' ---	1	
A	EP-A-0 546 898 (CONCEPTAIR) * abstract; figures 11,22,27,28 * ---	1	TECHNICAL FIELDS SEARCHED (Int.Cl.6) B05B
A	US-A-4 154 375 (BIPPUS) * the whole document * -----	1	

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	29 March 1995	Guastavino, L

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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